The role of parents in children's metacognition and self-regulation during musical learning

J Y CHEUNG

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The role of parents in children's metacognition and self-regulation during musical learning

JO YEE CHEUNG

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Statement of Originality and Length of Thesis

This dissertation is the result of my own work and includes nothing which is the outcome of work done in collaboration except where specifically indicated in the text. This dissertation does not exceed the word limit for the Degree Committee of RNCM Research Department/Manchester Metropolitan University.

Jo Yee Cheung

Date

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Abstract

This thesis comprises two studies which investigated the role of parents in children's metacognition and self-regulation during musical learning. In Study 1, 40 parents took part in an initial questionnaire study exploring trends in parental support given to children during piano practice. This was followed by a second, multi-method study involving 30 child-parent dyads, which combined questionnaires and interviews with systematic analysis of observational data of children's instrumental practice to explore children's metacognitive and self-regulatory processes and parental support across different contexts.

Findings from this thesis indicate a significant increase in children's use of metacognition and self-regulation during practice when supervised by parents, with parental demandingness negatively correlated with children's musical achievement. A further negative correlation was found between children's musical achievement and their ability to verbalise their thinking. Differences in support from parents with and without previous musical experience varied depending on the method of measurement. Although no correlation was found between reported support and parents' previous musical experience, observational measures of parental support were positively associated with parents' previous musical experience. Indeed, comparison of findings from multiple measures indicated complex variations in results produced by different collection methods – raising important questions about what exactly is being measured.

This thesis aims to shed light on the ways in which parents support their children's metacognition and self-regulation during musical learning, and the associations between these behaviours and children's musical achievement. Research into the ways in which parents can mediate these internal behaviours has the potential to reinvigorate the way in which we view musical learning – not as a series of outcomes, but as a continuous process of self-understanding in which parents play a vital role. This research project hopes to make an important contribution to this exciting area of musical and psychological discourse.

CHAPTER 1

Introduction

Metacognition is the awareness, monitoring and control of one's own thinking, and an essential part of being able to manage, plan and evaluate one's own learning (Hallam, 2001). Together with the self-regulation of emotional/motivational aspects of learning (Efklides, 2011; Zimmerman, 1995), these internal behaviours form the basis of essential competencies necessary for children learning to play an instrument and practise effectively outside of lessons. Much of the activity that goes into developing one's musical abilities takes place during instrumental practice sessions (Davidson, Sloboda & Howe, 1996). However, effective practice, which is aimed at and achieves a desired outcome (such as technical fluency), can only be achieved through the use of metacognitive and self-regulatory strategies (Hallam et al., 2012). In the case of novice musicians, such as young children, students may need additional support in order to properly self-regulate their practice outside lessons – most often, from parents.

Parents play an important role in supporting children's metacognitive and self-regulatory development (Grolnick, 2009; Pino-Pasternak & Whitebread, 2010; Valcan, Davis & Pino-Pasternak, 2017). It is unclear whether parents' previous musical experience is associated with their ability to support their children's musical development and their children's subsequent musical achievement (Davison et al., 1996; Gembris & Davidson, 2002; Margiotta, 2011). However, there is evidence to suggest that particular parenting styles may be more likely to encourage the development of children's metacognition and self-regulation than others – namely those rooted in responsive, autonomy-supportive parenting beliefs and behaviours (Evans, 2015; Pino-Pasternak, 2014; Ryan & Deci, 2000). Given the importance of metacognition and self-regulation in musical learning, parental attitudes and behaviours which support these internal behaviours in children may have significant implications for children's musical achievement too.

The motivation for this thesis did not only emerge from analysis of the literature but was also deeply rooted in the researcher's professional experience as a pianist and piano teacher. The link between metacognition, self-regulation and musical learning first became clear to the researcher as a performing musician, during countless hours spent in piano practice rooms. The most rewarding practice involved the use of mindful, deliberate and carefully chosen strategies which gradually improved performance – a process as satisfying as the outcome. Equally large portions of time were spent fruitlessly repeating the same passages of music, with little or no progression. It was during this time that it first became apparent to the researcher that the development of musical expertise, a process often regarded as being mysterious or mercurial, was underpinned by common internal behaviours regulating cognition and motivation – a view supported by a large body of research. Later, as a piano teacher, the researcher frequently encountered parents who were intuitively able to mediate their child's musical learning, in addition to parents who struggled to know how to support their child's practice at home. As these children got older and continued their piano lessons, some developed into highly resourceful and independent young musicians, whilst others clearly struggled to self-regulate their thoughts and emotions whilst playing. In all cases, parents displayed a genuine interest in learning how to improve the quality of their support, although many questioned their ability on the basis of their previous musical experience. These parenting patterns echoed the researcher's own experience of growing up in a loving family of non-musicians, encouraged and supported by Chinese-immigrant parents who were eager to help but unsure of how to do so. These formative personal and professional experiences – in particular, working closely with parents and children over a number of years – strongly influenced the researcher's interest in this area and inspired her investigation of this highly relevant and promising line of research.

The importance of metacognition and self-regulation in learning cannot be overstated. In their study of the relationship between intellectual and metacognitive skills in secondary school students, Veenman and Spaans (2005) found that metacognitive skilfulness outweighed intelligence as a predictor of learning performance. Moreover, many studies have found that students can be taught how to use metacognition and self-regulation, and that such interventions are highly successful at encouraging students' use of these internal strategies (Bathgate, Simsknight & Schunn 2012; White & Frederikson, 2005; Whitebread et al. 2005; Whitebread, Pino-Pasternak & Coltman, 2015). In other words, metacognition and self-regulation are not only teachable, but "may also compensate for students' cognitive limitations" (Veenman et al., 2006, p. 6; see also Schraw, 1998).

It is widely accepted that parental support has a positive effect on musical achievement (Creech, 2009; Creech & Hallam, 2010; Davidson et al., 1996; Margiotta, 2011; McPherson, 2009; McPherson & Davidson, 2002; Zdinski, 2002), and that metacognition and self-regulation play an important role in musical learning (Bathgate et al., 2012; Colombo & Antonietti, 2016; Hallam et al., 2012; Miksza, 2012; Varela, Abrami & Upitis, 2016). However, little has been written on the ways in which parents help to support their children's metacognitive and self-regulatory abilities during instrumental practice at home, and parenting styles associated with children's metacognition and self-regulation in musical learning.

This thesis is formed of two empirical studies and a pilot study, and uses a multi-method approach to examine associations between parental attitudes and support; children's metacognition and self-regulation during piano practice; and children's musical achievement – specifically, in the context of 6-9-year-old children learning to play the piano in the UK. Four overarching research questions are posited:

- RQ1 – What is the nature of parental support in children's musical learning and what is its associations with parents' previous musical experience?
- RQ2 – What are the indicators of children's metacognition and self-regulation in musical learning and what are their associations with musical achievement?

- RQ3 – What are the associations between parental support of children's metacognition and self-regulation, children's metacognition and self-regulation in musical learning and children's musical achievement?
- RQ4 – What are the associations between parenting style beliefs, children's metacognition and self-regulation in musical learning and children's musical achievement?

This thesis is structured into seven chapters, beginning with this introduction. Chapter 2 presents a general overview of the literature on metacognition, self-regulation and parental support in musical learning. In particular, this chapter examines the perceived distinction between cognitive and affective mental processes, as often represented through competing but overlapping theories of metacognition, self-regulation and self-regulated learning. Justification is given for the theoretically-based model of metacognition and self-regulation that was used to guide the analysis reported in this thesis, as well as the rationale for the following studies based on the gaps in the existing literature.

Chapter 3 presents a brief overview of the methodological approach taken in the present thesis, including data analysis methods, concluding with a short summary of ethical considerations for studies involving children and families.

Chapter 4 presents the research questions, methods and results of Study 1. This initial questionnaire study investigated trends in parental support of children's metacognitive behaviours during children's piano practice, and attempted to answer RQ1 – What is the nature of parental support of children's metacognition and self-regulation during piano practice and what are its associations with parents' previous musical experience? This study also investigated the validity and reliability of a questionnaire based on 33 items taken from the Cambridgeshire Independent Learning in the foundation stage (C.Ind.Le) coding scheme (Whitebread et al.,

2009) that was later used as part of the pilot study in Chapter 5 and a multi-method study in Chapter 6. Implications of the results of the questionnaire study for the main data collection are discussed.

Chapter 5 begins by presenting the methodological procedures involved in a pilot observation and interview study in preparation for Study 2, the main multi-method study of this thesis. In particular, adjustments made to the self-report instrument from Chapter 4 and practical considerations for Study 2 are discussed.

Chapter 6 presents the research questions, methods and results of Study 2. This study was underpinned by a quantitative multi-method approach, which combined questionnaires and interviews with systematic analysis of observational data of 30 children practising the piano with and without their parents. The results of Study 2 are based on data collected from questionnaire, interview and observational measures used to assess parental support of children's metacognition and self-regulation, parenting style beliefs, children's metacognition and self-regulation during piano practice, and children's musical achievement. These data were used to investigate RQ2 – what are the indicators of children's metacognition and self-regulation in musical learning and what are their associations with musical achievement?; RQ3 – what are the associations between parental support of children's metacognition and self-regulation, children's metacognition and self-regulation during musical learning and children's musical achievement?; and RQ4 – what are the associations between parenting style, children's metacognition and self-regulation during musical learning, and children's musical achievement?

Chapter 7 presents the final discussion. This chapter summarises the main findings of the two studies reported in this thesis in the context of the existing literature on children's metacognition and self-regulation, parental support, and its impact on musical learning and achievement. As well as discussing key findings and conclusions of these two studies, limitations are acknowledged, and possible solutions proposed. The chapter concludes with a discussion of this thesis' contribution to this field of knowledge and the implications of this work for future research as well as, of course, young musicians and their parents.

CHAPTER 2

Review of the Literature

2.1 Introduction

The aim of this chapter is to review relevant literature on children's metacognition and self-regulation and parental support of children's musical learning that underpins the conceptualisation of this thesis, as well as decisions related to the methodological design of each study and analysis of data.

This chapter is structured into five sections. Following this introduction (section 2.1), section 2.2 introduces the literature on learning to play an instrument, and the role of practice in musical development. Section 2.3 reviews the key literature on metacognition, self-regulation and self-regulated learning. Based on the literature, a theoretical model of metacognition and self-regulation is proposed, based on Whitebread et al.'s (2009) Cambridgeshire Independent Learning in the early years framework (C.Ind.Le). This section concludes with a summary of the extant literature on metacognition and self-regulation in musical development, teaching metacognition and self-regulation, and methodological challenges to reliable assessment. Section 2.4 provides an overview of the relevant research on parental support in relation to parental practices, attitudes and parenting style beliefs, and the role of parents in children's musical learning. Section 2.5 presents the rationale for the present thesis, based on literature reviewed, overarching research questions and an overview of the two empirical studies and pilot study which follow.

2.2 Learning to Play a Musical Instrument

Over the last thirty years, there has been significant interest around the issue of why some children are successful in learning to play a musical instrument, and others are not

(Davidson et al., 1996; Dell et al., 2014; Moore, Burland & Davison, 2003; Pitts, Davidson & McPherson, 2000). The literature paints a complex picture involving the interplay of multiple internal and environmental factors (e.g., motivation, practice strategies, environment and personality) which are often difficult to separate and quantify (Pitts et al., 2000). Regardless, Pitts et al., argue that "a stable, supportive home environment is essential if [children's musical learning] is to flourish" (2000, p. 64). Additionally, developing expertise involves the accumulation of deliberate practice – "a regimen of effortful activities […] designed to optimize improvement". (Ericsson, Krampe & Tesch-Römer, 1993, p. 363).

A great deal has been written on the role of practice in musical development (Hallam et al., 2018; López-Íñguez & Pozo, 2016; McPherson, Osborne, Evans & Miksza, 2017; McPherson & Davison, 2002; Miksza, 2007; Pike, 2017; Sloboda et al., 1996), in particular, the role of deliberate practice in the acquisition of expert musical skill (Bonneville-Roussy & Bouffard, 2015; Ericsson et al. 1993; Macnamara, Hambrick & Oswald, 2018; Mornell, Osborne & McPherson, 2018). There is widespread agreement across the music education literature that practice plays a key role in the development of musical expertise. Unlike teacher-led classroom learning or facility-based sports coaching, the majority of instrumental learning takes place during practice sessions between music lessons. Unsurprisingly, how much practice is undertaken by students on a regular basis, and the quality of these practice sessions, have important implications for students' progress.

2.2.1 The Role of Practice in Children's Musical Development

Developing expertise takes practice. Research conducted with 3,325 young people aged 6-19 suggests that learners at the highest level of expertise undertake over twice as much daily practice as beginners, withstanding large variations in the amount of practice reported at every level of expertise (Hallam et al., 2012). Similarly, in their study of 257 young musicians at a specialist music school, Sloboda et al. (1996) found that the highest achievers in the group were those who practiced the most overall and for the longest during each practice session. Importantly, Sloboda et al.'s (1996) study suggests that, regardless of group membership (high, moderate and low achievers, as indicated by music examination grades), it took on average 3,300 hours of practice to achieve the highest grade-level (Grade 8), as measured through Associated Board of the Royal Schools of Music (ABRSM) examinations. This result is echoed by Ericsson and colleagues (1993), who famously argued that it takes approximately 10,000 hours of practice to develop expertise regardless of discipline (e.g., science, literature, sport or music). Ericsson et al.'s study of musicians in particular found that the amount of practice accumulated by expert pianists was roughly 10 times that of amateurs in the same sample – a finding used to support their argument that the amount of time spent engaged in deliberate practice is monotonically related to an individual's level of performance expertise. More recently, Hallam (2011) explored possible predictors of expertise, quality of performance and future musical aspirations of young musicians aged 7-17. Hallam's study found that the length of time spent learning was the strongest predictor of level of expertise, with "weekly practice and what is undertaken during that practice used to making important contributions" (Hallam, 2011, p. 286). Taken together, these studies offer convincing evidence that developing expertise requires a significant commitment of time.

However, opinions differ on the importance of practice on musical learning relative to other factors. In his re-examination of findings by Sloboda & Howe (1991), Gagné (1999) argues that the large differences in musical ability between exceptional and average students are more readily explained by individual differences, or *musical giftedness*, than environmental variables such as practice. In their (1991) pilot study (which formed part of the preparatory work for Davidson et al., 1996; and Sloboda et al., 1996), Sloboda & Howe found that exceptional children "were not doing heroically large amounts of daily practice prior to coming to Chetham's [School of Music]" (p. 17). The same children practised up to a third less than average students once they entered the school, whilst at the same appearing to make twice as much progress. Gagné (1999) argues that the negative relationship between practice and achievement in these young musicians supports "individual differences in musical aptitudes as a significant explanatory factor of musical talent" (p. 50) – a position that Sloboda & Howe (1999) have rejected given the limited available evidence from the pilot (Sloboda & Howe, 1991) compared with later studies (i.e., Sloboda et al., 1996). Recent investigations by Mosing, Madison, Pedersen, Kuja-Halkola and Ullén (2014) have also challenged the familiar adage that "practice makes perfect". Their study of 10,500 monozygotic (identical) twins found that associations between music practice and musical ability (measured through pitch discrimination) were predominantly genetic. Interestingly, researchers found no difference in musical ability between twins who undertook differing amounts of practice, even after genetic disposition was controlled for. It is worth noting that Mosing et al.'s measure of musical ability was exclusively limited to pitch discrimination, rather than performance ability. Moreover, music practice was calculated based on the number of years participants had practiced during four age intervals (ages 0–5; 6–11; 12–17; and 18 years until present) and how many hours a week they reported practicing during these four intervals. Importantly, the quality of these practice sessions or the activities undertaken during them were not controlled for.

It is beyond the scope of this study to address ongoing debates around the influence of nature and nurture on musical talent, much less to argue a theoretical position. However, one possible explanation for the weak relationships between practice and expertise found in some studies (e.g., Mosing et al., 2014; Sloboda & Howe, 1991) may concern the quality of the practice undertaken – in particular, the use of metacognitive and self-regulatory strategies to support improvement and the significant levels of support required from parents in order for children to perform these executive functions.

2.2.2 Measuring Musical Achievement

> How does [belief in innate musical ability] square with the fact that there are singers who cannot read music, pianists who cannot sing in tune, performers who cannot compose and music critics who can neither play an instrument nor compose? Do all such people possess some common attribute in virtue of which they can be said to be musically able?
>
> Sloboda, 1993, p. 106

Sloboda's observation highlights the difficulty of attempting to identify a common set of factors underlying all musical ability, and how to measure them. Broadly speaking, Sloboda defines musical ability as "the ability to 'make sense' of music" (1993, p. 106). This ability, Sloboda surmises, develops naturally over the first 10 years of most peoples' lives through normal enculturation, but can also reach high levels through sustained musical engagement, usually as a result of learning a musical instrument (Sloboda, 1993).

The most widely used measures of musical ability typically involve assessments of aural perception (pitch and rhythm discrimination). Probably the most well-known of these instruments is the "Seashore Measure of Musical Talent" (SSMT) – a battery of controlled tests which measure respondents' ability to identify and discriminate between changes in pitch, loudness, tempo, timbre and rhythm (Seashore, 1919). Other widely used musical ability tests include "Measures of Musical Abilities" (Bentley, 1966), "Musical Aptitude Profile" (Gordon, 1967), "Advanced Measures of Music Audiation" (Gordon, 1989) and "Profile of Music Perception Skills" tests (Law & Zentner, 2012).

Of the instruments listed above, arguably only the last two are suitably named to reflect what they are actually measuring – namely music audiation or perception, a skill which is not much dependent on musical training (Karma, 2007; Mosing, et al., 2014). Moreover, the conflation of terms like musical *aptitude* and *ability* with aural perception has led to less easily measured indicators of musical achievement (such as performance ability) being overlooked in assessments of musical skill.

As discussed in section 2.2.1, Mosing et al. (2014) have contested Ericsson et al.'s (1993) assertion that expert performance largely reflects the amount of deliberate practice that has been engaged in. Of the 10,400 identical twins that took part in musical ability tests as part of the study, around 80% of women and 62% of men reported having played an instrument at some point in their life. Mosing et al. (2014) found no causal relationship between the frequency of participants' practice and participants' level of musical ability – namely, their capacity to discriminate musical sounds. Although this finding was used as evidence that "practice does not make perfect" (the title of Mosing et al.'s paper) it is worth pointing out at this stage, that measuring aural perception skills is not the same as assessing "expert musical performance" – nor does being excellent at aural discrimination always result in expert performance skills. Although historically, a large number of outstanding musicians have reported possessing absolute pitch (Sosniak, 1987), it does not hold that all individuals with perfect pitch will necessarily become expert performers – in the same way that being unusually tall does not destine someone to become an elite basketball player. More importantly, to refer to an earlier point by Sloboda (1993) – "what about the pianists that cannot sing in tune?" (p. 106). Although many studies have used assessments of live performances/examinations as a measure of musical ability (Bathgate, 2012; Hallam, 2012; Sloboda et al., 1996), an arguably more valuable measure of musical achievement would test elements of both performance and perception, in the context of specific musical activities (e.g., practising playing a piece of music).

It is not possible within the limited scope of this thesis to engage in the continuing debate around the impact of individual differences on musical talent (see Ericsson et al., 1993; Gagné, 1999; Sloboda & Howe, 1991). However, given that this thesis is primarily concerned with environmental influences on children's musical learning (namely the role of parents), the term musical *achievement* has deliberately been adopted instead of ability. Consequently, in Study 2, judgments of children's musical achievement were based on their level of competency and accomplishment in different areas of piano performance (e.g., pitch, time, tone and shape), rather than their aural ability to discriminate different rhythms and pitch. For a detailed account of the instrument used and its design, see section 6.2.10.

2.3 Metacognition, Self-Regulation and Self-Regulated Learning: What's the Difference?

In their systematic review of the literature on measurement tools used to assess metacognition in children aged 4-16, Gascoine, Higgins and Wall (2016) note the complexity of trying to define metacognition and the "fuzziness" of its successive conceptualisations since the term was first coined in the 1970s (p. 6). Gascoine et al.'s (2016) review of the literature is the most recent of its kind and, like others, has attempted to untangle the various debates surrounding metacognition's multifarious definitions – particularly its overlap with other related concepts such as self-regulation, self-regulated learning and executive function (see also Dinsmore, Alexander & Loughlin, 2008; Varela et al., 2016; Veenman et al. 2006). The pervasive lack of clarity across the psychological literature about the difference between these various theoretical constructs is a common criticism and concern for researchers (Dinsmore et al., 2008). In comparison with theoretical models of self-regulation and self-regulated learning, which vary enormously across studies and consequently demand a greater level of explication from their individual architects, a universal definition of metacognition is often taken for granted (Dinsmore et al., 2008). This assumption has led to metacognition becoming increasingly ill-defined and created considerable ambiguity around the construct's characteristics and theoretical parameters. In their meta-analysis of the literature on metacognition, self-regulation and self-regulated learning, Dinsmore et al. (2008) found that only 49% of target terms were specifically explicated by researchers, with 51% of constructs implicitly defined through allusion to key references. Of the three, explicit definitions were more frequent in the literature on self-regulation and self-regulated learning than in the metacognition literature (Dinsmore et al., 2008). Gascoine et al., (2016) note that in the fields of educational psychology and music education self-regulation and self-regulated learning are more often adopted than executive function and executive control, which are more widely used in developmental psychology, despite covering much of the same ground and being used interchangeably. This seemingly unstructured approach to the ways in which these different constructs are applied across disciplines has led to widespread misunderstanding about the theoretical foundations and boundaries between metacognition, self-regulation and self-regulated learning, as well as related concepts such as executive function and control. This section provides an overview of the more prominent debates around metacognition, in particular its relationship with self-regulation and self-regulated learning, with a view to outlining the justifications for the theoretical model and operationalisation of metacognition used in this thesis.

2.3.1 Metacognition

The term metacognition was first coined by developmental psychologist and Piagetian scholar, John Flavell, in his studies of children's metacognitive monitoring in the 1970s (Whitebread & Neale, 2020). Flavell defined metacognition as "referring to one's own knowledge concerning one's own cognitive processes" (1976, p. 323). Importantly, metacognition (unlike cognition), does not have direct access to behaviour and can only influence behaviour through its awareness and regulation of cognition; and planning, monitoring and evaluation of mental activity (Efklides, 2009). Flavell's original definition operationalised metacognition into four key areas – metacognitive knowledge, metacognitive experience, goals, and the activation of strategies (Flavell, 1979). By the 1980s, Flavell's conceptualisation had been diversified and expanded upon by individuals such as Baker and Brown (1984) and Nelson et al. (1992) to include other (meta)cognitive mechanisms – in particular, strategic control processes such as planning, checking task outcome, monitoring effectiveness and evaluating strategies.

Veenman et al. (2006) suggest that most contemporary models of metacognition comprise two key dimensions – "metacognitive knowledge" and "metacognitive skills" (p. 4). Theoretical frameworks also popularly divide metacognition into "knowledge of cognition" and "regulation of cognition" (Gascoine et al., 2016, p. 4), although the two types of classification are clearly related. Metacognitive knowledge is commonly subdivided into further subcategories, typically either "person, task and strategy" or "declarative, procedural and conditional" (see Neuenhaus et al., 2011). Efklides (2008) describes metacognitive knowledge as "declarative knowledge", information that a learner knows about a task or persons, including themselves (p. 278). Metacognitive skill (i.e., regulation of cognition) on the other hand is "procedural information" and refers to the "deliberate use of strategies […] to control cognition" (Efklides, 2008, p. 282). Some conceptual models, including Flavell's (1976), also encompass a third category – "metacognitive experience" (Efklides, 2001, 2008). Metacognitive experiences include "ideas, feelings, judgments and metacognitive knowledge evoked during problem solving" (Efklides 2002, p. 20) and can be defined as "what the person is aware of and what she or he feels when coming across a task and processing the information related to it" (Efklides, 2008, p. 279). Possession of metacognitive knowledge does not always guarantee effective regulation of learning behaviour (Veenman, Bavelaar, De Wolf & Haaren, 2014). Lack of motivation, for instance, may inhibit a learner from applying the prerequisite metacognitive knowledge to completing a task. Metacognitive experiences therefore play an important role in understanding the relationship between cognitive processes and affective aspects of learning such as feelings (of familiarity, difficulty, confidence and satisfaction), motivation and attitudes (Efklides, 2009) – an issue which is discussed in greater detail in section 2.3.3.

There is no single theoretical model of metacognition which dominates the literature. It is also not unusual for researchers to develop new categories and subcategories within existing frameworks – adding to the ever-increasing complexity of an already complicated and multifarious construct. Gascoine et al. (2016) note that ten years after he first coined the term, even Flavell was not confident he could clearly define metacognition, writing in 1987 that "none of us has yet come up with deeply insightful, detailed proposals about what metacognition is" (Flavell, 1987, p. 28). Over thirty years on, it seems that researchers are no closer to agreeing on consistent definition of metacognition. It is beyond the scope of this thesis to comprehensively list and untangle the countless metacognitive frameworks in the literature. However, the conceptual ambiguity within research into metacognition means that it is of paramount important that researchers are able to explicate differences between definitions of metacognition from self-regulation and self-regulated learning, and clearly articulate the theoretical parameters of the specific metacognitive model they are using in the context of their own research (Dinsmore, 2008) – as attempted here.

2.3.2 Self-Regulation and Self-Regulated Learning

In parallel with Flavell's work on metacognition, social cognitivists, such as Bandura (1982), began to develop an alternative model of learning called self-regulation. Compared with the internal, cognitive orientation of metacognition, Dinsmore et al., (2008) suggest that self-regulation models focus on the environment's role in stimulating self-awareness and cognitive response (rather than an individual's mind) and initiating subsequent behaviour – as in the Vygotskian psychological tradition. Additionally, models of self-regulation are characterised by the prioritising of behavioural and emotional regulation, particularly the ability to inhibit impulsive behaviour and remain attentive, over cognitive control (Zimmerman, 1995). In his seminal article, "Self-Regulation Involves More Than Metacognition: A Social Cognitive Perspective", Zimmerman argues that possession of metacognition alone does not instil learners with the ability to self-regulate existing metacognitive knowledge and skill (1995). Self-regulation, Zimmerman posits, is therefore "more than metacognition" in that it also involves motivational aspects of learning, such as students' "underlying sense of self-efficacy and personal agency" (p. 220). What is interesting about this explanation is that Zimmerman's definition of self-regulation, rather than being separate from metacognition, includes it. Indeed, in contrast to models which tend to focus on either cognitive or socioemotional/motivational aspects of learning, some researchers have operationalised self-regulation more broadly to describe both *cognitive* and *prosocial* elements of (children's) goal-directed learning (Bryce & Whitebread, 2012). In their chapter on self-regulation in early childhood, Pino-Pasternak, Valcan & Malpique (2019) adopt Byrce and Whitebread's (2012) model of self-regulation in order to explore how "metacognitive and motivational processes" (cognitive regulation) and "children's ability to modulate [their] own emotions, recognise the emotions of others, collaborate and negotiate effectively with others" (prosocial regulation) are related to children's early school success (p. 488). In short, although models of self-regulation generally tend to focus on social and affective aspects of learning, there is considerable overlap between both metacognition and self-regulation, with the latter construct often including aspects of both.

The increased focus on self-regulation by social cognitivist researchers during the 1980s led to the emergence of a new term, self-regulated learning, which rose to prominence in educational literature in the 1990s (see Paris & Paris 2001; Winne, 2010; Schunk & Zimmerman 1997; Zimmerman, 1989, 1995). In contrast to metacognition, self-regulated learning is much wider in its theoretical scope, combining elements of both metacognition and self-regulation theories to include a mixture of cognitive and affective processes within its models of learning. Self-regulated learning constructs also tend to consist of cyclical stages, rather than categories of behaviours, with different numbers of stages for different models of self-regulated learning. In contrast to metacognitive frameworks, models of self-regulated learning tend to be less granular in their description of specific cognitive behaviours, focusing instead on broader psychological processes (e.g., self-efficacy or intrinsic motivation) contained within more general phases of learning. Zimmerman's (2000) model of self-regulated learning, for instance, consists of three main stages – forethought, performance and self-reflection – with a mixture of both cognitive and affective processes included as part of each stage. Pintrich (2004) and Winne & Hadwin's (1998) self-regulated learning models both consist of four main phases. The former's model consists of forethought, monitoring, control and reflection, with a particular focus on motivation, self-efficacy and goal orientation (Pintrich, 2004). Winne and Hadwin's model postulates task definition, setting learning goals and plans, enactment of learning strategies and adapting as the four main stages of self-regulated learning, with learners returning to earlier phases in the process in order to improve the outcome of later stages. Unlike Zimmerman (2000) and Pintrich's (2004) models, Winne and Hadwin's framework focuses on the specific cognitive processes (e.g., memory operations), rather than social-cognitive influences. Although Zimmerman (2000), Pintrich (2004) and Winne and Hadwin (1998) are arguably the most influential models of self-regulated learning (Rovers, Clarebout, Savelberg, Bruin & Merriënboer, 2019), numerous self-regulated learning frameworks exist in the literature – each with their own number of phases, sub-processes and particular cognitive or socio-environmental focus, depending on the context in which they are being applied. As previously discussed, self-regulation and self-regulated learning models are particularly popular in the music education literature (see Leon-Guerrero, 2008; McPherson et al. 2019; Miksza, 2012; Nielsen, 2001; Pike, 2017; and Varela et al. 2016). Significantly fewer have applied metacognitive frameworks to studying musical learning (e.g., Bathgate et al., 2012; Colombo & Antonietti, 2016; Hallam, 2001). However, as in the education literature, the terms metacognition, self-regulation and self-regulated learning are often poorly defined in music studies, with all three terms used interchangeably.

One of the most contentious (and unresolved) debates surrounding metacognition and its intersection with self-regulation and self-regulated learning, is the issue of which is superordinate – is metacognition a facet of self-regulation and self-regulated learning, or are self-regulation and self-regulated learning facets of metacognition (Veenman et al., 2006)? As discussed, social cognitivists would argue that a highly metacognitive learner may still fail to self-regulate their behaviour and/or complete a task as a result of lack of motivation or self-efficacy (Zimmerman, 1995). However, the development of metacognition may also result in feelings of competence and empowerment in a learner – both of which may positively affect motivational orientation (Larkin, 2010). Additionally, some researchers argue that whilst self-regulation and self-regulated learning are popularly regarded in the literature as the "overarching" concepts, it is actually metacognition which "enables" models of both self-regulation and self-regulated learning in the first place (Gascoine, 2016, p. 4). Ultimately, Gascoine et al. (2016) question the wisdom of attempting to explore the intersections between metacognition, self-regulation and self-regulated learning through a hierarchical approach. The root of the issue, which is nonetheless worth exploring, can be traced back to the perceived divide between the roles of cognition (i.e., metacognition) and affect (i.e., self-regulation) in the learning process, processes often seen as occupying separate spheres of mental processing (Efklides, 2009).

2.3.3 Cognition and Affect

In the past, the conceptual divide between cognitive and affective processes in learning was often reflected in the view of metacognition as dealing with purely cognitive phenomena, and self-regulation/self-regulated learning as being more concerned with socioemotional influences on learning (e.g., motivation and self-efficacy). Karreman et al. (2006) suggest that the reason that cognitive and affective learning processes are generally studied separately is because the former relates to effort control, whereas the latter is more impulsive and concerns management of arousal and irritability. More recently, however, researchers have begun to look for integrated approaches to understanding the relationship between cognition and affect in the context of learning.

Efklides (2001, 2008, 2011, 2014) in particular, has written extensively on the role of affect (i.e., emotion) in effective metacognition. Efklides' work focuses mainly on the importance of metacognitive experience and its use of both the affective and cognitive regulatory loops. Unlike metacognitive knowledge and metacognitive skill, metacognitive experience can be affectively charged (Efklides, 2006). Efklides argues that metacognitive experiences are the result of task monitoring and can include feelings of knowing/doubt, feelings of competence/difficulty and feelings of confidence/under-confidence. These feelings can directly affect estimates of effort/time expenditure and judgments of learning, in turn affecting learner's ability to self-regulate effectively (Efklides 2006). In their study on the effect of mood on students' metacognitive experiences, Eflkides and Petkaki (2005) found that positive mood predicted interest and feeling of liking a task while simultaneously lowering estimates of effort and time needed to accomplish a task. Positive mood was also found to support future engagement with activity and counteract the effect of negative mood on feeling of difficulty (Efklides & Petkaki, 2005). In short, positive and negative affect, through their interaction with metacognitive experiences, have direct consequences for cognitive regulation during a task as well as on emotions that may endorse future engagement with the same activity.

The role of emotion in metacognition, through metacognitive experiences, goes some way in helping to explain why learners who appear to have considerable metacognitive knowledge or metacognitive skills may still fail to control their behaviour (e.g., performance anxiety), a phenomenon particularly relevant for performing musicians. Efklides (2009) argues that motivation induced by metacognitive experience may help to activate extant metacognitive knowledge and metacognitive skill. Consequently, the absence of such motivation may fail to induce the necessary activation of metacognitive knowledge/skill to allow a learner to control their behaviour (Efklides, 2009). Additionally, Zimmerman (1989) notes the importance of long-term goalsetting in the process of metacognitive and self-regulatory decision-making, giving the example of a child who is badly made fun of in band rehearsal for their poor performance. This child will only take on a self-instructive approach and motivate him or herself to try harder if he/she has a long-term goal they are working towards, such as being a professional musician. Without a long-term goal, the child is likely to become overly discouraged by the negative experience of being criticized in band rehearsal and is unlikely to motivate themselves to believe that the endeavour is worth continuing (Zimmerman, 1989).

The incorporation of affective states into models of metacognition and self-regulation is also seen in Whitebread et al.'s (2009) "Cambridgeshire Independent Learning in the Foundation

Stage Coding Framework" (C.Ind.Le) – the coding scheme used as the basis of the questionnaires and observational studies administered as part of the following studies (see section 4.1.7). In C.Ind.Le, "emotional and motivational monitoring" and "emotional and motivational regulation" are described as the awareness and expression of "positive or negative emotional experience of a task" (2009, p. 80). Gascoine and colleagues note that Whitebread et al.'s descriptions of "emotional and motivational monitoring" strongly resemble "feelings of difficulty/familiarity" that are generally described as metacognitive experiences (2016, p. 6). Furthermore, Whitebread et al. argue that use of the both metacognition and self-regulation in C.Ind.Le "recognise[s] those parts of our model of self-regulation which draws heavily upon the cognitive tradition", with "metacognition forming the cognitive parts of self-regulation, which also encompasses affective, motivational and social elements" (p. 64).

It is worth pointing out that not all metacognitive behaviour is positive for learning and that some behaviours may even have a negative impact. Too much negative self-evaluation, for instance, has been found to lead to learned helplessness, with individuals no longer trying to overcome obstacles because of the expectation that their efforts will be futile (Miller & Seligman, 1975). In the context of musical performance (an activity which to a large extent arguably relies on "letting go" on stage), while an appropriate level of metacognition may help to regulate performance anxiety, a surfeit could potentially make it worse (Kenny & Osborne, 2006). Additionally, metacognitive strategies may also be used to deliberately avoid goals, cheat or fabricate excuses in cases where learners do not enjoy the activity they are engaged in (Paris & Paris, 2001). The occurrence of such situations highlights the importance of awareness and control of emotion and motivation during learning. Clearly, any assessment tool aimed at meaningfully investigating the internal learning process must be able to account for the presence of both (meta)cognitive and affective behavioural processes – as outlined in the following theoretical model of metacognition and self-regulation, which is applied in this thesis.

2.3.4 Theoretical Model of Metacognition and Self-Regulation

Kaplan (2008) advocates the creation of a "multidimensional conceptual space of self-regulated action [which] requires researchers to define their particular theoretical and practical conceptualisation on a meaningful set of characteristics" (p. 480). This thesis takes as its foundation the belief that the ability to learn independently hinges on being able to regulate both cognitive and affective internal processes. The explicit awareness and control of these internal behaviours are particularly beneficial for children learning to play a musical instrument (Bathgate et al., 2012; Miksza, 2012). Taken together, metacognition and self-regulation present researchers with a theoretical lens through which to examine and investigate specific aspects of both cognitive and socioemotional areas of independent learning. However, as Gascoine et al. (2016) highlight, it is inherently risky to attempt to establish whether metacognition is an aspect of self-regulation or if self-regulation is a facet of metacognition based on the highly divisive extant literature – particularly given their distinct theoretical leanings. Consequently, rather than trying to subsume one construct within the other, in the present study, the term metacognition is used to identify cognitive internal behaviours (such as planning, monitoring and evaluation) used by learners to self-regulate their learning. The term self-regulation is used to refer affective behaviours, namely the awareness and control of emotion and motivation during learning.

It should be noted that the term self-regulation is not typically used to refer to affective behaviours exclusively, and that models of self-regulation generally include both cognitive and affective processes. However, as the cognitive elements of self-regulation are often poorly defined (often in the context of vague cyclical phases rather than explicated into particular behaviours), the use of metacognitive models was considered preferable for investigating specific cognitive behaviours. Moreover, given that self-regulation (unlike metacognition), also encompasses affective behaviours, self-regulation is used as shorthand for emotional/motivational aspects of learning, in the context of this thesis – as conceptualised in the C.In.Le coding scheme (Whitebread, et al., 2009).

As discussed, Whitebread et al.'s (2009) C.Ind.Le coding scheme includes both cognitive and affective categories of behaviours. Consequently, C.Ind.Le was deemed a highly suitable instrument for observing and assessing young children's metacognition and self-regulation in the following studies. Moreover, the instrument's explication of (33) specific behaviours, rather than a series of loose cyclical stages (as in self-regulated learning models such as Zimmerman, 2000) was considered highly practical for analysing children's behaviours during instrumental practice in detail. Table 1 describes the main categories and subcategories of metacognitive and self-regulatory behaviour contained within C.Ind.Le. A more detailed overview of the instrument, it's design and a complete list of items can be found in section 4.1.7.

Table 1
Theoretical model of metacognition and self-regulation, based on categories taken from C.Ind.Le (Whitebread et al., 2009)

Metacognitive Knowledge	**Metacognitive Regulation**	**Self-Regulation (Emotional/Motivational Regulation)**
Knowledge of Person Knowledge of Task Knowledge of Strategies	Planning Monitoring Control Evaluation	Emotional/Motivational Monitoring (i.e., Knowledge of emotion/motivation) Emotional/Motivational Control (i.e., Regulation of emotion/motivation)

As described above, metacognition was operationalised into two main components – *metacognitive knowledge* and *metacognitive regulation* (or skills). The former refers to a learner's knowledge about their own cognition, including Knowledge of Person (e.g., awareness of one's own strengths and weaknesses in relation to a task), Knowledge of Task (e.g., similarities and differences between different tasks, and what is needed in order to complete them) and Knowledge of Strategies (e.g., being able to define or explain different procedures involved in task) (Whitebread, et al., 2009). Metacognitive regulation refers to the regulation of cognition as a result of existing metacognitive knowledge, and may include behaviours related to Planning (e.g., setting goals), Monitoring (e.g., keeping a record of progress), Control (e.g., changing approach or strategy when something isn't working) and Evaluation (e.g., reviewing task progress) behaviours.

In addition to metacognitive knowledge and metacognitive regulation items, two self-regulatory (affective) constructs were also examined as part of this thesis (as in Whitebread et al., 2009) – namely, Emotional/Motivational Monitoring (i.e., awareness of one's emotions or level of motivation during a task) and Emotional/Motivational Control (i.e., regulating one's emotions or level of motivation during a task). As with the metacognitive items, these self-regulatory items are broadly separated into *knowledge* (i.e., monitoring) of emotion/motivation and *regulation* (i.e., control) of emotion/motivation.

To summarise, effective musical learning requires the use of both metacognitive (cognitive) and self-regulatory emotional/motivational) behaviours to support practice. However, there remains considerable overlap between some metacognitive and self-regulatory constructs – for instance, the metacognitive components of self-regulation (Zimmerman, 1995) and affective nature of metacognitive experiences (Efklides, 2008). To avoid confusion, both cognitive (metacognitive) and affective (self-regulatory) behaviours were investigated in the following studies using the integrated model of metacognition and self-regulation, developed by Whitebread et al. (2009) and adapted for the present thesis.

Having discussed the literature on metacognition, self-regulation and self-regulated learning, and operationalised the theoretical construct used in this thesis, the following section contextualises the role of metacognition and self-regulation in the context of musical learning, followed by an overview of the literature on parental support and the role of parents in supporting children's musical learning.

2.3.5 Metacognition and Self-Regulation in Musical Learning

Musical development is an area of music psychology which investigates how learners acquire and develop musical ability. Studies of musical development exist on a wide range of topics relating to children and adults of various ages and abilities. These include school-aged children (Davidson et al., 1996; Hallam, 2013; McPherson et al., 2015; Pitts et al., 2000), conservatoire students (Tânia, Williamon & Zicari., 2005; Valenzuela, Codina & Pestana, 2018), professional musicians (Altenmüller & Ioannou, 2015; Sosniak, 1985) and even child prodigies (Feldman, 1993; Howe & Sloboda, 1998; Lehmann, Ericsson & Hetzer, 2002). Much of this literature is focused on practice strategies used by musicians during musical learning (see Hallam, 2012; Hallam et al., 2017; McPherson & Renwick, 2001; Mornell et al., 2018; McPherson et al., 2019; Pike, 2017; Sloboda et al., 1996). As mentioned, a small number of studies have applied metacognitive models to studying instrumental music practice specifically (Bathgate & Sims-Knight, 2012; Colombo & Antonietti, 2016; Hallam, 2001; Hart, 2014) and these will be discussed shortly. A far greater number have used self-regulation and self-regulated learning frameworks (see Varela et al. 2016 for a systematic review of the literature on self-regulation and musical learning).

The effectiveness of applying metacognitive and self-regulatory strategies to musical learning is widely acknowledged within the extant music psychology research. Hart (2014) suggests that "at its core, and in the context of enhancing students' practice, metacognition entails students' planning for, developing, tracking, reflecting on, and changing their practice habits to effect the best performance improvement" (p. 58). In their study of young musician's practice and musical achievement, Sloboda et al. (1996) found a strong positive relationship between "formal task-oriented practice" and achievement in musical performance (p. 306). In terms of specific practice habits, the highest achievers in Sloboda et al.'s (1996) study tended to focus their practice in the morning to a greater extent than other groups and to demonstrate more day-to-day stability in their practising routine than low achievers – a result that echoes similar findings by Ericsson et al. (1993).

Similarly, in Hallam's (2012) study of practice strategies used by amateur and professional musicians, learners with higher levels of expertise utilised the most effective practising methods, making more use of the metronome and recordings, amongst other strategies, to enhance their practice. Hallam (2012) suggests that this kind of practice requires "considerable metacognitive skill" in order for learners to know what strategies will be most effective (p. 653). Similarly, in a study conducted by Sullivan and Cantewell (1999), musicians of varying levels of ability were asked to read lines of music in traditionally and graphically notated scores. Whilst reading the lines of music, a computer recorded how many times it took each participant to read each line. Sullivan and Cantwell (1999) found that, regardless of musical ability, participants who used metacognitive strategies (such as "scanning", "patterning" and "chunking") needed fewer repetitions to learn and memorise the music they had been given (p. 263). There is some evidence to suggest that the relationship between musical learning on the one hand and metacognition and self-regulation on the other is bidirectional. In their study of the impact of instrumental music learning on academic attainment in students aged 11-16, Hallam and Rogers (2016) found that young people who played instruments showed greater academic outcomes than those who didn't, with the greatest effect for those who had been learning the longest. One possible reason for these students' better performance, as speculated by the authors, is that students who played musical instruments had greater experience of metacognition and self-regulation, which they transferred to academic tasks – a finding with important implications for both academic and music education.

One of the key obstacles to young musicians' instrumental learning is what Mornell et al. (2018) describe as "habitual mindless practice" (p. 131). In their study of the self-regulated learning of fourteen staff, alumni and current students enrolled in music degree programs at a prominent European music school, Mornell and colleagues found that participating musicians lacked appropriate self-regulated learning strategies, demonstrated vague intentions and inefficient use of time in their practice, despite years of expert training. Participants were unable to identify when they were learning (i.e., experiencing an increase in competence), even when they were making progress. The risk of this widespread lack of self-awareness is that this kind of music practice is likely to leave students feeling frustrated or demotivated, regardless of positive or negative outcome. Additionally, bad practice habits, such as excessive mindless practice, have been linked to mental health problems in musicians, as well serious music-related physical injuries (Parry, 2004; Williamon & Thompson, 2006) – further evidence of the growing need for interventions which promote mindful practice behaviours. Similar results have been encountered by McPherson et al. (2019), who adopted a microanalytical approach to studying the self-regulated learning of two first-year Bachelor of Music students' piano practice over the course of a semester. Both students demonstrated "reactive learning styles", "vague goals" and "habitual strategy use" despite being at a relatively advanced level of musical training (McPherson et al., 2019, p. 29). However, both participants were highly receptive to self-reflection questions and the broader self-regulated learning framework, indicating that, even if music students are currently unaware of mental strategies that may help to optimise their practice, they can certainly be taught to use them.

2.3.6 Teaching Metacognition and Self-Regulation

It is clear from the extant research literature that learners in a range of disciplines can be trained to use metacognitive and self-regulatory strategies as part of their practice – and with great success. Ericsson et al. (1993) posit that "to assure effective learning, subjects ideally should be given explicit instructions about the best method and be supervised by a teacher to allow individualised diagnosis of errors, informative feedback and remedial part training" (p. 367). Practitioners in Bathgate et al.'s (2012) study of adolescent musicians and their teachers found that metacognitive teaching significantly increased students' use of metacognitive strategies as part of their instrumental practice compared to the control group. More importantly, students who received metacognitive teaching achieved higher performance ratings than the students who did not, despite no variation in practice time between the two groups. These results are echoed in academic contexts involving metacognitive and self-regulatory interventions. Whitebread et al.'s (2009) study, ChAT (children articulating thinking) clearly demonstrated that 5-to-6-year-old children who were explicitly taught how to articulate their thinking by their classroom teacher were all able to engage in metacognitive behaviours directed towards the achievement of task goals, regardless of the child's initial level. Perels et al. (2009) found that similar interventions, such as self-regulation training in maths, also significantly improved both self-regulation and mathematical achievement in participating students.

Despite the efficacy of metacognitive and self-regulatory interventions, attempts to teach metacognition in musical and other educational contexts remain relatively rare. Veenman (2006) suggests that, whilst many teachers are very willing to invest energy into teaching students to be metacognitive, very few possess sufficient knowledge to teach the associated skills effectively (p. 10). Veenman's concern is also reflected in the findings of Kuhn and Crowell's (2011) study, which suggests that adolescents as old as 10-14 demonstrate problems with inquiry learning. The ability to self-direct learning has become of paramount importance during the recent global pandemic, at a time when much teaching takes place remotely, if at all, and students are increasingly required to direct their own learning. A report by University College London's Institute of Education suggests that more than two million children in the UK have done almost no schoolwork during the 2020 lockdown in the UK ("Coronavirus: One in five, children have done almost no schoolwork during lockdown", 2020). These findings paint a gloomy picture of efforts by schools to foster children's independent learning skills and further highlight the importance of metacognitive teaching.

Within the music education literature, Hart (2014) asserts that there is currently little evidence to suggest that music educators are teaching students to use metacognition in their own practice either. Indeed, Jorgensen (2000) found that 40% of students entering tertiary music education reported that their teachers placed either "very little" or "no" importance on practice strategies. In contrast, students in Hallam's (2012) study reported not being taught metacognitive techniques in their lessons, despite teachers claiming otherwise. When asked how they had acquired metacognitive knowledge or skills about their practice, students in Colombo and Antonietti's (2016) study also reported that they had become metacognitive learners thanks to their own practice, rather than because of teachers applying metacognitive approaches in their lessons. Perhaps part of the problem is not only that metacognition is not widely taught in educational settings, but also that students do not always perceive that that is what they are being taught – an important consideration for both teachers and parents alike.

Although considerably less has been written about metacognition in the music education literature than in the educational psychology literature, the existing research on the role of metacognition in musical learning supports the view that metacognition is an invaluable tool for musicians which may help them to improve the quality of their practice. Crucially, there is evidence across the music education and educational psychology literature to suggest that metacognitive abilities can be improved upon, with the help of metacognitive/self-regulatory interventions and peer support (Bathgate et al., 2012; Perels et al., 2009). One of the challenges facing researchers interested in measuring the impact of metacognitive/self-regulatory interventions on learners' abilities therefore is identifying suitable methodologies measuring metacognition and self-regulation – as discussed in the following section.

2.3.7 Measuring Metacognition and Self-Regulation

What methodological instruments can be used to capture internal learning processes? How does the context in which they are being measured (e.g., online/on-task or offline/pre- or post-task) affect assessments of participants' metacognition and self-regulation? And how can we improve the reliability of self-report, or find alternative measurement solutions, in instances where participants' verbal abilities are limited (e.g., children)?

A large number of different methodologies and assessment tools exists in the metacognition and self-regulation literature. The most common involve self-report measures such as questionnaires (Händel, Cordula & Weinert, 2013; Mega, Ronconi & De Beni, 2014), interviews/stimulated recall (Marulis et al., 2016; Van Hout-Wolters, 2000), and think-aloud protocols (TAPs) (Veenman & Spaans, 2005; Veenman, Wilhelm & Beishuizen, 2004). Additionally, metacognition and self-regulation can also be assessed through systematic observation (Robson, 2010; Whitebread, et al., 2009; Zachariou & Whitebread, 2017) and eye-movement registration (Kinnunen & Vauras, 1995). These metacognitive assessments can be made either offline (e.g., in the case of interviews and questionnaires) or online (e.g., through TAPs and systematic observation). Both the context in which the behaviour is being observed, and the instrument employed to do so have a large bearing on the nature of information collected, with important implications for both construct validity (i.e., does the instrument being used measure the relevant construct?) and reliability (e.g., how reliable is a participant's memory; are they socially biased?).

An important consideration for researchers interested in studying young children's metacognition and self-regulation is identifying age-appropriate and developmentally sensitive methodological instruments – ones which allow researchers to make a fair assessment of children's internal behaviours without overly relying on children's verbal abilities or self-report. In their review of methodological instruments used to measure metacognition in children aged 4-16, Gascoine et al. (2016) observed that 61% of the 80 tools included involved self-report measures, namely questionnaires and surveys. However, these self-report methods were only used with children over the age of 7 years, with observational methods used in the majority of studies involving participants younger than 8 years old. The reason for this is that observational methodologies allow researchers working with young children to gather data in a relatively unobtrusive manner (often from video-footage during an activity) and from reasonably naturalistic settings (as opposed to written assessments or lab-based activities).

From the perspective of validity, it is clearly also advantageous for measurements to be based on researchers' judgments, rather than young children's self-report, where possible. Compared with adults and adolescents, young children's verbal and working memory abilities are necessarily limited by their stage of development. Larkin (2010) suggests that most young children would struggle to recall what they were thinking in an earlier task without considerable prompting from an adult. The use of developmentally inappropriate methodological instruments has led to major misconceptions about children's (lack of) metacognitive and self-regulatory abilities. In an important literature review by Veenman et al. (2006), the authors suggest that metacognitive traits do not emerge in children until age 8-10 years. Whitebread et al. (2009) argue that this kind of underestimation of young children's metacognitive and self-regulatory abilities is extremely common and that, with the right tools, indicators of metacognitive and self-regulatory behaviour can in fact be observed in children as young as three years old. Indeed, using observational measures reduces the risk of underestimating children's abilities by allowing researchers to measure both verbal and non-verbal indicators of metacognition and self-regulation (Whitebread et al., 2009). This is not to say that self-report instruments are obsolete in studies involving children. It is entirely possible, and important in situations where a child's opinion of their own learning is of significance to the research, to adjust the language used in interview situations and/or introduce developmentally appropriate props to encourage children to be able to talk about their thinking (e.g., using puppets to elicit talk, see Dorie et al., 2013 and Marulis et al., 2016).

The issue of validity and the choice of measurement instrument(s) are a key consideration for studies involving adults too. As with children, it is useful to be able to gather information on both general attitudes (e.g., through questionnaires and interviews) and context-specific behaviours (e.g., through observation during a specific task). Using a mixture of observational and self-report measurement instruments is particularly helpful in the case of parents, for whom parenting attitudes may be a sensitive issue and social desirability bias may affect the reliability of self-report (Krumpal, 2013). Applying a multi-method approach therefore allows researchers to record what parents actually do as well as what they recall or believe they do and, importantly, compare them (Veenman et al., 2006). Research on the use of multi-methods, and their theoretical and practical benefits and implications, are discussed in detail in Chapter 3 (section 3.2.1).

The previous sections have presented the literature on metacognition and self-regulation; a theoretical framework for the definitions operationalised in this thesis and their relevance to musical learning; and methodological considerations around the measurement of these psychological constructs in children. The second half of this literature survey gives a broad overview of the research on parental support (including the theoretical model of parental support used in this thesis) and the role of parents in musical learning.

2.4 Parental Support

The role of parents and the home environment in supporting children's socialisation has long preoccupied researchers interested in the impact of parental support on children's learning and development. It has been clear for many years that children's home environments play a crucial role in predicting children's early academic and socialisation outcomes (Baumrind, 1991; Maccoby & Martin, 1983), and that parenting practices and attitudes have a powerful influence on children's cognitive development (Grolnick & Ryan, 1989). Particular kinds of parental support may help to accelerate metacognitive and self-regulatory development and even mediate the negative impact of socio-economic disadvantage on children's development (Hart & Risley, 1995; Pino-Pasternak & Whitebread, 2010). Valcan et al.'s (2017) meta-analysis of associations between parental behaviours and executive function in early childhood revealed modest but significant associations between executive function, positive parenting and cognitive parental behaviours. Importantly, the relationship between cognitive parental support and executive function was strongest for younger children – a result which suggests that parental support may be most effective during early childhood.

As with metacognition and self-regulation, parental support is a multifaceted and multifarious concept which often suffers from lack of conceptual unity and consistent operational definitions. In this thesis, two key aspects of parental support are examined – parenting behaviours (Whitebread & Bingham, 2013) and parenting style beliefs (Darling & Steinberg, 1993; Hembacher & Frank, 2016), as discussed in the following section.

2.4.1 Parenting Behaviours

Whitebread and Bingham (2013) define parenting behaviours as "particular behaviours that parents use to prepare their child to adapt to a particular social group" (p. 10). These behaviours might include practical encouragement and financial or psychological support. In the context of children's academic learning, supportive parenting behaviours might take the form of doing homework together with children, facilitating time for children to read, providing learning materials such as books or being present at school events (Pino-Pasternak & Whitebread, 2010). Similar parenting behaviours can be used to support children's musical learning, and might include supervising children's practice, sitting in on music lessons and providing opportunities to perform to others or attend concerts (Dell et al., 2014; McPherson, 2009; Zdinski, 2002). From a theoretical standpoint, Pino-Pasternak & Whitebread (2010) suggest that parenting behaviours can be divided into two distinct categories: socioemotional and instructional.

Socioemotional parental behaviours are characterised by displays of parental warmth, responsiveness and control (Baumrind, 1967). In their meta-analysis of the literature on parental behaviours and children's executive functions, Valcan et al. (2017) found that positive socioemotional behaviours such as warmth and responsiveness were associated with higher global executive function, better inhibition and working memory in children. Negative socioemotional behaviours however, which are characterised by high levels of parental control and intrusiveness, were associated with lower global executive function and lower inhibition in children (Valcan et al., 2017).

Instructional parental behaviours refer to parental scaffolding of children's learning (Matte-Gagné & Bernier, 2011). Scaffolding takes place when a parent deliberately helps their child to perform a task they cannot yet perform independently, responding to the child's level of ability by offering support after failure and withdrawing it after success (Vygotsky, 1978). Vygotsky suggests that scaffolding problem-solving activities allows children to internalise external processes modelled by parents, thus helping children to be less dependent on their parents and more independent in their own learning (1978). Recent studies have found that a greater incidence of parental scaffolding and autonomy support is associated with higher levels of executive function, including the increased use of metacognitive and self-regulatory behaviours by children (Valcan et al., 2017). Given the evidence that metacognition and self-regulation may help accelerate young children's musical learning, these findings may also have important implications for parents with young children learning to play an instrument.

In the context of this thesis, parenting behaviours refer exclusively to parents' scaffolding of metacognitive and self-regulatory behaviours during their children's piano practice, or instructional behaviour – an area of parental support research which has historically received less focus than socio-emotional parental support (Pino-Pasternak & Whitebread, 2010; Valcan et al., 2017). In Study 2, the socio-emotional dimension of parents' support took the form of responses to hypothetical questions relating to parenting style beliefs, rather than measurement of actual behaviours. Consequently, parents' levels of responsiveness and demandingness (Maccoby & Martin, 1983; Hembacher & Frank, 2016) were investigated through the lens of parenting attitudes (in this case, parenting style beliefs), as discussed in the following section.

2.4.2 Parenting Attitudes

Parenting attitudes are beliefs held by parents about their children and the most appropriate way of parenting them. These parenting beliefs have an important role in shaping the individual parenting practices that parents use to socialise their children. Parental attitudes may be consciously articulated or intuitive, with both conscious and unconscious parenting theories found to influence parental behaviour (Darling and Steinberg, 1993). Hembacher and Frank (2020) suggest that parents' approaches to parenting vary in predictable ways depending on parents' perceptions about their children's learning and development. Parents with higher socioeconomic status (SES), for instance, may prioritise cultivating their child's talents more than lower SES parents, who see their primary duty as keeping their children safe, allowing any talents to thrive naturally (Lareau, 2003). This relationship between parenting attitudes and support behaviours is also true of parents' beliefs about their children and their children's musical abilities. Creech and Hallam (2003) suggest that self-efficacious parents consider education as a shared responsibility, whilst those who doubt their efficacy to help their children learn rely instead on teachers to educate their children. In their study of mother-child interactions during the first year of learning an instrument, Davidson & McPherson (2002) found that mothers had already decided how much support they would need to provide before their child began lessons. Within the first month of learning, mothers had already made a decision about how much or little practice they would enforce based on their child's enjoyment and their own willingness to invest in helping their child to practice. In the words of Davidson & McPherson (2002), "no one would expect children of 7-9 years of age to undertake literacy practice such as reading aloud or writing without a great deal of support and individual attention" (p. 152). The parenting practices actually used to support children during musical learning therefore depend heavily on the attitudes parents hold.

Hembacher and Frank (2016) suggest that parents' early parenting attitudes can be divided into three broad categories: beliefs about rules and respect; affection and attachment; and early learning. The *rules and respect* and *affection and attachment* items in Hembacher and Frank's

(2016) framework are directly based on Maccoby and Martin's (1983) responsiveness and demandingness parenting dimensions, which are in turn strongly influenced by Baumrind's classic (1971) tripartite parenting style typology (see section 2.4.3). In Baumrind's (1991) words:

> Demandingness refers to the claims parents make on their child to become integrated into the family as a whole by their maturity demands, supervision disciplinary efforts and willingness to confront the child who disobeys. Responsiveness refers to the actions which intentionally foster individuality, self-regulation and self-assertion by being attuned, supportive and acquiescent to the child's special needs and demands. (p. 748)

It is worth noting that the term responsiveness is sometimes used interchangeably with parental *warmth* and demandingness with *control* (e.g., Pinquart, 2016; Chao, 2000; see section 6.1.2) although many researchers regard all four terms as separate constructs (e.g., Pino-Pasternak & Whitebread, 2010). For the purposes of this thesis, definitions for responsiveness and demandingness are taken from Baumrind's (1991 conceptualisation), as described above.

2.4.3 Parenting Style Beliefs

Parenting style is "a constellation of attitudes toward the child that are communicated to the child and that, taken together, create an emotional climate in which the parent's behaviours are expressed" (Darling & Steinberg, 1993 p. 488) Although mainly concerned with parental attitudes, parenting style can also include specific, goal-directed behaviours informed by parental beliefs. In this sense, parenting style can be seen as a combination of both parenting behaviours and beliefs.

The two most influential and enduring parenting style models belong to Baumrind (1971) and Maccoby and Martin (1983). Baumrind's classic tripartite typology (1967, 1968, 1971) measures parenting style across a single dimension which she described as control. However, rather than organising parental control linearly from high to low, Baumrind (1971) identified three qualitatively different types of parental control – authoritarian, authoritative and permissive – with authoritative parenting (characterised by regular expressions of warmth and clear boundary setting), seen as the most beneficial for children's socialisation and development. In contrast, both authoritarian and permissive parenting styles are characterised by their emotional detachment, ineffective communication skills and lower maturity demands, with authoritarian parents also exhibiting bullying and intrusive behaviours and permissive parents an avoidance of parent-child conflict (Baumrind, 1967). Unlike orthogonal parenting constructs, which rely on theoretical dimensions alone, Baumrind's work used a configurational approach to investigate and organise naturally occurring parenting styles as observed through empirical study (Darling & Steinberg, 1993).

Building on this work, Maccoby and Martin (1983) expanded Baumrind's model across two dimensions – demandingness (equivalent to Baumrind's (1971) control dimension) and responsiveness – in order to form a fourfold typology of parenting styles. In Maccoby and Martin's (1983) model (illustrated by Figure 1), authoritative parenting is characterised by high responsiveness and demandingness and authoritarian parenting by low responsiveness and high demandingness. In contrast to Baumrind's (1971) model, which based its definition of permissive parenting on empirical observations, Maccoby and Martin's (1983) typology characterises permissive parents as high in responsiveness but low in demandingness. They add the further category of neglectful parenting, which is low in both responsiveness and demandingness. Darling and Steinberg (1993) suggest that the addition of the neglectful category arises logically as a consequence of crossing the responsiveness and demandingness dimensions, but also ecologically, in that it allows broader range of parenting styles (i.e., less conscientious parenting patterns) to be explored alongside Baumrind's original categories.

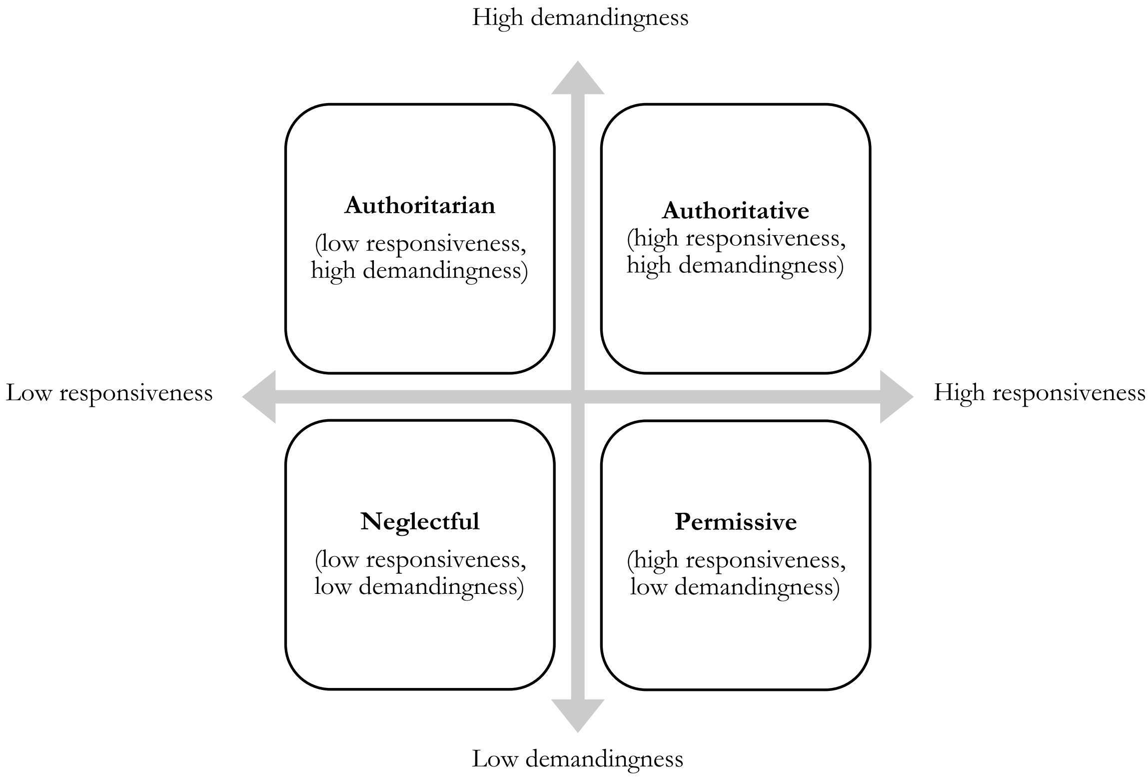


Figure 1
Maccoby & Martin's (1983) fourfold parenting style typology

Although parenting style is generally understood as comprising both parental practices and attitudes, in the context of this thesis parenting style beliefs were measured through the lens of parents' responsive or demanding attitudes only (as investigated in Study 2). Moreover, given that the questionnaire instrument used in Study 2 is only intended to survey parenting beliefs (Hembacher & Frank, 2016), rather than identify participants' specific parenting styles, participants were not assigned a specific parenting style based on their responses. Thus, for the purposes of this study, the term *parenting style beliefs* is used to refer to the level of responsiveness or demandingness indicated by parents' questionnaire responses in Study 2 – but not through any observed behavioural measure of parenting style. A more detailed review of the literature on parenting style, and its impact on children's metacognition and self-regulation, as well as a description of the measurement instrument used, can be found in sections 6.1.2 and 6.2.6.2 respectively.

2.4.4 Theoretical Model of Parental Support

As discussed in the previous sections, and illustrated in Figure 2, parental support was operationalised across two dimensions: *parenting behaviours* and *parenting style beliefs* (or parenting attitudes). Parenting behaviours are investigated within the context of instructional parental behaviour, namely parents' support of children's metacognition and self-regulation during musical learning (as reported in Study 1; and reported and observed in Study 2). In the context of this thesis, the term parenting style beliefs is used to refer to parents' attitudes around parental responsiveness and demandingness (as reported in Study 2). Taken together, these socioemotional beliefs are likely to inform behaviours parents use to socialise their children. Research suggests that these parenting style beliefs and behaviours are likely to impact on the development of children's metacognitive and self-regulatory abilities (Valcan et al., 2017) – cognitive behaviours which are regularly associated with higher levels musical achievement in performance (Hallam et al., 2012; Power & Powell, 2018; Bathgate, Simsknight & Schun, 2012). In addition to the effect parental behaviours and attitudes may have on children's learning outcomes, it may be that parents' behaviours and parenting style beliefs are affected by observations of their child's musical achievement – or indeed beliefs about their children's musical abilities (McPherson & Davidson, 2002). If this is the case, then it may be that the relationship between parenting beliefs behaviours, and children's musical achievement, is bi-directional, as indicated in Figure 2. For ease of written communication, and to avoid over-complicating terms, in the context of Study 1 and Study 2, the term parental support is used to refer to instructional support of children's metacognition and self-regulation (i.e., parenting behaviours) unless indicated otherwise.

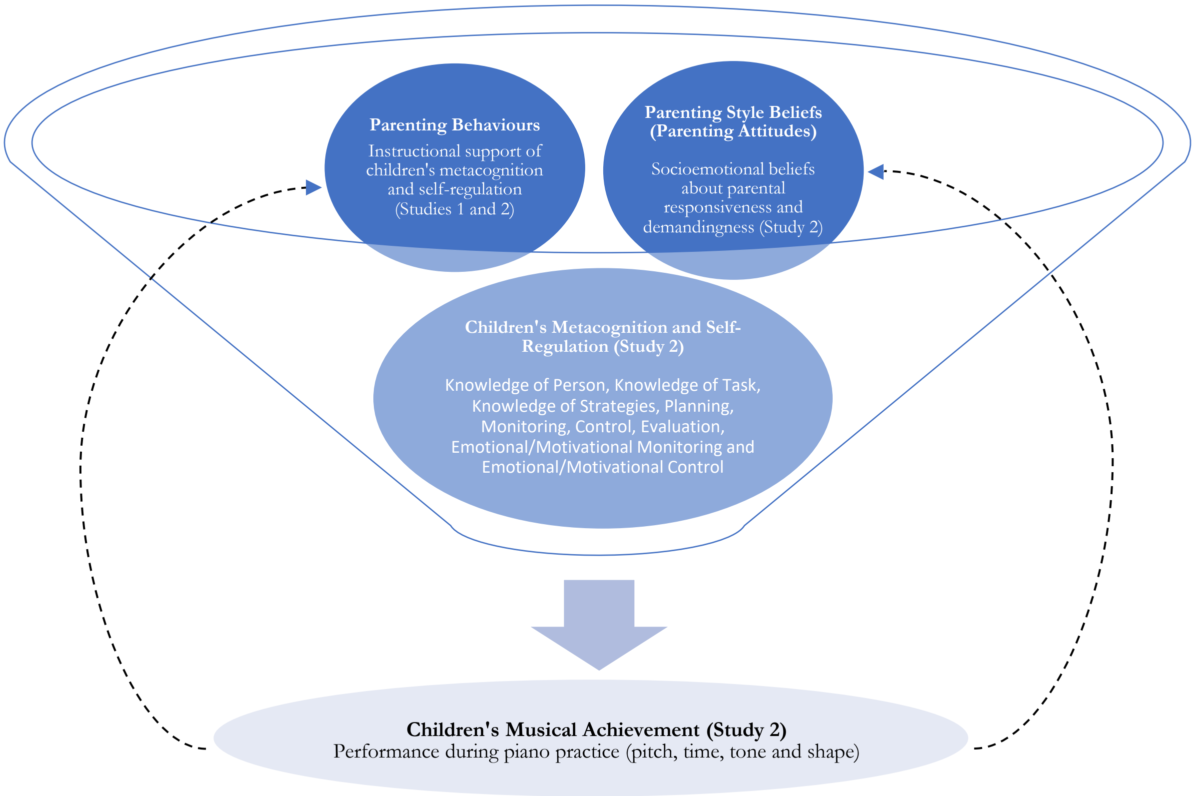


Figure 2
Theoretical model of parental support, children's metacognition and self-regulation, and children's musical achievement

This section has attempted to present a brief overview of the literature on parental support. More detailed accounts of the literature on parenting behaviours, parenting attitudes and parenting style can be found in their relevant literature reviews, as part of Studies 1 and 2. The following section discusses how parental support affects children's musical learning, and the role of parents in supporting their children's instrumental practice.

2.4.5 The Role of Parents in Children's Musical Learning

What happens during practice sessions is crucial in determining an individual's level of musical achievement (Davidson et al., 1996). Unlike traditional schooling, where much of a child's formal learning is supervised by a teacher in classroom settings, for most musicians, the bulk of musical learning takes place in between lessons during practice sessions – often at home and supported by parents. Parents therefore play a vital role in children's musical learning and development.

Few beginners in a new discipline immediately develop the motivation and self-regulatory behaviours needed to succeed at an activity such as learning a musical instrument. If not socially encouraged and guided by parents and teachers, they are likely to lose interest in practising (McPherson & Zimmerman, 2002). The importance of adult figures in supporting children's musical development has also been highlighted by Creech (2009) in her taxonomy of parent-teacher-pupil interactions. In Creech's (2009) model, child, parent and teacher are entwined in a dynamic structure in which interpersonal interactions between teacher-parent-pupil contribute to a child's overall musical development. Creech's (2009) study of child-parent-teacher interactions found that children whose parents adopted an autonomy-supportive approach were more likely to have a sustained interest and commitment to musical learning – a finding reflected in the educational psychology literature on self-determination theory and parenting (Niemiec & Ryan, 2009; Ryan & Deci, 2000). This was particularly true of younger children, who benefitted from greater involvement and direct supervision from their parents than adolescents (Creech, 2009).

Despite this, there is some evidence to suggest that parental involvement may be associated with musical ability in older children too. In his study of the relationship between parental involvement and aural perception/musical literacy in adolescents, Zdinski (2002) compared the scores of 248 instrumental and vocal students aged 11-18 years in the Advanced Measures of Musical Audiation (AMMA) and Iowa Tests of Musical Literacy (ITML) with scores from the Parental Involvement Measure (PIM). Zdinski found that PIM scores related to all other measures, accounting for 10% of the variance in ITML scores – a result which points to the enduring importance of parental support, even in adolescence.

In addition to emotional encouragement, novice musicians such as children may require instructional support in order to engage in metacognitive and self-regulatory behaviours and, as a result, practice more effectively (Hallam, 2006). Larkin (2010) observes that, without prior training, most young children would struggle to recall what they were thinking during a particular activity without assistance. Indeed, while some children may display some metacognitive processes, Larkin asserts "articulating thinking processes during problem solving is not a frequent activity unless prompted by an adult" (p. 123). In her study of the relationship between organised, adult-supervised practice, unorganised, unsupervised practice and children's musical achievement, Barry (1990) found that the children who practiced with an adult, experienced better musical gains than those in the unsupervised group. Similarly, in their study of young musicians studying at an elite music school, Davidson et al. (1996) found that children who were most successful in their musical learning often had parents who, although not necessarily musical, actively supported their child's practice. This support took the form of sitting in on lessons, seeking regular feedback from their child's teacher, reminding their child to practise, offering encouragement and moral support, and sometimes even direct supervision. In short, parents play a critical role in their children's musical development by encouraging their child's metacognition and self-regulation during practice and consequently supporting their children to become effective and self-sufficient learners.

Despite the commonly held view that the talents of musical child prodigies develop independent of their environment (Gagné, 2009; Ruthsatz, Ruthsatz & Stevens, 2014), studies of gifted children suggest that even exceptionally precocious musicians were often systematically supported and supervised by their parents. In his longitudinal study of a 10-year-old female pianist and child prodigy, McPherson (2007) describes the child's musically untrained mother "sitting with her daughter during the early of months of [her] child's learning and playing games that helped focus the young musician on repetition and mastery" (p. 3). Support strategies used by the mother included asking her daughter "can you play that piece again five times correctly? Can you play it correctly 10 times correctly? Now, can you play the piece 50 times correctly?" (McPherson, 2007, p. 3). To take a famous example of musical prodigiousness, Lehmann et al. (2002) also concluded from their in-depth historical examination of Mozart's musical education that the high level of parental support young Mozart received played a key role in the composer's musical development. Mozart's father, a famous musical pedagogue, home-schooled both of his children and travelled with both siblings for musical engagements as well as supporting them financially. Importantly, Lehmann et al. (2002) note that the level of support Mozart received in his home and early professional environment far exceeded the assistance Mozart's less successful contemporaries received. The authors go as far as to suggest that this "unique environment [was] sufficiently different from that of his peers to explain his uniqueness" (Lehmann et al., 2002, p. 3). Similarly, Sosniak's (1985) famous study of successful adult concert pianists found that parents of these young musicians made enormous personal and financial sacrifices in order to support their children's ambitions – committing huge amounts of time, money and energy to provide their children with better teachers, instruments and opportunities, like travelling to concerts and competitions. Moreover, the fact that very few of the adult pianists studied by Sosniak (1985) were child prodigies suggests that the kinds of parental support these musicians received as children may have positively impacted the long-term nature of their musical development and success. These findings contribute to the evidence that, regardless of prodigiousness, parents play a vital role in supporting the development of young musicians and (in Sosniak's words) that successful musical learning is "a group effort" (1987, p. 289).

2.5 Rationale and Research Questions

Having reviewed the relevant literature on metacognition and parental support in children's musical learning, it is possible to present a number of claims derived from research evidence to support the conceptualisation of the present thesis. They are as follows:

1. Research in the area of metacognition and self-regulation has provided consistent evidence that academic achievement is associated with students' metacognitive and self-regulatory abilities (Veenman et al., 2006; Veenman & Spaans, 2005), and that metacognitive interventions can be highly effective in improving students' use of metacognition and self-regulation during academic tasks (Kinnunen & Vauras, 1995; White & Frederikson, 2005).
2. Research into metacognition and self-regulation in musical contexts has also demonstrated a close relationship between metacognitive and self-regulatory ability, effective instrumental practice and musical achievement (Bathgate et al. 2012; McPherson & Renwick, 2001; Sloboda et al. 1996; Varela et al., 2016).
3. Previous research into metacognition and self-regulation in musical contexts has explored relationships between metacognition and musical achievement in older students and adult musicians (Colombo & Antonietti, 2016; Hallam, 2012; Mornell et al., 2019). However, very little has been written on children's metacognition during musical learning (i.e., instrumental practice).
4. This may in part be due to a tendency to rely on self-report measurements, which are often developmentally inappropriate for young children. Only a limited number of studies have employed observational methods to observing children's metacognition in musical contexts e.g., during musical play, see Zachariou & Whitebread (2017).

5. Although older children may not benefit as much from parental involvement during musical learning (Creech, 2009), parental support is highly advantageous for younger children (aged 9 years and below) learning to play an instrument and is associated with improved musical achievement outcomes (Barry, 1990; Pitts et al., 2000) regardless of parents' level of previous musical experience (Davison et al., 1996; Sosniak, 1987).
6. The emotional climate in which children are raised by their parents plays an important role in children's emotional, pro-social and cognitive development (Darling & Steinberg, 1993). In the context of musical learning, it may be that certain parenting style beliefs (i.e., those relating to parental responsiveness and demandingness) are associated with children's metacognition and self-regulation during musical learning, and musical achievement.

These claims suggest that there is a clear need for further research into the role of parents in supporting children's metacognition and self-regulation during musical learning. Moreover, given the possible implications of particular kinds of parental support (instructional behaviours and parenting style beliefs) on children's musical achievement, it is of great importance to researchers, teaching practitioners and parents alike that we are able to explore and better understand the associations between parental support, children's metacognition and self-regulation and musical achievement. The goal of the present thesis is to investigate these issues, using a mixture of self-report and observational methods, and respond to the research questions in the following studies:

Study 1: Trends in Parental Metacognitive and Self-regulatory support during Children's Piano Practice:

RQ1 - What is the nature of parental support of children's metacognition and self-regulation in musical learning and what its associations with parents' previous musical experience?

Study 2: Associations between Parental Support and Parenting Style, Children's Metacognition and Self-Regulation during Musical Learning and Children's Musical Achievement:

RQ2 - What are the indicators of children's metacognition and self-regulation in musical learning, and what are their associations with musical achievement?

RQ3 – What are the associations between parental support of children's metacognition and self-regulation, children's metacognition and self-regulation in musical learning and children's musical achievement?

RQ4 - What are the associations between parenting style beliefs, children's metacognition and self-regulation in musical learning, and children's musical achievement?

By presenting an overview of the relevant literature in the fields of metacognition, self-regulation and parental support in children's musical learning, this chapter has provided a clear rationale for the present thesis and the two studies which follow. Detailed literature reviews pertaining to the particular focus of each study's research questions are presented in their relevant chapters, accompanied by their specific hypotheses. The next chapter presents an overview of the methodological approach taken in this thesis, based on the literature on measuring metacognition and self-regulation in children, and a summary of the methods used in each of the following two studies.

CHAPTER 3

Overview of Methodology

3.1 Introduction

The purpose of this chapter is to present a general overview of the methodological approach that underpins the research strategy adopted in this thesis, as well as an overview of the two studies which make up this thesis.

This chapter is structured into four sections, including this introduction (section 3.1). Section 3.2 discusses the theoretical model underpinning the methodological approach adopted in the present thesis, as well as the benefits and challenges of multi-method research designs. Section 3.3 provides a brief overview of the two studies and pilot which make up this thesis, and approach to data collection and analysis. (In depth methodological accounts of each study, as well as their results and conclusions, are reported in Chapters 4, 5 and 6). Finally, section 3.4 discusses ethical considerations around research involving the participation of children and families.

3.2 Methodological Approach

The methodological approach adopted in this thesis is guided by a socio-cultural understanding of children's learning. Within the Vygotskian socio-cultural tradition, children's learning is understood as originating in social contexts, whereby behaviours first experienced externally in social settings are then internalised (Whitebread et al., 2015). Socio-cultural theories of learning address the way in which children move from being dependent on an adult or experienced peer to complete a task (other-regulated), to being able to carry out a task independently (self-regulated).

With this in mind, the present thesis brings together elements of music education, early childhood research and educational psychology that, even though explored in isolation in previous research, have not been investigated together as part of a single research project – namely children's metacognition and self-regulation during musical learning, children's musical achievement, and parental support. Additionally, this thesis aims to address issues around the measurement and frequent underestimation of children's abilities in decontextualized problem-solving or assessment settings, by exploring parent-child dynamics in naturalistic environments. Given the idiosyncratic nature of musical learning, it was considered particularly important that assessments of children's metacognition and self-regulation were made during naturalistic, context-specific tasks – in this case, children's piano practice at home. Finally, by considering the perspectives of different participants (children, parents and teachers) as well as gathering data from multiple sources (video observations of piano practice, interviews and questionnaires), this thesis also aims to further conceptual understanding of the fluctuating nature of parent and child behaviours in different settings. In doing so, it is hoped that the results of this thesis may make a valuable contribution to the existing literature on the use of multi-method methodologies in applied behavioural sciences.

3.2.1 Multi-Method Methodologies

As discussed in Chapter 2, using a combination of online and offline measures of metacognition, self-regulation and parental support may help to provide a fuller picture of participants' beliefs and behaviours, as well as contextualise findings across different contexts. Veenman (2005) has stressed the usefulness of employing multi-method approaches to assessing metacognition in particular, due to the fluctuating nature of this construct across different settings.

The majority of diagnostic tools used to assess metacognition and self-regulation rely on prospective or retrospective (offline) measures. Concurrent (online) assessments, such as TAPs and observations, may provide more valid assessments of participants' behaviour than self-report but can be expensive and time-consuming to deliver (Veenman et al., 2006). Despite the validity and respondent reliability issues associated with questionnaires and interviews, well-designed self-report measures may help to provide valuable insight into participants' beliefs and attitudes, as well as other unobservable psychological traits.

3.2.2 Online and Offline, Context-Specific and General Measures of Metacognition, Self-Regulation and Parental Support

Indicators of metacognition are highly dependent on context. In addition to measures which assess online indicators of metacognition, it is also methodologically beneficial to examine participants' context-specific knowledge about a task, as well as what they know about the activity (for themselves and other people) in general. Similarly, parental support measures which allow researchers to understand how participants behave in the context of a specific task, as well their beliefs about parenting more generally, may help to provide a more valid assessment of the support children receive. Indeed, respondent reactivity during online measures may mean that the behaviours observed as part of a study do not reflect parents' typical beliefs about parenting (Havermans, Vanassche & Matthijs, 2015). In these cases, it is also invaluable to be able to understand what kinds of parental support parents may give (or believe they give) their children outside of observations.

With regards to children's metacognition and self-regulation, there may be a difference in the way in which children understand context-specific questions relating to a task they have just completed themselves and general questions about the nature of musical learning. The ability to consider the perspective of another learner faced with the same task is related to children's theory of mind. Theory of mind is described as "children's ability to attribute mental states, such as beliefs, desires and intentions, to self and others […] and knowledge of mental representations of events [that] need not correspond to reality" (Lockl & Schneider, 2006, p. 16). Lang and Perner (2010) argues that the core skill that underpins theory of mind is the ability to meta-represent how other people use their minds in similar situations and use this knowledge within a theory of behaviour to explain success and failure. Although previously considered distinct and unconnected areas of research, more recent studies have highlighted the significant overlap between theory of mind competencies and aspects of metacognitive knowledge (Lang and Perner, 2010). Consequently, one of the areas explored in Study 2 is children's context-specific and general metacognitive and self-regulatory knowledge, from the perspective of reflecting on their own practice (context-specific) and how another person might go about practising the piano (general).

3.2.3 Convergence Validity in Multi-Method Studies

A key concern in multi-method studies is whether results gathered using different measures can be triangulated – an issue known as convergence validity (Rovers et al., 2019). Convergence validity refers to the degree of correspondence between participants' self-report and their actual behaviours, as observed in an online setting (Winne and Jamieson-Noel, 2002). Research suggests that convergence between self-report statements and concurrent behaviour in multi-method studies tends to be low (Veenman et al., 2006). In addition to low self-reporting ability of respondents, Schellings, Hout-Wolters, Veenman & Meijer (2012) suggest that low correlations between online and offline measures may partly be the result of conceptual differences in the metacognitive activities in different contexts. Unlike online measures of metacognition, for instance, offline methods are not directed at a specific learning task and may therefore be measuring different aspects of the same phenomenon. Additionally, Rovers et al. (2019) suggest that granularity (the level of detail at which processes are measured) is an important factor influencing convergence between students' self-report and behavioural indicators of self-regulated learning. Their review of results gathered using offline and online instruments found that studies that indicated high levels of calibration focused on global use of self-regulatory strategies (coarse-grained analysis), with much lower convergence validity in studies involving detailed analysis of specific self-regulatory behaviours (fine-grained analysis).

Given the multi-method design of Study 2, one of the goals of this thesis is to examine how different measures of parental and children's metacognition vary across contexts. Due to the fined-grained nature of the analysis conducted (Rovers et al., 2019), high convergence between measures is not anticipated. However, it is hoped that the use of multiple measures to investigate singular constructs will be methodologically valuable to this research, helping to highlight different facets of children's metacognition and self-regulation, and parental support, and the complex interactions between them.

3.3 Overview of Studies

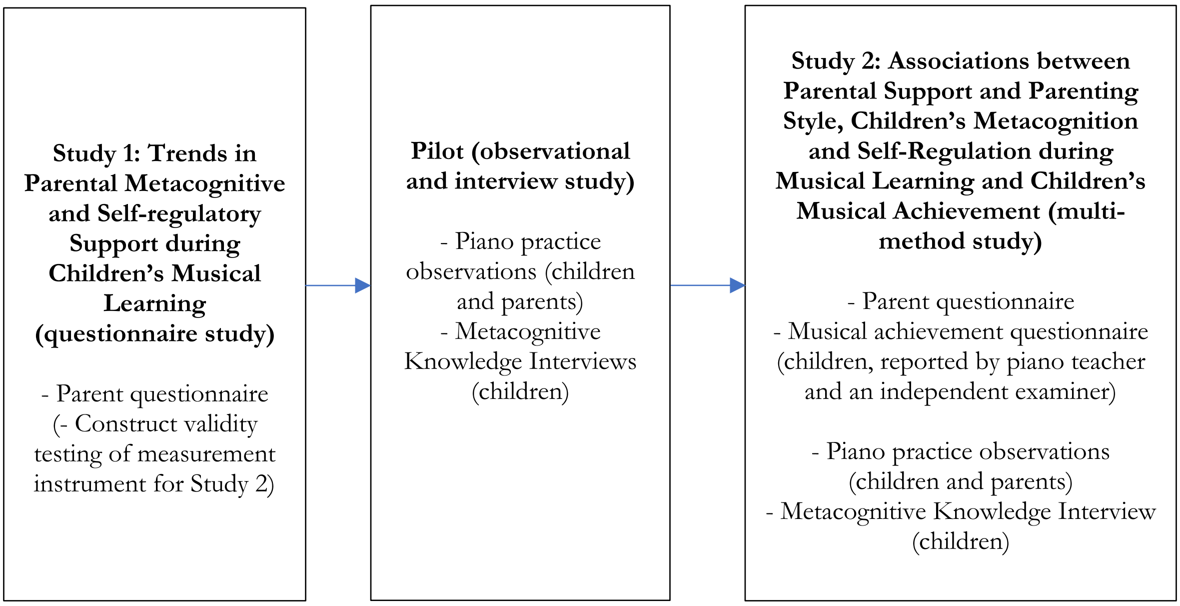


Figure 3
Overview of studies

The following section presents a brief overview of the methodological approach taken to the initial questionnaire study (Study 1), the pilot observational and interview study and the main multi-method study (Study 2) which comprise this thesis (as described in Figure 3). As stated, more detailed accounts of instruments, participants, procedures and possible limitations are included as part of the studies reported in Chapters 4 (Study 1), 5 (Pilot Study) and 6 (Study 2).

3.3.1 Study 1 – Trends in Parental Metacognitive and Self-regulatory Support During Children's Musical Learning

An initial questionnaire study exploring trends in parental support of 6-9-year-old children's metacognition and self-regulation during instrumental practice was conducted with 40 parents living in the UK. The aims of this study were to: a) trial the use of categories and descriptions taken from the "Cambridgeshire Independent Learning in the Early Years" coding scheme (Whitebread et al., 2009, hereafter C.Ind.Le) in a questionnaire format; b) gather descriptive results about metacognitive and self-regulatory behaviours parents use to assist their children whilst practising the piano; c) investigate possible links between parents' previous musical experience and the amount of metacognitive support given to children by their parents whilst practising the piano and d) investigate possible links between the amount of metacognitive and self-regulatory support given to children by their parents whilst practising the piano, and the frequency of children's practising. The questionnaire was designed using Bristol Online Surveys and disseminated via email to participants through a combination of private piano teachers, local music hubs, music schools and junior music colleges.

Given the continuing debate around parents' previous musical experience and possible associations with the kinds of support parents are able to give their children (e.g., domain-specific musical support and/or domain-general metacognitive and self-regulatory support), this study was mainly concerned with exploring the kinds of support parents with and without previous musical experience report giving their children – with a view to investigating how this support relates to children's metacognition, self-regulation and musical achievement in Study 2.

Of the 44 items in the questionnaire, 33 were based on metacognitive categories and descriptions taken from C.Ind.Le (Whitebread et al.'s, 2009) and were specifically concerned with metacognitive and self-regulatory behaviours parents' report supporting their children with during piano practice. In addition to questions relating to parental support of metacognitive and self-regulatory behaviours, parents were also asked how often their children spent practising the piano per week; how often parents assisted with their children's practice; and parents' previous musical experience. The latter was investigated through two questions: "Have you ever had formal music lessons" and "Do you currently play/sing/compose (formally or informally)?" Results from Study 1 were used to explore the following overarching (RQ1) and specific (RQ1a and RQ1b) research questions described in Table 2:

Table 2
Research questions, with independent and dependent variables, for Study 1

	Question	Independent variable(s)	Dependent variable(s)
RQ1	What is the nature of parental support of children's metacognition and self-regulation in musical learning and what are its associations with parents' previous musical experience?	Parental metacognitive and self-regulatory support	Parents' previous musical experience
RQ1a	To what extent is parental metacognitive and self-regulatory support and frequency of parental supervision during their children's practice associated with parents' previous musical experience?	Amount of support; frequency of support	Parents' previous musical experience
RQ1b	To what extent is frequency of children's practice associated with parental metacognitive and self-regulatory support and frequency of parental supervision during children's practice?	Frequency of practice	Amount of support; frequency of support

Consequently, descriptive results gathered from the questionnaire were also used to investigate the construct validity of the new questionnaire instrument, in preparation for use in the pilot and Study 2. The original 33 C.Ind.Le items from Study 1 were also streamlined into an 8-item questionnaire and coding instrument, following construct validity testing. A more detailed account of the reliability testing procedures and amendments made the original instrument can be found in see Chapter 4 (section 4.2).

3.3.2 Pilot Study

Pilot studies, or feasibility studies, are miniature versions of full-scale studies used to pre-test a particular research instrument and a crucial component of good study design (Teijlingen & Hundley, 2001). Following the initial questionnaire study, a pilot observational and interview study was conducted with three children (aged 6-8 years) and two parents at a small music academy in the UK. The aim of the pilot was to trial the questionnaire instrument developed in Study 1 with a small group of participants in the in order to troubleshoot methodological or practical issues in advance of Study 2. In addition to trialling the 32-item instrument (in the form of a teacher questionnaire and an observational practice coding scheme), the pilot was also an opportunity to practice administering a Metacognitive Knowledge Interview protocol, based on Marulis et al.'s (2016) child interview instrument.

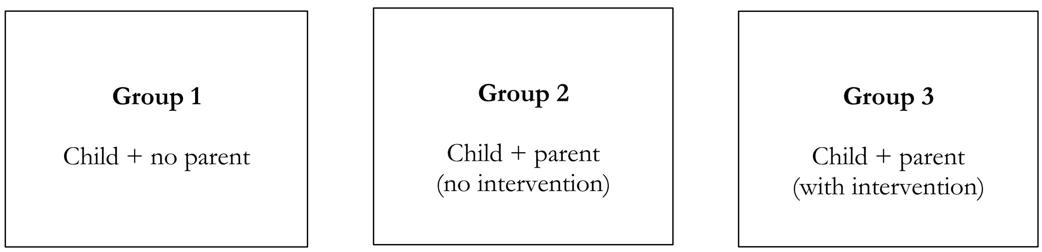


Figure 4
Overview of pilot study

As shown in Figure 4, two child-parent dyads (Group 2 and 3) were videoed practising the piano together for 15-minutes. One child (Group 1) was also videoed practising on their own, without a parent. Children were asked to practice whatever they had been given as homework by their piano teacher that week, as they would normally. Of the two children who practised with their parents (Groups 2 and 3), one parent participated in a metacognitive intervention (Group 3) intended to raise their awareness of how parents can help support their child's metacognition during their piano practice. This intervention took the form of a 10-minute discussion with the researcher about a magazine article (Cheung, 2018) written by the researcher on the topic of parental metacognitive support during piano practice, which parents were asked to read prior to the session. After the practice sessions, all children (Group 1, 2 and 3) were then interviewed about their experiences, and their responses transcribed and coded.

Although the original intention was to conduct the pilot with a larger sample of children (six children and four parents), logistical problems meant that results were only collected for three children and two parents. Due to the limited sample size, as well as other methodological problems with the pilot, these results are not reported as part of this thesis. Instead, a descriptive account of the procedures and methodology is given followed by reflections on the pilot, including possible refinements to consider in the data collection of Study 2.

3.3.3 Study 2 - Associations Between Parental Support, Parenting Style Beliefs, Children's Metacognition and Self-Regulation during Musical Learning, and Children's Musical Achievement

In Study 2, questionnaire, interview and observational video data were collected from 30 6-9-year-old children, 30 parents and 17 teachers living in the UK. The purpose of this study was to use the validated instrument from Study 1 to a) observe children's metacognition and self-regulation during independent and parent-supported piano practice; b) observe parents' support of children's piano practice and c) investigate associations between parental support, parenting style beliefs, children's metacognition and self-regulation during musical learning, and children's musical achievement. The data collection process is described in Figure 5:

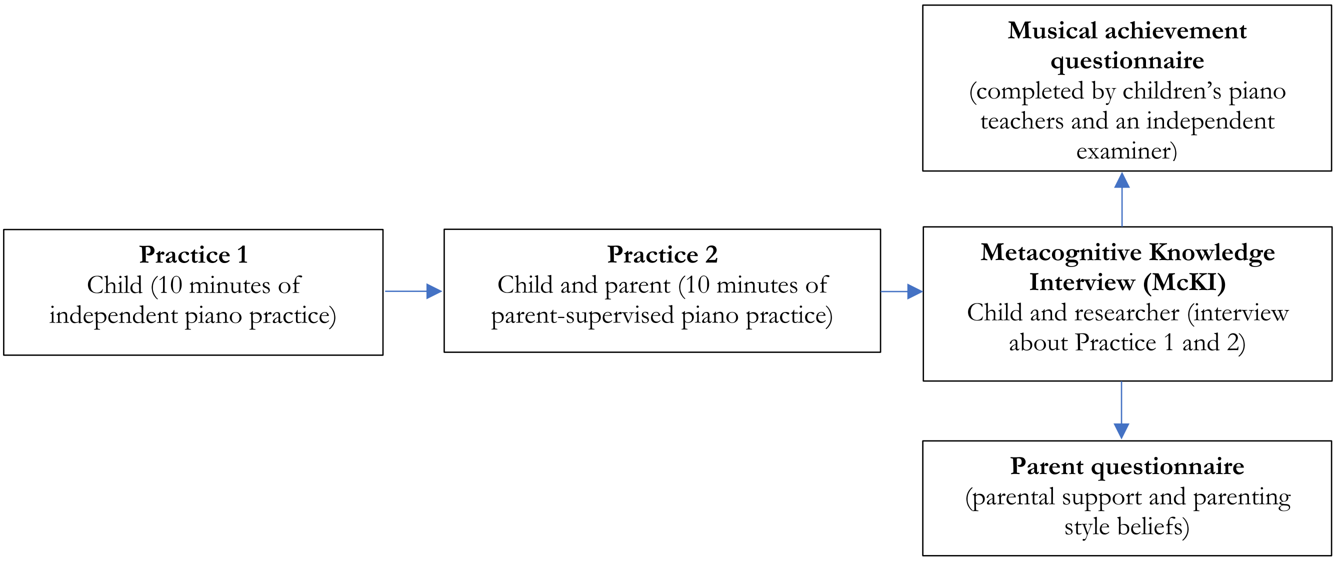


Figure 5
Overview of Study 2

Invitations to participate in the study were disseminated via email through a combination of private piano teachers, local music hubs, music schools and junior music colleges across the UK. The researcher then travelled to children's homes, where they were videoed practising for 10 minutes on their own (Practice 1) and 10 minutes with the help of a parent (Practice 2). As in the pilot, children were asked to practice whatever they had been given as homework by their piano teacher that week. Practice sessions were followed by a Metacognitive Knowledge Interview (McKI) conducted by the researcher with the child (Marulis et al., 2016). In addition to the practice session and McKI, parents were asked to complete a 24-item questionnaire about the kinds of metacognitive and self-regulatory behaviours they generally support their child with during practice; and their parenting style beliefs. Children's piano teachers were contacted separately (either by email or post) and asked to complete a short survey about their pupil's level of musical achievement, based on items taken from Associated Board of the Royal Schools of Music's (ABRSM) performance examination marking guidelines (ABRSM, 2018). An independent ABRSM examiner was also asked to make an assessment of each child's musical achievement level, based on their practice videos.

Both the parent questionnaire and observational coding schemes used in Study 2 were based on the validated questionnaire instrument from Study 1. As discussed, the main data collection instrument(s) were the result of rigorous reliability testing and practical adjustments, such as streamlining the original 44-item questionnaire to 8 items. The parent questionnaire also included items from Hembacher and Frank's (2016) Early Parenting Attitudes Questionnaire (EPAQ). A more detailed methodological account of Study 1 and Study 2 can be found in Chapters 4 and 6 respectively.

3.4 Ethical Considerations

As in any study involving human participation, it is vital that all possible risks to participants and the researcher are carefully considered – particularly in the case of young children, who are unable to give consent (Arnott, Martinez-Lejarreta, Wall, Blaisdell, Palaiologou, 2020). In order to ensure informed consent, all adult participants (parents and teachers) were invited to read a participant information sheet and sign a consent form before participating in either of the two studies or pilot. In the case of children, consent was obtained from their parent. However, in order to dilute the adult-child power imbalance and ensure that parents discussed their child's participation in the project beforehand, a small "consent form" in child-friendly language was made for the child too (see Appendix J).

In agreement with ethical guidelines (BERA, 2018), participants were made aware that they could decide not to continue their involvement at any time and with no need to provide any explanation. It was made clear to participants that withdrawing participation would not affect them or their child in any negative way. Finally, participants were also made aware that in the event they decided to withdraw participation that their data would be destroyed. In addition to keeping all data strictly confidential all participants have been kept anonymous.

The main ethical consideration raised by this project was the visiting of young children (aged 6-9 years) in their homes in Study 2. It should be noted that at the time of the study, the researcher possessed over six years of experience working with and teaching young children and, in addition to being fully DBS-checked, had undertaken appropriate safeguarding training. As the researcher was not in the room for either practice session, the total contact time the researcher spent with the child without the presence of the parent was kept to an absolute minimum – roughly 5-10 minutes for the McKI. Suitable measures were also put in place in order to limit the possibility of children feeling overly fatigued or uncomfortable – for instance, by limiting each practice observation in Study 2 to 10 minutes and filming the observations in a familiar environment (i.e., participants' homes). Prior to videoing, children were also invited to tell the researcher about themselves and to show the researcher any drawings they may have done prior to the study (in response to an invitation to draw something for the researcher on the child's consent form) to help put them at ease. As recommended by child psychologists (Cameron, 2005; Danby, Ewing & Thorpe, 2011; Irwin & Johnson, 2005), McKIs were conducted side-by-side, eye-level with the children and in a friendly and informal manner (see Chapter 6, section 6.2.8). At the end of their participation, each child was invited to choose a small prize (pencil, rubber or stickers) from a "surprise box" and given a certificate from the researcher to recognize and thank them for their help. The researcher made it clear to participants throughout that they could stop at any point and/or ask her to leave to the house without any explanation. In the unlikely event that participants (children or adults) experienced undue stress as result of the study, the researcher was prepared to guide affected participants towards appropriate support services – although this fortunately did not occur.

Ethical approval for Study 1, the pilot and Study 2 was granted by the RNCM Research Ethics Committee. Research Ethics certificates for all studies can be found in Appendices A, B and C.

CHAPTER 4

Study 1 - Trends in parental metacognitive and self-regulatory support during children's musical learning

4.1 Introduction

It is widely acknowledged that parents play an important role in supporting children's metacognition (Pino-Pasternak & Whitebread, 2007; Sonnenschein, Baker & Cerro, 1992; Thomas & Anderson, 2013; Wall, Burns & Llewellyn, 2017), particularly in the case of younger children, who may need additional support to employ metacognitive and self-regulatory strategies during learning tasks (Larkin, 2010; Pino-Pasternak, 2014; Whitebread et al. 2019). The same can also be said for children's musical learning, with parents providing essential support for young children learning to practice their instrument at home (McPherson, 2008; Pike, 2017). The behaviours used by parents to support their children's learning are strongly shaped by their beliefs about musical learning and practice. One factor which may affect parental attitudes and the behaviours they use to support their children's practice is parents' level of previous musical experience, although findings vary across studies (Custodero & Johnson-Green, 2003; Illari, 2005; Pitt & Hargreaves, 2017). An important area of investigation related to the possible associations between previous musical experience and parents' support of their children's musical learning is the extent to which metacognition and self-regulation are domain-specific or domain-general behaviours. It may be that a parents' metacognitive and self-regulatory knowledge from other areas may allow them to offer domain-general metacognitive and self-regulatory support to their child during musical learning – helping to compensate for a lack of domain-specific (that is, musical) knowledge.

A questionnaire study exploring parents' support of children's metacognitive and self-regulatory behaviours during their piano practice was conducted with 40 parents of children aged

6-9 years learning to play the piano in the UK. The aims of this study were to a) gather descriptive statistics about metacognitive and self-regulatory behaviours parents report assisting their children with during piano practice, b) explore associations between parental metacognitive and self-regulatory support, frequency of supervision, parents' previous musical experience, and frequency of children's practice; and c) trial the use of categories and descriptions taken from Cambridgeshire Independent Learning in the early years coding scheme (C.Ind.Le, Whitebread et al., 2009) in a questionnaire format, with a view to developing and reliability-testing observational and self-report instruments for Study 2.

This chapter is structured into seven sections. Building on the overview of the literature in Chapter 2, this section (4.1) presents a more detailed overview of the literature on children's practice and the role of parental support. Additionally, this section introduces different measures of parental support from the literature, as well as justifications for the use of C.Ind.Le (Whitebread et al., 2009) as the basis of this study's questionnaire instrument. Section 4.2 reports the methodological approach used in this study, including participants, materials and procedures, followed by an overview of data analysis procedures in section 4.3. Section 4.4 reports the results of Study 1, followed by the Discussion in section 4.5 and Limitations in section 4.6. This chapter concludes with section 4.7, which summarises the main conclusions of this study.

4.1.1 Children's Instrumental Practice

As discussed in Chapter 2, "understanding children's musical progress involves much more than simply examining the relationship between the amount of practice they have accumulated and their achievement on their instrument" (McPherson, 2005, p. 27). Indeed, studies which support positive associations between practice and expertise rarely omit the caveat that, in order to improve musically, the practice undertaken by learners must be "deliberate" (Bonneville-Roussy & Bouffard, 2015; Ericsson, et al., 1993; Mornell et al. 2018; Pike, 2017).

The highest achieving musicians in Hallam et al.'s (2012) study were those that not only undertook the most practice but reported adopting more effective practice strategies and correcting errors in their performance. Advanced music students in Nielsen's (2001) study demonstrated extensive metacognitive and self-regulatory skills that included setting specific goals, engaging in strategic planning and detailed self-monitoring – behaviours which enabled them to optimise their learning and performances. The use of mental strategies has also been found to be a powerful predictor of ability to sight-read, play from memory and play by ear – importantly, it may be that early difficulties in the same areas may hinder progress later (McPherson, 2005). The use of mental strategies during practice from an early stage may therefore help to avoid problems in these areas of musicianship and sustain musical development later on.

However, videotape analyses of young children's home practice suggest that over 90% of practice is spent playing pieces through from beginning to end, without the use of any strategies or techniques to improve performance – an approach which is unlikely to lead to musical success (McPherson & Renwick, 2001). In a three-month study of teenaged pianists at-home practice, Pike (2017) found that adolescent participants regularly practiced in unideal circumstances, had limited attention spans (typically not more than 8-10 minutes) and that practice mostly took the form of playing through pieces indiscriminately. In contrast to the highest achieving musicians in Ericcsson et al.'s (1993) and Sloboda et al.'s (1996) studies, who practiced first thing in the morning, many of the participants in Pike's (2017) study left music practice as the last activity of the day before going to bed.

These studies paint a very poor picture of the quality of practice being undertaken at home. Pike (2017) found that rehearsal strategies taught to students by the same teachers may encourage some students to practice effectively, but not others, which suggests that there might be additional underlying reasons for why students did not transfer these skills to practice at home. For young children, whose metacognitive and self-regulatory skills are not yet fully developed and may require additional support to practice (Pino-Pasternak, 2014), parents play a key role not only in supporting their children to practice enough but also in ensuring that this practice is sufficiently goal-directed to support improvement.

4.1.2 The Role of Parents in Children's Music Practice

It is clear from the literature that regular, high-quality practice is crucial to developing musical expertise (Sloboda et al., 1996; Ericsson et al., 1993; Hallam et al., 2012). However, very few young children are equipped with the self-efficacy and intrinsic motivation necessary to persist in practising without adult support, particularly in the face of obstacles or frustrations (Sloboda et al., 1999; McPherson, 2005). Pike (2017) suggests that teacher instruction lays the foundation for self-regulation in students, offering recommendations and advice for teachers on how to help their students self-regulate their practice at home. However, given that teachers are not present or able to control what happens outside of lessons, it could be argued that the people best placed to support their children's metacognition and self-regulation during practice at home are, in fact, parents.

4.1.3 Parental Support Behaviours

Parents play a key role in supporting the development of children's metacognitive and self-regulatory abilities, helping their children to become independent and self-efficacious learners (Pino-Pasternak, 2014). Moreover, early studies support the view that parental support, in particular parental supervision of practice, is strongly associated with musical achievement in the early stages of learning an instrument (Brokaw, 1982; Sosniak, 1985). These findings echo more recent findings from the educational psychology literature which suggest that, once socio-economic status is accounted for, the biggest influence on children's motivation and academic attainment is parental support (Desforges & Abouchaar, 2003; Harris & Goodall, 2007).

Veenman et al., (2006) argue that the vast majority of students unconsciously absorb metacognitive behaviours learnt from their parents and teachers. Self-regulation (i.e., emotional/motivational regulation), in particular, takes place in a social context which is difficult to extrapolate from interactions with others. Caregivers, for instance, may set or share goals with children that conflict with the child and therefore require regulation of emotion by both parties (Efklides & Misalidi, 2019). In addition to the unconscious transfer of metacognitive and self-regulatory knowledge through socio-emotional behaviours, parents may also provide their children with explicit instructional support. Valcan et al., (2017) suggest that parental scaffolding of homework tasks may predict higher levels of executive function in childhood. As discussed, scaffolding takes place when adult caregivers help children to tackle aspects of problem-solving tasks that the child cannot yet perform independently (Matte, Gagné & Bernier, 2011). Importantly, effective scaffolding relies on providing contingency support after failure and withdrawing support after success, thus encouraging children's autonomous and independent learning. Diamond (2013) suggests that internalising positive learning behaviours, learnt through parental support practices such as scaffolding, may help children learn to regulate their own emotions and response to challenges. This view is supported by McPherson (2009) and Creech (2009), who argue that parental support behaviours are most effective when they involve structuring learning and are autonomy-supportive, helping a child to focus on the processes involved in learning. When parents proactively make an effort to provide information, guidelines and feedback to their child during musical learning in this way, they enhance their child's feeling of competence and facilitate their acquisition of skills (Pomerantz et al., 2005). These behaviours, which are initially modelled by parents, are then adopted by their children who in turn begin to regulate their own thinking and learning.

4.1.4 Parental Attitudes

As previously explored, the kinds of musical and metacognitive/self-regulatory support parents give their children are often shaped by parents' beliefs about musical learning. In their study of mother-child interactions in the first year of learning to play an instrument, McPherson & Davidson (2002) found that approximately 80% of children in their sample were reminded to practice in the first month of learning; and that these reminders dropped to 48% by the ninth month. While some parents continued to support practice schedules even after their child's interest had begun to wane, the majority stopped reminding their child to practice their instrument. Reasons given by mothers who chose to stop practice reminders included that they felt their child wasn't "coping emotionally"; that if "[their child] was really interested that they would do it anyway"; and that "they were unwilling themselves to invest the time and effort needed to regulate their child's daily practice" (McPherson & Davidson, 2002, p. 154). Similar results were encountered in a subsequent study by McPherson (2006) which found that the way parents viewed music compared to other subjects (i.e., music having high intrinsic value but low attainment and utility value) had far-reaching consequences on children's music education and interactions between parents and children during musical learning. In short, parental attitudes may play a key role in influencing the types of support a parent will give their child and, consequently, the quality of their child's musical learning at home.

Parents' beliefs about their own role in supporting their child's musical development may in part be influenced by children's instrumental teachers (Macmillan, 2004). Macmillan's survey of piano teachers' attitudes towards parental involvement suggests that, although some teachers encourage it, very few teachers demonstrate awareness of the ways in which parents could offer support from home. Macmillan (2004) argues that "where there is very little communication between teacher and parent, there can be differences between the teacher's and the parent's perception of the parent's role in practice" (p. 309). Macmillan also suggests that parental support behaviours vary between families, with some involvement occurring without teachers necessarily being aware. However, the lack of specific advice from teachers on how to support their child's practice may affect parents' confidence in their ability to support their child's musical learning at home and deter them from getting involved in between lessons (Macmillan, 2004). Another important consideration for parents is the way in which parental attitudes may affect children's beliefs about the value of different activities, as inferred by adult presence or absence (Robson & Rowe, 2012). In her study of the impact of parental presence on children's metacognition and self-regulation during play, Robson (2010) found that children were more likely to demonstrate responsibility and leadership when with their similar-aged peers, than with adults. However, Robson's findings also indicate that children are keen to display their knowledge to people they consider significant or important, such as adults. Children may therefore view certain activities as important because adults tend to be present when they take place (e.g., classroom learning), therefore absorbing implicit messages that the only valued activities are the ones at which adults are present (Robson, 2010).

In addition to attitudes about music learning and parental involvement, parents may also hold beliefs about the process of teaching children to learn independently. In their study of skills that mothers taught to their pre-school-aged children, Sonnenschein et al. (1992) asked mothers about the importance of learning-to-learn. Sonnenschein and colleagues found that all participants claimed that these skills were important, believing that they had either taught their children learning-to-learn skills or that their children were already in possession of them. However, when asked to give examples of the kinds of techniques they had taught their children, mothers were only able to talk about basic cognitive skills rather than explain how they facilitated the development of higher-order, metacognitive abilities (Sonnenschein et al., 1992). This finding suggests that the importance parents place on learning-to-learn skills is not always reflected in their actual understanding of what learning-to-learn means or what they have actually taught their children. This disconnect between what parents believe their children already know and are able to do, and what their children are actually able to do without help, may in part explain why some parents withdraw help prematurely (McPherson & Davidson, 2002). Furthermore, it may be that parental support behaviours echo parents' own individual experiences of learning (Taylor et al., 2004). Taylor and colleagues (2004) argue that parental behaviours "may serve as important mediators of parents' experiences, providing the opportunity for positive parenting behaviours to stifle the impact of negative experiences that parents may have had during their own years of formal schooling" (p. 174). In the context of musical learning, it may be that parents' previous musical experience may help to inform parental beliefs about musical learning and the kinds of support they give their children.

4.1.5 Parents' Previous Musical Experience

A continuing debate in music education research focuses on whether parents with previous musical experience are more likely to support and/or are more able to effectively support their children's musical development than musically inexperienced parents. However, definitions and criteria for musical expertise are highly subjective and vary widely across the literature depending on context. Zhang and Schubert (2019) note that music psychologists typically group "musicians" and "non-musicians" based on their responses to a single item measure related to some type of musical expertise e.g., years spent learning or hours of daily practice. In their study of musical sophistication indexes and single item measures of musical expertise, Zhang and Schubert (2019) found individuals' self-assessed level of musical identity was the best single item for estimating musical sophistication and the strongest indicator of what constitutes a musician.

The issue of parents' previous musical experience is a particularly important consideration for music teachers hoping to advise parents on how to support their child's musical learning at home. As discussed in Chapter 2, Sosniak (1985) found that the parents of successful concert pianists were not necessarily musicians themselves or from musical backgrounds. This result has been replicated by Sloboda & Howe (1991), who found that exceptionally able musicians at a specialist music school had on average less musically active parents than children with lower musical achievement outcomes. In their later study, Davidson et al. (2002) also found that the most successful children in their sample had parents who, though not necessarily musicians themselves, understood the value of music and enjoyed listening to music recreationally. Macmillan (2004) argues that many parents seem to underestimate their ability to help with their children's music practice and that even musically untrained parents would be able to "contribute a great deal", with appropriate guidance and confidence-building from their children's teachers (p. 310).

Studies by other authors suggest a different picture. Hallam (1998), for instance, argues that parents without any prior musical experience are less likely to actively support their children's musical development than musically experienced parents. In her study of predictors of musical achievement and drop-out in instrumental learning, Hallam (1998) found that parents without previous musical experience often sat passively during their child's instrumental lesson or simply chaperoned their child to and from their classes. In contrast, musically trained parents engaged actively in lessons, asking their child's teacher questions, and often supervised their child's practice at home. Equally, both Custodero & Johnson-Green (2003) and Illari (2005) have found that mothers with previous musical experiences and/or partners or family members who were musicians reported listening to music with or singing to their infants more often than mothers without. These findings are echoed by Duke et al. (1997), who suggest that children whose mothers played piano when they were young tended to be rated by their piano teachers as more proficient than children whose mothers did not play a musical instrument. Similarly, in their study of parental rationales for parent-child group music-making with young children, Pitt and Hargreaves (2017) found that parents who took part in group music sessions with their children were more likely to reinforce musical learning from the sessions at home, presumably, because taking part in the session gave them the knowledge they needed to replicate these musical activities with their children.

An important consideration for researchers, therefore, is not only whether parents involve themselves in their children's musical learning, but also whether they are able to offer musically minded support (Macmillian, 2003; Margiotta, 2011). In their study of mother and child interactions during children's first year of instrumental learning, McPherson and Davidson (2002) found that parental support of instrumental practice was characterised by three main behaviours: modelling; reinforcement; and direct instruction. While parents reported feeling comfortable with these three techniques, McPherson and Davison (2002) observed that most parents lacked the requisite musical knowledge to assist through "modelling" or "direct instruction". Instead, the majority of parents relied on "reinforcement" behaviours, such as reminding their child to practice or reinforcing a regular practice schedule (McPherson & Davidson 2002) – behavioural support that does not require domain-specific musical knowledge to administer.

Music-specific support aside, another way in which parents (particularly those without previous musical experience) may be able to support their children's musical learning is by applying domain-general metacognitive knowledge and skills gleaned from other areas. Veenman et al. (2006) suggests that "general metacognition may be instructed concurrently in different learning situations and may be expected to transfer to new ones, whereas specific metacognition has to be taught for each task or domain separately" (p. 7). Research into the transferability of metacognitive and self-regulatory skills across disciplines suggests that, for the most part, children's abilities are domain-specific and not easily replicated without training (Neunhaus et al., 2011), although the transferability of these skills appear to improve with age (Bellon, Fias & Smedt, 2020; Guerten, Meulemans & Lemaire, 2018; Van der Stel & Veenman, 2014; Veenman & Spaans, 2005). Guerten et al. (2018) have attempted to investigate the developmental course of the transition of children's metacognitive abilities from domain-specific to domain-general and found that a gradual shift occurs in children between ages 8-13. By the age of 10, Guerten and colleagues argue that children's metacognition is "no more bounded by task content and domain knowledge" (p. 77). Similarly, Bellon et al. (2020) found that 8-9-year-old children's metacognitive monitoring abilities in spelling and arithmetic tasks were predictive of each other, even after controlling for academic performance – a finding which supports Geruten et al.'s suggestion that domain-general metacognitive abilities emerge around the age of 8 years. There is evidence to suggest that adult learners, however, more easily transfer metacognitive and self-regulatory skills learnt in one area to another (McCurdy et al., 2013; Schraw et al., 1995), although researchers' opinions differ (see Fitzgerald, Arvaneh & Dockree, 2017). Others suggest a mixed-theory of domain-specificity/generality (e.g., metacognitive knowledge and skill as domain-general; metacognitive accuracy as domain-specific) dependent on other factors, such as perceptions of difficulty or level of interest (Scott & Berman, 2013). The implication of this is that if parents' metacognitive abilities are by and large domain-general, it may be that musically untrained parents are able to offer invaluable metacognitive and self-regulatory help to their children learned from other areas of expertise.

There continues to be no strong consensus as to whether parents' previous musical experience has an impact on the quality and frequency of support given to children during musical learning. Moreover, it remains unclear whether previous musical experience is associated with the ability to give appropriate metacognitive and self-regulatory help to children during musical learning – one of the issues explored in the present study.

4.1.6 Measuring Parental Support of Children's Metacognition and Self-Regulation

As discussed in Chapter 2, there are a large number of measurement instruments in the educational psychology literature that have been developed to assess participants' metacognition and self-regulation in online (on-task) and offline (pre or post-task) settings. The majority of these tools are aimed at measuring adolescent and adult metacognitive and self-regulatory behaviours offline (Gascoine et al., 2016) and rely on complex verbal demonstrations of understanding far beyond the abilities of young children (Shamir, Mevarech & Gida, 2009). The challenges surrounding valid measurement of participants' metacognition and self-regulation have been compounded by the diversity of forms of investigation and lack of parallel studies or replications by independent researchers (Baker & Cerro, 2000).

Questionnaires are a particularly popular method of assessment in psychological research as they are easily administered and allow for data to be collected from large numbers of participants. One of the most well-known and widely used self-report measures is Dennison and Schraw's (1994) Metacognitive Awareness Inventory (MAI). Comprising 52 items grouped under eight subcomponent processes, responses to statements are given on a continuous, 100-point bipolar scale with *true* at one end and *false* at the other. Examples of items from MAI include "I ask myself periodically if I am meeting my goals", "I consider several alternatives to a problem before I answer" and "I try to use strategies that have worked in the past" (Dennison & Shraw, 1994, p. 473). MAI has been used in many subsequent studies (e.g., Kleitman & Stankov, 2007; Magno, 2010; Young & Fry, 2008) but, as in Dennison and Schraw's (1994) original experiments, only in self-report studies involving adolescent and adult learners. Metacognitive and self-regulatory self-report measures are also widely used in musical settings (e.g., Hallam, 2011; Hallam et al., 2012; McPherson & McCormick, 1999). Miksza (2012) used a study of 302 middle school band students' self-regulated practice behaviours to develop and validate a new measurement instrument based on existing items from previously used measures. The 47-item questionnaire includes five subscales (self-efficacy/motive; method; behaviour; time management; and social influences) aimed at capturing different dimensions of self-regulated learning in beginners and intermediate musicians. However, as with all self-report measures, the reliability of the results collected using questionnaires relies heavily on participants' honest account and accurate memory retrieval (Schellings & Hout-Wolters, 2011) – a largely unavoidable methodological limitation of self-report.

In addition to questionnaires, several studies have explored the use of Think Aloud Protocols (TAPs) as a means of assessing participants' online metacognition during task activity

(Bannert & Mengelkamp, 2008; Schellings et al., 2012; Schellings & Broekkamp, 2011). TAPs require participants to verbalise their sequence of thoughts whilst performing a task – allowing researchers to make online assessments of learners' internal activity (Goo, 2010). Research suggests that explaining and elaborating aloud whilst reading may improve comprehension, helping both children and adult learners retain text and solve problems (Pressley & Afflerbach, 1995). However, as with questionnaires, the use of TAPs as a valid measure of children's metacognitive and self-regulatory awareness may be limited by children's limited verbal abilities. In their study of intellectual and metacognitive skills across different age groups, Veenman & Spaans (2005) asked secondary school students to solve six maths problems while thinking aloud during individual 45-minute sessions. These sessions were videoed, and metacognitive behaviours rated post-hoc. In a separate 35-minute session, participants also took part in a series of computerised experiments and instructed to find out how different variables affected the height of plant growth. Even adjusting for the level of challenge posed by the learning content, methods which require the assessment of extended learning tasks are highly unsuitable for young children, who may struggle to sustain attention for long periods (Mahone & Schneider, 2012). Moreover, TAPs place considerable demands on participants' working memory, requiring participants to retain and use relevant information during a task and deliver concurrent verbal commentary. Although TAPs have not been found to change the course of structure of adults' thought processes (Ericsson & Simon, 1993), where working memory is limited and language skills not fully developed (as in the case of young children) it may be that TAPs can confound results unrelated to respondents' metacognitive abilities (Veenman et al., 2006).

In order to overcome the challenges to reliability associated with self-report, some studies have employed methods which allow metacognitive assessments to be made by the researcher instead – for instance, through trace data from computer learning tasks (Azevedo & Hadwin, 2005; Perry & Winne, 2006). Another common form of metacognitive and self-regulatory assessment involves observational analysis and coding, with numerous studies conducted in academic (Pino-Pasternak & Whitebread, 2010; Thomas & Anderson, 2013; see also Wall et al., 2013) and musical settings (Bathgate et al., 2012; Colombo & Antonietti, 2016; McPherson et al., 2017; Zachariou & Whitebread, 2017). Recently, McPherson and colleagues (2019) applied a microanalytical approach to studying two undergraduate conservatoire students' self-regulated learning during piano practice. Their analysis protocol was based on the three-phase model of self-regulated learning (forethought, performance and self-reflection) and aimed to assess participants' "authentic moment-to-moment behavioural interactions" in an ecologically sensitive and context-specific manner (Cleary et al., 2012, p. 4). In addition to observing the two students' practising at three separate time points in a semester, participants were also interviewed before practising (forethought questions), during practice (performance questions) and after practising (self-reflection) using an 18-item guided self-regulated learning interview protocol. This extremely detailed and time-consuming approach allows a more task-specific understanding of learners' self-regulated behaviours during practice but may prove difficult to administer across large samples of participants – making it difficult to identify common factors across case studies and/or substantiate results.

As discussed, the importance of developing ecologically valid, task-specific measures of metacognition and self-regulation is particularly important in studies involving children, given their limited ability to report their behaviours retrospectively. Indeed, studies set in naturalistic settings and where tasks are age-appropriate have helped to elucidate the metacognitive and self-regulatory abilities of young children (aged 8 and below), whose abilities have previously been underestimated (Marulis et al., 2016; Shamir et al., 2009; Whitebread et al., 2009). Destan et al. (2014) used a pictorial confidence scale (with an unconfident looking child at one end, and a confident looking child at the other) to explore 7-year-olds Judgments of Learning (JOLs) and Confidence Judgments (CJs) following a paired learning task involving 16 Japanese characters. A cardboard treasure chest (correct items) and trash can (incorrect items) were used as part of a metacognitive control task, helping to situate the assessment activity in an age-appropriate and play-led environment (Robson & Rowe, 2012). Destan et al.'s study illustrates how developmentally sensitive adjustments to measurement protocols can help facilitate children's reliable self-report (in this case, JOLs and CJs) as a measure of their metacognitive ability. In addition to self-report measures, several studies have also employed observational methods to measuring children's metacognition and self-regulation. In their study of the relationship between parental scaffolding and children's self-regulated learning, Zhang and Whitebread (2017) video-recorded 130 4-6-year-old Chinese kindergarten children and their parents in a range of problem-solving tasks. Parent-child interactions and child-alone behaviours were analysed in depth, with both child and parent behaviours coded using behavioural coding schemes by Neitzel and Stright (2003), Pino-Pasternak (2014) and Pino-Pasternak et al. (2010). Observational coding systems are "list[s] of mutually exclusive labels, categories, and so forth – each of which characterises a coherent dimension of interest – used for classifying information obtained by observing others" (APA Dictionary of Psychology, 2020). Like Zhang and Whitebread (2017), Zachariou and Whitebread (2017) have also applied observational coding schemes to the study of children's regulation during musical play. In addition to identifying children's regulatory behaviours using C.Ind.Le (Whitebread et al., 2009), the authors also attempted to respond to the distinctive character of musical play by coding regulatory behaviours in terms of their "social intentionality" and "direction of the activity" (p. 223). As with other observational studies, this approach has significant methodological advantages in that it allows assessments to be made by an experienced researcher, is not limited by children's verbal abilities and facilitates non-intrusive and naturalistic observation of on-task metacognition and self-regulation – methodological considerations that played an important role in choosing the measurement instrument used as the basis of the assessment tool in the following two studies.

4.1.7 The Cambridgeshire Independent Learning in the Early Years Coding Scheme (Whitebread et al., 2009)

One of the challenges for this thesis was identifying a measurement tool that could be used to assess metacognitive and self-regulatory abilities of young children during musical learning specifically. Moreover, given the multi-method design of Study 2, the instrument used also needed to be easily adapted for use as a questionnaire, interview and observational coding protocol. Part of the reason for choosing one coding scheme as the basis of three different instruments was to allow for alignment of constructs (e.g., parental support and children's metacognition and self-regulation) and comparison of results across different measures. Indeed, Schellings and Van-Hout Wolters (2011) argue that, when choosing a measurement instrument, "it is important not to simply select a popular one (e.g., MSLQ, Pintrich and De Groot 1990; MAI, Schraw and Dennison, 1994) but to question exactly which learning strategies have to be measured and which learning strategies are measured by the chosen instrument" (p. 84).

The Cambridgeshire Independent Learning in the Early Years (C.Ind.Le) coding scheme is widely regarded as the first to reveal and catalogue metacognitive and self-regulatory abilities of children aged 3 to 5 (Whitebread et al., 2009). Unlike other measurement tools, C.Ind.Le is specifically designed with young children's verbal and non-verbal metacognitive and self-regulatory behaviours in mind. Additionally, unlike other frameworks (e.g., Zimmerman, 2002) which offer only vague metacognitive and self-regulatory descriptors based on theoretical models, C.Ind.Le provides an extremely detailed and comprehensive list of possible indicators of metacognition and self-regulation in children. Descriptors listed in C.Ind.Le are based on 96 hours of footage of metacognitive and self-regulatory behaviours exhibited by 1,440 children aged 3-5 playing and working in classrooms over two years. From these video data, 582 events were identified as showing "general evidence of metacognitive or self-regulatory behaviours (involving all of the children in the sample at least once and in many cases on several occasions)" (Whitebread et al., 2009, p.71). Following several further stages of identification and analysis, a final subset of 60 events "were coded at the most detailed level of categories represented in the coding scheme" (p. 72). Unlike many other instruments in the literature (Gascoine et al., 2016) the final instrument resulting from the C.Ind.Le project has been subject to rigorous reliability testing – demonstrating good levels of agreement between interraters both at a unitising level ("agreeing which units of behaviour should be coded", 66%) and absolute agreement level ("agreeing which codes should be assigned to the agreed units of behaviour", 96.1%) (Whitebread et al., 2009, p. 72; see also Bakeman & Gottman, 1997). Finally, the C.Ind.Le coding scheme has been successfully applied to multiple empirical studies involving young children (Marulis et al. 2016; Robson, 2010; Whitebread & Coltman, 2010), including one study of children's self-regulation during musical play specifically (Zachariou & Whitebread, 2017). The same framework has also been used to investigate metacognition in adult learners and their teachers during piano lessons (Colombo & Antonietti, 2016) – an indication of its suitability for use in music education settings.

The metacognitive and self-regulatory behavioural categories developed in the C.Ind.Le coding scheme are a combination of a priori categories derived from an analytical model of cognitive self-regulation by Pino-Pasternak (2006), and new groupings that emerged from analysis of data collected from the C.Ind.Le project. In line with the conceptualisation of metacognition outlined in Chapter 1, and applied to the present study, the C.Ind.Le model synthesises elements of both "cognitive information processing" (i.e., metacognition) and "affective, social and motivational elements" (i.e., self-regulation) (Whitebread et al. 2009, p. 64). These metacognitive and self-regulatory dimensions are separated into nine subcategories described in Table 3:

Table 3
C.Ind.Le coding scheme: verbal and nonverbal indicators of metacognition and self-regulation in 3- to 5-year-olds category (Whitebread et al., 2009)

Category Name	Description
Knowledge of Persons (KoP) A verbalization demonstrating the explicit expression of one's knowledge in relation to cognition or people as cognitive processors. It might include knowledge about cognition in relation to: - Self: Refers to own capabilities, strengths and weaknesses, or academic/task preferences; comparative judgments about own abilities - Others: Refers to others' processes of thinking or feeling toward cognitive tasks - Universals: Refers to universals of people's cognition Knowledge	• Refers to his/her own strengths or difficulties in learning and academic working skills • Refers to others' strengths or difficulties in learning and academic working skills • Talks about general ideas about learning • Compares
Knowledge of Task (KoT) A verbalization demonstrating the explicit expression of one's own knowledge in relation to strategies used or performing a cognitive task, where a strategy is a cognitive or behavioral activity that is employed so as to enhance performance or achieve a goal.	• Refers to his/her own strengths or difficulties in learning and academic working skills • Refers to others' strengths or difficulties in learning and academic working skills • Talks about general ideas about learning • Compares across tasks identifying similarities and differences • Makes a judgment about the level of difficulty of cognitive tasks or rates the tasks on the basis of pre- established criteria or previous knowledge
Knowledge of Strategies (KoS) A verbalization demonstrating the explicit expression of one's own knowledge in relation to strategies used or performing a	• Defines, explains or teaches others how she/he has done or learned something • Explains procedures involved in a particular task

cognitive task, where a strategy is a cognitive or behavioral activity that is employed so as to enhance performance or achieve a goal.	• Evaluates the effectiveness of one or more strategies in relation to the context or the cognitive task.
Planning (P) Any verbalization or behaviour related to the selection of procedures necessary for performing the task, individually or with others	• Sets or clarifies task demands and expectations • Allocates individual roles and negotiates responsibilities • Sets goals and targets • Decides on ways of proceeding with the task • Seeks and collects necessary resources
Monitoring (M) Any verbalization or behaviour related to the ongoing on-task assessment of the quality of task performance (of self or others) and the degree to which performance is progressing towards a desired goal	• Self- commentates • Reviews progress on task (keeping track of procedures currently being undertaken and those that have been done so far) • Rates effort on-task or rates actual performance • Rates or makes comments on currently memory retrieval • Checks behaviors or performance, including detection of errors Self-corrects Checks and/or corrects performance of peer
Control (C) Any verbalization or behaviour related to a change in the way a task had been conducted (by self or others), as a result of cognitive monitoring	• Changes strategies as a result of previous monitoring • Suggests and uses strategies in order to solve the task more effectively • Applies a previously learnt strategy to a new situation • Repeats a strategy in order to check the accuracy of the outcome • Seeks help • Uses nonverbal gesture as a strategy to support own cognitive activity Copies from or imitates a model Helps or guides another child using gesture

Evaluation (E) Any verbalization or behaviour related to reviewing task performance and evaluating the quality of performance (by self or others).	• Reviews own learning or explains the task • Evaluates the strategies used Rates the quality of performance • Observes or comments on task progress Tests the outcome or effectiveness of a strategy in achieving a goal
Emotional/Motivational Monitoring (EMM) Any verbalization or behaviour related to the assessment of current emotional and motivational experiences regarding the task	• Express awareness of positive or negative emotional experience of a task • Monitors own emotional reactions while being on task
Emotional/Motivational Control Any verbalization or behaviour related to the regulation of one's emotional and motivational experiences while on task	• Controls attention and resists distraction or returns to task after momentary distraction • Self-encourages or encourages others • Persists in the face of difficulty or remains in task without help

Given C.Ind.Le's use in a number of peer-reviewed and frequently cited studies across multiple disciplines, and its alignment with the theoretical model of metacognition and self-regulation operationalised in this thesis, the C.Ind.Le coding scheme was considered highly appropriate for use as the basis of a parent questionnaire exploring parental support of children's musical learning. Having reviewed the literature on parental support, previous musical experience and measuring children's metacognition and self-regulation, the following section now summarises the rationale for the present study emerging from the literature and subsequent research questions.

4.1.8 Rationale and Research Questions

It is clear from the extant literature that parents play an important role in supporting their children's practice and, in doing so, the development of their children's musical expertise.

The most musically successful children use a number of metacognitive and self-regulatory practice strategies to structure and enhance their practice (McPherson, 2005). However, younger children may struggle to use such mental strategies during their practice without adult support (Barry, 1990; Larkin, 2010). Outside of music lessons, the individuals best placed to offer this support are likely parents (Macmillan, 2004). It is unclear whether parents' previous musical experience may affect the support parents give their children, or whether domain-general metacognitive and self-regulatory knowledge from other areas are sufficient to supervise their children's practice effectively.

The aim of the present study therefore is to survey parental support of children's metacognition and self-regulation as reported by parents using a questionnaire based on items from the C.Ind.Le coding scheme (Whitebread et al., 2009) – an instrument deemed suitable due to its focus on children's abilities and use in multiple other peer-reviewed musical studies (e.g., Colombo & Antonietti, 2016). Additionally, this study explores associations between parental metacognitive and self-regulatory support, frequency of parental supervision, parents' previous musical experience, and frequency of children's practice (as reported by parents). The present study is underpinned by the following overarching (RQ1) and specific (RQ1a and RQ1b) research questions:

RQ1 - What is the nature of parental support of children's metacognition and self-regulation in musical learning and what are its associations with parents' previous musical experience?

RQ1a - To what extent is parental metacognitive and self-regulatory support and frequency of parental supervision during their children's practice associated with parents' previous musical experience?

RQ1b - To what extent is frequency of children's practice associated with parental metacognitive and self-regulatory support and frequency of parental supervision during children's practice?

To aid clarity, these research questions have been abbreviated to the following when they recur in section titles:

RQ1 – Parental Support and Previous Musical Experience

RQ1a – Parental Support, Frequency of Supervision and Previous Musical Experience

RQ1b – Parental Support, Frequency of Supervision and Frequency of Children's Practice

Based on the review of the literature, three hypotheses were made in relation to these research questions:

H1 - The amount of metacognitive and self-regulatory support children receive from their parents during piano practice is positively correlated with parents' previous musical experience.

H1a - How frequently parents supervise their children's piano practice is positively correlated with parents' previous musical experience.

H1b - The frequency of children's practice is positively correlated with parental metacognitive and self-regulatory support and frequency of parental supervision during practice

The following section provides an account of the methodology used in the present study, including adaptations to C.Ind.Le (Whitebread et al., 2009) made as part of the questionnaire instrument construction, reliability testing and data analysis procedures.

4.2 Methodology

4.2.1 Participants

The respondents of the questionnaire were 40 parents of children aged between 6-9 years and taking piano lessons in the UK. Invitations to take part in the study were circulated via email through communication channels such as local music hubs and private piano teachers (see section 4.2.3). Only one parent per family was allowed to complete the questionnaire. 43 responses were collected in total, with data for three participants excluded due to the children being either too young or too old (ages 5, 11 and 13). Where children were younger than 6 years or older than 9 years, results were considered likely to reflect a level of parental support that may confound results – particularly in the case of adolescents, who may be less receptive to adult help (Creech, 2009). Additionally, given that children younger than 5 may not yet have begun school and are therefore unlikely to have experienced much time apart from their parents, parents with children aged 6 years or under were also considered likely to offer a level of support much higher than children who have already begun to attend school.

In addition to the three participants whose responses were removed, an additional two respondents who took part in the questionnaire reported having children aged 9 years. Although the study originally advertised for children aged between 6-8 years to take part, given the very small difference in age and similar level of cognitive development between ages 7-9 years (see Babakr, Mohamedamin & Kakamad, 2019 for an overview of Piagetian developmental stage theory) it was felt that including children aged 9 years was unlikely to affect results. The upper age limit was therefore extended to 9 years old and data for these two participants included as part of the study.

Of the 40 parents whose results were included, 34 were female and six were male. Participants were aged 29-51 years (M = 39, SD = 2.83), and all were living in the UK at the time of the study. Importantly, only a very small number of participants identified themselves as professional musicians or music teachers (one "pianist" and one "musicians/music teacher/primary class teacher"). In response to the question "have you ever had formal music lessons" and/or "currently play/sing/compose (formally or informally)", 21 of the 40 participants (including those who identified as professional musicians or teachers) reported that they had previously had formal lessons or currently played/sang/composed informally. Thus, the results collected represent a sample of people of which roughly half considered themselves to be "musically experienced" and half "without previous musical experience".

4.2.2 Ethics Procedure

Ethics approval for this questionnaire study was granted by RNCM Research Ethics Committee in January 2018 (see Appendix A). Participant consent was indicated through their participation in the online questionnaire, which included a participant information sheet and consent form. All responses were anonymised.

4.2.3 Materials and Dissemination

The online questionnaire was designed using Bristol Online Surveys and invitations to participate sent to parents via email, as well as being disseminated through private music teachers, local schools, Saturday music schools (e.g., Junior Royal Northern College of Music, Sheffield Music Academy, Yorkshire Young Musicians) regional music services (e.g., Greater Manchester Music Hubs) and musical associations (e.g., British Suzuki Institute and European Piano Teachers Association) to parents.

4.2.4 Questionnaire Design

The questionnaire used in this study comprised 44 questions relating to parental metacognitive and self-regulatory support of children's piano practice; parents' previous musical experience; frequency of children's practice; and frequency of parental support – as reported by parents. The following section describes the construction of the questionnaire instrument used, including adaptations made to the C.Ind.Le coding scheme (Whitebread et al., 2009) for the purposes of this questionnaire study. The complete questionnaire, as it appeared on Bristol Online Surveys, can be found in Appendix D.

4.2.5 Parental Metacognitive and Self-Regulatory Support

Of the 44 questions in the questionnaire, 33 were based on descriptions of metacognitive and self-regulatory categories and behaviours listed in the C.Ind.Le coding scheme (Whitebread et al., 2009). Questions (adapted from descriptions of behaviours taken from C.Ind.Le) were specifically concerned with parental support of children's metacognition and self-regulation during piano practice. Taken together, parents' responses to these 33 items were used as a measure of the amount of parental metacognitive and self-regulatory support given to children during their piano practice in different areas, as reported by parents.

In order to fit the context of the study (i.e., children's piano practice) and the questionnaire format, descriptions of metacognitive and self-regulatory behaviours listed in the C.Ind.Le coding scheme (Whitebread et al., 2009) were adapted for the present study (see Table 4). Knowledge of Task, for example, is listed in C.Ind.Le as being observable through "a verbalisation demonstrating the explicit expression of one's own long-term memory knowledge in relation to elements of the task". Descriptions of possible behaviours include "compar[ing] across tasks identifying similarities and differences" and "mak[ing] a judgment about the level of difficulty of cognitive tasks or rates the tasks on the basis of pre-established criteria or previous knowledge". In the questionnaire, this category is reflected in the statements "I help my child to be able to compare different kinds of tasks with each other by encouraging my child to compare the experience of practising pieces with practising sight-reading or scales" and "I help my child to be able to judge the relative difficulty of a task by encouraging my child to compare how difficult they find this week's homework, compared with homework set last week/month". As seen from the exemplar statements above, each questionnaire item was accompanied by a context-specific example – e.g., make a practice chart; ask their child to evaluate their progress; correct mistakes – in order to help participants, respond as accurately as possible. Responses were given on a 7-point Likert scale indicating level of agreement, with descriptors at extreme points (1 = *not at all* to 7= *completely*), resulting in a possible total score out of 231. Table 4 describes the main 33 items of the questionnaire.

Table 4
Metacognitive/self-regulatory categories, question number, question code, description of behaviour taken from C.Ind.Le (Whitebread et al., 2009) and questionnaire item.

Metacognitive/ Self-Regulatory Category	**Question Number**	**Question code**	**Description of behaviour** (from C.Ind.Le coding scheme, Whitebread *et al.* 2009)	**Questionnaire Item**
Knowledge of Persons	**8**	**KoP1**	Refers to his/her own strengths or difficulties in learning and academic working skills	I help my child to be able to evaluate their own strengths or difficulties during their practice, for example by encouraging my child to talk about what they feel they are very strong at, and which things they find more difficult during their piano practice.
	9	**KoP2**	Talks about general ideas about learning	I help my child to be able to talk about general ideas about learning by encouraging my child to describe what the experience of learning the piano is like for them and how it might be for others.
Knowledge of Task	**10**	**KoT1**	Compares across tasks identifying similarities and differences	I help my child to be able to compare different kinds of tasks with each other, for example by encouraging my child to compare the experience of

				practising pieces with practising sight-reading or scales.
	11	**KoT2**	Makes a judgment about the level of difficulty of cognitive tasks or rates the tasks on the basis of pre-established criteria or previous knowledge	I help my child to be able to judge the relative difficulty of a task, for example by encouraging my child to compare how difficult they find practicing their pieces with how difficult they find practicing sight-reading or scales.
Knowledge of Strategies	**12**	**KoS1**	Defines, explains or teaches others how she/he has done or learned something	I help my child to be able to define or explain how she/he has done or learned something, for example by encouraging my child to verbalise the strategies they used to overcome a tricky passage in a piece of music they are learning
	13	**KoS2**	Explains procedures involved in a particular task	I help my child to be able to explain procedures involved in a particular task, for example encouraging my child to describe the different stages of learning a new piece of music.
	14	**KoS3**	Evaluates the effectiveness of one or more strategies in relation to the context or [sic] the cognitive task	I help my child to be able to evaluate the effectiveness of different strategies for achieving their practice goals, for example by encouraging my child to consider if their practice is most effective when undertaken before, during or after school.
Planning	**15**	**P1**	Sets or clarifies task demands and expectations	I help my child to be able to set or clarify task demands and expectations, for example by

				encouraging my child to discuss the possible challenges of preparing for a graded exam, and what they will need to do in order to prepare in time.
	16	**P2**	Sets goals and targets	I help my child to be able to set themselves targets, for example by encouraging my child to devise regular goalposts, such as memorising a scale or being able to perform a piece confidently by the end of a practice session.
	17	**P3**	Decides on ways of proceeding with the task	I help my child to be able to decide on ways of proceeding with a task, for example by encouraging my child to explore different ways of practising a difficult passage of music and deciding on the best method.
	18	**P4**	Seeks and collects necessary resources	I help my child to be able to seek and collect necessary resources, for example by encouraging my child to find Youtube videos of the pieces they're currently learning or to attend performances by other pianists.
Monitoring	**19**	**M1**	Self-commentates	I help my child to be able to self-commentate, for example by encouraging my child to verbalise their thought processes as they're working through a problem.
	20	**M2**	Reviews progress on task (keeping track of procedures currently being undertaken and	I help my child to be able to review their progress during a task, for example by encouraging my child to keep a practice record

			those that have been done so far)	of what they have already done and what they have left to do in preparation for their next lesson.
	21	**M3**	Rates effort on-task or rates actual performance	I help my child to be able to assess their own effort and/or performance, for example by encouraging my child to rate themselves on different aspects of their practice.
	22	**M4**	Rates or makes comments on currently [sic] memory retrieval	I help my child to be able to assess their current memory retrieval, for example by encouraging my child to rate how well they were able to play a scale they were trying to memorise, after they closed the scale book.
	23	**M5**	Checks behaviours or performance, including detection of errors	I help my child to be able to detect errors in their practice, for example by encouraging my child to check their posture, or by pointing out differences between how your child's teacher has suggested they practice and how your child is actually practising.
	24	**M6**	Self-corrects	I help my child to be able to correct themselves, for example by encouraging my child to identify and correct their mistakes whilst practising.
Control	**25**	**C1**	Changes strategies as a result of previous monitoring	I help my child to be able to change their approach when things aren't working, for example by encouraging my child to try new practice strategies when they find themselves 'stuck' on a difficult section of music, without

			improvement, for an extended period of time.
26	**C2**	Suggests and uses strategies in order to solve the task more effectively	I help my child to be able to suggest and use strategies which may help them to solve a task more effectively, for example by encouraging my child to think about different ways of improving their practice and testing which ones are most effective.
27	**C3**	Applies a previously learnt strategy to a new situation	I help my child to be able to apply a previously learned strategy to a new situation, for example by encouraging my child to think about what they learnt in their last practice session that worked well, and apply it in their next practice session.
28	**C4**	Repeats a strategy in order to check the accuracy of the outcome	I help my child to be able to check the accuracy of the outcome of their work, for example by encouraging my child to play through their scales or pieces a second time, following a successful rendition, to see if they can perform them again with the same level of accuracy as the first time.
29	**C5**	Seeks help	I help my child to be able to seek help, for example by encouraging my child to ask their teacher for help with a problem they experienced whilst practising during the week.
30	**C6**	Uses nonverbal gesture as a strategy to support own cognitive activity	I help my child to be able to use non-verbal gestures as a strategy to support their own cognitive activity, for example by

				encouraging my child to clap the rhythm of a piece out loud to help them work out a tricky rhythm, or remember to adjust their posture when practising to ensure they're sat in the correct position.
	31	**C7**	Copies from or imitates a model	I help my child to be able to copy or imitate a model, for example by encouraging my child to listen to recordings of other pianists and attend concerts.
Evaluation	**32**	**E1**	Reviews own learning or explains the task	I help my child to be able to review their own learning or explain the task, for example by encouraging my child to keep a practice diary or chart and record their achievements, and use it to look over and reflect on their learning outcomes over the course of several weeks/months.
	33	**E2**	Evaluates the strategies used	I help my child to be able to evaluate the strategies they've used, for example by encouraging my child to reflect on whether a strategy they used in a practice session helped them to achieve their goals (e.g., - does using a metronome help them to play with a steadier beat?)
	34	**E3**	Rates the quality of performance	I help my child to be able to rate the quality of their performance, for example by encouraging my child to regularly rate their performances at the end of a practice session when learning a new piece of music.

	35	**E4**	Observes or comments on task progress	I help my child to be able to observe and comment on task progress, for example by encouraging my child to make judgments about how well they feel their practice is going during a practice session.
	36	**E5**	Tests the outcome or effectiveness of a strategy in achieving a goal	I help my child to be able to test the outcome or effectiveness of a strategy in achieving a goal, for example by encouraging my child to test themselves on their memory of their scales at the end of a practice session, after using a new strategy for learning scales.
Emotional/ Motivational Monitoring	**37**	**EMM1**	Express awareness of positive or negative emotional experience of a task	I help my child to be able to express how they feel whilst practising, for example by encouraging my child to talk about what they find frustrating when their practice is not going well.
	38	**EMM2**	Monitors own emotional reactions while being on a task	I help my child to be able to monitor their emotional reactions to different practice tasks, for example by encouraging my child to talk about how they are feeling at different points in their practice.
Emotional/ Motivational Control	**39**	**EMC1**	Controls attention and resists distraction or returns to task after a momentary distraction	I help my child to be able to control their attention whilst practising, for example by encouraging my child to turn off the TV, radio, phone or any other distractions whilst practising, and/or persuading them to return

			to their practice after a momentary distraction
40	**EMC2**	Self-encourages	I help my child to be able to encourage themselves whilst practising, for example by encouraging my child to remain optimistic and give themselves positive encouragement when they are experiencing difficulties during their practice.

Whilst care was taken to preserve as much of the C.Ind.Le coding scheme as possible, four items related to group learning were deemed irrelevant to practising piano with a parent and omitted from the questionnaire. These four items – "refers to others' strengths or difficulties in learning and academic working skills", "allocates individual roles and negotiates responsibilities", "checks and/or corrects performance of peer" and "helps or guides another child using gesture" – were used by Whitebread and colleagues to analyse the behaviour of children working with other children in a group. As these areas were outside the scope of this study and therefore not relevant to the research questions, these four items were not included as part of the questionnaire.

4.2.6 Parents' Previous Musical Experience

In order to investigate associations between frequency and amount of parental metacognitive/self-regulatory support and parents' level of musical experience, respondents were asked two questions: "have you ever had formal music lessons" and "do you currently play/sing/compose (formally or informally)?" These items were chosen in order to create a multi-item measure combining participants' self-assessment of their own formal musical training (i.e., music lessons) and informal musical engagement (e.g., singing in church) (Zhang and

Schubert, 2019). It is worth acknowledging that, as well established in the music education, music psychology and ethnomusicology literature (see Bharucha, Curtis & Paroo, 2006; Boso, Politi, Barale & Emanuele, 2006; Elliott, 1984; Negus & Pickering, 2002), that all human beings are "musically experienced" in some capacity regardless of training. However, in order not to privilege music-making as a result of formal lessons over more casual but equally legitimate forms of playing or singing, or suggest that some forms for music-making require more expertise than others, in the context of this study, the term *musical experience* is used to refer to parents' participation in music-making instead of previous musical "training" or "expertise". Consequently, respondents who answered "yes" to one or both of the questions above were deemed to be "musically experienced". Those who answered "no" to both questions were judged to not have any previous musical experience (that is, that they did not report playing an instrument or singing). Based on responses to questions above, 21 respondents were deemed to have previous musical experience and 19 were deemed not to – a split of roughly half and half.

4.2.7 Children's Age

In some cases, parents had more than one child aged 6-9 years learning to play the piano. As parents were only asked to fill out the questionnaire once irrespective on the number children they had, a mean age was used in instances where parents had more than one child in the given age range. As the questionnaire was designed to examine parental behaviours, the specific ages of the children within the 6-9 year age range was not deemed to be a central factor in terms of the research questions of this study. A mean child's age was only required for six respondents out of the 40 in the sample.

4.2.8 Frequency of Children's Practice

Participants were asked to report how long their child practised for each week in order to investigate associations between frequency of children's practice, frequency of parental support and amount of parental metacognitive support. Respondents were asked to choose from one of 9 statements in response to the question "On average, how long does your child spend practising the piano per week? (If you have more than one child learning to play the piano, please select 'other')". Descriptors for each score as shown in Table 5.

Table 5
Scoring for frequency of children's practice

Statement	Score
Less than 15 mins a week	**1**
15-30 mins a week	**2**
30-45 mins a week	**3**
45-60 mins a week	**4**
1-2 hours a week	**5**
2-3 hours a week	**6**
3-4 hours a week	**7**
4-5 hours a week	**8**
5 hours or more a week	**9**
Other	**n/a**

To account for parents who had multiple children aged 6-9 years and learning to play the piano, participants were asked to specify how long each of their children practised for. Only two respondents out of 40 reported having two children between the ages of 6-9 years learning to play the piano – in these two cases, an average was calculated based on the time periods specified.

4.2.9 Frequency of Parental Support

In addition to measuring the amount of parental support given to children during their practice (as assessed through the total score of parents' responses to the 33 parental metacognitive support statements, out of 231), parents were also asked to indicate how often they supervised their child during practice sessions. Respondents were asked "which of the following statements best describes how often you help your child(ren) with their piano practice?" Possible responses and scores were given on a 7-point Likert scale. Each statement was given a score of between 1-7, based on how frequently respondents reported helping their child, as described in Table 6.

Table 6
Scoring for frequency of parental support

Score	Statement
1	I never help my child(ren) with their piano practice
2	I rarely help my child(ren) with their piano practice, less than once a month
3	I occasionally help my child(ren) with their piano practice, at least once a month but not regularly
4	I sometimes help my child(ren) with their piano practice, in less than half of their practice sessions
5	I often help my child(ren) with their piano practice, in over half of their practice sessions
6	I almost always help my child(ren) with their piano practice, in most of their practice sessions
7	I always help my child(ren) with their piano practice, in all of their practice sessions

To avoid parents who had more than more child having to fill out separate questionnaires for each child, it was assumed (given that all children were aged between 6-9 years) that similar levels of parental support were given to each child (see section 4.6 Limitations).

4.3 Data Analysis

The present study investigated associations between parental metacognitive and self-regulatory support, frequency of parental supervision, parents' previous musical experience and frequency of children's practice using inferential statistics. Research questions and hypotheses are shown in Table 7, along with short-form names for each research question.

Table 7
Research questions, independent and dependent variables, and hypotheses for Study 1

	Question	Short-form name	Independent variable(s)	Dependent variable(s)	Hypothesis
RQ1	What is the nature of parental support of children's metacognition and self-regulation in musical learning and what are its associations with parents' previous musical experience?	Parental Support and Previous Musical Experience	Parental metacognitive and self-regulatory support	Parents' previous musical experience	H1 - The amount of metacognitive and self-regulatory support children receive from their parents during piano practice is positively correlated with parents' previous musical experience.
RQ1a	To what extent is parental metacognitive and self-regulatory support and frequency of parental supervision during their children's practice associated with parents' previous musical experience?	Parental Support, Frequency of Supervision and Previous Musical Experience	Amount of support; frequency of supervision	Parents' previous musical experience	H1a - How frequently parents supervise their children's piano practice is positively correlated with parents' previous musical experience.
RQ1b	To what extent is frequency of children's practice associated with parental metacognitive and self-regulatory support and frequency of parental supervision	Frequency of Children's Practice, Parental Support and Frequency of Supervision	Frequency of practice	Amount of support; frequency of supervision	H1b - The frequency of children's practice is positively correlated with parental metacognitive and self-regulatory support and frequency of parental

	during children's practice?	supervision during practice.

Additionally, internal reliability testing is used to investigate the construct validity of a 33-item questionnaire based on items adapted from C.Ind.Le (Whitebread et al. 2009). The following section presents an overview of the data analysis procedures used to arrive at the findings presented in section 4.4, in relation to the research questions and hypotheses discussed above.

4.3.1 Choice of Statistical Tests – Assumptions for Parametric and Non-Parametric Testing

As part of the preliminary data analysis, all data sets were analysed using a Shapiro-Wilk test – a statistical test which examines whether or not a variable is normally distributed (Field, 2009). This is because the validity of some statistical tests (i.e., parametric tests) relies on a normally distributed sample population. Applying parametric tests to non-normal data therefore risks invalidating the results of analyses conducted on them and increases the possibility of Type-1 errors (Wilcox, 2016). Non-parametric tests (also known as distribution-free tests because they do not assume that data are normally distributed) are judged as having less statistical power than their parametric equivalents (Field, 2009). Nevertheless, given the risk to validity that applying parametric tests to non-normal data can pose, the application of non-parametric tests is considered an appropriate measure when dealing with small and/or non-normal samples of data (Wilcox, 2016). This approach was considered preferable to attempting to transform the data (a process which attempts to make highly skewed distributions less skewed), instead using non-parametric tests to preserve the granularity of the data collected (Field, 2009).

Consequently, the approach taken in both Studies 1 and 2 was to analyse normally distributed data which met assumptions for parametric testing using parametric tests (such as Pearson's product-moment and t-tests). Those that violated assumptions were analysed using their non-parametric equivalents (e.g., Spearman's and Kendall's tau-b for correlations, and Wilcoxon's signed-rank test in place of paired samples t-tests). Where analyses were conducted across multiple data sets, and several of the data sets being analysed had non-normal distributions, a non-parametric test was still applied – typically, Spearman's correlation co-efficient for correlations and Wilcoxon's signed-rank test for tests of mean differences. In some cases, where there were a large number of tied-ranks in data being analysed using bi-variate correlations (an issue which can confound results for Spearman's co-efficient – see Field, 2009), Kendall's tau-b correlation was used instead of Spearman's.

A detailed overview of and justifications for the specific statistical tests used for each analysis, including results of Shapiro-Wilk tests for all relevant data sets, are described in the following section.

4.3.2 Construct Validity – Internal Reliability Testing

Construct validity is "the degree to which the measure of a construct sufficiently measures the intended construct" (O'Leary-Kelly & Vokurka, 1998, p. 387). Failure to adequately investigate the construct validity and in particular the internal reliability of new instruments can undermine statistical conclusions gathered using these measures (MacKenzie, Podsakoff & Podsakoff, 2011). In order to be able to defend the validity of the results reported in this thesis (using the instrument developed in the present study), internal reliability testing was carried out on the 33 parental metacognitive and self-regulatory support items adapted from C.Ind.Le (Whitebread et al., 2009) using Cronbach's alpha. Kendall's tau-b correlation was also used to investigate associations between participants scores across the 33 parental support items. Table 8 reports all inter-item correlations. As indicated in Table 8, statistically significant correlations (p = <.05) were found between the majority of items within each of the nine categories (Knowledge of Persons, Knowledge of Task, Knowledge of Strategies, Planning, Monitoring, Control, Evaluation, Emotional/Motivational Monitoring and Emotional/Motivational Control), which justified the use of category means in the main analysis. Moreover, Cronbach's alpha showed the questionnaire to reach acceptable reliability, $\alpha = .96$, indicating a high level of internal consistency across all 33 parental metacognitive and self-regulatory support items. For a complete list of p values for all correlations in Table 8, see Appendix E.

Table 8

Kendall's tau-b correlation co-efficients for 33 parental metacognitive and self-regulatory support items

	KoP1 (Q8)	KoP2 (Q9)	KoT1 (Q10)	KoT2 (Q11)	KoS1 (Q12)	KoS2 (Q13)	KoS3 (Q14)	P1 (Q15)	P2 (Q16)	P3 (Q17)	P4 (Q18)	M1 (Q19)	M2 (Q20)	M3 (Q21)	M4 (Q22)	M5 (Q23)	M6 (Q24)	C1 (Q25)	C2 (Q26)	C3 (Q27)	C4 (Q28)	C5 (Q29)	C6 (Q30)	C7 (Q31)	E1 (Q32)	E2 (Q33)	E3 (Q34)	E4 (Q35)	E5 (Q36)	EMM1 (Q37)	EMM2 (Q38)	EMC1 (Q39)	EMC2 (Q40)
KoP1 (Q8)																																	
KoP2 (Q9)	.63**																																
KoT1 (Q10)	.57**	.43**																															
KoT2 (Q11)	.41**	.30*	.45**																														
KoS1 (Q12)	.66**	.60**	.52**	.44**																													
KoS2 (Q13)	.73**	.44**	.57**	.45**	.72**																												
KoS3 (Q14)	.38**	.37**	.44**	.56**	.55**	.43**																											
P1 (Q15)	.42**	.31*	.38**	.19	.52**	.45**	.36**																										
P2 (Q16)	.62**	.38**	.59**	.45**	.67**	.66**	.39**	.49**																									
P3 (Q17)	.52**	.47**	.54**	.38**	.61**	.59**	.46**	.39**	.572**																								
P4 (Q18)	.07	-.01	.13	-.02	.21	.13	.04	.36**	.268*	0.23																							
M1 (Q19)	.42**	.31*	.37**	.29*	.40**	.31*	.46**	.17	.376**	.497**	0.20																						
M2 (Q20)	.41**	.34**	.43**	.40**	.35**	.41**	.39**	.25*	.42**	.463**	.17	.39**																					
M3 (Q21)	.45**	.44**	.47**	.43**	.50**	.50**	.35**	.39**	.49**	.632**	.15	.33**	.59**																				
M4 (Q22)	.55**	.35**	.56**	.34**	.54**	.66**	.37**	.52**	.68**	.564**	.34**	.32**	.46**	.45**																			
M5 (Q23)	.2	.19	.27*	.17	.35**	.29*	.26*	.33**	.31*	.500**	.32**	.29*	.28*	.29*	.36**																		
M6 (Q24)	.292*	.22	.26*	.16	.41**	.34**	.20	.30*	.23*	.490**	.25	.39**	.26*	.30*	.28*	.71**																	
C1 (Q25)	.39**	.31*	.40**	.30*	.51**	.41**	.40**	.47**	.47**	.554**	.36**	.47**	.33**	.42**	.42**	.63**	.65**																
C2 (Q26)	.37**	.33**	.39**	.26*	.35**	.36**	.45**	.30*	.33**	.507**	.24	.70**	.37**	.31*	.34**	.32*	.37**	.51**															
C3 (Q27)	.32*	.28*	.40**	.22	.31*	.36**	.27*	.33**	.31*	.511**	.34**	.38**	.42**	.37**	.52**	.57**	.59**	.62**	.49**														
C4 (Q28)	.16	.14	.18	.16	.30*	.22	.17	.25	.31*	.348**	.46**	.29*	.22	.20	.38**	.55**	.53**	.65**	.30*	.54**													
C5 (Q29)	.15	.15	.07	-.03	.16	.08	.06	.24	.08	0.20	.29*	.18	.24	.25*	.22	.41**	.45**	.40**	.08	.42**	.36**												
C6 (Q30)	.21	.12	.27*	.15	.25*	.33**	.05	.29*	.36**	.368**	.22	.24	.38**	.34**	.38**	.52**	.53**	.35**	.25*	.46**	.33**	.34**											
C7 (Q31)	.14	.12	.16	.12	.12	.10	-.02	.27*	.22	0.22	.36**	.21	.36**	.42**	.36**	.31*	.23	.27*	.17	.38**	.28*	.46**	.49**										
E1 (Q32)	.34**	.32**	.39**	.37**	.27*	.23	.30*	.21	.30*	0.21	-.05	.32*	.57**	.45**	.33**	.02	.01	.14	.20	.22	-.02	.21	.13	.36**									
E2 (Q33)	.50**	.42**	.58**	.48**	.48**	.46**	.50**	.36**	.53**	.463**	-.02	.46**	.55**	.47**	.47**	.26*	.22	.39**	.46**	.41**	.16	.06	.26*	.27*	.64**								
E3 (Q34)	.44**	.57**	.40**	.37**	.58**	.39**	.37**	.32*	.40**	.505**	.16	.26*	.29*	.49**	.46**	.36**	.36**	.46**	.18	.32**	.34**	.33**	.20	.33**	.33**	.46**							
E4 (Q35)	.61**	.43**	.52**	.46**	.62**	.68**	.31*	.30*	.57**	.576**	.04	.31*	.35**	.55**	.48**	.34**	.34**	.40**	.23	.28*	.06	.16	.23	.15	.34**	.44**	.44**						
E5 (Q36)	.64**	.47**	.63**	.51**	.54**	.59**	.55**	.31*	.59**	.533**	.09	.53**	.55**	.43**	.60**	.31*	.22	.35**	.52**	.43**	.21	.09	.28*	.22	.53**	.78**	.42**	.50**					
EMM1 (Q37)	.33**	.29*	.21	.13	.36**	.26*	.30*	.39**	.26*	.323**	.17	.26*	.34**	.37**	.32*	.35**	.38**	.30*	.18	.31*	.12	.38**	.33**	.31*	.34**	.31*	.29*	.33**	.34**				
EMM2 (Q38)	.50**	.40**	.32**	.28*	.44**	.50**	.29*	.23	.37**	.384**	-.03	.26*	.43**	.51**	.43**	.13	.11	.20	.19	.22	-.03	.21	.28*	.22	.48**	.37**	.31*	.49**	.45**	.53**			
EMC1 (Q39)	.17	.09	.23	.12	.29*	.17	.15	.28*	.39**	.354**	.43**	.29*	.19	.14	.39**	.64**	.52**	.49**	.18	.44**	.46**	.34*	.38**	.27*	.04	.22	.31*	.31*	.28*	.24	.06		
EMC2 (Q40)	.21	.26*	.19	.22	.33*	.14	.21	.13	.31*	.326*	.28*	.34**	.08	.11	.22	.40**	.39**	.40**	.26*	.37**	.29*	.21	.23	.18	.08	.24	.28*	.35**	.28*	.31*	.15	.59**	

Note. KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control. * *p* =<.05 level (2-tailed) and ** *p* = <.01 level (2-tailed)

4.3.3 RQ1 – Parental Support and Previous Musical Experience

In order to answer RQ1, descriptive statistics were used to characterise the nine categories of metacognitive and self-regulatory support (Knowledge of Persons; Knowledge of Task; Knowledge of Strategies; Planning; Monitoring; Control; Evaluation; Emotional/Motivational Monitoring and Emotional/Motivational Control) parents reported giving their children during piano practice. This was done by comparing parents' mean scores, standard deviation, kurtosis and skewness for each of the nine categories. As discussed, the amount of parental support was given as a score out of 231.

Additionally, bi-variate correlations were used to explore associations between scores across these nine questionnaire categories. The results of a Shapiro-Wilk test indicated that, unlike scores for all 33 items, mean scores for the nine categories were all normally distributed except for two (Knowledge of Strategies and Emotional/Motivational Control), as described in Table 9.

Table 9
Results of a Shapiro-Wilk test for mean scores in nine categories of metacognition and self-regulation.

	Shapiro-Wilk		
	Statistic	**df**	**Sig.**
KoP	.95	40	.10*
KoT	.96	40	.18*
KoS	.94	40	.04
P	.95	40	.10*
M	.97	40	.40*
C	.98	40	.50*
E	.95	40	.09*
EMM	.95	40	.09*
EMC	.82	40	<.001

Note. KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control).
* normal distribution (p = >.05)

Consequently, in addition to descriptive statistics, Pearson's *r* was used to investigate possible correlations between mean scores for each category.

4.3.4 RQ1a - Parental Support, Frequency of Supervision and Previous Musical Experience

Questionnaire scores for parental metacognitive and self-regulatory support, frequency of parental supervision and parents' previous musical experience were characterised using descriptive statistics. The results of a Shapiro-Wilk test indicated that while parental support scores were normally distributed, scores for previous musical experience and frequency of parental support were non-normally distributed, as described in Table 10.

Table 10
Results of a Shapiro-Wilk test for previous musical experience, parental support and frequency of parental support scores

	Shapiro-Wilk		
	Statistic	**df**	**Sig.**
Amount of Parental Support	.97	40	.29*
Frequency of Parental Supervision	.89	40	.001
Previous Musical Experience	.76	40	<.001

Note. * normal distribution (p = >.05)

Associations between respondents' total scores in each of these areas were therefore explored using a Spearman's correlation. As discussed in section 4.2.5, the amount of parental support given during practice was scored out of 231 (based on participants' responses to the 33 metacognitive and self-regulatory support items on a 7-point Likert scale). Scores for frequency of parental support were given out of 7 (based on parents' responses to this questionnaire item on a 7-point Likert scale) and previous musical experience out of 2 (0 = *answered no to both musical experience questions*, 1 = *answered yes to one of the musical experience questions*, 2 = *answered yes to both of the musical experience questions*).

In addition to individual scores for each participant, mean scores were calculated for each of the nine metacognitive and self-regulatory categories and used to investigate differences in parents' support of different metacognitive and self-regulatory behaviours. This also allowed for a more in-depth analysis of different aspects of parental support and its associations with previous musical experience and frequency of support. Finally, a Mann-Whitney U test was used to compare a) amount of metacognitive support and b) frequency of parental support given to children by parents with musical experience (i.e., those that answered yes to one or both of the musical experience questions) and without previous musical experience (i.e., those that answered no to both of the musical experience questions).

4.3.5 RQ1b - Frequency of Children's Practice, Parental Support and Frequency of Supervision

As discussed, although results for parental metacognitive support were normally distributed, results for frequency of parental supervision were not. Additionally, a Shapiro-Wilk test for frequency of children's practice scores indicated that these data also violated assumptions for parametric testing, as described in Table 11.

Table 11
Results of a Shapiro-Wilk test for frequency of children's practice scores

	Shapiro-Wilk		
	Statistic	**df**	**Sig.**
Frequency of Children's Practice	.94	40	.03

Consequently, Kendall's tau-b correlation was used to explore associations between frequency of children's practice, parental metacognitive and self-regulatory support and frequency of parental supervision, as reported by parents.

In addition to comparing frequency of children's practice with total scores for parental support, associations between frequency of children's practice and different aspects of parental support were explored in two additional ways. Firstly, frequency of children's practice was mapped against mean scores for each of the nine parental metacognitive and self-regulatory support categories; and secondly, with metacognitive items and self-regulatory items analysed as two separate categories. This was done in order to investigate broad trends across large-scale items as well as more fine-grain patterns in frequency of children's practice and particular aspects of parental metacognitive and self-regulatory support – for instance, support of cognitive and affective behaviours. The following section reports the results of the data analysis procedures described above.

4.4 Results

4.4.1 RQ1 – Parental Support and Previous Musical Experience

Table 12 presents descriptive statistics for nine metacognitive and self-regulatory categories. As discussed in section 4.3.3, all responses were given on a 7-point Likert scale with descriptors of level of agreement at extreme points (i.e., 1 = *not at all* and 7 = *completely*).

Table 12 – *Descriptive statistics for mean scores from nine parental metacognitive and self-regulatory support categories, in rank order by mean score (from highest to lowest).*

	Mean	SD	Skewness	Kurtosis
EMC	6.00	1.18	-1.03	.04
C	4.57	1.39	–.12	-.58
P	4.38	1.64	–.12	-1.07
M	4.25	1.50	–.11	-.88
KoP	3.99	1.78	–.14	-.97
KoS	3.97	1.85	–.19	-1.10
EMM	3.90	1.69	.23	-1.01
KoT	3.78	1.71	.21	-.73
E	3.57	1.69	.19	-1.10

Note. KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control.

Descriptive results indicate that parents reported supporting Emotional/Motivational Control (EMC) behaviours (*M* = 6.00, *SD* = 1.18) the most and Evaluation (E) behaviours (*M* = 3.57, *SD* = 1.69) the least during their children's practice. Apart from EMC, there was very little variation of mean scores across categories, with responses predominantly banded around the midpoint. Total scores across all categories ranged from 58.00 to 229.00 out of 231 (*M* = 139.90; *SD* = 43.21).

Descriptive statistics were also used to characterise frequency of parental supervision and previous musical experience scores. The mean score for frequency of parental supervision was 5.13 (*SD* = 1.59) – "I often help my child(ren) with their piano practice, in over half of their practice sessions" (see section 4.2.4.4 for full list of descriptors). The mean score for previous musical experience was .76 (*SD* = .83).

Table 13

Descriptive statistics for frequency of parental support and previous musical experience scores

	Mean	SD	Skewness	Kurtosis
Frequency of Parental Supervision	5.13	1.59	-.82	.11
Previous Musical Experience	.76	.83	.45	.37

In order to investigate associations between amount of parental support (*Mdn* = .140.50), frequency of parental supervision (*Mdn* = 5.50) and previous musical experience (*Mdn* = 1.00), a two-tailed Kendall's tau-b correlation test was applied. Table 14 reports all inter-item correlations.

Table 14
Kendall's tau-b correlations for Amount of Parental Support, Frequency of Parental Supervision and Previous Musical Experience.

	Amount of Parental Support	Frequency of Parental Supervision	Previous Musical Experience
Amount of Parental Support			
Frequency of Parental Supervision	.32**		
Previous Musical Experience	.22	.20	

** p = <.05 (2-tailed) ** p = <.01(2-tailed)*

Kendall's tau-b revealed that frequency of parental support was positively correlated with amount of parental support (τ_b = .32, *p* = <.001). No further statistically significant correlations were found.

Bi-variate correlations were also used to explore associations between parents' previous musical experience and specific categories of metacognitive and self-regulatory support. In order to avoid the possibility of Type 2 errors (given that the data points for seven of the nine other categories were normally distributed), a parametric test was applied. Results of a two-tailed Pearson's product moment correlation test are reported in Table 15. Pearson's *r* revealed no statistically significant associations these categories of metacognitive and self-regulatory support and parents' previous musical experience.

Table 15
Pearson correlation co-efficients for mean scores in nine metacognitive and self-regulatory questionnaire categories and parents' previous musical experience scores

	KoP	KoT	KoS	P	M	C	E	EMM	EMC
Previous musical experience	.25	.25	.30	.28	.20	.15	.28	.20	.25

Note. KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control.

Additionally, a two-tailed Pearson's product moment was used to explore possible correlations between respondents' mean scores for each of the nine categories of metacognitive and self-regulatory support, as described in Table 16 (see Appendix F for exact *p* values). As with the previous analysis, as the majority of these data were normally distributed, a parametric test was used to reduce the risk of a Type 2 error.

Table 16
Pearson correlation co-efficients for mean scores for nine metacognitive and self-regulatory questionnaire categories

	KoP	**KoT**	**KoS**	**P**	**M**	**C**	**E**	**EMM**	**EMC**
KoP									
KoT	.65**								
KoS	.79**	.77**							
P	.60**	.62**	.74**						
M	.63**	.67**	.75**	.82**					
C	.42**	.42**	.47**	.70**	.85**				
E	.77**	.80**	.77**	.65**	.78**	.55**			
EMM	.56**	.39*	.56**	.48**	.60**	.44**	.63**		
EMC	.26	.33*	.32*	.52**	.51**	.54**	.39*	.28	

Note. KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control.
** p = <.05 (2-tailed) ** p = <.01(2-tailed)*

For comparison (and in order to reduce the risk of a Type 1 error), Kendall's tau-b correlation for the same nine categories are also reported in Table 17 (see Appendix G for exact *p* values).

Table 17
Kendall's tau-b correlation co-efficients for mean scores for nine metacognitive and self-regulatory questionnaire categories

	KoP	KoT	KoS	P	M	C	E	EMM	EMC
KoP									
KoT	.50**								
KoS	.63**	.62**							
P	.43**	.48**	.58**						
M	.48**	.50**	.58**	.63**					
C	.36**	.32**	.38**	.56**	.70**				
E	.62**	.64**	.61**	.46**	.62**	.44**			
EMM	.43**	.28*	.44**	.34**	.44**	.34**	.47**		
EMC	.26*	.25*	.31*	.37**	.38**	.42**	.31**	.23	

Note. KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control.
** p = <.05 (2-tailed) ** p = <.01(2-tailed)*

Both Pearson's *r* and Kendall's tau-b found statistically significant positive correlations between all parental metacognitive and self-regulatory support categories except between Emotional/Motivational Control and Emotional/Motivational Monitoring. This result indicates a high level of internal consistency across all nine categories and suggests that those parents who tended to encourage some metacognitive and self-regulatory items, were likely to support others too. *P* values for Tables 16 and 17 can be found in Appendices F and G.

4.4.2 RQ1a - Parental Support, Frequency of Supervision and Previous Musical Experience

As discussed, musical experience was scored from 0-2, amount of parental metacognitive and self-regulatory support scores were calculated out of 231, and frequency of parental supervision calculated on a 7-point Likert scale. Descriptive statistics for frequency of parental support at each level of previous musical experience (0-2) are characterised in Tables 18-20.

Table 18
Descriptive statistics for amount of parental support and frequency of supervision, for parents who scored 0 for previous musical experience

	N	Min	Max	Mean	SD
Amount of Parental Support	19	64.00	197.00	130.63	40.32
Frequency of Parental Supervision	19	1.00	7.00	4.68	1.73

Table 19
Descriptive statistics for amount of parental support and frequency of supervision, for parents who scored 1 for previous musical experience

	N	Min	Max	Mean	SD
Amount of Parental Support	11	58.00	196.00	136.00	39.81
Frequency of Parental Supervision	11	2	7.00	5.45	1.63

Table 20
Descriptive statistics for amount of parental support and frequency of supervision, for parents who scored 2 for previous musical experience

	N	Min	Max	Mean	SD
Amount of Parental Support	10	77.00	229.00	161.80	48.44
Frequency of Parental Supervision	10	4.00	7.00	5.60	1.07

As shown in Figure 6, descriptive statistics for participants' previous musical experience, parental metacognitive and self-regulatory support and frequency of parental support scores suggest general upwards movement in mean scores for parental metacognitive and self-regulatory support and frequency of parental supervision as musical experience scores increase.

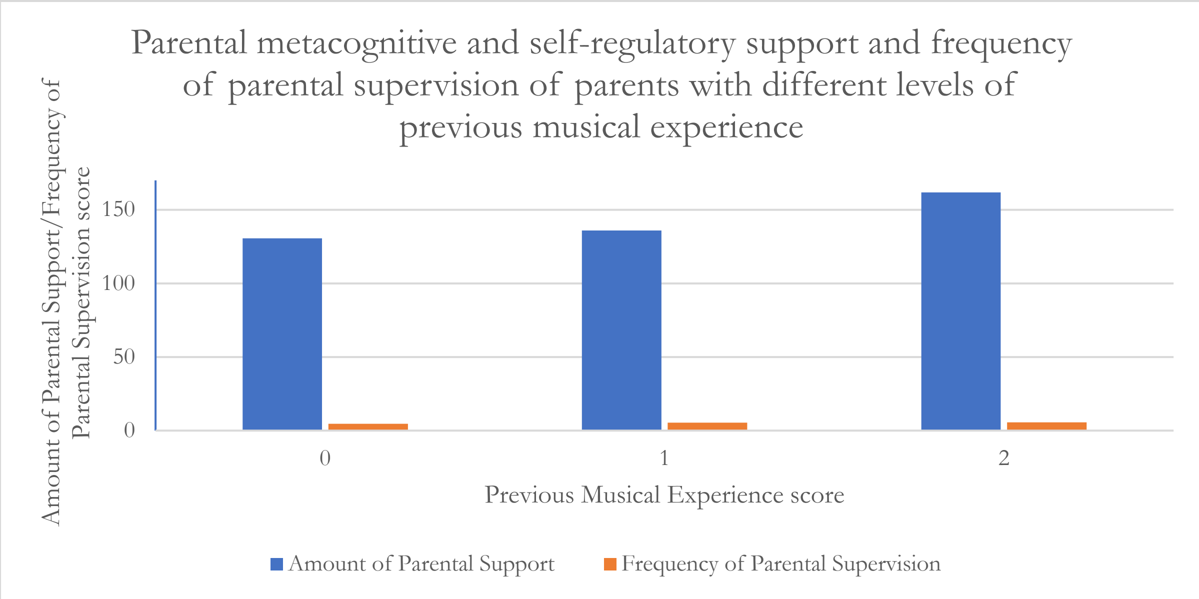


Figure 6
Scores for parental support and frequency of supervision for parents with different levels of   123 previous musical experience

In addition to analysing scores across all 33 metacognitive and self-regulatory questionnaire items, descriptive statistics were used to compare parental support of metacognitive behaviours with parental support of self-regulatory behaviours, across different levels of previous musical experience. Tables 21-23 suggest an increase in mean scores for parental support of self-regulatory behaviours between parents who scored 0 for previous musical experience and parents who score 1, but not metacognitive behaviours.

Table 21
Descriptive statistics for parental support of metacognitive and self-regulatory behaviours for parents who scored 0 for previous musical experience

	N	Min	Max	Mean	SD
Metacognitive support	19	2.00	5.93	3.86	1.29
Self-regulatory support	19	2.50	7.00	4.72	1.13

Note. Metacognitive support = Knowledge of Persons, Knowledge of Task, Knowledge of Strategies, Planning, Monitoring, Control and Evaluation; Self-regulatory support = Emotional/Motivational Monitoring and Emotional/Motivational Control

Table 22
Descriptive statistics for parental support of metacognitive and self-regulatory behaviours for parents who scored 1 for previous musical experience

	N	Min	Max	Mean	SD
Metacognitive support	11	1.52	6.03	4.03	1.27
Self-regulatory support	11	3.50	6.25	4.80	.95

Note. Metacognitive support = Knowledge of Persons, Knowledge of Task, Knowledge of Strategies, Planning, Monitoring, Control and Evaluation; Self-regulatory support = Emotional/Motivational Monitoring and Emotional/Motivational Control

Table 23
Descriptive statistics for parental support of metacognitive and self-regulatory behaviours for parents who scored 2 for previous musical experience

	N	Min	Max	Mean	SD
Metacognitive support	10	2.17	6.93	4.82	1.52
Self-regulatory support	10	3.50	7.00	5.52	1.29

Note. Metacognitive support = Knowledge of Persons, Knowledge of Task, Knowledge of Strategies, Planning, Monitoring, Control and Evaluation; Self-regulatory support = Emotional/Motivational Monitoring and Emotional/Motivational Control

As with total scores for parental support and frequency of supervision, scores for metacognitive and self-regulatory support appear to increase with previous experience, as shown in Figure 7.

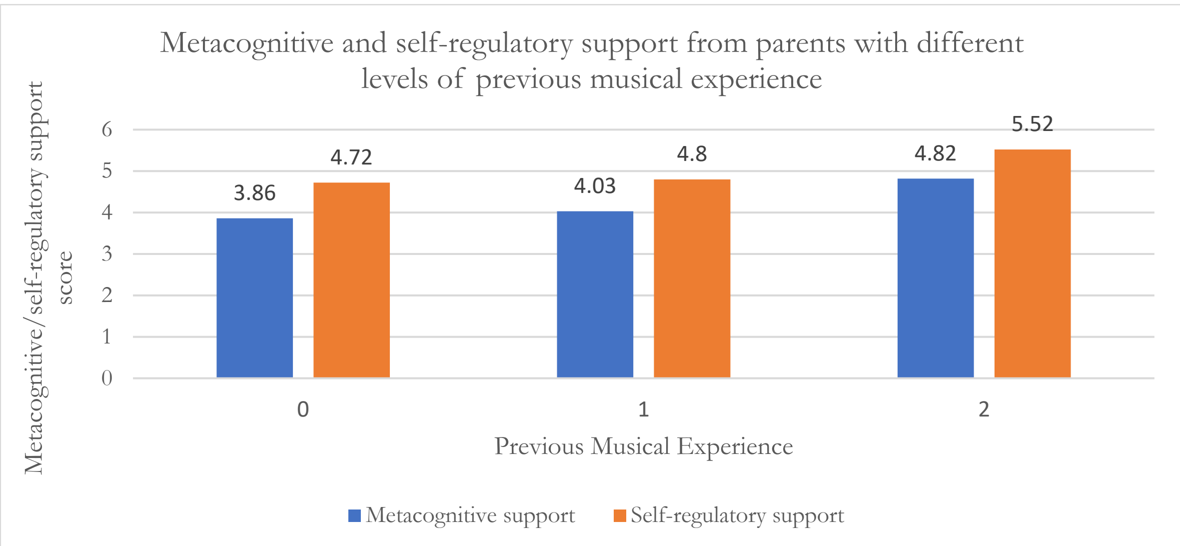


Figure 7
Scores for metacognitive and self-regulatory support from parents with different levels of previous musical experience

However, as shown in Table 24, these descriptive patterns were not found to be statistically significant. When analysed using a two-tailed Kendall's tau-b correlation coefficient, no significant correlations were found between previous musical experience and amount of parental metacognitive and self-regulatory support given ($\tau_b = .22$, $p = .09$), and previous musical experience and frequency of supervision ($\tau_b = .20$, $p = .15$).

Table 24
Kendall's Tau-b correlation co-efficients for previous musical experience, amount of parental metacognitive support and frequency of parental support

	Previous Musical Experience
Frequency of Parental Support	.20
Amount of Parental Support	.22

Similarly, no correlation was found between previous musical experience and support of metacognitive ($\tau_b = .21$, $p = .10$) and self-regulatory behaviours ($\tau_b = .17$, $p = .19$) when analysed separately (see Table 25).

Table 25
Kendall's Tau-b correlation co-efficients for previous musical experience, metacognitive support and self-regulatory support.

	Previous Musical Experience
Metacognitive support	.21
Self-regulatory support	.17

A two-tailed Mann-Whitney U test was also used to investigate possible differences in amount of parental support given (*Mdn* =150.00) and frequency of supervision (*Mdn* = 6.00) between parents with ($n = 21$), and amount of parental support (*Mdn* =131.00) and frequency of supervision (*Mdn* = 5.00) without previous musical experience ($n = 19$). No significant differences were found in amount of parental metacognitive and self-regulatory support given

(z = -1.29, p = .20, r = .20) or frequency of parental supervision (z = -1.57, p = .13, r = .25) between musically experienced and inexperienced parents.

4.4.3 RQ1b - Frequency of Children's Practice, Parental Support and Frequency of Supervision

A two-tailed Kendall's tau-b correlation was used to investigate associations between frequency of children's practice, parental support, and frequency of parental supervision. Results are reported in Table 26. Analysis revealed no correlation between frequency of parental support and frequency of children's practice, but that the amount of parental metacognitive support given was positively correlated with frequency of children's practice (τ_b = .31, p = .007).

Table 26
Kendall Tau-b correlation co-efficients for parental metacognitive and self-regulatory support, frequency of parental support and frequency of children's practice

	Frequency of Parental Supervision	Amount of Parental Metacognitive Support
Frequency of Children's Practice	.23	.31**

Note. ** p = <0.01(2-tailed)

As well as associations between total scores for frequency of children's practice and parental support, Kendall's tau-b was also used to explore associations between frequency of children's practice and mean scores for specific categories of parental metacognitive and self-regulatory support. As described in Table 27, a two-tailed Kendall's tau-b coefficient found positive correlations between frequency of children's practice and parental support of Knowledge of Strategies (τ_b = .28, p = .02), Planning (τ_b = .36, p = .002), Monitoring (τ_b = .33, p = .004) and Control (τ_b = .30, p = .009).

Table 27
Kendall's Tau-b correlation co-efficients for nine metacognitive and self-regulatory questionnaire categories, frequency of children's practice

	KoP	KoT	KoS	P	M	C	E	EMM	EMC
Frequency of children's practice	.14	.16	.28*	.36**	.33**	.30**	.20	.13	.21

Note. KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control.
* p = <0.05 (2-tailed) ** p = <0.01 (2-tailed)

When separated into metacognitive support and self-regulatory support, a two-tailed Kendall's Tau-b test revealed a strong positive correlation between amount of metacognitive support and frequency of children's practice ($\tau_b = .31, p = .007$) but no correlation between frequency of children's practice and amount of self-regulatory support (see Table 28).

Table 28
Kendall's Tau-b correlation co-efficients for metacognitive support, self-regulatory support, frequency of parental support and frequency of children's practice

	Metacognitive support	Self-regulatory support
Frequency of children's practice	.31**	.17

Note. ** p = <.01 (2-tailed)

4.5 Discussion

This questionnaire study surveyed the responses of 40 parents of children aged 6-9 years learning to play the piano and provides insight into trends in parents' support of metacognitive and self-regulatory behaviours during children's piano practice. In addition to testing the internal reliability of a new 33-item parent questionnaire instrument, this study explored three research questions:

RQ1 - What is the nature of parental support of children's metacognition and self-regulation in musical learning and what is its associations with parents' previous musical experience?

RQ1a – To what extent is parental metacognitive and self-regulatory support and frequency of parental supervision during their children's practice associated with parents' previous musical experience?

RQ1b - To what extent is frequency of children's practice associated with parental metacognitive and self-regulatory support and frequency of parental supervision during children's practice?

Based on the extant literature reviewed in section 4.1, the following hypotheses were made:

H1 - The amount of metacognitive and self-regulatory support children receive from their parents during piano practice is positively correlated with parents' previous musical experience.

H1a – How frequently parents supervise their children's piano practice is positively correlated with parents' previous musical experience.

H1b - The frequency of children's practice is positively correlated with parental metacognitive and self-regulatory support and frequency of parental supervision during practice.

Figure 8 illustrates the main associations revealed by Study 1:

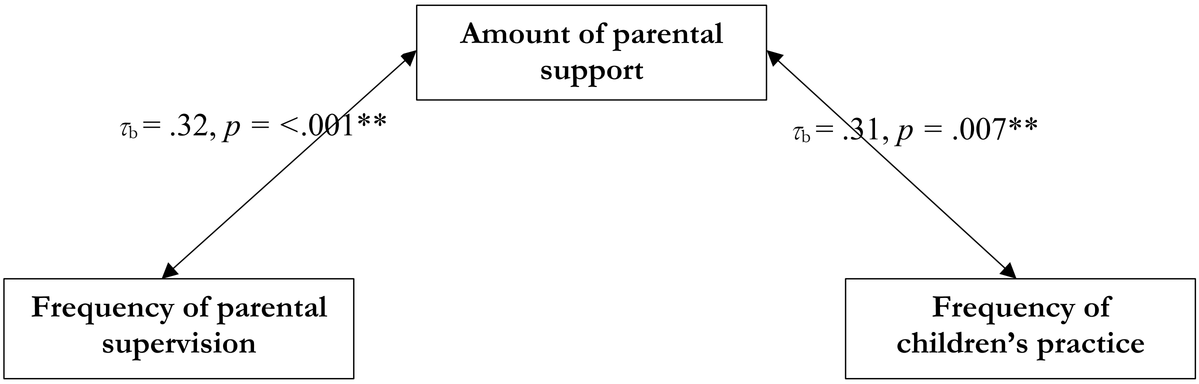


Figure 8
Overview of statistically significant correlations in Study 1, with effect sizes and significance levels

Note. p = <.01**

In relation to reliability testing of the questionnaire instrument, a high level of internal consistency was found across all nine categories of metacognitive and self-regulatory support items. This result indicates that, as a whole, items within the same categories appeared to measure the same construct and justified the use of category means as part of the data analysis. Additionally, correlations were found between all categories (except for Emotional/Motivational Control, Knowledge of Person, Knowledge of Task and Emotional/Motivational Monitoring) at a significance level of $p < .01$ (see Table 8). The large number of moderate to strong positive correlations across items suggests that the questionnaire instrument is theoretically robust, and that parents who reported encouraging some aspects of metacognition and self-regulation were very likely to support other metacognitive/self-regulatory behaviours too.

There are a number of possible explanations for the lack of correlation between Knowledge of Person (KoP), Knowledge of Task (KoT) and Emotional/Motional Monitoring (EMM), and Emotional/Motivational Control (EMC) categories. As discussed in the review of the literature, it is generally accepted that cognitive and affective behaviours occupy separate spheres of mental processing (Efklides, 2009). Both KoP and KoT are concerned with declarative aspects of metacognitive knowledge (e.g., knowledge of one's strengths and weaknesses in learning; understanding what is required to complete a task), whereas EMC involves regulating emotional responses to arousal and irritation. Given the key differences in the nature of these behaviours, parents who often support one kind of behaviour may not necessarily also regularly support the other. It may also be that certain parental attitudes (e.g., those high in responsiveness vs. high demandingness) are associated with prioritising particular kinds of behaviour, without much intersection.

Perhaps more surprising is that, of the nine categories, EMM was not associated with EMC despite both being related to affective regulatory behaviours. It may be that supporting children to monitor their emotional and motivational behaviours is not necessarily associated with supporting children to be able to control the same impulses. In their study of teachers' monitoring of pre-school children during socio-emotional challenges in day care, Kurki, Järvenoja, Järvelä and Mykkänen (2017) found considerable differences in the ways in which teachers monitored children's behaviour, offered support and/or interfered during challenges. Teacher interference (which was often the result of a teacher's desire to resolve an emotionally challenging situation quickly), was found to be less constructive to children's self-regulation than continuous monitoring and supportive actions when needed. It may be that respondents in the present study, as in Kurki et al.'s, were keen to encourage their children to control challenging emotions (e.g., distraction) quickly but did so without encouraging prior emotional/motivational monitoring.

In relation to RQ1, results indicate that parents reported supporting Emotional/Motivational Control (EMC) behaviours the most, and Evaluation behaviours the least, during their children's piano practice. In the questionnaire, EMC behaviours were characterised by the ability to control attention and resist distraction and return to task after a momentary distraction, and self-encouragement. Evaluation behaviours included being able to review one's own learning; explain the task; evaluate strategies used; rate the quality of performance; observe or comment on task progress; and test the outcome or effectiveness of a strategy in a achieving a goal (see section 4.1.7 for a complete list). Additionally, the mean score for frequency of parental support was 5.13 out of 7, a finding that suggests that on average respondents helped their children in "over half of their practice sessions".

Analysis revealed a strong correlation between parental metacognitive and self-regulatory support and frequency of parental supervision. This result suggests that parent who reported giving more metacognitive and self-regulatory support also reported supporting their children's practice more frequently too. Given the nature of the analysis conducted, it is not possible to ascertain the direction of this relationship. If frequency of parental supervision predicts the amount of parental metacognitive and self-regulatory support being given, it may be that parents who support their children's practice more often get better at doing so, thereby improving their ability to give metacognitive and self-regulatory support – irrespective of previous musical experience.

However, in relation to H1a, no statistically significant correlations were found between quality or frequency of parental metacognitive support and parents' previous musical experience. Moreover, there was no statistical difference between the amount of parental metacognitive and self-regulatory support given to children by parents with previous musical experience and by parents without - a result which echoes the findings of previous studies on parental musical expertise and parental support (Ericsson et al., 1993; Sloboda et al., 1996; Sloboda & Howe, 1991). This finding has important implications for both teachers and parents anxious that lack of musical training may hinder parents' ability to provide effective support during their child's practice. It may be that the domain-general nature of many of the metacognitive and self-regulatory skills needed to support musical learning makes this kind of support achievable for both parents with and without previous musical experience.

In relation to H1b, analysis revealed a positive correlation between frequency of children's practice and parental metacognitive and self-regulatory support. Specifically, parental support of Planning, Monitoring, Control, Evaluation and EMC were all positively correlated with frequency of children's practice. Parental support of metacognitive behaviours, but not self-regulatory behaviours, was associated with frequency of children's practice. However, there was no correlation between frequency of children's practice and frequency of parental support. These findings suggest that the amount of metacognitive and self-regulatory support that children receive from their parents may be more important than how often their parents supervise their practice. However, given that both parental support and frequency of supervision were positively correlated (RQ1), it is likely that children who received more metacognitive and self-regulatory support from their parents were also supervised more frequently. Moreover, as the analysis conducted was non-directional, it cannot be ascertained whether the nature of parental support children received caused the increase in children's practice. It may be, depending on the direction of the relationship between these variables, that children who practice more frequently and (in this case) cue their parents' ability to support them, create opportunities for their parents to observe the process of musical learning at home.

These results are limited by the reliability of parents' self-report, which may have been affected by social desirability bias (Grimm, 2010; see section 4.6). Further research is needed to determine associations between parents' previous musical experience and observed parental support behaviours during children's practice – as explored in Study 2. More importantly, what are the associations between parental metacognitive and self-regulatory support, children's metacognition and self-regulation during practice, and children's musical achievement?

4.5.1 Parents' Feedback on the Questionnaire Study

At the end of the online survey, participants were invited to provide "any extra comments [they felt were] relevant, and/or feedback [they] might have about this questionnaire" – their responses are shown in Table 29.

Table 29
Participant comments and feedback on the parent questionnaire

I'm non musical & tone deaf - so I can encourage & help emotionally, plus encourage practice etc. I can't 'help' as I know little about music
I sit in on my childrens' formal lessons so that I can then support them at home, continuing the strategies that the teacher used. After completing this questionnaire there are other things I will begin to do with my children such as encouraging them to rate their performances, set targets and create a prastice log.
As a parent, this is the first time I read about the different ways I can help my child to practice, would be useful to read more about it
One of the challenge I do find is sometimes I do not sure about the notes and keys and couldn't help him if he is unsure/ or play wrong.
Fascinating subject choice!
This has been very helpful. Thanks
I provide structure to their daily practice routines and additional incentives as aims (other than ABRSM exams).
It is difficult to help your own child to learn piano as they are often quite resistant to parents' suggestions!
The lessons are with a teacher and I am not in the room. My child practices on her own with her headphones plugged in, most mornings. This is the way she likes to practice and she does this of her own accord. She will then play us what she has learned or practiced and more often than not, it's music she has composed herself.
This is a thought-provoking questionnaire. Our biggest challenge is finding the time to practise and so we do not really spend very much time at all on reflection. I am conscious that this is different to our approach to discussing the practice our children do for their various sporting activities. I wonder if that is because we both played sport for longer in our childhood and into adulthood and so have a better framework for this. Also, as we do not observe the piano lessons our children are given at school by specialist teachers, we do not have a coach to learn from and emulate.
I am not musical therefore limited in the help I can give. But I can give support and encouragement

Although not included as part of the formal analysis of results, these comments from parents suggest strong interest around the topic of how to support their children's practice ("this is the first time I read about the different ways I can help my child to practice, would be useful to read more about it") and a desire to share their own experiences with others ("I sit in on my childrens' [sic] formal lessons so that I can then support them at home"; "Our biggest challenge is finding the time to practise […] I wonder if that is because we both played sport for longer in our childhood and into adulthood and so have a better framework for this". Moreover, these comments provide important insight into some of the challenges parents may be facing at home ("it is difficult to help your own child to learn piano as they are often quite resistant to parents' suggestions") – particularly anxieties around their own musical abilities and how this may affect their ability to help with practice ("I'm non musical & tone deaf […] I can't 'help' as I know little about music"; "I am not musical therefore limited in the help I can give"; "as we do not observe the piano lessons our children are given at school by specialist teachers we do not have a coach to learn from and emulate"). Although existing research has explored parents' attitudes towards supporting their children's musical learning at home (e.g., McPherson & Davidson, 2002; Creech, 2009; Pitt & Hargreaves, 2017), future research aimed at developing practical guidelines and advice for parents wishing to better support their children's practice (particularly those with prior musical experience) would be an invaluable next step, with clear benefits for both parents and music practitioners.

4.6 Limitations

The study's very specific participant requirements (i.e., parents of children aged 6-9 years learning to play the piano in the UK) resulted in some difficulties with recruitment. Of the 43 parents who submitted responses, three had children who were outside the specified age range, resulting in a final sample size of 40. It is possible that some participants were put off by the length of the questionnaire and/or the similarity of some of the questions, with the whole questionnaire taking approximately 20 minutes to complete – an issue addressed in the development of materials for Study 2 (see section 6.2)

Another limitation of the original questionnaire, which emerged retrospectively, is the lack of indication as to which parent *usually* supervises their child's practice, and which parent was completing the questionnaire. It may be that, in some cases, the parent responding to the questionnaire was not the one who usually assists with their child's practice – if so, they may not have been the parent best placed to provide information on the kinds of support their child usually received during their practice. This issue is also addressed in Study 2, by asking respondents to specify which parent (i.e., them or their partner) usually supervises their child's practice, where applicable.

Finally, as discussed in the previous section, it is important to consider the possible effect of social desirability bias. This issue is particularly important for self-report studies involving potentially sensitive topics, such as parenting, and where participants may feel the need to give responses which they believe are socially acceptable or present a positive picture of themselves and their children (Krumpal, 2013). Although efforts were taken to reassure participants in the present study that the questionnaire was entirely non-judgmental, it is possible that some parents felt pressured to give responses which they thought would appease the researcher, rather than answering in a way which reflected what they actually do at home with their child. Again, attempts were made to address these issues in Study 2, where the researcher had the opportunity to meet all of the participants (parents and children) in person to discuss any concerns and encourage them to answer truthfully. Moreover, the multi-method design of Study 2, which allowed for observation of parental support behaviours during their children's practice, made it possible for the researcher to make assessments of observed parental support in addition to collecting questionnaire responses.

Despite the limitations of the present study, several interesting and important conclusions can also be elicited from the data collected and subsequent analysis. Moreover, issues encountered in Study 1 provide an important foundation for methodological improvements made in Study 2. The following section discusses conclusions drawn from the present study and directions for future research.

4.7 Conclusion

The results of this questionnaire provide evidence that parents' previous musical experience may not be related to the amount of metacognitive support they are able give their child during their practice, nor how often they involve themselves during their child's practice sessions. This finding contrasts with research by Hallam (2012) which suggests parents without previous musical experience are less able to give constructive support. Moreover, the results of this questionnaire study provide encouraging evidence that high quality metacognitive and self-regulatory parental support is associated with frequency of children's practice. Findings also indicate that parents who reported giving higher quality parental support also tended to do so more frequently. Given the lack of correlation between previous musical experience and parental metacognitive and self-regulatory support, parents and teachers of young children learning to play an instrument should feel encouraged that prior musical experience may not affect a parents' ability to provide their children with effective help.

Due to the analyses conducted, it is not possible to determine the direction of these relationships and future research may wish to apply regression analysis to studies of the same nature. It would also be useful for future research to explore which aspects of metacognition and self-regulation in music are domain-specific and domain-general, and whether there is a difference in how useful domain-specific and domain-general support is for children and their musical progress. Crucially, the present study is not able to link parental support with children's behaviours – an important direction for future studies and the focus of Study 2.

As discussed in Chapters 2 and 3, self-report studies are necessarily limited in nature, offering only a small glimpse into respondents' perspectives on their own behaviour and/or what they feel the researcher would like to hear. Nevertheless, given the wide-ranging scope of this thesis, this study is an important opportunity to test some existing assumptions about the nature of parental support its associations with parents' previous musical experience, as well as develop a suitable measurement instrument for use in the pilot and Study 2. Multi-method approaches, which use both self-report and observational measures to assess parental support and children's behaviours, may help to elucidate other aspects of participants' behaviours, as well as strengthen existing findings – as explored in Study 2.

CHAPTER 5

Pilot Study – Reflection

5.1 Introduction

Following Study 1, a multi-method pilot study was conducted at a small music academy in Cheshire, in preparation for Study 2. The pilot study took the form of video-recorded piano practice sessions and interviews with children, and questionnaires completed by the children's piano teacher (about children's metacognition and self-regulation use during music lessons), using the data collection instrument developed and validated in Study 1. The aims of the pilot were to a) trial the proposed multi-method methodology and procedures for Study 2 and b) to practice administering the Metacognitive Knowledge Interview (McKI) protocol (Marulis et al., 2016). Due to a number of logistical and methodological complications, which are discussed over the course of this reflection, it was not possible to include any results from the pilot as part of this thesis. Nevertheless, the pilot study played an important role in refining research questions and methodology for the main data collection, as well as providing important experience of videoing piano practice sessions and interviewing children.

This chapter is structured into five sections, including this introduction. Following an overview of the rationale for this pilot and research questions in section 5.2, section 5.3 describes the methodology used in the pilot, including participants, procedures and instruments. Challenges to recruitment are discussed. In place of results, section 5.4 presents a reflection on the pilot – in particular methodological limitations which prevented the reporting of valid findings. Finally, section 5.5 presents the conclusions of this pilot, including lessons learned and methodological considerations for Study 2 (Chapter 6).

5.2 Rationale and Research Question

As discussed, pilot studies are regularly included as part of larger scale study designs in order to prepare for data collection with larger samples of participants (Teijlingen & Hundley, 2001). The purpose of a pilot generally is not to test the effectiveness of an intervention but to assess whether the proposed intervention is feasible (Connelly, 2008). Additionally, pilot studies may help to identify practical problems in the research procedure, such as timetabling or scheduling, which could potentially derail a larger version of the same study. As advised by De Vaus (2016), "Do not take the risk. Pilot test first" (p. 48).

In the context of the present thesis, this pilot study was intended to bridge the gap between Study 1, which surveyed trends in parental support, and Study 2, which aimed to investigate associations between trends in parental support with children's behaviours as observed by the researcher and reported by participants. Given the significant ambition and scope of Study 2 and the use of previously untrialled instruments and protocols, the pilot was also an opportunity to explore practical considerations around videoing children's practice and conducting interviews. As recommended by Peat, Mellis, Williams and Xuan (2002), no specific hypotheses were tested. Nevertheless, in order to orient the study and its design, the following research question was posited:

- What are the indicators of children's metacognition and self-regulation in musical learning and what are their associations with parental support?

Having discussed the rationale underpinning this pilot, the following section now describes the methodology used to deliver this study.

5.3 Methodology

5.3.1 Participants

Participants were children and parents who attended a small music academy in Cheshire which provides instrumental lessons to children and adults after school and on weekends. At the time of the study, the academy was relatively newly established (just over a year old).

Experts recommend a pilot study sample of 10% of the sample projected for the main study (Connelly, 2008). Based on this advice, following several meetings with the Principal of the academy, six 6-8-year-old children and four mothers were initially identified as suitable participants. Participants were chosen based on their availability and willingness to take part, as well as the age of the child participants.

5.3.2 Complications With Recruitment and Scheduling

Due to a number of unexpected personal problems, communication from the academy's Principal became very erratic close to the beginning of the data collection period, culminating in significant delays in, and problems with, data collection (see section 5.4.3). Every effort was taken to communicate with the Principal in advance of the proposed data collection sessions (practice sessions and interviews with children), with the original timetable organised several months in advance of the proposed data collection period and regular update and reminder emails sent by the researcher. On several occasions, the researcher arrived to find no participants at the venue, following extended periods of silence from the Principal and earlier confirmation that participants would be there.

Due to these scheduling issues, and the time constraints of this research project, only three children and two parents ultimately participated in the pilot study. Consequently, due to the limited sample size and statistical reliability problems, the results of the pilot are not reported as part of this thesis.

5.3.3 Ethical Approval

Ethics approval for the pilot study was granted by RNCM Research Ethics Committee in May 2019 (see Appendix B). Participant consent forms were signed by parents, on behalf of their children as well as for themselves, in hardcopy.

5.3.4 Procedures and Timetable

Over the course of three months, the children's piano teacher (the Principal of the music academy) completed a 33-item questionnaire at the end of each child's lesson, over three lessons – 18 30-minute lessons in total, for three children. As in the parent questionnaire, the 33 items in the teacher-pupil questionnaire were based on descriptions of metacognitive and self-regulatory behaviours taken from C.Ind.Le (see section 5.3.6). Scores from the three lessons were averaged and use to establish an average metacognitive/self-regulatory score for each child. In order to test for interrater reliability, one lesson per child was also coded by the researcher and scores compared with the children's piano teacher.

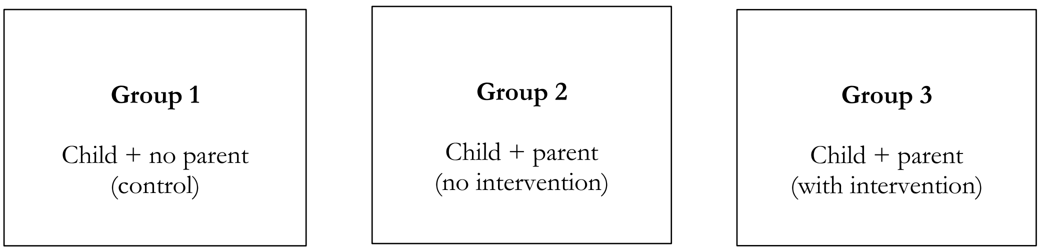


Figure 9
Overview of participant practice groups in the pilot study

In December, practice sessions and metacognitive knowledge interviews were conducted at a local town hall with three children and two mothers (see section 5.4). Figure 9 describes the three groups of children and/or parents who took part in the pilot and were observed practising the piano. Each of the three children was videoed practising either independently (Group 1 – control group) or with their parent (Group 2 – no intervention; Group 3 – with intervention groups) for a duration of 15 minutes, whilst the researcher waited outside of the room. As shown in Figure 9, one parent (Group 3 – with intervention) was subject to an intervention. This intervention took the form of reading a magazine article on the role of parents in supporting children's metacognition during piano practice, written by the researcher, in advance of the practice session. This parent was also shown their child's teacher-pupil questionnaire scores and given advice on how best to support areas of metacognition and self-regulation suggested by the questionnaire. The remaining parent (Group 2 – no intervention) was asked to assist their child as they might do normally at home.

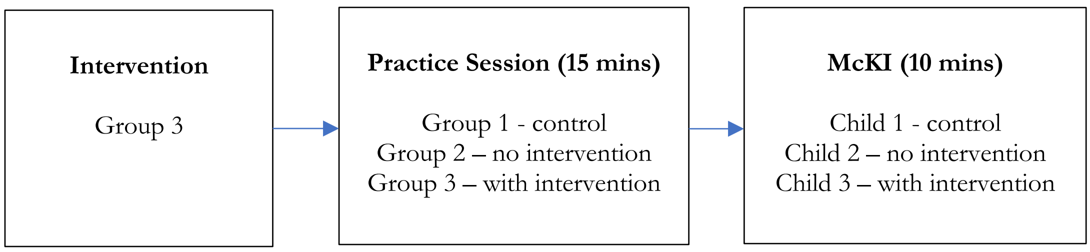


Figure 10
Overview of data collection procedure in the pilot study

Note. McKI = Metacognitive Knowledge Interview

After the 15-minute practice sessions, each child took part in a Metacognitive Knowledge Interview (McKI) with the researcher based on an interview protocol developed by Marulis et al., 2016 (see section 5.3.6). At the end of the interviews, parents in the control and non-intervention groups were debriefed, invited to see their child's pupil-teacher questionnaire scores and given the opportunity to ask any questions and/or give feedback on the experience. Each child was also given a thank you card and a chocolate rabbit to thank them for their participation in the study.

5.3.5 Venue and Materials

Practice sessions took place in a local town hall, close to the music academy. Observations were originally intended to take place at the music academy – a venue that both children and parents were familiar and comfortable with, and equipped with appropriate instruments. However, due to the scheduling problems described, practice sessions and interviews were relocated to an external venue with an electronic keyboard provided by the researcher (see section 5.4). Video-recording of practice sessions and McKIs was undertaken using a Canon Legria HF R806 Digital Camcorder and folding tripod stand.

5.3.6 Instruments

Three main instruments were used in the pilot:

- A nine-item observational coding scheme for assessing children's metacognition and self-regulation, based on Whitebread *et al.*'s (2009) Cambridgeshire Independent Learning in the early years framework (C.Ind.Le)
- A corresponding observational coding scheme which measured parents' support of children's metacognition and self-regulation during practice in relation to the nine C.Ind.Le items and
- A Metacognitive Knowledge Interview (McKI) script based on a protocol by Marulis et al. (2016) (see Appendix I)

Categories from C.Ind.Le (as adapted in the questionnaire study) formed the basis of the coding scheme used to observe and assess indicators of children's metacognition and self-regulation and indicators of parental support, during the practice session. The McKI protocol was used to measure children's metacognition and self-regulation after practising, in the context of an interview. A detailed account of coding procedures for each aspect of the study (practice sessions and McKIs) are discussed in the following two sections.

5.3.7 Practice Sessions – Coding Procedures

Dialogue from each practice session video was transcribed, and coded twice using categories taken from C.Ind.Le (Whitebread et al., 2009) and adapted for the questionnaire study – first, for evidence of children's metacognition and self-regulation; and second, for evidence of parental support of children's metacognitive and self-regulatory behaviours. One item (which was considered by the researcher to best represent its behavioural category as a whole) was chosen from each of the nine categories of metacognitive and self-regulatory behaviours listed in C.Ind.Le were chosen, resulting in a nine-item coding scheme. Table 30 describes the nine items adapted from C.Ind.Le and used to score children and parents.

Scores for each of nine items in the coding scheme were given every 3.75 minutes (four times over 15 minutes), and a total score calculated for each participant out of a possible 36 (nine items coded four times). Parents were given a score of either 0 (*support not observed*) or 1 (*support observed*) or each item in Table 30. Similarly, children could score either 0 (*behaviour not observed*), 0.5 (*behaviour observed with parental support)* or 1 (*behaviour observed)*, depending on whether they were practising by themselves (Group 1) or with a parent (Groups 2 and 3).

Table 30
Observational coding schemes used in the Pilot Study

	Child (0-1)	Parent (0-1)
Knowledge of Persons	Child talks about their own strengths and weaknesses in relation to practising the piano	Parent encourages child to talk about their own strengths and weaknesses in relation to practising the piano
Knowledge of Task	Child describes or compares practice tasks (e.g., scales, pieces, sight-reading), and/or how difficult they find each activity	Parent encourages child to describe or compare practice tasks (e.g., scales, pieces, sight-reading), and/or how difficult they find each activity
Knowledge of Strategies	Child applies a previously learned strategy and/or evaluates the strategies they	Parent encourages child to apply a previously learned strategy, and/or evaluate the

	used to learn something whilst practising e.g., by playing along to a metronome and/or use mnemonics to help with note-reading	strategies they used to learn something whilst practising e.g., by encouraging them to play along to a metronome and/or use mnemonics to help with note-reading
Planning	Child plans their practice e.g., by deciding on what to do before they start and/or structuring their practice around comments made by their teacher	Parent encourages child to plan their practice e.g., by encouraging them to decide on what to do before they start and/or structure their practice around comments made by their teacher
Monitoring	Child monitors their progress e.g., by identifying errors and/or using a practice chart	Parent encourages child to monitor their progress e.g., by encouraging them identify errors and/or use a practice chart
Control	Child changes their strategy or approach when something isn't working	Parent encourages child to change their strategy or approach when something isn't working
Evaluation	Child evaluates or reviews their learning/piano practice	Parent encourages child to evaluate or review their learning/piano practice
Emotional/Motivational Monitoring	Child talks about their emotions or level of motivation whilst practising	Parent encourages child to talk about their emotions or level of motivation whilst practising
Emotional/Motivational Control	Child regulates their emotions, and/or resist distractions, whilst practising e.g., by encouraging themselves when they are feeling frustrated or and/or turning the telly off whilst they're practising	Parent encourages child to regulate their emotions, and/or resist distractions, whilst practising e.g., by reminding them to encourage themselves when they are feeling frustrated or and/or turning the telly off whilst they're practising

As mentioned previously, coding was completed retrospectively using videos of the practice sessions, rather than in real-time. This was done in order to give children and parents sufficient privacy whilst practising and to encourage more naturalistic behaviour from participants. Coding retrospectively also made it easier to code the videos twice (for children's metacognition and parent scaffolding) and helped to increase the reliability of coding by allowing the researcher to go back and make changes if necessary.

5.3.8 Metacognitive Knowledge Interviews (McKI) – Coding Procedures

The McKI script used in the present study was based on an interview protocol developed by Marulis et al. (2016), which used McKIs to assess 3-5-year-old children's metacognition in relation to a problem-solving puzzle task. Questions in Marulis et al.'s interview protocol were designed to activate metacognitive knowledge from three main areas: Knowledge of Persons, Knowledge of Task and Knowledge of Strategies. One of the particularly innovative aspects of Marulis et al.'s interview design is that seven of the 11 questions in the script are asked by a puppet called Gogi – a creature from a faraway land who had never seen puzzles and would like the child to help them learn about them. Puppet mediators are regularly used in studies which involve interviewing children and may help to relax children and focus their responses (Cameron, 2005; Danby et al., 2011).

The McKI script used in the present study consisted of 12 questions. As in Marulis et al.'s script, a proportion of these questions (five) were asked by Gogi. In the present study, Gogi's questions were targeted at assessing children's general metacognitive knowledge. The remaining seven questions were aimed at accessing conditional metacognitive knowledge related specifically to the practice they had just completed, as well their perception of their parents' help. A complete copy of the McKI script used in can be found in Appendix H.

As with the practice sessions, videos of the McKIs were transcribed and coded retrospectively. Scores were given on scale of 0-2, as in Marulis et al.'s original study (0 = not metacognitive at all; 1 = *partially metacognitive*; 2 = *appropriately metacognitive*) for each question. The maximum number of marks available per child in the McKI was 12. Coding was completed using guidance from Marulis et al.'s McKI protocol and "Annotated Scoring Notebook", a copy of which can be found in Appendix I.

5.4 Reflection

Teijlingen and Hundley (2001) suggest that one of the main advantages of conducting a pilot study is that it may give advance warning of where a main research project may encounter difficulties due to inappropriate or overly complicated instruments or research protocols. Indeed, a number of difficulties and limitations characterised the present study and helped to highlight areas of improvement for Study 2.

The first, and most glaring, problem encountered in the pilot was the size of the participation sample. As previously discussed, the specificity of the project's topic and its research aims created considerable difficulties with recruitment. Communication problems with the Principal of the music academy made it difficult to arrange practice sessions and interviews in her absence. The significant delays in gathering participant consent forms and organising times for observations meant that by the time the observations were due to take place, it was already too late to try to find an alternative sample to collect data from – resulting in an extremely limited set of data.

Another major limitation of the pilot was the venue in which the practice sessions took place, and the musical instrument used for the observations. As discussed, it was originally agreed that practice sessions and interviews would take place at the music academy attended by the children – an environment familiar to the children and their families and equipped with acoustic pianos. Communication problems between the researcher and the academy's Principal meant that an alternative venue and portable instrument had to be found at short notice. The instrument used for the practice sessions was an electronic keyboard and of poor quality. In particular, the instrument was not touch sensitive (the volume of the instrument does not change in response to finger pressure), resulting in problems for children attempting to practice the use of dynamics.

From the methodological standpoint, the intervention was of questionable validity and arguably not sufficient to elicit a change in parents' ability to provide metacognitive support. The pilot also suffered from issues with instrument alignment and comparability of data across different data sources (i.e., practice observations and interviews) – especially given limited alignment between metacognitive and self-regulatory measures in the practice sessions and McKIs.

With regard to delivery, there were also a number of measures that the researcher could have taken to improve the experience of the children who participated which may have helped to improve the reliability of the data collected. The video camera, for instance, could have been positioned in a less prominent location (to the side of, rather than facing the child) and the researcher could have sat side-by-side with the children instead of across from them, to help them feel more at ease. The effect of these configurations would not only have helped the children to feel more comfortable and relaxed but may also have helped to elicit more natural behaviour from the children (and parents), helping to improve the validity of the data too – issues discussed in detail as part of Study 2.

5.5 Conclusion

This pilot study provided an important opportunity for the researcher not only to test the proposed methodology and practice using the coding instruments but also to consider potential methodological and practical challenges ahead of the main data collection in Study 2. Methodologically, the pilot highlighted significant problems with instrument alignment and the validity of the intervention activity and provided an opportunity to rethink the configuration of these instruments and procedures for the main data collection. Additionally, practical issues arising from the pilot relating to recruitment and participant commitment informed the decision to visit participants in their homes and video practice sessions on children's own pianos in Study 2 – changes which may considerably reduce respondent reactivity and improve the reliability of results collected. Finally, perhaps the most important learnt from the pilot was the importance of establishing a direct line of communication between the researcher and participants, and rather than relying on a mediator (such as a teacher) to communicate with participating children and parents. These experiences were invaluable in helping to inform the design and delivery of Study 2 – as elaborated on in the following chapter.

CHAPTER 6

Study 2 - Associations between Parental Support, Parenting Style Beliefs, Children's Metacognition and Self-Regulation During Musical Learning and Children's Musical Achievement

6.1 Introduction

Having surveyed general trends in parental metacognitive and self-regulatory support through an initial questionnaire study (Chapter 4) and piloted the use of an observational coding scheme and Metacognitive Knowledge Interview (McKI) protocol (Chapter 5), this chapter now proceeds with the main study of this thesis. Using a combination of videoed piano practice sessions, interviews and questionnaires, this study aimed to investigate the fluctuating character of children's metacognition and self-regulation, and parental support, during musical learning in a variety of contexts. In addition to instructional parental support, as assessed through parents' support of children's metacognition and self-regulation during their children's practice, this study also examines the role of parenting style beliefs in parental support and children's musical learning.

The present chapter is structured into seven sections. This section (6.1) presents an overview of the relevant literature on parenting style dimensions, the development of metacognition and self-regulation in children, and measurements of children's metacognitive and self-regulatory abilities, concluding with the study's research questions. Section 6.2 describes the methodological approach taken in this study, including detailed accounts of participants, materials, instruments and procedures, followed by an overview of data analysis procedures in section 6.3. Section 6.4 reports the results of Study 2, followed by discussion of these results in section 6.5. Section 6.6 examines the limitations of the study and directions for future research.

Finally, this chapter concludes with section 6.7, which presents a summary of the findings from this study.

6.1.1 Parenting Style Beliefs

As discussed in Chapter 2 (section 2.4.3), parenting style can be understood as a combination of parenting attitudes and behaviours which, taken together, help to shape goal-directed behaviours used by parents to socialise their children (Darling & Steinberg, 1993). In contrast to situation-specific parenting practices, parenting style is characterised by emotional tone and the relational aspects between parent and child. Importantly the emotional climate created by parents as a result of their parenting style beliefs "profoundly influences children's musical education" (McPherson, 2009, p. 105).

The measure of parenting style beliefs used in this study (Hembacher & Frank, 2016) addresses parenting beliefs related to parental responsiveness and demandingness. However, as discussed, the present study does not attempt to measure aspects of both dimensions to categorise participants' parenting styles as being either authoritarian, authoritative, permissive or neglectful (Maccoby & Martin, 1983). In order to contextualise the findings of this study, the following sections examine the extant literature on children's responses to parental responsiveness and demandingness, as well as cultural differences in communication of parenting style beliefs and outcomes.

6.1.2 Parental Responsiveness and Demandingness

As discussed in Chapter 2, research typically operationalises parenting style along two orthogonal dimensions – responsiveness (and/or warmth) and demandingness (and/or control) (see section 2.4.3). Different levels of responsiveness and demandingness, as integrated into parents' beliefs and behaviours, have been associated with various socialisation outcomes for children. In particular, the positive impact of authoritative parenting style, characterised by high levels of both demandingness and responsiveness, on children's academic and socialisation outcomes is well documented (Nyarko, 2011; Pinquart, 2016; Steinberg, Lamborn, Dornbusch & Darling, 1992). In their meta-analysis of parental behaviours predicting early childhood executive functions, Valcan et al. (2017) found associations between negative, controlling parenting and lower executive function in children, with stronger effect sizes in younger children. Similarly, Evans (2003) suggests that certain kinds of parental control, particularly when paired with low levels of responsiveness, may impair internalisation of self-regulation behaviours. In contrast, parents who exert low levels of control over their children implicitly communicate confidence in their children's abilities (Pasternak & Whitebread, 2010). In doing so, parents may help support their children's feelings of competence and attribution of outcomes as the result of personal effort and persistence. Additionally, positive affect from parents has been found to be a predictor of better self-regulation in children (Neitzel & Stright, 2003). One explanation for this is that positive environments result in lower levels of cortisol (associated with stress), which may result in improved executive function over time (Blair et al., 2011).

It should be noted that conceptual definitions of parenting style dimensions remain inconsistent across studies. High demandingness/control, for instance, is considered an essential part of authoritative parenting but regarded negatively in the context of controlling parental behaviours (Pino-Pasternak and Whitebread, 2010). Due to the diversity of descriptors of parenting style dimensions, it is not always clear whether parental responsiveness/warmth/affection, and demandingness/control/strictness, should be regarded as separate or interchangeable. Interpretations of findings are complicated yet further when cultural differences in communication and reception of parenting style are considered (as in the following section). For clarity, the present study treats responsiveness and demandingness as conceptually separate from other terms and focuses specifically on associations between parenting style beliefs characterised by these two particular constructs and children's musical learning.

6.1.3 Cultural Differences in Children's Response to Parenting Styles

Cultures vary in their parenting norms, and expressions of parental responsiveness and demandingness. Taylor et al. (2004) argue that children from some cultures demonstrate fewer negative outcomes as a result of authoritarian parenting (characterised by high demandingness and low responsiveness) than others and that this indicates that cultural context may be an important factor influencing parent-related child outcomes.

In particular, Wu and Chao (2005) suggest that Asian cultures are less physically and emotionally expressive. In her study of the parenting styles of immigrant Chinese and European American mothers, Chao (2000) found that Chinese mothers tended to demonstrate their responsiveness through involvement and support, in particular prioritising caretaking and education. Chao suggests that this is because training children through guidance and monitoring of behaviour plays an important role in Chinese parents' parenting style beliefs. In contrast, parental responsiveness for European mothers was characterised by demonstrations of affection or praise. Chao (2000) goes on to argue that while training or *chiao shun* does emphasise "obedience and a set standard of conduct" (similar to aspects of authoritarian parenting), that there are important differences between authoritarianism and the Chinese training concept (p. 234) – with both chiao shun and authoritative parenting styles directed towards similar socialisation goals for children.

The way in which children perceive expressions of parental responsiveness or demandingness may also differ from the way in which parents intend them to be understood, with intergenerational cultural conflicts particularly common between immigrant parents and children (Wu & Chao, 2005). Wu and Chao found that some Asian American adolescents perceived their parents as not conveying warmth to them in the ways they wanted, with these adolescents expressing similar parenting ideals to their American peers. Despite earlier research which suggests different effects of authoritarian parenting for children from ethnic minority families (Baumrind, 1972), more recent studies have indicated that (as with American and European children) the authoritative parenting style is associated with better behavioural outcomes for children from African (Querido, Warner & Eyberg, 2002), Saudi Arabian (Alnafea & Curtis, 2017) and Chinese backgrounds (Chen, Dong & Zhou, 1997) .

These findings highlight the importance of acknowledging the tendency for parenting studies to focus on predominantly European and American populations, as well as highly educated and middle-class participants (Pino-Pasternak & Whitebread, 2010). A key reason for this is that families with higher levels of education and socioeconomic status tend to be more available to take part in research studies, resulting in fewer studies involving culturally diverse or low-income families (Xu & Corno, 1998). These sampling trends are important when considering conceptions of parenting historically based on mainstream American or European populations and highlight the possibility of different patterns of parenting style beliefs and children's outcomes across culturally diverse samples.

6.1.4 Impact of Parenting Style Beliefs on Children's Metacognition and Self-Regulation, and Musical Learning

Children's independent use of metacognitive behaviours is closely related to parents' ability to encourage their children's autonomy and provide support in a contingent manner – key aspects of the authoritative parenting style (Pino-Pasternak et al., 2019). Erden and Uredi's (2008) study of perceived parenting styles on secondary school students' self-regulated learning found that the children of authoritative parents used the most self-regulated learning strategies, as well as demonstrating the most self-efficacy. Similarly, children of permissive parents were found to employ more cognitive and metacognitive strategies than students with authoritarian or neglectful parents – echoing Pino-Pasternak and Whitebread's (2010) suggestion that low levels of parental control may help to encourage children's autonomous learning.

As reiterated throughout this thesis, metacognitive and self-regulatory abilities play an important role in the development of musical expertise. McPherson and Zimmerman (2002) argue that better music learners are more likely to self-regulate their learning and know how to work independently. Given the associations between parenting style beliefs and children's ability to self-regulate their learning, it stands to reason that the emotional climate in which parents raise their children has important implications for children's musical learning too. Dell et al.'s (2014) exploratory study of parental involvement and home environment in music (PIHEM) found that parenting style was related to all PIHEM factors (musical home structure, parental expectations for music study, family musical participation, musical home environment, parental attitudes towards music study and family music background). Creech (2009) argues that the best musical outcomes for children are achieved when parents move between close and distant positions on the responsiveness axis, and directive and acquiescent positions on the control axis. Rather than remaining static, Creech suggests that parenting style should be reflexive and respond to the particular needs of the child in different situations. Strongly influenced by the relationship between parent support and self-determination theory (Pomerantz, Grolnick & Price 2005), McPherson's (2009) framework for studying parent-child interactions proposes a feedback loop whereby children are most likely to be positively engaged when their psychological needs (competence, autonomy, relatedness and purposefulness) are met by their parents. Within this model, McPherson argues that close parent-child bonding and positive affect are likely to encourage mastery-oriented motivation and greater use of self-regulated learning skills, particularly where parental practices also support children's autonomy. In line with early childhood research, the use of controlling parental practices during musical tasks children are struggling with have been found to reinforce children's view of themselves as having less ability than others or not coping well with a task (McPherson, 2000).

To summarise, findings across the parenting and music education literature support the view that high levels of parental responsiveness are related to positive learning outcomes for children. Due to the conceptual diversity surrounding definitions of parental control, as well as cultural differences in parent-child interactions, it is less clear how different forms of parental demandingness may be related to children's learning outcomes (as in the classic model of authoritative parenting). Having surveyed the literature on parental metacognitive and self-regulatory support in Chapter 4 (section 4.1.3) and parenting style beliefs in this chapter, the following section now presents the literature on the development of children's metacognition and self-regulation, and its empirical measurement.

6.1.5 Young Children's Metacognitive and Self-Regulatory Abilities

Whitebread and Neale (2020) suggest that the earliest roots of the study of metacognition (prior to Flavell, 1979) can be traced back to Piaget – in particular findings from Piaget and Inhelder's (1964) reclassification tasks, which required young children to classify objects according to certain criteria and then reclassify them using a second criterion. Later studies by Piaget (1977, 1978), which asked children to reliably choose the odd one out of a set of objects found that whilst most children could identify the correct object by the age of 6 years, it was not until age 8 tears that they could reliably explain how they chose it. More recently, the use of observational methods, in addition to brain imaging, has allowed researchers to identify sophisticated metacognitive abilities in children as young as 3 years old (Ferandez-Duque, Baird & Posner, 2000; Marulis et al., 2016; Whitebread et al., 2007, 2009).

As discussed in Chapter 2, metacognition is typically operationalised into metacognitive knowledge (awareness) and metacognitive skills (regulation). Despite the emergence of both of these developing abilities from an early age, young children are often limited by their ability to use their metacognitive knowledge to select an appropriate cognitive strategy during learning tasks (Whitebread et al., 2015). Whitebread and colleagues (2015) suggest that the reason underpinning this difference is the developmental trajectory of monitoring and control processes, with monitoring abilities maturing uniformly with age but control behaviours heavily reliant on experience and practice. This view is supported by studies by Eme et al. (2006) and Puustinen (1998), who have found that high-achieving young children tend to be average in their monitoring skills but significantly advanced in their ability to choose appropriate and affective cognitive strategies to support their learning.

Self-regulatory abilities (such as maintaining attention and self-encouraging) have been found to emerge as young as 14 months and have been frequently linked to early language use (Berk & Spuhl, 1995; Vallotton & Ayoub, 2011; Winsler et al., 2009). Originating with Vygotsky, social cognitivists argue that interaction, communication and language play a vital role in the children's self-regulatory development by helping to internalise ways of understanding, skills and mental states of others first experienced socially (Whitebread et al., 2015). Indeed, Lockl and Schneider (2006) have found strong associations between metacognitive vocabulary and metamemory in young children, with children whose metacognitive vocabulary was already ahead of others tending to remain ahead of the rest of the group at a later point.

Interventions targeted at improving young children's metacognition and self-regulation – particularly ones that encourage metacognitive talk (Whitebread et al., 2007, 2009) or facilitate parental engagement in children's learning (Pino-Pasternak, 2014; Wall et al., 2017) – have been found to be highly effective. In what Whitebread and Neale (2020) describe as an "ironic twist, given the earlier rejection of self-report of a valid measure of young children's metacognitive abilities" (p. 12), recent studies have found that children as young as three may benefit from interventions which encourage them to talk about their learning with peers or adults (Whitebread et al., 2015). To the researcher's knowledge, despite the clear benefits of teaching young musicians how to employ metacognitive and self-regulatory strategies to support their practice, no such interventions have been trialled with young beginner children learning to play an instrument – an intriguing area for future research.

6.1.6 Impact of Age on Children's Metacognition and Self-Regulation

Despite evidence to suggest that environmental factors, such as social interaction and parental support, may play an important role in metacognitive and self-regulatory development, it is clear that the maturation of some aspects of young children's metacognition and self-regulation are necessarily limited by age (Whitebread et al., 2015). Given that most children in the UK do not attend school until age 4 or 5 (reception class), it is expected that older children in the present study will have more developed verbal abilities as a result of socialisation opportunities at school. As discussed in the previous section, whereas metacognitive control behaviours are more likely to be affected by external influences, monitoring appears to develop chronologically with little individual difference between children of the same age (Eme et al., 2006; Puustinen, 1998). It is unclear whether these trajectories follow the same pattern in the context of musical learning – an issue which is investigated and controlled for as part of the present study (see section 6.1.10 Research Questions).

6.1.7 The Role of Metacognition and Self-Regulation in Music Practice

As discussed in Chapter 2 (section 2.3.5), research has established strong associations between the use of metacognition and self-regulation during music practice and higher levels of musical achievement. As in other areas of learning, metacognitive strategies enable musicians to monitor, evaluate and regulate their learning better, leading to practice which is more effective and efficient (Bathgate et al., 2012; Hallam et al., 2001). Leon-Guerrero (2008) suggests that young musicians who are not properly taught how to practice by their teachers may not develop the necessary metacognitive and self-regulatory abilities to support their practice and sustain musical progress. It is therefore of high importance that young children are supported to develop these skills from the beginning of their musical education.

The majority of studies on musicians' use of metacognition and self-regulation during music practice have focused on adolescents and adults, with only a small number involving young beginner musicians. Pitts et al. (2000) used case studies from primary school-aged children in their first three years of learning to play an instrument to explore possible reasons for the success and drop-out of beginner musicians. Findings from their study suggest that the children who maintained interest and enthusiasm for their instrument after the first 20 months of learning demonstrated long-term motivation to learn and applied self-regulatory techniques such as using a clock to time their daily practice. In their study of 7-9-year olds at the beginning of learning to play an instrument, McPherson and Renwick (2001) found low levels of self-regulatory behaviour in children's practice, with learning strategies mostly confined to playing through pieces once or twice. Nevertheless, students who used more self-regulatory techniques experienced better musical gain than those who did not. McPherson and Renwick go onto suggest that many of musicians in the sample "possessed the *will* to learn their instrument, but not necessarily the level of *skill* required to ensure efficient and effective practice" (2001, p. 184) – a finding which provides further evidence of the need for metacognitive and self-regulatory interventions for young beginner musicians.

A more recent study by Power and Powell (2018) investigated the effectiveness of a two-year project designed to encourage young string players aged 8-17 to engage in metacognition as part of guided rehearsals and tutorials. Findings of thematic discourse analysis suggest that participants engaged in five main kinds of metacognitive activities: understanding the structure, marking the score, process goals, expert modelling and segmentation. However, of the reflections included as part of case studies, the youngest musician from which reflections were collected was 13 years old, with no comments provided from younger musicians. Although Hallam et al.'s (2012) survey of practising strategies used by young people included participants that ranged from age 6-19, it questionable whether the youngest children in the group were fully able to comprehend the nature of questionnaire items. Given the limited number of studies involving young beginner musicians, wider use of multi-method methodologies, including observations, may help to better elucidate the trajectory young children's metacognition and self-regulation during musical learning – as it already has in the early childhood and educational psychology literature.

6.1.8 Interviewing Young Children – Methodological Considerations

In the words of Folque (2001), "interviewing children presents special challenges and special rewards" (p. 240). In the context of musical learning and parental support, children's perceptions of their own learning are invaluable to understanding their metacognition and self-regulation during musical learning, as well as the possible obstacles and frustrations they may face during practice. Despite concerns about children's verbal abilities and ability to reliably self-report, Folque argues that children are able to give significant and important information about their own experiences, provided researchers enable children to express themselves through developmentally sensitive questions and activities.

Unlike adult interviewees, children may require additional scaffolds and supports appropriate to their developmental abilities to facilitate their responses. As discussed, a commonly used technique in interviews with children involves the use of artefacts or, in particular, puppets, which may help to encourage more elaborate responses and aid memory retrieval (Cameron, 2005; Danby et al., 2011). Additionally, Irwin and Johnson (2005) suggest that some children may prefer closed-ended questions as some children may not be able to deal with the complexity of open questions without cues or prompts. Another important consideration when interviewing children concerns how to dilute adult-child power relationships (Woodhead & Faulkner, 2000). Doing so is not only ethically appropriate, but methodologically sensible from the point of view of respondent reliability. Measures that may help to dilute power imbalances between researchers and young interviewees include avoiding sitting behind a desk, keeping a consistent but gentle eye gaze and avoiding distracting movements or other signs of inattention (Cameron, 2005). Finally, where possible, it is recommended that researchers facilitate opportunities to build rapport with children prior to interviews – a measure that may lead to fuller and less constrained disclosure.

6.1.9 Research Questions

Three overarching research questions were used to frame the second study in this thesis:

RQ2 – What are the indicators of children's metacognition and self-regulation in musical learning and what are their associations with musical achievement?

RQ3 – What are the associations between parental support of children's metacognition and self-regulation, children's metacognition and self-regulation in musical learning and children's musical achievement?

RQ4 – What are the associations between parenting style beliefs, children's metacognition and self-regulation in musical learning and children's musical achievement?

In addition to these three overarching questions, the following sub-questions were also investigated in detail:

RQ2a – To what extent is children's metacognition and self-regulation associated with their age?

RQ2b – To what extent is children's musical achievement associated with their age?

RQ3a – Is there a difference in children's metacognition and self-regulation when practising independently, and when practising with a parent?

RQ3b – Is there a difference in the level of parental metacognitive and self-regulatory support given to children by parents with and without previous musical experience?

To aid clarity, these research question have been abbreviated to the following when they recur in section titles:

RQ2 – Children’s Musical Achievement and Metacognition/Self-Regulation

RQ2a – Children’s Metacognition/Self-Regulation and Age

RQ2b – Children’s Musical Achievement and Age

RQ3 – Musical Achievement, Metacognition/Self-Regulation and Parental Support

RQ3a – Metacognition/Self-Regulation and Parental Supervision

RQ3b – Parental Support and Parents’ Previous Musical Experience

RQ4 – Musical Achievement, Metacognition/Self-Regulation and Parenting Style

Based on the literature on parental support (i.e., practices), parenting attitudes, children’s metacognition/self-regulation and musical achievement, the following hypotheses were made – described in Table 31.

Table 31
Research questions, independent and dependent variables, and hypotheses for Study 2

	Question	Short-form name	Independent variable(s)	Dependent variable(s)	Hypothesis
RQ2	What are the indicators of children’s metacognition and self-regulation in musical learning, and what are their associations with musical achievement?	Children’s Musical Achievement and Metacognition/Self-Regulation	Children’s musical achievement	Children’s metacognition and self-regulation	H2 – Children who demonstrate higher levels of metacognition and self-regulation experience higher levels of musical achievement
RQ2a	To what extent is children’s metacognition and self-regulation in musical learning	Children’s Metacognition/Self-Regulation and Age	Children’s metacognition and self-regulation	Age	H2a – Children’s ability to use metacognition and self-

	associated with their age?				regulation in musical learning increases with their age
RQ2b	To what extent is children's musical achievement associated with their age?	Children's Musical Achievement and Age	Children's musical achievement	Age	H2b – There is no association between children's age and their level of musical achievement
RQ3	What are the associations between parental support of children's metacognition and self-regulation, children's metacognition and self-regulation in musical learning and children's musical achievement?	Musical Achievement, Metacognition/Self-Regulation and Parental Support	Children's musical achievement, metacognition and self-regulation	Parental metacognitive and self-regulatory support	H3 - Children who receive more parental support demonstrate higher levels of metacognition, self-regulation and musical achievement.
RQ3a	Is there a difference in children's metacognition and self-regulation when practising independently, and when practising with a parent?	Metacognition/Self-Regulation and Parental Supervision	Children's metacognition and self-regulation	Parental supervision during piano practice	H3a – There is a significant difference in children's metacognition and self-regulation when practising the piano independently and when practising with a parent.
RQ3b	Is there a difference in the level of parental metacognitive and self-regulatory support given to children by parents with and without previous musical experience?	Parental Support and Parents' Previous Musical Experience	Parental metacognitive and self-regulatory support	Parents' previous musical experience	H3b - There is no difference in the level of parental support given to children by parents with and without previous musical experience
RQ4	What are the associations between parenting style, children's metacognition and	Musical Achievement, Metacognition/Self-Regulation and Parenting Style	Children's musical achievement, metacognition	Parenting style (parental responsiveness and demandingness)	H4 - Children whose parents report higher levels of responsiveness

self-regulation in musical learning and children's musical achievement?	and self-regulation	in their parenting demonstrate higher levels of metacognition, self-regulation and musical achievement

The following section outlines the methodology underpinning the following study, including participants, ethics procedures, materials and data analysis strategy.

6.2 Methodology

This study employed a multi-method approach to investigate associations between parental support, parenting attitudes, and children's metacognition and self-regulation during musical learning. In order to understand how these behaviours varied in different contexts (e.g., during a task, and in an interview setting), as well as explore differences in observed and self-reported measurements of metacognition/self-regulation and parental support, children and parents were assessed in several different ways. Figure 11 describes the main data collection process:

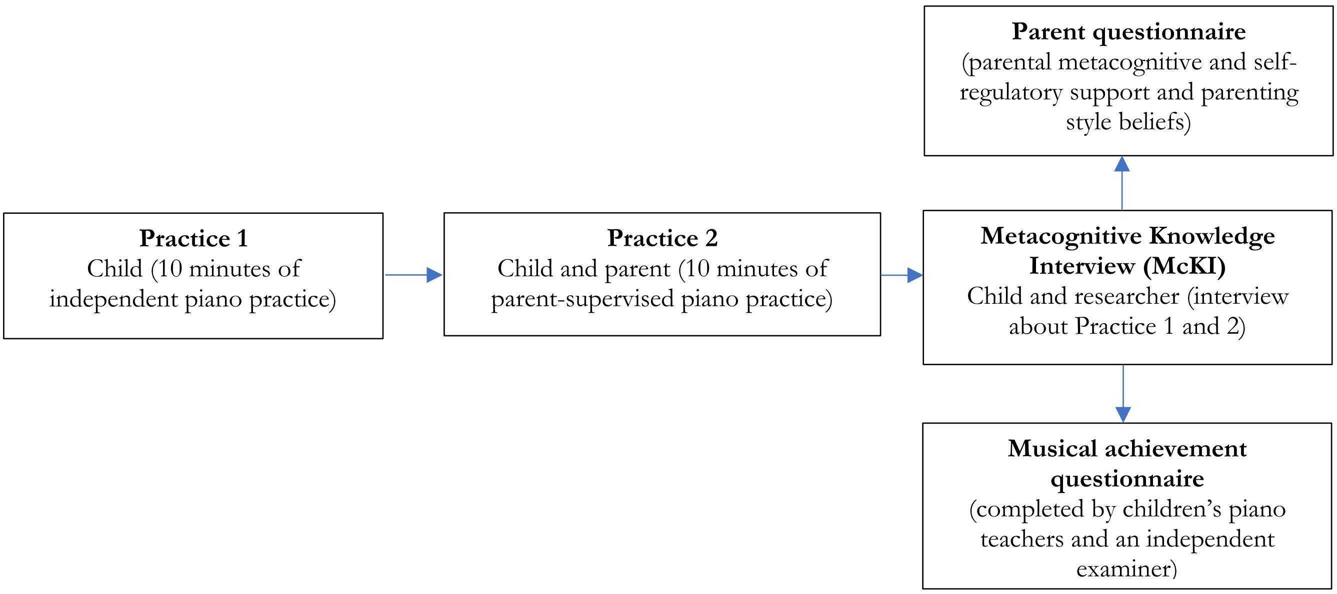


Figure 11
Overview of data collection procedure for Study 2

In Practice 1 and 2, children were video-recorded practising the piano without and with their parents, respectively, in their homes. Children subsequently took part in a Metacognitive Knowledge Interview (McKI) with the researcher, where they were asked questions about the piano practice they had just undertaken, as well as learning the piano more generally. Whilst the McKI was being administered following Practice 2, parents were asked to complete a questionnaire about their parenting attitudes (in relation to parental demandingness and responsiveness) and the kinds of metacognitive and self-regulatory support they usually gave their child whilst practising. Finally, children's musical achievement was measured through piano teachers' responses to a questionnaire about different areas of their pupils' musical performance abilities. The musical achievement questionnaire was also completed by an independent examiner, based on his assessment of children's performance during practice session videos.

6.2.1 Participants

The participants in this study were 6-to-9-year-old children (N = 30), learning to play the piano and their parents (N = 30) and teachers (N = 17), living in the Manchester, Sheffield, Cambridge and Betws-y-Coed in the UK. Participants were recruited through music services and private music teachers, who were sent invitations to take part in the study by email.

As described in Table 32, nine of the children were aged 6, eight were aged 7, nine were aged 8 and two were aged 9 (M = 7.17, SD = .95). 12 of the children were male and 18 were female. Time spent learning the piano ranged between 5 and 48 months (M = 22.67, SD = 12.07).

Table 32
Ages of children (in years) and time spent learning the piano (in months)

	Min.	Max.	Mean	SD
Age (in years)	6	9	7.17	.95
Time spent learning (in months)	5	48	22.67	12.07

For each child, one parent was asked to take part in Practice 2 and complete the parent questionnaire (N = 30). Of these parents, six were male and 27 were female. In order to ascertain whether or not the parent who completed the questionnaire was the same parent who usually practices with their child, respondents were also asked to report who usually supervised their child's practice. Participating parents were asked to describe both their own and (where applicable) their partner's previous musical experience in their own words. Previous musical experience was decided on the basis of the experience of the parent who took part in Practice 2 and the questionnaire. In all cases except two, the parent who participated in the study was also the parent who usually supervised their child's practice. Results pertaining to parents' levels of musical experience can be found in section 6.4.3.

In addition to children and parents, 17 teachers also completed a musical achievement questionnaire for their pupils. Among the 30 children who participated in the study, there were several teachers who taught more than one of the children in the sample. Teachers for five of the 30 children declined to complete a questionnaire for their pupil resulting in an incomplete dataset of teachers' musical achievement scores for their pupils (n = 24). Consequently, an independent examiner (a professional pianist, piano teacher, and a qualified music examiner for the Associated Board of the Royal Schools of Music) was also asked to provide scores for all 30 children (see also section 6.2.10 Musical Achievement Questionnaire).

6.2.2 Context

Given the relatively small and diverse sample of participants, it is necessary to offer some additional information about the participants who took part in this study – for instance, the participants' backgrounds and the kinds of piano lessons the children were undertaking (e.g., private piano lessons/in-school classes) – in order to contextualise the study's results. It should be noted that participants (parents) were only asked to report their children's age, gender, time spent learning, grade level (if appropriate) and their own level of musical experience as part of the study. This was because of feedback gathered from participants in Study 1, which suggested that participants felt they were asked to provide too many personal details which were ultimately not used as part of the study. Though potentially relevant, no specific questions were included about participants' ethnicities (see section 6.1.3), possible disabilities or financial backgrounds in Study 2. The following information is therefore based solely on the researcher's observations and conversations with children and parents who, in order to protect their identities and in line with ethical guidelines (BERA, 2008), have been kept anonymous.

Instrumental music teaching takes many forms and can be delivered in a wide of settings, including formal/informal private one-to-one lessons, group classes and even online (Hallam, Creech & McQueen, 2017; Rose, Bartoli & Heaton, 2019). In the context of this study, all of the children who took part were engaged in formal, weekly, one-to-one piano lessons with a specialist piano teacher. 28 of the children were visited at home by their teacher or went to their teacher's home for their piano lessons (including four pupils of the researcher) and three took their lessons at school – including one child at a specialist Music School (the other two took lessons at their local primary school). One child in the sample was taught by her father, who is a professional pianist and piano teacher. Additionally, three were engaged in Suzuki lessons and regularly observed other children's lessons and took part in weekly group theory/musicianship classes, alongside their weekly piano lessons. All children attended mainstream primary schools (Key Stages 1 and 2), except for the one at Music School and one child who was home-schooled.

As discussed, it is not possible (nor ethical) to attempt to confirm the ethnic backgrounds of participants without their consent and/or through observation alone. However, as a fluent Cantonese speaker, 15 of the 30 parents who participated engaged in informal conversation with the researcher in Cantonese (NB - all interviews with children were conducted in English). Furthermore, from the conversations had with parents, it is possible to ascertain that the sample also included families of Caucasian, Thai, Polish, Indian and Bangladeshi descent. All children were born in the UK and spoke English as their first language.

Families lived in a mixture of houses and flats, of varying sizes and neighbourhoods. When visiting the children and their families, most children had access to an acoustic piano or electronic keyboard in a discrete room – most often a living room, bedroom or sometimes, music room. One child's piano was located in the family kitchen (see section 7.3.2 Issues Emerging During the Studies). After their practice, the children chose where they felt most comfortable conducting the Metacognitive Knowledge Interviews, typically on the sofa in the living room though others preferred to stay in their practice room or, in some cases, show the researcher their bedrooms (it should be noted that all of this was done with parental consent, in close proximity of parents and with doors left open).

Finally, with regards to SES of the families who took part, to the researcher's knowledge, the very large majority of the sample came from middle-class backgrounds, with one or more parents in professional jobs and families residing comfortable accommodation in suburban neighbourhoods. The only exceptions to this were three families. However, as with the previous contextual information, this information is

purely based on the observations of the researcher and conversations with parents, and impossible to confirm without further discussion (and consent) from parents.

6.2.3 Ethical Approval

Ethics approval was granted by the RNCM Research Ethics Committee on 5th June 2019. Participating parents were advised to read the participant information sheet to their children (see section 6.2.4). A copy of the Ethics Approval Certificate granted by the RNCM REC can be found in Appendix C. Every effort was made to ensure that participants felt comfortable and happy, e.g., by allowing children to take breaks in between the practice sessions and interviews if they wished. Children and parents were regularly reminded that they were welcome to discontinue at any point, and/or withdraw from the study without needing to offer any explanation. Each participant received a short face-to-face debriefing at the end of their participation and the opportunity to ask any questions they may have and/or offer feedback on the study.

6.2.4 Consent Forms

Consent was obtained from parents on behalf of their children, as well as for the participating parents and teachers themselves. Although consent to participate can of course only be obtained from parents on behalf of minors under the age of 16, a small "consent form" was also made for the children. This was done in order to ensure that parents discussed their child's participation with their child before taking part in the study and to help children to feel listened to and involved. In addition to a space for the child to "sign" their name, children were also encouraged to produce a small drawing, which they were invited to tell the researcher about when they met in person. This was done in order to make the children's participation feel relaxed and enjoyable, and to create an opportunity for the child and the researcher to talk informally and before being videoed for the study. Building rapport with children in this way helps to facilitate fuller and less constrained disclosure from children (Irwin & Johnson, 2005). Moreover, as discussed, obtaining consent from children participating in research can help to dilute adult-child power relationships (Woodhead & Faulkner, 2000) and encourage a sense of shared purpose (Cameron, 2005) – both of which have been found to help increase the reliability of the data collected (Folque, 2001).

In addition to parents and children, consent was also obtained from children's piano teachers and the independent music examiner who reported on children's musical achievement levels. A copy of the information sheet sent to parents and consent forms for all participants can be found in Appendix J.

6.2.5 Materials

All practice sessions and Metacognitive Knowledge Interviews (McKIs) were filmed using a Canon Legria HF R806 Digital Camcorder and a small folding tripod – equipment specifically chosen to be as discreet and unobtrusive as possible. Paper copies of the parent questionnaires and participant consent forms were completed in person when the researcher visited. The majority of the teacher questionnaires, and their participant consent forms, were sent out and completed via email, although a small number were also posted to the researcher in hardcopy.

6.2.6 Instruments and Data Collection Procedures

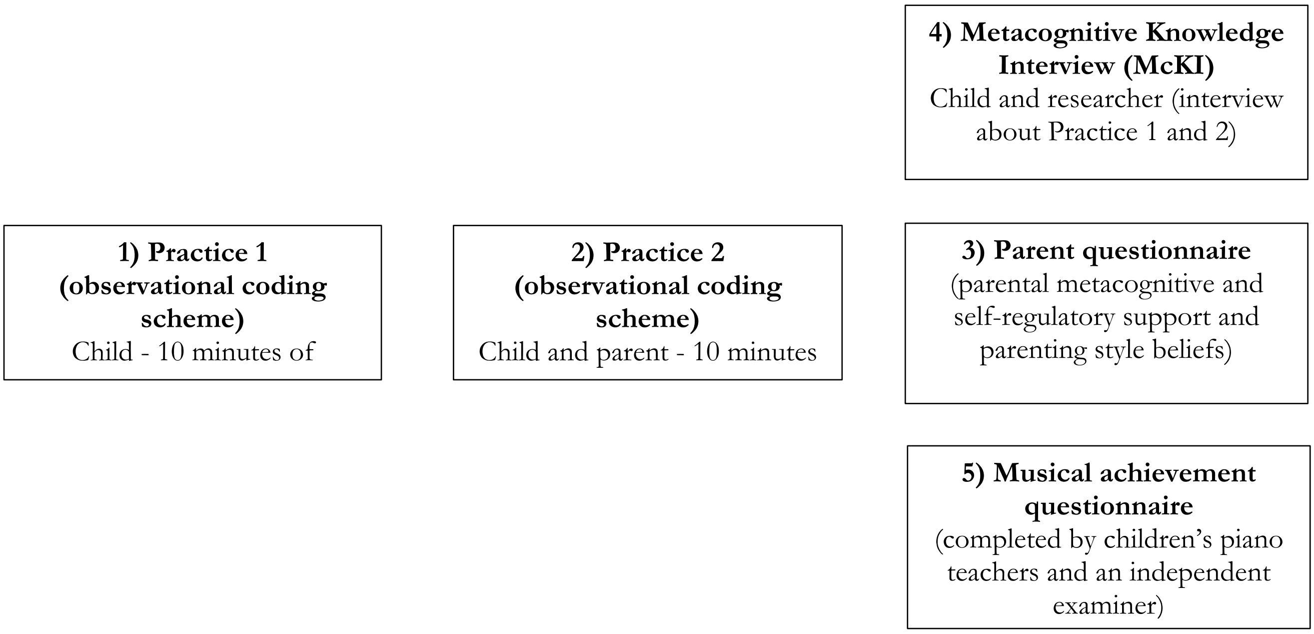


Figure 12
Data collection instruments and procedures for Study 2

Figure 12 maps the five measurement instruments used as part of the data collection phase of this study:

1. An observational coding scheme for assessing children's metacognition and self-regulation during Practice 1 and Practice 2, based on Whitebread et al.'s (2009) Cambridgeshire Independent Learning in the early years framework (C.Ind.Le)
2. A corresponding observational coding scheme which measured parents' support of children's metacognition and self-regulation during Practice 2
3. A parent questionnaire, based on items taken from C.Ind.Le (Whitebread et al., 2009) and Hembacher and Frank's (2016) Early Parenting Attitudes Questionnaire

(EPAQ), which assessed parents' metacognitive/self-regulatory support and parenting style beliefs (in relation to parental demandingness and responsiveness)

4. A Metacognitive Knowledge Interview (McKI) protocol (Marulis et al., 2016), aligned with items from C.Ind.Le (Whitebread et al., 2009), which measured children's context-specific (i.e., related to Practice 1 and 2) and general metacognition around piano practice and
5. A musical achievement questionnaire based on items taken from the examination marking criteria of the Associated Board of the Royal Schools of Music (ABRSM, 2018).

Instruments 1-4 all used the same items adapted from C.Ind.Le (Whitebread et al., 2009) in Study 1 to allow for comparison and convergence of related behavioural constructs in different settings – for instance, comparison of children's metacognition and self-regulation as observed online during Practice 1 and 2, and children's self-report of metacognitive and self-regulatory strategies employed during Practice 1 and 2 in the McKI. For clarity and in order to avoid repetition, the following section combines discussion of both instrument construction (including adaptations) and data collection procedures together for each phase of Study 2.

6.2.7 Parent Questionnaire

The 24-item parent questionnaire developed for Study 2 was used to measure parents' metacognitive and self-regulatory support of their children's practice and parenting style beliefs, as reported by respondents. In response to each statement, participants were asked to indicate their level of agreement on a 7-point Likert scale, where 1= *completely disagree* and 7 = *completely agree*.

Of the 24 statements in the questionnaire, eight were based on items adapted from C.Ind.Le (Whitebread et al., 2011) for Study 1. As in Study 1, statements were designed to measure parents' perceived support of their children's metacognition and self-regulation during piano practice. The eight metacognitive areas these statements areas aimed to measure were parental support of children's

- Knowledge of Persons (KoP);
- Knowledge of Task (KoT);
- Knowledge of Strategies (KoS);
- Planning (P);
- Monitoring (M);
- Control (C);
- Evaluation (E) and
- Emotional/Motivational Control (EMC).

The remaining 16 statements were based on items taken from Hembacher and Frank's (2016) Early Parenting Attitudes Questionnaire (EPAQ). Of these 16 items, eight related to parents' attitudes towards rules and respect, and eight to parents' attitudes towards attachment and affection in relation to their children.

In addition to questions relating to parental metacognitive support and parenting style, parents were also asked to report:

- their previous musical experience, and that of their partner (if applicable), in their own words;
- the age of their child;
- how long their child had been learning to play piano, at the time of the study;

- which parent usually supervises their child's practice;
- how often they supervise their child's practice and
- how long they have been supervising their child's practice for (e.g., since their child started; two months ago?).

During a visit to participants' homes, parents were asked to complete a paper copy of the questionnaire whilst their child took part in the McKI with the researcher. Following the McKI, parents were asked if there were any items they were unsure of how to interpret or answer. This was done in order to allow participants to clarify any items they were unclear on, and to avoid the possibility of 'guessed' answers. The following section describes the development and construction of the parental metacognitive support and parenting style components of the parent questionnaire in detail.

6.2.7.1 Parental Metacognitive and Self-Regulatory Support

In order to address some of the issues experienced in Study 1 and the pilot, including the length of the questionnaire (which took 15-20 minutes to complete and may have put some participants off) parental support items in the new questionnaire were condensed from 33 items down to eight items. The original 33 statements are listed in Table 33.

Table 33
Original 33-item parental metacognitive and self-regulatory support instrument from Study 1

Metacognitive Support Category	Code	Questionnaire Item
Knowledge of Persons (KoP)	KoP1	I help my child to be able to evaluate their own strengths or difficulties during their practice, for example by encouraging my child to talk about what they feel they are very strong at, and which things they find more difficult during their piano practice.

	KoP2	I help my child to be able to talk about general ideas about learning by encouraging my child to describe what the experience of learning the piano is like for them and how it might be for others.
Knowledge of Task (KoT)	KoT1	I help my child to be able to compare different kinds of tasks with each other, for example by encouraging my child to compare the experience of practising pieces with practising sight-reading or scales.
	KoT2	I help my child to be able to judge the relative difficulty of a task, for example by encouraging my child to compare how difficult they find practicing their pieces with how difficult they find practicing sight-reading or scales.
Knowledge of Strategies (KoS)	KoS1	I help my child to be able to define or explain how she/he has done or learned something, for example by encouraging my child to verbalise the strategies they used to overcome a tricky passage in a piece of music they are learning
	KoS2	I help my child to be able to explain procedures involved in a particular task, for example encouraging my child to describe the different stages of learning a new piece of music.
	KoS3	I help my child to be able to evaluate the effectiveness of different strategies for achieving their practice goals, for example by encouraging my child to consider if their practice is most effective when undertaken before, during or after school.
Planning (P)	P1	I help my child to be able to set or clarify task demands and expectations, for example by encouraging my child to discuss the possible challenges of preparing for a graded exam, and what they will need to do in order to prepare in time.
	P2	I help my child to be able to set themselves targets, for example by

		encouraging my child to devise regular goal-posts, such as memorising a scale or being able to perform a piece confidently by the end of a practice session.
	P3	I help my child to be able to decide on ways of proceeding with a task, for example by encouraging my child to explore different ways of practising a difficult passage of music, and deciding on the best method.
	P4	I help my child to be able to seek and collect necessary resources, for example by encouraging my child to find YouTube videos of the pieces they're currently learning or to attend performances by other pianists.
Monitoring (M)	M1	I help my child to be able to self-commentate, for example by encouraging my child to verbalise their thought processes as they're working through a problem.
	M2	I help my child to be able to review their progress during a task, for example by encouraging my child to keep a practice record of what they have already done and what they have left to do in preparation for their next lesson.
	M3	I help my child to be able to assess their own effort and/or performance, for example by encouraging my child to rate themselves on different aspects of their practice.
	M4	I help my child to be able to assess their current memory retrieval, for example by encouraging my child to rate how well they were able to play a scale they were trying to memorise, after they closed the scale book.
	M5	I help my child to be able to detect errors in their practice, for example by encouraging my child to check their posture, or by pointing out differences between how your child's teacher has

		suggested they practice and how your child is actually practising.
	M6	I help my child to be able to correct themselves, for example by encouraging my child to identify and correct their mistakes whilst practising.
Control (C)	C1	I help my child to be able to change their approach when things aren't working, for example by encouraging my child to try new practice strategies when they find themselves 'stuck' on a difficult section of music, without improvement, for an extended period of time.
	C2	I help my child to be able to suggest and use strategies which may help them to solve a task more effectively, for example by encouraging my child to think about different ways of improving their practice and testing which ones are most effective.
	C3	I help my child to be able to apply a previously learned strategy to a new situation, for example by encouraging my child to think about what they learnt in their last practice session that worked well, and apply it in their next practice session.
	C4	I help my child to be able to check the accuracy of the outcome of their work, for example by encouraging my child to play through their scales or pieces a second time, following a successful rendition, to see if they can perform them again with the same level of accuracy as the first time.
	C5	I help my child to be able to seek help, for example by encouraging my child to ask their teacher for help with a problem they experienced whilst practising during the week.
	C6	I help my child to be able to use non-verbal gestures as a strategy to support their own cognitive activity, for example by encouraging my child to clap the rhythm of a piece out loud to help them work out a tricky rhythm, or remember to

		adjust their posture when practising to ensure they're sat in the correct position.
	C7	I help my child to be able to copy or imitate a model, for example by encouraging my child to listen to recordings of other pianists and attend concerts.
Evaluation (E)	E1	I help my child to be able to review their own learning or explain the task, for example by encouraging my child to keep a practice diary or chart and record their achievements, and use it to look over and reflect on their learning outcomes over the course of several weeks/months.
	E2	I help my child to be able to evaluate the strategies they've used, for example by encouraging my child to reflect on whether a strategy they used in a practice session helped them to achieve their goals (e.g., - does using a metronome help them to play with a steadier beat?)
	E3	I help my child to be able to rate the quality of their performance, for example by encouraging my child to regularly rate their performances at the end of a practice session when learning a new piece of music.
	E4	I help my child to be able to observe and comment on task progress, for example by encouraging my child to make judgments about how well they feel their practice is going during a practice session.
	E5	I help my child to be able to test the outcome or effectiveness of a strategy in achieving a goal, for example by encouraging my child to test themselves on their memory of their scales at the end of a practice session, after using a new strategy for learning scales.
Emotional/Motivational Monitoring (EMM)	EMM1	I help my child to be able to express how they feel whilst practising, for example by encouraging my child to talk about what they find frustrating when their practice is not going well.

	EMM2	I help my child to be able to monitor their emotional reactions to different practice tasks, for example by encouraging my child to talk about how they are feeling at different points in their practice.
Emotional/Motivational Control (EMC)	EMC1	I help my child to be able to control their attention whilst practising, for example by encouraging my child to turn off the TV, radio, phone or any other distractions whilst practising, and/or persuading them to return to their practice after a momentary distraction
	EMC2	I help my child to be able to encourage themselves whilst practising, for example by encouraging my child to remain optimistic and give themselves positive encouragement when they are experiencing difficulties during their practice.

In order to reduce the number of items in the questionnaire, initially one item from each of the nine C.Ind.Le categories (Knowledge of Persons, Knowledge of Task, Knowledge of Strategies, Planning, Monitoring, Control, Evaluation, Emotional/Motivational Monitoring and Emotional/Motivational Control) was chosen as a measure of parental support in this area. Items for each category were chosen based on which was most representative of the category as a whole – a decision made in collaboration with an associate professor of early childhood psychology, and a specialist in children's metacognition and self-regulation (Pino-Pasternak, 2019, personal communication). Subsequent reliability testing of these nine items revealed Cronbach's alpha to be .90, indicating a high level of internal consistency. This increased to α = .91, when one item of the original nine items, Emotional/Motivational Monitoring (EMM), was removed – possibly due to the similarity of both Emotional/Motivational Monitoring (EMM) and Control (EMC) as self-regulatory constructs. Consequently, the final 8-item instrument comprised one statement per category from Knowledge of Persons (KoP); Knowledge of Task

(KoT); Knowledge of Strategies (KoS); Planning (P); Monitoring (M); Control (C); Evaluation (E); and Emotional/Motivational Control (EMC). Table 34 describes each of the eight C.Ind.Le items, as they appeared in the parent questionnaire.

Table 34
8-item parental metacognitive and self-regulatory support instrument for Study 2

Metacognitive Support Category	Code	Questionnaire item
Knowledge of Persons (KoP)	KoP1	I help my child to be able to evaluate their own strengths or difficulties during their practice e.g., by encouraging my child to talk about what they feel they are very strong at, and which things they find more difficult during their piano practice
Knowledge of Task (KoT)	KoT1	I help my child to be able to compare different kinds of tasks with each other e.g., by encouraging my child to compare the experience of practising pieces with practising sight-reading or scales
Knowledge of Strategies (KoS)	KoS1	I help my child to be able to define or explain how she/he has done or learned something e.g., by encouraging my child to verbalise the strategies they used to overcome a tricky passage in a piece of music they are learning
Planning (P)	P2	I help my child to be able to set themselves targets e.g., by encouraging my child to devise regular goal-posts, such as memorising a scale or being able to perform a piece confidently by the end of a practice session
Monitoring (M)	M5	I help my child to be able to detect errors in their practice e.g., by encouraging my child to check their posture, or by pointing out differences between how your child's teacher has suggested they practice and how your child is actually practising
Control (C)	C1	I help my child to be able to change their approach when things aren't working e.g., by encouraging my child to try new practice strategies when they find themselves 'stuck' on a difficult section of music, without improvement, for an extended period of time
Evaluation (E)	E4	I help my child to be able to observe and comment on task progress e.g., by encouraging my child to make judgments on how well they feel their practice is going during a practice session

Emotional/Motivational Control (EMC)	EMC1	I help my child to be able to control their attention whilst practising e.g., by encouraging my child to turn off the TV, radio, phone or any other distractions whilst practising, and/or persuading them to return to their practice after a momentary distraction

6.2.7.2 Parenting Style Beliefs

The remaining 16 questions in the parent questionnaire were taken from the Early Parenting Attitude Questionnaire (EPAQ), developed by Hembacher and Frank (2016). The original EPAQ, which is comprised of 24 questions, is based on Baumrind's (1971) work on parental beliefs and measures parenting attitudes in three key areas (rules and respect; affection and attachment; and early learning) with six questions for each area. For the purposes of this study, only 16 statements, namely those pertaining to "rules and respect" and "affection and attachment" were retained (see Table 35) – categories broadly aligned with Maccoby and Martin's (1983) demandingness and responsiveness parenting dimensions respectively. Of the 16 EPAQ items used, eight (four "rules and respect" and four "affection and attachment") were reversed coded in order to reduce response bias and increase validity of results (Weijters, Baumgartner & Schillewaert, 2013).

Table 35
Parenting style ("rules and respect" and "attachment and affection") items taken from the Early Parenting Attitudes Questionnaire (Hembacher & Frank, 2016)

Rules and Respect	Attachment and Affection
It is very important that children learn to respect adults, such as parents and teachers. (RR+)	It's important for parents to help children learn to deal with their emotions. (AA+)
It is very important for young children to do as they are told, for example, waiting when they are told to wait. (RR+)	A child who has close bonds with his or her parents will have better relationships later on in life. (AA+)

It is very important that there are consequences when a child breaks a rule, big or small. (RR+)	Children should be comforted when they are scared or unhappy. (AA+)
Children should be grateful to their parents. (RR+)	Parents should pay attention to what their child likes and dislikes. (AA+)
Parents do not need to worry if their child misbehaves a lot. (RR-)	Too much affection, such as hugging and kissing, can make a child weak. (AA-)
It is okay if young children boss around their caregivers. (RR-)	Parents should not try to calm a child who is upset, it is better to let children calm themselves. (AA-)
It is okay if children see adults as equals rather than viewing them with respect. (RR-)	Children and parents do not need to feel emotionally close as long as children are kept safe. (AA-)
Young children should be allowed to make their own decisions, like what to play with and when to eat. (RR-)	Children who receive too much attention from their parents become spoiled. (AA-)

Note. RR = Rules and Respect; AA = Affection and Attachment. Items with a "+" (e.g., RR+) indicates a positively worded statement, whereas items with a "-" (e.g., RR-) indicate a reverse-coded item.

For a complete copy of the parent questionnaire (including additional questions, as listed in section 6.2.6 and presented to parents), see Appendix K.

6.2.8 Practice Sessions

As well as administering parent questionnaires, the researcher filmed children practising the piano with and without their parents at home. In order to mitigate the effects of the researcher's presence and to ensure maximum ecological validity (Schmuckler, 2001), practice sessions took place in the room and on the piano children usually practiced on, as indicated by children and parents. The video equipment used was deliberately chosen to be as small and unobtrusive as possible, in order to help put participants at ease and encourage naturalistic behaviour. As in the pilot study, the video camera was positioned to the side of the piano, rather than facing the participant(s) to encourage participants to forget about filming and to behave as naturally as possible. The researcher remained outside the room throughout both practice sessions.

As discussed, the first 10 minutes of practice were completed by the child independently (Practice 1), followed by a further 10 minutes where they were joined by their parent (Practice 2). Children were asked to practice whatever they had been given as homework by their piano teacher that week, as they would normally, and try as much as possible to ignore the video camera. As in the pilot (see Chapter 5 section 5.3.7), all videoing for Practice 1 (independent piano practice) and Practice 2 (parent-supervised piano practice) took place with the researcher in a different room, with videos coded by the researcher post-hoc.

Parents were made aware that it was preferable that the parent who usually supervises their child's practice be the one to supervise their child in Practice 2. However, in some cases, this parent was not available, resulting in the other parent supervising their child in Practice 2 instead. In order to control for differences in parental supervision, the parent who participated in the study was asked to indicate which parent usually supervised their child's practice in the parent questionnaire (see Section 6.2.7 Parent Questionnaire).

6.2.8.1 Observational Coding Schemes – Practice 1 and Practice 2

A 33-item observational coding scheme was used to record and assess children's metacognition and self-regulation during Practice 1 (independent piano practice) and 2 (parent-supervised piano practice), and parents' support of their children's metacognition during Practice 2. As with the parent questionnaire, descriptions for each item were adapted from C.Ind.Le (Whitebread et al., 2009). The wording of each statement was amended, depending on whether the coding scheme was being used to assess children or parents. For example, item KoP1 (see Table 36) would take the form of "child refers to his/her own strengths or difficulties" for children and "parent helps child to be able to refer to his/her own strengths or difficulties" for parents.

Table 36
33-item observational coding scheme based on C.Ind.Le (Whitebread et al., 2009)

Metacognitive Category	Code	Description of behaviour (from C.Ind.Le Coding Scheme)
Knowledge of Persons (KoP)	**KoP1**	Refers to his/her own strengths or difficulties
	KoP2	Talks about general ideas about learning
Knowledge of Task (KoT)	**KoT1**	Compares across tasks identifying similarities and differences
	KoT2	Makes a judgment about the level of difficulty of cognitive tasks or rates the tasks on the basis of pre-established criteria or previous knowledge
Knowledge of Strategies (KoS)	**KoS1**	Defines, explains or teaches others how she/he has done or learned something
	KoS2	Explains procedures involved in a particular task
	KoS3	Evaluates the effectiveness of one or more strategies in relation to the context or [sic] the cognitive task
Planning (P)	**P1**	Sets or clarifies task demands and expectations
	P2	Sets goals and targets
	P3	Decides on ways of proceeding with the task
	P4	Seeks and collects necessary resources
Monitoring (M)	**M1**	Self-commentates
	M2	Reviews progress on task (keeping track of procedures currently being undertaken and those that have been done so far)
	M3	Rates effort on-task or rates actual performance
	M4	Rates or makes comments on currently [sic] memory retrieval
	M5	Checks behaviours or performance, including detection of errors
	M6	Self-corrects
Control (C)	**C1**	Changes strategies as a result of previous monitoring
	C2	Suggests and uses strategies in order to solve the task more effectively
	C3	Applies a previously learnt strategy to a new situation
	C4	Repeats a strategy in order to check the accuracy of the outcome
	C5	Seeks help
	C6	Uses nonverbal gesture as a strategy to support own cognitive activity
	C7	Copies from or imitates a model
Evaluation (E)	**E1**	Reviews own learning or explains the task
	E2	Evaluates the strategies used
	E3	Rates the quality of performance
	E4	Observes or comments on task progress

	E5	Tests the outcome or effectiveness of a strategy in achieving a goal
Emotional/Motivational Monitoring (EMM)	**EMM1**	Express awareness of positive or negative emotional experience of a task
	EMM2	Monitors own emotional reactions while being on a task
Emotional/Motivational Control	**EMC1**	Controls attention and resists distraction or returns to task after a momentary distraction
	EMC2	Self-encourages

As discussed, all practice sessions were videoed with the researcher out of the room and analysed post-hoc. Each 10-minute video (of Practice 1 and Practice 2) was coded every 2.5 minutes i.e., four times per 10-minute video. For each of the four 2.5-minute practice intervals, the researcher recorded whether any of the 33 metacognitive and self-regulatory behaviours listed in the coding scheme were observed. A total mean score was then calculated for each participant for Practice 1 (child) and Practice 2 (child and parent), by averaging the four sets of scores recorded from each 2.5 interval.

In Practice 1, children were given a score of either 0 (*behaviour not observed*) or 1 (*behaviour observed*) for performing one of the 33 metacognitive and self-regulatory behaviours listed in the coding scheme. Similarly, in Practice 2, parents were given a score of either 0 (*support of behaviour not observed*) or 1 (*support of behaviour not observed*) in relation to their support of metacognitive and self-regulatory behaviours during their child's practice. Crucially, in order to score a mark, parental support needed to take the form of encouragement – either a question or suggestion (e.g., "how do you feel that went?") – rather than a direct instruction (e.g., "play it again"). This was done in order to ensure that parents' scores reflected parents' support of children's metacognition and self-regulation – behaviours which require the child to manage and regulate their own learning, rather than simply telling a child what to do. Consequently, parental behaviours which were unidirectional in nature and did not support a child's autonomous decision-making were not included as part of the coding.

In Practice 2, as well as scores of 0 (*behaviour not observed*) and 1 (*behaviour observed*), children could also receive a score of 0.5 (*behaviour observed with parental support*) when the child performed a behaviour with the support of or in response to a question from a parent. This was done in order to account for instances where children either did not initiate or were not able use to a metacognitive or self-regulatory technique independently but could do so when scaffolded by an adult. Similar scoring procedures are often used in observational studies involving young children and adults (e.g., Pino-Pasternak, 2014) as a way of acknowledging young children's developing abilities within the zone of proximal development (Vygotsky, 1978).

6.2.8.2 Adaptations to the Coding Scheme

Initially, in order to align measures of the same constructs (e.g., parental support) across different instruments (e.g., questionnaire and coding scheme), the observational coding scheme used in the practice sessions initially comprised of only eight items described in Table 37. These same eight items are also used as the basis of items in the parent questionnaire (see the previous section 6.2.7). As discussed, each of the eight items was chosen as being the most representative of their respective categories and demonstrated a high level of internal reliability when tested using Cronbach's alpha (α = .91).

However, after coding and analysing practice videos for all 30 children and parents using the 8-item coding scheme, it became apparent that a large number of metacognitive and self-regulatory behaviours were being overlooked during coding, despite their appearance on the initial 33-item inventory. Consequently, videos for all 30 child-parent dyads were coded a second time but with reference to all 33 items.

Table 37
Original 8-item observational coding scheme – metacognitive behaviour descriptors for parents and children.

Metacognitive Category	Code	Description of behaviour (from C.Ind.Le Coding Scheme)
Knowledge of Persons (KoP)	KoP1	Refers to his/her own strengths or difficulties
Knowledge of Task (KoT)	KoT1	Compares across tasks identifying similarities and differences
Knowledge of Strategies (KoS)	KoS1	Defines, explains or teaches others how she/he has done or learned something
Planning (P)	P2	Sets goals and targets
Monitoring (M)	M5	Checks behaviours or performance, including detection of errors
Control (C)	C1	Changes strategies as a result of previous monitoring
Evaluation (E)	E4	Observes or comments on task progress
Emotional/Motivational Monitoring (EMM)	EMM1	Express awareness of positive or negative emotional experience of a task
Emotional/Motivational Control	EMC1	Controls attention and resists distraction or returns to task after a momentary distraction

Nevertheless, in order to explore the convergence validity of the same metacognitive and self-regulatory items across different measures, children and parents' scores for the original eight items in Practice 1 and 2 were compared with scores for the same items in the parent questionnaire and metacognitive knowledge interview – in addition to analyses conducted using scores derived from the 33-item coding scheme (see Table 36).

6.2.9 Metacognitive Knowledge Interviews (McKI)

Following the practice sessions, a Metacognitive Knowledge Interview (McKI) was conducted by the researcher with each child. The aim of the McKI was to assess 1) children's context-specific metacognitive knowledge about the practice they had just completed 2) their general metacognitive knowledge around playing the piano more broadly and 3) children's views on parental support whilst practising.

McKIs were conducted in person with the researcher and participant sitting side-by-side, with the interviewer maintaining eye-level with the children and in a friendly and informal manner, in order to help put children at ease and encourage naturalistic behaviour. Items from the McKI protocol were read out, and children given an opportunity to respond. In some instances, children struggled to answer a question in which case they were given a pre-prepared prompt by the researcher. If they were still unable to answer the question after the prompt, the researcher moved onto the next question. At the end of the McKI, children were invited to choose a small prize (a pencil, rubber or stickers) and given a certificate from the researcher to recognize and thank them for their participation.

As in the pilot, children could score either 0 (*not metacognitive at all*), 0.5 (*partially metacognitive*) or 1 (*appropriately metacognitive*). Scoring criteria were based on Marulis et al. (2016) but were decided on a case by case basis depending on their response to the specific question, as described in Table 38.

Table 38
Scoring instructions for the Metacognitive Knowledge Interview (McKI), adapted from Marulis et al., 2016

Score	Description	Example
0 – not at all metacognitive	Response does not refer to knowledge about the child's thinking or cognitive ability/capability; the difficulty of the task itself or the efficacy/efficiency of a strategy.	Child disagreed that talking to oneself can be helpful in solving a task without an appropriate explanation (e.g.,, said I don't know or because I don't like to do it). *NOTE: child could receive the full score (1 point) for a negative response to this question IF she or he provided a metacognitive explanation such as talking to oneself is not helpful because it will distract their thinking or make them not be able to attend to the task. The full points refer to an appropriate metacognitive response; thus yes OR no could be a fully metacognitive response depending on the explanation.
0.5 – partially metacognitive	Response refers to knowledge about the child's thinking or cognitive ability/capability; the difficulty of the task itself or the efficacy/efficiency of a strategy but not completely/fully or without an explanation that backs up the response.	Child agreed that talking to oneself can be helpful in solving a task but their reason was not related to cognition (e.g.,, because it's fun) or they didn't know why.

1 – appropriately metacognitive	Response refers to knowledge about the child's thinking or cognitive ability/capability; the difficulty of the task itself for the efficacy/efficiency of a strategy in a complete/full way or with a metacognitive explanation that backs up the response.	Child agreed that talking to oneself can be helpful in solving a task because it helps them remember how to do the task/helps their brain think better, etc. OR child disagreed that talking to oneself is helpful because it would distract them.

Note. Marulis' et al.'s original McKI protocol gave participants scores of 0 (*not metacognitive at all*), 1 (*partially metacognitive*) or 2 (*appropriately metacognitive*), as opposed to 0, 0.5 and 1. All other scoring instructions remain the same.

The McKI instrument used in this study was designed to overcome some of the difficulties experienced in the pilot. In particular, the new McKI protocol aimed to align responses related to offline (i.e., post-task) metacognitive knowledge with online (i.e., on-task) metacognitive and self-regulatory behaviours observed by the researcher during Practice 1 and Practice 2. As discussed, the new McKI protocol also included a pre-prepared prompt for children who were unable to answer the question on a first attempt and required additional support. This was done in order to ensure that any children who needed it were given an opportunity to answer the question again, with support, but that all children received the same level of help. Those unable to answer the question, even with the help of a prompt, were given a nil score for that item.

The amended McKI script consisted of 13 main questions (excluding a possible follow-up question to question 5a). The first five questions were targeted at children's conditional knowledge about the piano practice they had just completed e.g., "Do you think you did a good job, an okay job or a not so good job of practising today? Why?" Three questions were aimed at the children's views on their parents' assistance e.g., "Did you find it helpful when mummy/daddy practised with you?". As discussed in Chapter 3, the final five questions were asked from the point of view of a puppet called Gogi, an alien from outer space who wants to learn about playing the piano (see Marulis et al., 2016). These questions were aimed at measuring children's general metacognition about playing the piano, rather than their metacognition about a specific practice session, through questions which allowed participants to "teach" Gogi about aspects of piano playing e.g., "What could Gogi do to make sure s/he does enough practice between his/her lessons?" McKI questions and prompts described in Table 39.

Table 39
Questions 1-13 and pre-prepared prompts in the Metacognitive Knowledge Interview (McKI)

McKI Question	Prompt	Metacognitive/self-regulatory category
1 - What did you practice today? I didn't see or hear any of your practice session, so please tell me about what you practised in as much detail as possible.	For example, did you practice your pieces and scales today?	Context-specific metacognitive knowledge Knowledge of Task (KoT)
2 - Do you think you did a good job, an okay job or a not so good job or practising today? Why?	What things did you do that make you feel did a good/okay/not so good job in your pieces, for example?	Context-specific metacognitive knowledge Evaluation (E)
3 - Which parts of your practice did you find most difficult? Why?	For example, were there any bits where you had to move around a lot, which you found difficult?	Context-specific metacognitive knowledge Knowledge of Persons (KoP)
4 - With these difficult parts, what could you do to make them become easier?	Does playing difficult parts more slowly make them easier to play? Why?	Context-specific metacognition Knowledge of Strategies (KoS)
5a - How did you feel when you were practising today? Why?	For example, did you feel happy, or maybe frustrated? Why?	Context-specific metacognitive knowledge Emotional/Motivational Monitoring (EMM)
5b - *(If negative emotion)* What could you do to help yourself feel calm and happy again?	Is it helpful, for example, to tell yourself you can do it, or take a short break? What else could you do?	Context-specific Emotional/Motivational Control (EMC)
6 - Did you find it helpful when mummy/daddy practised with you?	Or maybe was it easier when you practised alone?)	n/a
7 - Is there anything that mummy/daddy did that you found particularly helpful?	For example, is it helpful when mummy/daddy gives you encouragement?	n/a

8 - Is there anything that mummy/daddy did that you found less helpful?	For example, is it unhelpful when mummy/daddy talk over you?	n/a
9 - What makes a good pianist? What characteristics do you have?	For example, is it important for good pianists to be able to able to play in time? Why?	General metacognitive knowledge Knowledge of Persons (KoP)
10 - Could you explain to Gogi how practising [x] is different from practising [x]?	Should you e.g., spend a lot of time practising sight-reading exercises before you play them? What about with your pieces? *(NB – only applicable to those who were asked about the difference between sightreading and pieces. See 6.2.8.1)*	General metacognitive knowledge Knowledge of Task (KoT)
11 - What could Gogi do to make sure s/he does enough practice between his/her lessons?	Would it be useful, for example, for Gogi to make a practice chart? What else could s/he do?)	General metacognitive knowledge Knowledge of Strategies (KoS)
12 - How will Gogi know when s/he's done enough practice?	How do you know when *you've* done enough practice? Might this be the same for Gogi?	General metacognitive knowledge Evaluation (E)
13 - Gogi gets distracted easily. What could Gogi do to try and help him/her concentrate better whilst practising?	What do you do when you get distracted? How might this help Gogi?	General metacognitive knowledge Emotional/Motivational Control (EMC)

In addition to questions 1-13, children who answered question 5a ("How did you feel when you were practising today? Why?") negatively (e.g., "not good" or "I felt worried") were asked an additional, follow-up question (5b) – "What could you do to help yourself feel calm and happy again?" This question was intended to measure children's Emotional/Motivational Control (EMC) – an area of self-regulation which can be difficult to assess in an offline setting (i.e., after the activity has taken place; Schellings, 2011). The 12 participants which responded negatively to question 5a were subsequently asked all the follow-up question (5b).

In order to align the questions in the McKI with the metacognitive and self-regulatory categories from C.Ind.Le (Whitebread et al., 2009), and facilitate comparison of the same measures in the practice sessions and parent questionnaire, each item from the McKI was labelled according to the C.Ind.Le category it represented. The six metacognitive categories represented in the McKI were:

- Knowledge of Persons (KoP)
- Knowledge of Task (KoT)
- Knowledge of Strategies (KoS)
- Evaluation (E)
- Emotional/Motivational Monitoring (EMM) and
- Emotional/Motivational Control (EMC).

The two categories missing from the list, Monitoring and Control, can only be assessed online (during an activity) – in other words, it is not possible to monitor or control behaviour retrospectively such as in an interview situation. In this respect, it could be argued that Evaluation represents the offline (or post-task) equivalent of Monitoring and Knowledge of Strategies the offline equivalent of Control – both of which were explored through questions in the McKI. A complete copy of the McKI script and coding procedures can be found in Appendix L.

6.2.9.1 Adjustments to the McKI Protocol

For question 10 ("could you explain to Gogi how practising [x] is different from practising [x]?"), the researcher asked children if they could explain the difference between practising pieces and practising sightreading by default. The prompt previously prepared for children struggling to answer without help therefore was "should you e.g., spend a lot of time practising sight-reading exercises before you play them? What about with your pieces?". It quickly became apparent that many children participating in the study had never encountered sightreading in their lessons and that some children had only ever played pieces (i.e., no scales or exercises). Consequently, for children who did not know what "sightreading" was, this question was either adjusted to reflect what they did know (e.g., "could you explain to Gogi how practising scales is different from practising pieces?") or omitted entirely, if they had only ever played pieces with their teachers. This was deemed by the researcher as the fairest way of assessing children's metacognitive knowledge in this area, without penalising children who had not yet encountered these musical activities and tasks.

6.2.10 Musical Achievement Questionnaire

A questionnaire was administered to children's piano teachers in order to assess children's level of musical achievement. Measures for musical achievement were based on the Associated Board of the Royal School of Music's (ABRSM, 2018) music examination marking criteria for pieces for Grades Initial to 8 – reproduced in Table 40.

Table 40
ABRSM music examination marking criteria for grades Initial to 8

	Pitch	Time	Tone	Shape	Performance
Distinction 27-30	Highly accurate notes and intonation	Fluent, with flexibility where appropriate Rhythmic character well conveyed	Well projected Sensitive use of tonal qualities	Expressive, idiomatic musical shaping and detail	Assured Fully committed Vivid communication of character and style
Merit 24-26	Largely accurate notes and intonation	Sustained, effective tempo Good sense of rhythm	Mainly controlled and consistent Good tonal awareness	Clear musical shaping, well-realised detail	Positive Carrying musical conviction Character and style communicated

Pass 20-23	Generally correct notes Sufficiently reliable intonation to maintain tonality	Suitable tempo Generally stable pulse Overall rhythmic accuracy	Generally reliable Adequate tonal awareness	Some realisation of musical shape and/or detail	Generally secure, prompt recovery from slips Some musical involvement
Below Pass 17-19	Frequent note errors Insufficiently reliable intonation to maintain tonality	Unsuitable and/or uncontrolled tempo Irregular pulse Inaccurate rhythm	Uneven and/or unreliable Inadequate tonal awareness	Musical shape and detail insufficiently conveyed	Insecure, inadequate recovery from slips Insufficient musical involvement
13-16	Largely inaccurate notes and/or intonation	Erratic tempo and/or pulse	Serious lack of tonal control	Musical shape and detail largely unrealised	Lacking continuity No musical involvement
10-12	Highly inaccurate notes and/or intonation	Incoherent tempo and/or pulse	No tonal control	No shape or detail	Unable to continue for more than a short section
0	No work offered	No work offered	No work offered	No work offered	No work offered

ABRSM's approach to marking music examinations is to apply "universal, non-instrument-specific criteria […] focusing on the musical outcome, not the technical means behind it" (ABRSM, "Graded Music Exam Marking Criteria", 2018). ABRSM's marking guidelines are a widely recognised framework amongst music teachers, with a large proportion of children in the study having previously prepared for and/or sat an ABRSM piano exam prior to the study. Many previous studies have used either ABRSM Grade levels or examination marking guidelines as part of measures of musical achievement or performance ability (e.g., Hallam, 2012; Sloboda et al., 1996). Given their wide use in music teaching, and music education research, this marking framework was considered appropriate for use in the present study.

As seen in Table 40, ABRSM's marking criteria consist of seven levels of marks where the top three are represented by distinction, merit and pass, with each band of marks accompanied by descriptors of playing. The musical achievement questionnaire developed for the present study used five measures taken from ABRSM's mark scheme (pitch (i.e., accuracy), time, tone, shape and performance) to assess children's musical achievement. As shown in Table 41, only descriptors for the top five mark-bands (13-16, below pass, pass, merit and distinction) were retained. This is because it was felt that the lower descriptors (e.g., "incoherent tempo"; "no tonal control"; "unable to continue for more than a short section") were unlikely to be used to by teachers to describe their own pupils' playing. The descriptor for 0 marks ("no work offered") was also considered potentially irrelevant in a non-exam setting, unless students consistently arrived with nothing to play – which seemed unlikely if parents had agreed for them to take part in the study.

Table 41
Marking criteria for teachers and independent examiners' scoring of children's musical achievement level, based on ABRSM's music exam marking criteria

	Descriptions (taken from ABRSM's Graded music exam marking criteria (2018)
Pitch	*5 (Distinction)* – Highly accurate notes and intonation *4 (Merit)* – Largely accurate notes and intonation *3 (Pass)* – Generally correct notes; sufficiently reliable intonation to maintain tonality *2 (Below pass)* – Frequent note errors; insufficiently reliable intonation to maintain tonality 1 – Largely inaccurate notes and/or intonation
Time	*5 (Distinction)* – Fluent, with flexibility where appropriate; rhythmic character well-conveyed *4 (Merit)* – Sustained, effective tempo; Good sense of rhythm *3 (Pass)* – Suitable tempo; Generally stable pulse; Overall rhythmic accuracy *2 (Below pass)* – Unsuitable and/or uncontrolled tempo; irregular pulse; inaccurate rhythm *1* – Erratic tempo/and or pulse

Tone	*5 (Distinction)* – Well projected; sensitive use of tonal qualities *4 (Merit)* – Mainly controlled and consistent; good tonal awareness *3 (Pass)* – Generally reliable; adequate tonal awareness *2 (Below pass)* – Uneven and/or unreliable; inadequate tonal awareness *1* – Serious lack of tonal control
Shape	*5 (Distinction)* – Expressive, idiomatic musical shaping and detail; *4 (Merit)* – Clear musical shaping, well-realised detail *3 (Pass)* – Some realisation of musical shape and/or detail *2 (Below pass)* – Musical shape and detail insufficiently conveyed *1* – Musical shape and detail largely unrealized
Performance	*5 (Distinction)* – Assured, fully committed, vivid communication of character and style *4 (Merit)* – Positive, carrying musical conviction, character and style communicated *3 (Pass)* – Generally secure, prompt recovery from slips, some musical involvement *2 (Below pass)* – Insecure, inadequate recovery from slips, insufficient musical involvement *1* – Lacking continuity, no musical involvement

Originally, the musical achievement questionnaire developed for Study 2 also included measures for scales and arpeggios, sightreading, and aural tests – the other aspects of an ABRSM music performance examination. These were ultimately removed due to some children having not encountered yet these aspects of musicianship training in their piano lessons (as indicated by some children's responses in the McKI). Moreover, given that an independent examiner was later required to make assessments of children's musical achievement based on 20 minutes of videoed practice, it was not possible to assess these other areas of musicianship if children did not include this as part of their practice. Consequently, assessments of musical achievement were made on the basis on children's pitch (i.e., accuracy), time, tone, shape and performance of their general piano playing only.

Scores for each musical achievement category were given out of 5 where 1-5 are represented by the descriptors in Table 41. Musical achievement scores for children were initially reported by children's piano teachers, on behalf on their pupils and either completed on paper and posted or emailed as word documents to the researcher.

6.2.10.1 Teachers vs. Independent Examiner's Assessments of Children's Musical Achievement

Based on the researcher's professional experience as a piano teacher (including preparing children for ABRSM music examinations), it seemed that some teachers' scores for their pupils were unrealistically high. Some children who were unable to play fluently in Practice 1 or Practice 2 for example were given full or close to full marks (4 or 5 out of 5) by their teacher for "time". Criteria for scores in this area were "fluent, with flexibility where appropriate; rhythmic character well-conveyed" (5 points) and "sustained, effective tempo; good sense of rhythm" (4 points) – descriptions which did not match the level of musical achievement observed by the researcher in Practice 1 and 2. It may be that this discrepancy between pupils' performances in practice sessions and scores given by their teachers was caused by children feeling nervous about being filmed (see section 6.6 Limitations).

In order to address the possibility of teacher bias, as well as differences in teachers' interpretations of the marking criteria, an independent assessor (a professional pianist, teacher and ABRSM examiner) was later asked to provide musical achievement scores for all 30 children. Participants' teachers' scores were also retained in order to be able to account for teachers' ability to provide a more global view of their pupils' musical achievement, outside of the 20 minutes of practice observed in Practice 1 and Practice 2. Two sets of children's musical achievement scores were therefore obtained for each child: one as reported by children's piano teachers (n = 24) and one as reported by an independent examiner (N = 30).

6.3 Data Analysis

As discussed, the following data were collected from children, parents, piano teachers and an independent music examiner during this study:

- Children's observed metacognition and self-regulation scores from Practice 1 and Practice 2
- Parents' observed metacognitive and self-regulatory support scores from Practice 2
- Children's metacognition and self-regulation scores from the Metacognitive Knowledge Interview (McKI)
- Children's Musical Achievement scores, as reported by their piano teacher and an independent examiner and
- Parents' reported metacognitive support and parenting style scores from the parent questionnaire

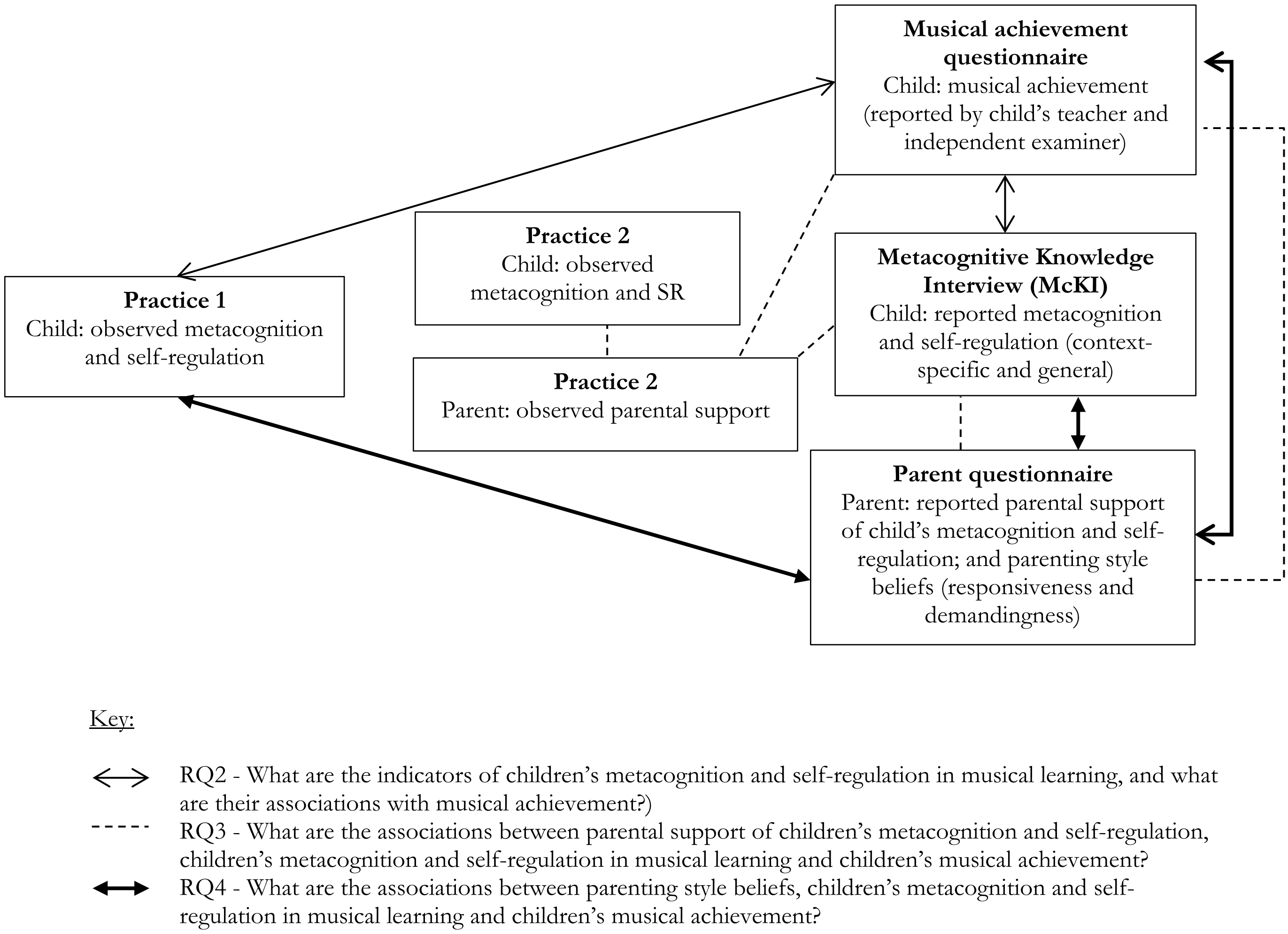


Figure 13

Overarching research questions and correlational analyses for Study 2

Note. Data relating to RQ2 is indicated by the thinner line; RQ3 by the dotted line and RQ4 by the bold line.

Figure 13 illustrates the ways in which data from different measures were compared with one another as part of the data analysis, in order to investigate and answer the study's overarching research questions (RQ2-4). As in Study 1, all statistical tests were conducted using the Statistics Package for Social Sciences software (SPSS). The following section outlines preliminary data analysis procedures (including testing for statistical assumptions), scoring and an overview of statistical tests used as part of the main data analysis.

6.3.1 Choice of Statistical Tests

As in Study 1, data for all variables were tested using a Shapiro-Wilk test in order to establish whether data were normally distributed and therefore met assumptions for parametric testing. Similarly, where the majority of data were normally distributed, analyses were conducted using parametric tests such as T-tests and Pearson's' *r* to reduce the risk of Type-2 errors. Data which were non-normal and violated assumptions for parametric testing were analysed using non-parametric tests such as Spearman's correlation or Kendall's tau-b (where there were a large number of tied ranks) in order to lessen the possibility of Type-1 errors. As in Study 1, when comparing means across data sets with non-normal distributions, Wilcoxon's signed-rank (paired samples) and Mann-Whitney U (independent samples) tests was used. A more detailed discussion around meeting distribution assumptions for statistical tests and implications for statistical validity can be found in Chapter 4, section 4.3.1.

6.3.2 Coding Schemes - Interrater Reliability Testing

Interrater reliability is the extent to which assessments of a phenomenon by two or more raters are influenced by the phenomenon being observed, rather than by the observers rating it (DeVellis, 2005). Statistical measures of interrater reliability, such as Cronbach's alpha coefficient and Cohen's kappa, provide an indication of the level of agreement between raters and the subsequent consistency of a rating system (Anastasi & Urbina, 1997). A high level of interrater reliability indicates that data collected in the study are correct representations of the variables measured (McHugh, 2012). Cohen (1960) suggests that a kappa score of .41-.60 indicates a moderate level of agreement, with .61-.80 considered substantially aligned and .81-1.00 as almost perfect agreement. With regards to Cronbach alpha scores, Kline (1999) recommends that although $\alpha = .80$ or above may be appropriate for cognitive tests (such as assessments of IQ), that a Cronbach alpha of .70 would represent an appropriate level of agreement for tests of ability. Moreover, when dealing with psychological constructs, Kline suggests that values of below .70 can realistically be expected due to the diversity of the constructs being measured.

In order to investigate reliability of the coding scheme used to analyse results collected in Practice 1 and 2, an additional rater (the independent examiner who scored children's musical achievement) was asked to code 10% of children and parents' Practice 1 and Practice 2 videos from Study 2. Cohen's kappa found a good level of agreement between two raters assessments of Practice 1 and 2 scores ($\varkappa = .64$, $p = <.001$). Cronbach's alpha was found to be $\alpha = .764$, representing an appropriate level of agreement between raters, in addition to a high level of internal consistency between all 33 items in the coding scheme ($\alpha = .905$).

Interrater reliability testing of the McKI instrument was conducted after the main data analysis, the findings of which are considered in section 6.5.4.

6.3.3 Musical Achievement Questionnaire

As discussed, two sets of children's musical achievement scores were obtained from children's teachers ($n = 24$) and an independent examiner ($N = 30$). Scores for each of the five items in the questionnaire were given out of 5, with total scores given out of 25, and mean scores calculated for each participant.

A Shapiro-Wilk test indicated that the independent examiner's scores were normally distributed and therefore met assumptions for parametric testing ($W(30) = .97$, $p = <.51$). However, piano teachers' scores of their pupils' musical achievement were found to be non-normal (see Table 42). Consequently, Spearman's or Kendall's tau-b correlation was used where one or more datasets being analysed were non-normal, and Pearson's product moment was applied to analysis where all datasets being compared were normally distributed.

Table 42
Results of a Shapiro-Wilk test for children's musical achievement scores, as assessed by their piano teacher and an independent examiner

	Shapiro-Wilk		
	Statistic	**df**	**Sig.**
MusAcExamMean30	.97	30	.51*
MusAcExamMean24	.97	24	.704*
MusAcTeachMean24	.90	24	.017

Note. * indicates normal distribution (p = >.05)

Associations were explored between children's scores from Practice 1, Practice 2 and McKI and children's musical achievement scores, as well as associations between parental metacognitive and self-regulatory support, and parenting style (as measured in Practice 2, and in the parent questionnaire) – as described in Figure 14.

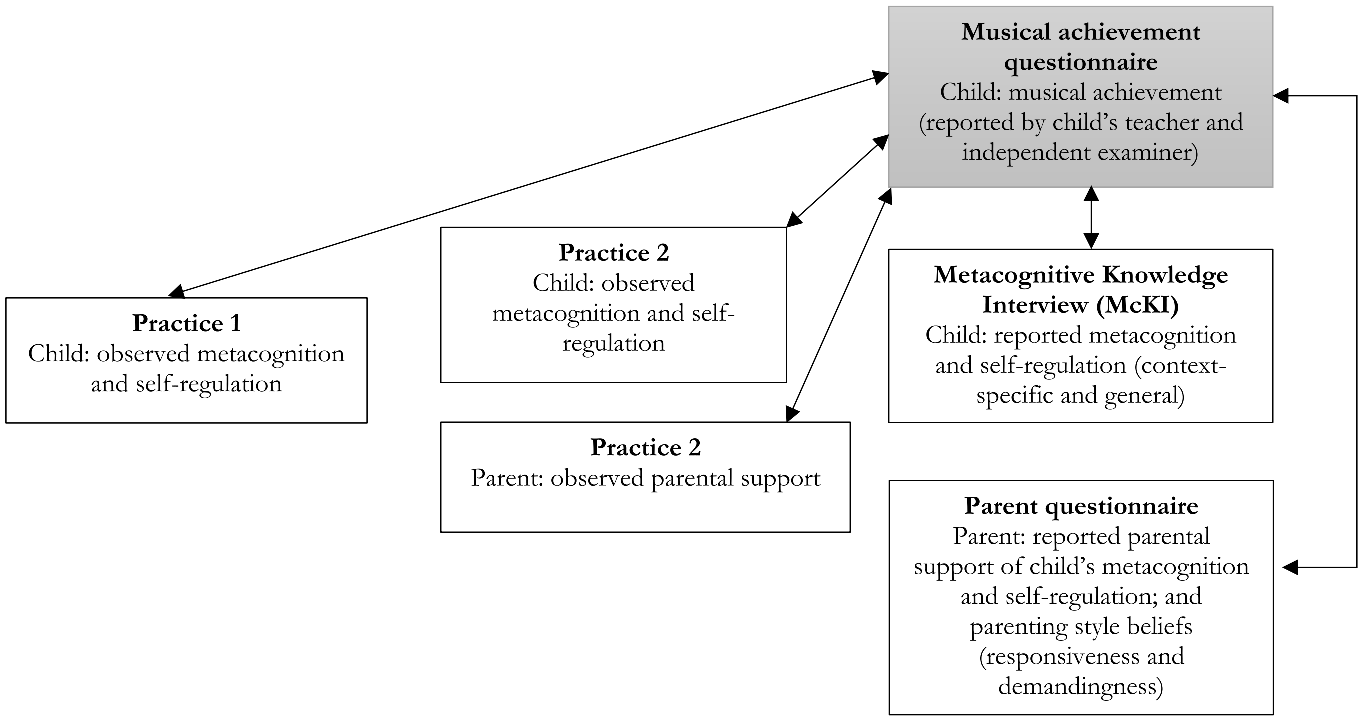


Figure 14
Data analysis procedure for the musical achievement questionnaire

6.3.4 Practice Sessions

In order to explicate the procedure used to derive data from Practice 1 and 2 for analysis, the following section describes the approach used to arrive at scores for each child's metacognition and self-regulation in Practice 1 and 2.

As explained in section 6.2.7, in Practice 1 and 2, children and parents received a score of either 0 (*behaviour not observed* or *support not observed*) or 1 (*behaviour observed* or *support observed*) for each of 33 metacognitive and self-regulatory behaviours listed in the observational coding scheme. In Practice 2, as well as scores of 0 or 1, it was also possible for children to score 0.5 when a metacognitive or self-regulatory behaviour was performed in response to a prompt or with the help of a parent. Each 10-minute practice session was divided into four equal intervals, with scores for each of the 33 items in the coding scheme allocated to each participant every 2.5 minutes. In total, each child received four sets of metacognition and self-regulation scores for Practice 1 and 2, and parents received four sets of parental scores for Practice 2. Children's scores for Practice 1 across four 2.5-minute intervals are presented in Tables 43-46. The four sets of scores from each 10-minute practice session (scores for each 2.5-minute interval) were used to calculate an average score for each of the 33 items in the coding scheme for each participant. Table 47 describes children's mean scores for each metacognitive/self-regulatory item in Practice 1, based on means of scores from Tables 43-46.

Table 43

Children's observed metacognition and self-regulation scores for Practice 1, interval 1

	Practice 1 (Child) Interval 1																																
Participant	**KoP 1**	**KoP 2**	**KoT 1**	**KoT 2**	**KoS 1**	**KoS 2**	**KoS 3**	**P 1**	**P 2**	**P 3**	**P 4**	**M 1**	**M 2**	**M 3**	**M 4**	**M 5**	**M 6**	**C 1**	**C 2**	**C 3**	**C 4**	**C 5**	**C 6**	**C 7**	**E 1**	**E 2**	**E 3**	**E 4**	**E 5**	**EMM 1**	**EMM 2**	**EMC 1**	**EMC 2**
1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	0	0	1	0	0	0	0	0	0	0	0	1	0	1	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
3	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
4	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	0
7	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	0
8	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
9	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
10	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0
14	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1	0	1	0	0	0	0	0	1	0	0	1	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	1	0	0	1	0
17	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0
21	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
22	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
24	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0
27	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	0
29	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0
30	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0

Note. KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control.

Table 44

Children's observed metacognition and self-regulation scores for Practice 1, interval 2

	Practice 1 (Child) Interval 2																																
Participant	**KoP 1**	**KoP 2**	**KoT 1**	**KoT 2**	**KoS 1**	**KoS 2**	**KoS 3**	**P 1**	**P 2**	**P 3**	**P 4**	**M 1**	**M 2**	**M 3**	**M 4**	**M 5**	**M 6**	**C 1**	**C 2**	**C 3**	**C 4**	**C 5**	**C 6**	**C 7**	**E 1**	**E 2**	**E 3**	**E 4**	**E 5**	**EMM 1**	**EMM 2**	**EMC 1**	**EMC 2**
1	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	1	1	1	0
2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
3	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
4	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0
5	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
6	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	1	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0
8	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
9	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
10	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
11	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
12	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
13	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
14	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	1	0	0	1	0
16	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	1	0	0	1	0
17	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0
20	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0
22	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0
24	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
26	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
27	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
28	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0
29	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
30	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0

Note. KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control.

Table 45

Children's observed metacognition and self-regulation scores for Practice 1, interval 3

Participant	Practice 1 (Child) Interval 3																																
	KoP 1	KoP 2	KoT 1	KoT 2	KoS 1	KoS 2	KoS 3	P 1	P 2	P 3	P 4	M 1	M 2	M 3	M 4	M 5	M 6	C 1	C 2	C 3	C 4	C 5	C 6	C 7	E 1	E 2	E 3	E 4	E 5	EMM 1	EMM 2	EMC 1	EMC 2
1	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0
2	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
3	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
4	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0
5	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	0
7	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0
8	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
9	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
10	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
11	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
12	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
13	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0
14	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	1	0	0	1	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	1	0	0	1	0
17	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
20	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0
22	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
23	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
24	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0
26	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
27	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
29	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0
30	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0

Note. KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control.

Table 46

Children's observed metacognition and self-regulation scores for Practice 1, interval 4

	Practice 1 (Child) Interval 4																																
Participant	KoP 1	KoP 2	KoT 1	KoT 2	KoS 1	KoS 2	KoS 3	P 1	P 2	P 3	P 4	M 1	M 2	M 3	M 4	M 5	M 6	C 1	C 2	C 3	C 4	C 5	C 6	C 7	E 1	E 2	E 3	E 4	E 5	EMM 1	EMM 2	EMC 1	EMC 2
1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	2	2	4	0	0	0	0	0	0	1	0	1	0	1	0
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0
6	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0
8	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
9	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	1	0	1	0	0	0	0	0	0	0	0	1	0
14	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	1	0	0	1	0
16	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	1	0	0	1	0
17	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0
20	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
22	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
23	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
27	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
29	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0
30	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0

Note. KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control (NB – Participants 2 and 24 did not complete the full 10 minutes practice, and therefore received no scores for interval 4)

Table 47

Mean scores for children's observed metacognition and self-regulation in Practice 1, calculated from scores from Practice 1 intervals 1-4 in Tables 43-46

	Children's average metacognition/self-regulation scores across intervals 1-4 in Practice 1																																	
Par.	**KoP 1**	**KoP 2**	**KoT 1**	**KoT 2**	**KoS 1**	**KoS 2**	**KoS 3**	**P 1**	**P 2**	**P 3**	**P 4**	**M 1**	**M 2**	**M 3**	**M 4**	**M 5**	**M 6**	**C 1**	**C 2**	**C 3**	**C 4**	**C 5**	**C 6**	**C 7**	**E 1**	**E 2**	**E 3**	**E 4**	**E 5**	**EMM 1**	**EMM 2**	**EMC 1**	**EMC 2**
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.25	0.50	1.00	0.25	0.00	0.00	1.00	0.50	0.50	0.75	1.00	1.25	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.75	0.25	1.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.67	0.33	0.00	0.00	0.00	1.00	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	1.00	0.75	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.50	0.75	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.25	0.25	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.75	0.25	0.50	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	1.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.75	1.00	0.00	0.00	0.00	0.75	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.50	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	0.75	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.75	0.00	0.00	0.00	0.00	0.75	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.75	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75	0.25	0.00	0.00	0.00	0.25	0.25	0.00	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
12	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.75	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	1.00	0.75	0.25	0.00	0.00	0.75	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.25	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.50	1.00	1.00	0.75	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.25	0.25	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75	0.75	0.00	0.00	0.00	1.00	1.00	0.50	0.25	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	1.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.25	0.00	0.00	0.00	0.75	1.00	0.00	0.50	0.25	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.50	0.00	0.00	0.00	1.00	1.00	0.25	0.50	0.00	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.75	1.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.25	0.75	0.00	0.25	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.75	0.25	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.67	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.75	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.25	1.00	0.75	0.00	0.00	0.00	0.25	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.50	0.50	0.25	0.00	0.00	0.75	0.75	0.00	1.00	0.00	0.00	0.00	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00

Note. Par. = participant; KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control.

In addition to average scores for each the 33 items in the coding scheme, mean scores for each metacognitive or self-regulatory category (Knowledge of Persons (KoP); Knowledge of Task (KoT); Knowledge of Strategies (KoS); Planning (P); Monitoring (M); Control (C); Evaluation (E); Emotional/Motivational Monitoring and Emotional/Motivational Control (EMC)) were calculated by averaging scores of items within the same category. For instance, participants' scores for items C1, C2, C3, C4, C5, C6 and C7 (see Table 47) were averaged in order to arrive at a category score for 'Control' (C) - resulting in nine average category scores per practice session per participant, as well as a grand mean across all categories for Practice 1 and Practice 2.

Table 48

Mean scores for each metacognitive and self-regulatory category, and grand mean for each child in Practice 1

Participant	KoT	KoS	P	M	C	E	EMM	EMC	Mean
1	0.00	0.00	0.25	0.46	0.50	0.10	0.50	0.50	0.26
2	0.00	0.00	0.25	0.33	0.00	0.00	0.00	0.50	0.12
3	0.00	0.00	0.31	0.21	0.07	0.00	0.00	0.50	0.12
4	0.00	0.00	0.25	0.17	0.07	0.00	0.00	0.38	0.10
5	0.00	0.00	0.13	0.08	0.04	0.00	0.00	0.50	0.08
6	0.00	0.00	0.13	0.33	0.21	0.05	0.00	0.50	0.14
7	0.00	0.00	0.13	0.29	0.18	0.00	0.00	0.50	0.12
8	0.00	0.00	0.25	0.08	0.04	0.00	0.00	0.50	0.10
9	0.00	0.00	0.25	0.29	0.14	0.00	0.00	0.50	0.13
10	0.00	0.00	0.25	0.25	0.00	0.05	0.00	0.38	0.10
11	0.00	0.00	0.19	0.13	0.14	0.00	0.00	0.50	0.11
12	0.00	0.00	0.00	0.17	0.04	0.00	0.00	0.50	0.11
13	0.00	0.00	0.13	0.29	0.18	0.00	0.00	0.50	0.12
14	0.00	0.00	0.25	0.38	0.04	0.00	0.00	0.50	0.13
15	0.00	0.00	0.00	0.17	0.68	0.20	0.00	0.50	0.17
16	0.00	0.00	0.13	0.33	0.64	0.20	0.00	0.50	0.20
17	0.00	0.00	0.19	0.46	0.18	0.05	0.00	0.50	0.15
18	0.00	0.00	0.00	0.04	0.04	0.00	0.00	0.00	0.01
19	0.00	0.00	0.06	0.33	0.18	0.00	0.00	0.50	0.12
20	0.00	0.00	0.13	0.42	0.21	0.00	0.00	0.50	0.14
21	0.00	0.00	0.06	0.29	0.07	0.00	0.00	0.50	0.10
22	0.00	0.00	0.25	0.33	0.07	0.00	0.00	0.50	0.13
23	0.00	0.00	0.13	0.17	0.04	0.00	0.00	0.50	0.09
24	0.00	0.00	0.17	0.11	0.05	0.00	0.00	0.50	0.09
25	0.00	0.00	0.00	0.33	0.07	0.00	0.00	0.50	0.10
26	0.00	0.00	0.00	0.42	0.04	0.00	0.00	0.50	0.11
27	0.00	0.00	0.25	0.25	0.00	0.00	0.00	0.50	0.11
28	0.00	0.00	0.06	0.33	0.11	0.00	0.00	0.50	0.11
29	0.00	0.00	0.25	0.38	0.25	0.00	0.00	0.50	0.15
30	0.00	0.00	0.25	0.04	0.00	0.00	0.00	0.50	0.09

Note. KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control.

This process was repeated for every child and parent in the sample order to arrive at a dataset which represented children and parents' online metacognition and self-regulation, and parental metacognitive and self-regulatory support during Practice 1 and Practice 2.

Tables 49-53 show the results of a Shapiro-Wilk test, which was used to calculate whether or not the data collected from Practice 1 and 2 (for children and parents) were normally distributed. Only children's scores from Practice 2 were normally distributed (*W*(30) = .97, *p* = .240) – analyses conducted using these data and non-normally distributed data sets were conducted using non-parametric tests. The remainder of both total mean scores and category scores for children and parents in Practice 1 and 2 were non-normal, and therefore also violated assumptions for parametric testing.

Table 49
Results of a Shapiro-Wilk test for children and parents' total mean scores in Practice 1 and 2

	Shapiro-Wilk		
	Statistic	**df**	**Sig.**
Practice 1 (child)	.86	30	.001
Practice 2 (child)	.96	30	.24*
Practice 2 (parent)	.81	30	<.001

Note. * indicates normal distribution (*p* = >.05)

Table 50
Results of a Shapiro-Wilk test for children's metacognition and self-regulation mean scores across nine categories in Practice 1

	Shapiro-Wilk		
	Statistic	**df**	**Sig.**
Practice 1 KoP (child)	.18	30	<.001
Practice 1 KoT (child)	.	30	.
Practice 1 KoS (child)	.	30	.
Practice 1 P (child)	.87	30	.002
Practice 1 M (child)	.95	30	.14*
Practice 1 C (child)	.71	30	<.001
Practice 1 E (child)	.47	30	<.001
Practice 1 EMM (child)	.18	30	<.001
Practice 1 EMC (child)	.29	30	<.001

Note. KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control.
* indicates normal distribution (*p* = >.05)

Table 51
Results of a Shapiro-Wilk test for children's metacognition and self-regulation mean scores across nine categories in Practice 2

	Shapiro-Wilk		
	Statistic	df	Sig.
Practice 2 KoP (child)	.76	30	<.001
Practice 2 KoT (child)	.61	30	<.001
Practice 2 KoS (child)	.80	30	<.001
Practice 2 P (child)	.89	30	.005
Practice 2 M (child)	.92	30	.037
Practice 2 C (child)	.71	30	<.001
Practice 2 E (child)	.83	30	<.001
Practice 2 EMM (child)	.59	30	<.001
Practice 2 EMC (child)	.58	30	<.001

Note. KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control.

Table 52
Results of a Shapiro-Wilk test for parental metacognitive and self-regulatory support mean scores across nine categories in Practice 2

	Shapiro-Wilk		
	Statistic	df	Sig.
Practice 2 KoP (parent)	.35	30	<.001
Practice 2 KoT (parent)	.45	30	<.001
Practice 2 KoS (parent)	.66	30	<.001
Practice 2 P (parent)	.78	30	<.001
Practice 2 M (parent)	.71	30	<.001
Practice 2 C (parent)	.78	30	<.001
Practice 2 E (parent)	.46	30	<.001
Practice 2 EMM (parent)	.18	30	<.001
Practice 2 EMC (parent)	.28	30	<.001

Note. KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control.

Table 53
Results of a Shapiro-Wilk test for parents' mean scores for specific metacognitive and self-regulatory items in Practice 2

	Shapiro-Wilk		
	Statistic	**df**	**Sig.**
Practice 2 KoP1 (parent)	.27	30	.000
Practice 2 KoT1 parent)	.	30	.
Practice 2 KoS1 (parent)	.67	30	.000
Practice 2 P2 (parent)	.70	30	.000
Practice 2 M5 (parent)	.68	30	.000
Practice 2 C1 (parent)	.45	30	.000
Practice 2 E4 (parent)	.18	30	.000
Practice 2 MC1 (parent)	.28	30	.000

Note. KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control. Numbers next to metacognitive/self-regulatory category labels indicate which specific item this question is based on from the full 32-item list (see Section 6.2.7.1 Parental Metacognitive and Self-Regulatory Support).

Non-parametric tests were used to explore associations and differences between children's metacognitive and self-regulatory scores in Practice 1 and 2. Associations between parents' scores for specific metacognitive and self-regulatory items in Practice 2 and corresponding items in the parent questionnaire were also investigated (see section 6.4.5). Finally, correlational analysis was used to explore associations between children's metacognition/self-regulation during piano practice (Practice 1 and 2) and in the McKI; children's level of musical achievement; and parental metacognitive support and parenting style (as measured in Practice 2, and reported by parents in the parent questionnaire) (see Figure 15).

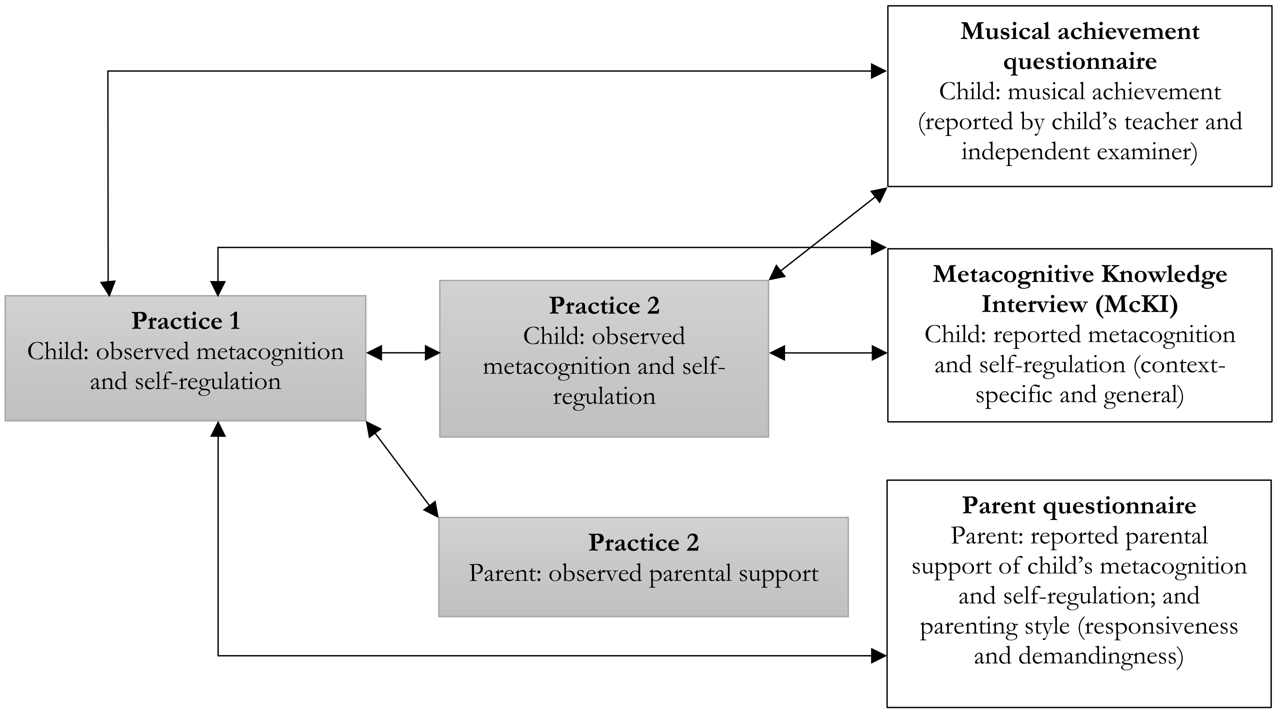


Figure 15
Data analysis procedures for the results of Practice 1 and 2

6.3.5 Metacognitive Knowledge Interviews (McKIs)

As previously discussed, children could score up to 11 points in the Metacognitive Knowledge Interview (McKI), depending on the number of questions they were asked/able to answer. Children who mentioned negative feelings in response to Question 5a ("how did you feel when you were practising today?"), for instance, were asked a follow-up question (5b – "what could you do to make yourself feel happy and calm again?"). In some cases, children had not yet learnt enough in their piano lessons to be able to answer certain questions e.g., Question 10 ("Could you explain to Gogi how practising [X] is different from practising [X]?"). For children who had had never encountered anything apart from pieces in their piano lessons (e.g., scales or sightreading exercises), it seemed unfair to assess them on this knowledge and this question was therefore omitted. To account for children answering different numbers of questions in the McKI, overall scores were calculated as percentages of the total possible marks they could have obtained, and analysis undertaken using these percentage scores.

Shapiro-Wilk' test indicated that children's total mean scores in the McKI were normally distributed ($W(30) = .94$, $p = <.108$), as shown in Table 54. However, as reported in Table 55 mean scores for individual categories of context-specific and general metacognitive and self-regulatory questions were all non-normal.

Table 54
Results of a Shapiro-Wilk test for children's total mean scores in the Metacognitive Knowledge Interview (McKI)

	Shapiro-Wilk		
	Statistic	**df**	**Sig.**
McKI	.94	30	.11*

Note. * indicates normal distribution of data.

Table 55
Results of a Shapiro-Wilk test for children's mean scores for questions testing context-specific (CS) and general (G) areas of metacognition and self-regulation in the Metacognitive Knowledge Interview (McKI)

	Shapiro-Wilk		
	Statistic	**df**	**Sig.**
E (CS)	.47	30	<.001
KoP (CS)	.51	30	<.001
EMM (CS)	.58	29	<.001
EMC (G)	.69	30	<.001
KoT (G)	.40	21	<.001
KoS (CS)	.70	27	<.001
KoT (CS)	.64	30	<.001
KoP (G)	.75	30	<.001
EMC (CS)*	.78	12	.006
E (G)	.79	28	<.001
KoS (G)	.79	30	<.001

Note. KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control; * = question 5b

Associations between children's McKI scores, reported and observed parental support (as measured in the parents' questionnaire and Practice 2 respectively) and children's metacognition/self-regulation (as measured in Practice 1, Practice 2 and the McKI) and musical achievement were explored using non-parametric tests such as Spearman's and Kendall's tau-b correlation, except in cases where all variables being compared met assumptions for parametric testing. In these cases, Pearson's product moment was calculated instead. As distributions for all category scores in the McKI were non-normal, non-parametric tests were also used to explore associations between children's responses to context-specific and general metacognitive and self-regulatory questions in the McKI (see Figure 16).

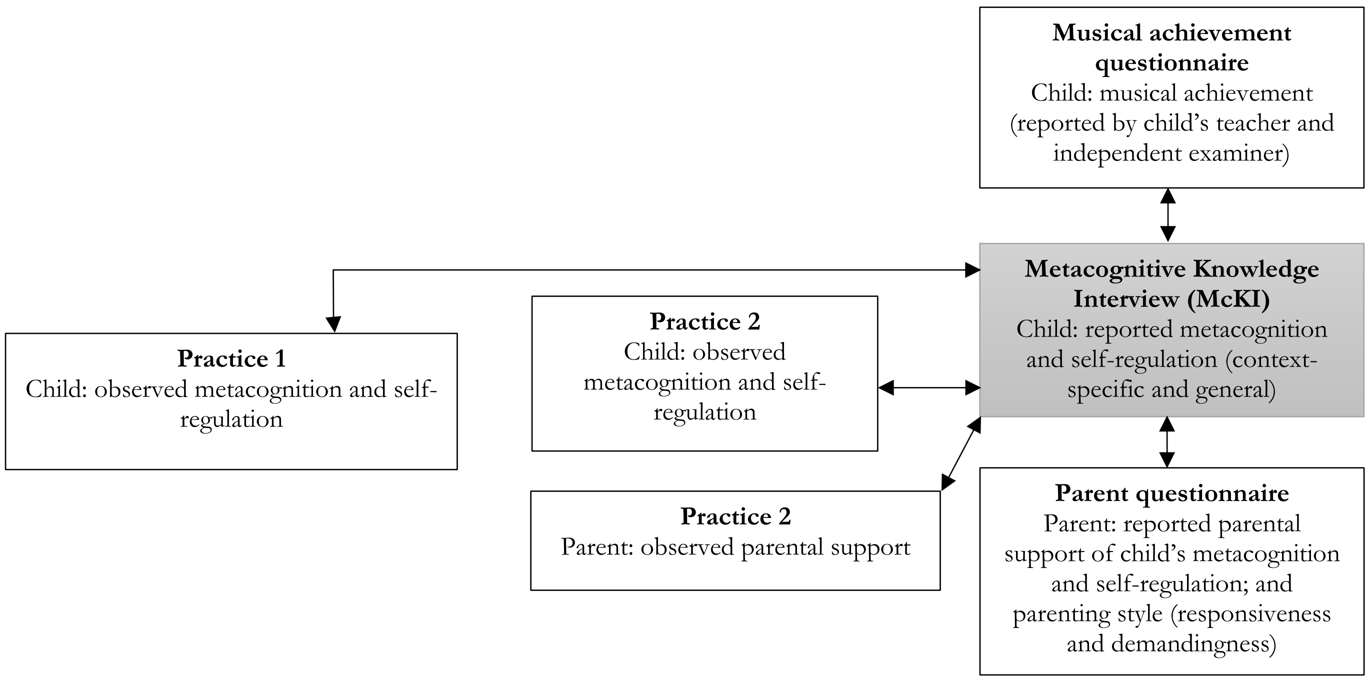


Figure 16
Data analysis procedures for the results of the McKI

6.3.6 Parent Questionnaires

The parent questionnaire aimed to measure two main constructs: parental metacognitive and self-regulatory support; and parenting style beliefs. The latter consisted of measures relating to parental responsiveness ("affection and attachment") and demandingness ("rules and respect"). Questionnaire responses were measured on a 7-point Likert scale where 1 = *strongly disagree* and 7 = *strongly agree.* If respondents left a questionnaire rating blank, then a score of 4 was inserted in the data, as this represents a neutral response of neither agree nor disagree. Taking into account reverse-coded items, a possible total score out of 168 was calculated based on parents' responses to the 24 items in the parent questionnaire and transformed into a percentage score. As one parent did not wish to answer any of the items referring to parental metacognitive support, comparison of parents' responses to metacognitive support items in the questionnaire and children's metacognition during independent practice (Practice 1) was only undertaken for 29 child and parent dyads. All other analyses (i.e., of scores from practice sessions) are based on the full dataset of 30 children and parents.

Shapiro-Wilk' test indicated that parents' mean scores for the responsiveness and demandingness dimensions of the parent questionnaire were normally distributed (Affection and Attachment, $W(30) = .95, p = <.14$; Rules and Respect, $W(30) = .97, p = <.48$) and therefore met assumptions for parametric testing. Parents' mean scores for reported metacognitive and self-regulatory support, both overall scores (see MC/SR in Table 56) and scores for individual metacognitive and self-regulatory items (Table 57), were non-normal.

Table 56
Results of a Shapiro-Wilk test for parents' total mean scores for parental metacognitive and self-regulatory support, responsiveness (affection and attachment) and demandingness (rules and respect) in the parent questionnaire

	Shapiro-Wilk		
	Statistic	**df**	**Sig.**
MC/SR	.90	30	.006
AA	.95	30	.14*
RR	.97	30	.48*

Note. MC/SR = metacognition and self-regulation; AA = affection and attachment; RR = rules and respect. * indicates normal distribution ($p = >.05$)

Table 57
Results of a Shapiro-Wilk test for parents' total mean scores for parental support for the eight metacognitive and self-regulatory items in the parent questionnaire

	Shapiro-Wilk		
	Statistic	**df**	**Sig.**
KoP1	.87	27	.003
KoT1	.89	27	.007
KoS1	.86	27	.002
P2	.84	27	.001
M5	.84	27	.001
C1	.77	27	<.001
E4	.88	27	.005
MC1	.56	27	<.001

Note. KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control. Numbers next to metacognitive/self-regulatory category labels indicate which specific item this question is based on from the full 32-item list (see Section 6.2.7.1 Parental Metacognitive Support).
* indicates normal distribution (p = >.05)

As illustrated in Figure 17, bi-variate correlations were used to explore associations between the kinds of metacognitive and self-regulatory support parents report giving their children (in the questionnaire), and parental support behaviours observed in Practice 2. Additionally, Spearman's and Kendall's tau-b correlations were used to explore associations between parenting style (responsiveness and demandingness) and children's metacognition (in Practice 1 and the McKI) and musical achievement. Associations between parents' questionnaire scores and children's metacognition/self-regulation (as measured in Practice 1, Practice 2 and the McKI) and musical achievement (as measured in the musical achievement questionnaire completed by children's' teachers and an independent examiner) were also explored using Spearman's correlation.

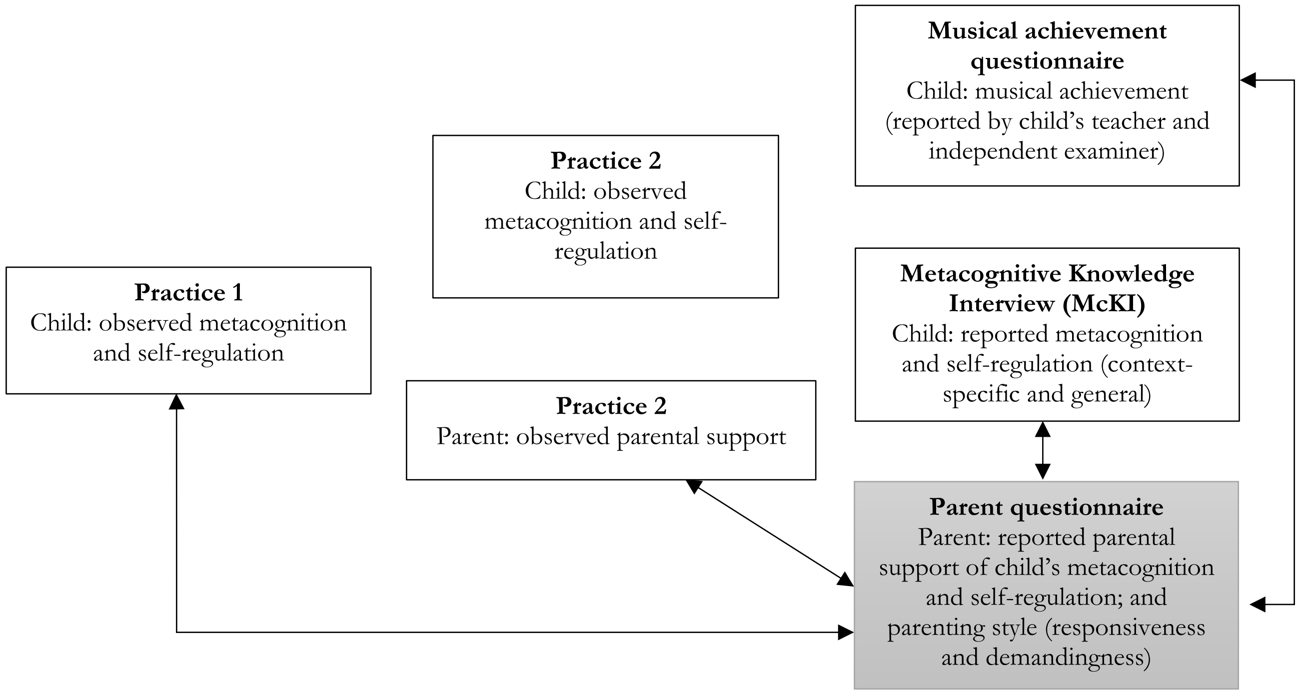


Figure 17
Data analysis procedure for the parent questionnaire

6.4 Results

The following section reports the findings of Study 2. Results are structured into three main sections, with one section for each set of research questions as follows:

- RQ2 – What are the indicators of children's metacognition and self-regulation in musical learning and what are their associations with musical achievement?
- RQ2a – To what extent are children's metacognition and self-regulation associated with their age?
- RQ2b – To what extent is children's musical achievement associated with their age?

- RQ3 – What are the associations between parental support of children's metacognition and self-regulation, children's metacognition and self-regulation in musical learning and children's musical achievement?
- RQ3a – Is there a difference in children's metacognition and self-regulation when practising independently, and when practising with a parent?
- RQ3b – Is there a difference in the level of parental metacognitive and self-regulatory support given to children by parents with and without previous musical experience?
- RQ4 – What are the associations between parenting style beliefs, children's metacognition and self-regulation in musical learning and children's musical achievement?

<u>As discussed, the following short-form titles are used to aid clarity:</u>

RQ2 – Children's Musical Achievement and Metacognition/Self-Regulation

RQ2a – Children's Metacognition/Self-Regulation and Age

RQ2b – Children's Musical Achievement and Age

RQ3 – Musical Achievement, Metacognition/Self-Regulation and Parental Support

RQ3a – Metacognition/Self-Regulation and Parental Supervision

RQ3b – Parental Support and Parents' Previous Musical Experience

RQ4 – Musical Achievement, Metacognition/Self-Regulation and Parenting Style

6.4.1 RQ2 - Children's Musical Achievement and Metacognition/Self-Regulation

6.4.1.1 Practice 1 (independent practice)

Table 58 reports children's mean scores across nine metacognitive and self-regulatory categories whilst practising independently for 10 minutes during Practice 1, as well as mean scores for each participant.

Table 58
Children's observed metacognition scores during Practice 1 (independent practice)

Participant	KoP	KoT	KoS	P	M	C	E	EMM	EMC	Mean
1	0.00	0.00	0.00	0.25	0.46	0.50	0.10	0.50	0.50	0.26
2	0.00	0.00	0.00	0.25	0.33	0.00	0.00	0.00	0.50	0.12
3	0.00	0.00	0.00	0.31	0.21	0.07	0.00	0.00	0.50	0.12
4	0.00	0.00	0.00	0.25	0.17	0.07	0.00	0.00	0.38	0.10
5	0.00	0.00	0.00	0.13	0.08	0.04	0.00	0.00	0.50	0.08
6	0.00	0.00	0.00	0.13	0.33	0.21	0.05	0.00	0.50	0.14
7	0.00	0.00	0.00	0.13	0.29	0.18	0.00	0.00	0.50	0.12
8	0.00	0.00	0.00	0.25	0.08	0.04	0.00	0.00	0.50	0.10
9	0.00	0.00	0.00	0.25	0.29	0.14	0.00	0.00	0.50	0.13
10	0.00	0.00	0.00	0.25	0.25	0.00	0.05	0.00	0.38	0.10
11	0.00	0.00	0.00	0.19	0.13	0.14	0.00	0.00	0.50	0.11
12	0.25	0.00	0.00	0.00	0.17	0.04	0.00	0.00	0.50	0.11
13	0.00	0.00	0.00	0.13	0.29	0.18	0.00	0.00	0.50	0.12
14	0.00	0.00	0.00	0.25	0.38	0.04	0.00	0.00	0.50	0.13
15	0.00	0.00	0.00	0.00	0.17	0.68	0.20	0.00	0.50	0.17
16	0.00	0.00	0.00	0.13	0.33	0.64	0.20	0.00	0.50	0.20
17	0.00	0.00	0.00	0.19	0.46	0.18	0.05	0.00	0.50	0.15
18	0.00	0.00	0.00	0.00	0.04	0.04	0.00	0.00	0.00	0.01
19	0.00	0.00	0.00	0.06	0.33	0.18	0.00	0.00	0.50	0.12
20	0.00	0.00	0.00	0.13	0.42	0.21	0.00	0.00	0.50	0.14
21	0.00	0.00	0.00	0.06	0.29	0.07	0.00	0.00	0.50	0.10
22	0.00	0.00	0.00	0.25	0.33	0.07	0.00	0.00	0.50	0.13
23	0.00	0.00	0.00	0.13	0.17	0.04	0.00	0.00	0.50	0.09
24	0.00	0.00	0.00	0.17	0.11	0.05	0.00	0.00	0.50	0.09
25	0.00	0.00	0.00	0.00	0.33	0.07	0.00	0.00	0.50	0.10
26	0.00	0.00	0.00	0.00	0.42	0.04	0.00	0.00	0.50	0.11
27	0.00	0.00	0.00	0.25	0.25	0.00	0.00	0.00	0.50	0.11
28	0.00	0.00	0.00	0.06	0.33	0.11	0.00	0.00	0.50	0.11
29	0.00	0.00	0.00	0.25	0.38	0.25	0.00	0.00	0.50	0.15
30	0.00	0.00	0.00	0.25	0.04	0.00	0.00	0.00	0.50	0.09

Note. KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control

As described in Table 59, the metacognitive/self-regulatory behaviours children most often performed during Practice 1 (from all nine metacognitive and self-regulatory categories) were related to Emotional/Motivational Control (EMC), (M = .48, SD = .09). The metacognitive behaviours performed most often by children in Practice 1 were Monitoring (M) behaviours, M = .26, SD = .12. The metacognitive behaviours children exhibited the least of during Practice 1 were related to Knowledge of Task (KoT) and Knowledge of Strategies (KoS) – with no metacognitive behaviours from either of these categories observed by the researcher from any of the participating children.

Table 59
Descriptive statistics for children's mean scores from Practice 1 in rank order (from highest to lowest)

Metacognitive/self-regulatory category	Mean	SD	Skewness	Kurtosis
EMC	.48	.09	-4.72	23.58
M	.26	.12	-.28	-.87
P	.16	.10	-.37	-1.17
C	.14	.17	2.12	4.18
E	.02	.05	2.79	7.26
EMM	.02	.09	5.48	30.00
KoP	.01	.05	5.48	30.00
KoT	.00	.00	.	.
KoS	.00	.00	.	.

Note. KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control

As well as deriving descriptive statistics from Practice 1, a two-tailed Kendall's tau-b correlation was used to explore associations between these indicators of children's metacognition and self-regulation during Practice 1 (see Table 60). Kendall's tau-b correlation coefficient is a non-parametric test which can be used on smaller samples of data when assumptions for parametric tests such as Pearson's r (e.g., normal distribution) are violated and there are a large number of tied ranks (i.e., identical scores across participants) in the data. Field (2009) suggests that, although "Spearman's statistic is the more popular of the two coefficients", that Kendall's tau should be used to analyse data with multiple tied ranks (p. 181). Moreover, Field (2009) suggests that the results produced by Spearman and Kendall are very similar. To illustrate this point, results for both Kendall's tau-b and Spearman's *r* are reported in Table 60 and Table 61 respectively.

Table 60
Kendall's tau-b correlation co-efficients for children's metacognitive and self-regulatory behaviours during Practice 1

Metacognitive/self-regulatory category	KoP	KoT	KoS	P	M	C	E	EMM	EMC
KoP									
KoT	.								
KoS	.	.							
P	-.25	.	.						
M	-.13	.	.	-.00					
C	-.14	.	.	-.14	.36**				
E	-.09	.	.	-.03	.22	.41**			
EMM	-.03	.	.	.17	.26	.24	.37*		
EMC	.06	.	.	-.04	.28	.23	-.07	0.61	

Note. * p < = .05 (2-tailed) ** p < = .01 (2-tailed).

Table 61
Spearman's correlation co-efficients for children's metacognitive and self-regulatory behaviours during Practice 1

Metacognitive/self-regulatory category	KoP	KoT	KoS	P	M	C	E	EMM	EMC
KoP									
KoT	.								
KoS	.	.							
P	-.28	.	.						
M	-.15	.	.	.01					
C	-.16	.	.	-.19	.45*				
E	-.09	.	.	-.03	.27	.47**			
EMM	-.03	.	.	.19	.30	.27	.38*		
EMC	.06	.	.	-.04	.32	.27	-.07	.06	

Note. * p < = .05 (2-tailed) ** p < = .01 (2-tailed).

Both Kendall's tau-b and Spearman's *r* found statistically significant positive correlations between children's mean scores for Control (C) and Monitoring (M) (r_s = .45, N = 30, p = .01; τ_b = .36, p = .01); Control (C) and Evaluation (E) (r_s = .47, N = 30, p = .009; τ_b = .407, p = .009);

and Evaluation (E) and Emotional/Motivational Monitoring (EMM) (r_s = .38, N = 30, p = .04; τ_b = .373, p = .04). Given the similarity of the results produced by both Spearman and Kendall's tau-b correlations, all future correlations (where the data defies assumptions for parametric testing) will be calculated using Spearman's r. In cases where a large number of tied-ranks are present in the data (as in the present analysis), Kendall's tau-b correlation coefficient will be calculated instead.

6.4.1.2 Practice 2 (parent-supervised practice)

Table 62 reports children's scores across nine metacognitive and self-regulatory categories whilst practising for 10 minutes supervised by a parent during Practice 2, as well as mean scores for each participant.

Table 62
Children's observed metacognition during Practice 2 (parent-supervised practice)

Participant	KoP	KoT	KoS	P	M	C	E	EMM	EMC	Mean
1	0.25	0.00	0.13	0.16	0.46	0.27	0.00	0.00	0.50	0.20
2	0.00	0.00	0.00	0.00	0.29	0.07	0.03	0.00	0.75	0.13
3	0.06	0.00	0.29	0.38	0.13	0.07	0.00	0.13	0.50	0.17
4	0.00	0.00	0.00	0.16	0.15	0.04	0.00	0.00	0.50	0.09
5	0.00	0.00	0.00	0.00	0.13	0.04	0.00	0.25	0.50	0.10
6	0.25	0.06	0.33	0.19	0.13	0.05	0.08	0.13	0.50	0.19
7	0.13	0.13	0.08	0.06	0.23	0.11	0.08	0.00	0.50	0.15
8	0.19	0.00	0.04	0.13	0.10	0.07	0.08	0.13	0.44	0.13
9	0.00	0.13	0.29	0.31	0.25	0.00	0.00	0.00	0.50	0.16
10	0.00	0.00	0.21	0.13	0.13	0.07	0.00	0.38	0.44	0.15
11	0.13	0.38	0.08	0.06	0.25	0.11	0.15	0.00	0.38	0.17
12	0.38	0.19	0.17	0.13	0.13	0.02	0.05	0.00	0.50	0.17
13	0.00	0.00	0.04	0.00	0.15	0.11	0.00	0.00	0.44	0.08
14	0.00	0.13	0.00	0.19	0.42	0.05	0.10	0.00	0.50	0.15
15	0.00	0.00	0.00	0.00	0.33	0.64	0.10	0.00	0.50	0.18
16	0.00	0.00	0.00	0.13	0.33	0.46	0.10	0.00	0.50	0.17
17	0.25	0.00	0.08	0.06	0.33	0.16	0.05	0.00	0.50	0.16
18	0.06	0.00	0.00	0.06	0.15	0.11	0.00	0.13	0.44	0.10
19	0.00	0.00	0.13	0.19	0.13	0.11	0.03	0.19	0.38	0.13
20	0.13	0.00	0.21	0.19	0.33	0.11	0.00	0.00	0.50	0.16
21	0.00	0.00	0.00	0.44	0.17	0.02	0.05	0.00	0.50	0.13
22	0.13	0.00	0.00	0.19	0.23	0.11	0.00	0.00	0.50	0.13
23	0.06	0.13	0.17	0.00	0.19	0.21	0.05	0.00	0.44	0.14
24	0.13	0.13	0.00	0.13	0.25	0.25	0.00	0.00	0.50	0.15
25	0.00	0.00	0.25	0.03	0.21	0.18	0.03	0.00	0.50	0.13

26	0.00	0.19	0.04	0.09	0.35	0.14	0.10	0.13	0.50	0.17
27	0.13	0.00	0.00	0.09	0.31	0.09	0.00	0.00	0.50	0.12
28	0.00	0.00	0.00	0.00	0.25	0.05	0.03	0.00	0.50	0.09
29	0.00	0.00	0.00	0.28	0.38	0.09	0.00	0.00	0.50	0.14
30	0.00	0.00	0.04	0.00	0.17	0.05	0.03	0.00	0.50	0.09

Note. KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control)

As in Practice 1, the metacognitive/self-regulatory behaviours children most often performed during Practice 2 were related to Emotional/Motivational Control (EMC) (M = .49, SD = .06). The metacognitive behaviours performed most often by children in Practice 2 were Monitoring (M) behaviours (M = .24, SD = .10). Compared with Practice 1 (where no behaviours from Knowledge of Strategies (KoS) or Knowledge of Task (KoT) were observed), there were considerably more demonstrations of metacognitive knowledge behaviours such as KoS (M = 0.9, SD = .11); Knowledge of Persons (KoP) (M = 0.8, SD = .10); and KoT (M = .05, SD = .09). In Practice 2, the metacognitive behaviours children exhibited the least often related to Evaluation (E) (M = 0.4, SD = 0.4).

Table 63
Descriptive statistics for children's mean scores from Practice 2 in rank order (from highest to lowest)

Metacognitive/self-regulatory category	Mean	SD	Skewness	Kurtosis
EMC	.49	.06	2.36	12.00
M	.24	.10	.55	-.664
C	.13	.13	2.59	7.64
P	.13	.12	1.03	.924
KoS	.09	.11	1.02	-.248
KoP	.08	.10	1.33	1.22
EMM	.05	.09	2.11	4.52
KoT	.05	.09	2.16	5.32
E	.04	.04	.89	-.110

Note. KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control)

For comparison, children's mean scores from Practice 1 and 2 across nine metacognitive and self-regulatory categories are shown in Figure 18.

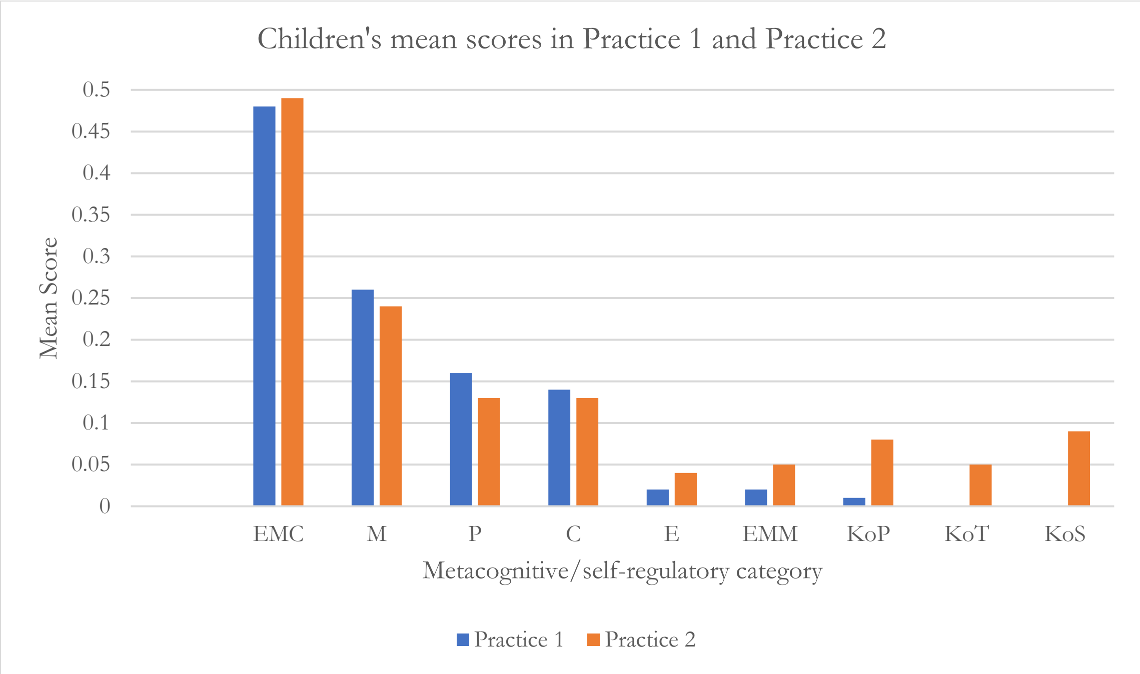


Figure 18
Comparison of children's mean scores in Practice 1 and Practice 2

Note. KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control)

As indicated by the results of a Shapiro-Wilk test ($W(30) = .96, p = .24$), children's mean scores from Practice 2 were normally distributed and therefore met assumptions for parametric testing. Pearson's correlation coefficient is widely considered a more powerful statistical test than Spearman's rho or Kendall's tau-b and is therefore the more suitable test where data meets the necessary assumptions for parametric testing (Field, 2009). Consequently, Pearson's product moment was used to explore associations between indicators of children's metacognition and self-regulation during Practice 2 – as shown in Table 64.

Pearson's r found strong positive correlations between children's mean scores for Knowledge of Task (KoT) and Evaluation (E) ($r = .58$, df = 29, $p = .001$); and Monitoring (M) and Control (C) (r = .41, df = 29, p = .03). Additionally, a statistically significant negative correlation was found between Monitoring (M) and Emotional/Motivational Monitoring (EMM) (r = .48, df = 29, p = .008).

Table 64
Pearson's correlation co-efficients for children's metacognitive and self-regulatory behaviours during Practice 2

Metacognitive/self-regulatory category	KoP	KoT	KoS	P	M	C	E	EMM	EMC
KoP									
KoT	.25								
KoS	.28	.12							
P	.03	-.07	.29						
M	-.01	.09	-.26	-.01					
C	-.70	-.10	-.19	-.28	.41*				
E	.10	.58**	-.10	-.18	.18	.31			
EMM	-.14	-.16	.24	.03	-.48**	-.21	-.14		
EMC	-.07	-.25	-.15	-.06	.30	-.03	-.15	-.29	

Note. KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control)
* p < = .05 (2-tailed) ** p < = .01 (2-tailed).

6.4.1.3 Metacognitive Knowledge Interviews (McKI)

Table 65 reports children's scores in the metacognitive knowledge interview. McKI scores were based on children's responses to questions around aspects of their context-specific metacognitive and self-regulatory knowledge (of Practice 1 and Practice 2) and general metacognitive and self-regulatory knowledge about piano practice more broadly.

Table 65
Children's scores in the Metacognitive Knowledge Interview (McKI)

Participant	Context Specific							General						McKI Grand Mean
	KoT	E	KoP	KoS	EMM	EMC	Context Specific Mean	KoP	KoT	KoS	E	EMC	General Mean	
1	0.5	0.5	0	0.5	0.5	0.5	0.60	0.5	1	0.5	0.5	0.5	0.42	0.50
2	0.5	1	1	0.5	1	0.5	0.63	0.5	n/a	1	0.5	0.5	0.75	0.70
3	0.5	1	0.5	n/a	1	n/a	0.50	1	n/a	0.5	0	0.5	0.75	0.63
4	0.5	1	1	0.5	1	0.5	0.80	1	0.5	0.5	1	1	0.75	0.77
5	0.5	1	1	0.5	1	n/a	0.50	0.5	0	0.5	0.5	1	0.80	0.65
6	1	1	1	1	1	0.5	0.63	1	0.5	0.5	n/a	0.5	0.92	0.80
7	0.5	1	1	0.5	1	n/a	0.50	0.5	0	0.5	0.5	1	0.80	0.65
8	0.5	1	1	0.5	1	0.25	0.60	1	1	0	0.5	0.5	0.71	0.66
9	0.5	1	1	1	1	n/a	0.88	1	n/a	1	0.5	1	0.90	0.89
10	1	1	1	1	1	1	0.70	1	1	0	0.5	1	1.00	0.86
11	0.5	1	0.25	n/a	1	1	1.00	1	n/a	1	1	1	0.75	0.86
12	1	1	1	0.5	0.5	n/a	0.60	0.5	0	1	0.5	1	0.80	0.70
13	0.5	1	1	1	1	n/a	0.60	0.5	1	0.5	0.5	0.5	0.90	0.75
14	1	1	1	1	1	n/a	0.88	1	n/a	1	1	0.5	1.00	0.94
15	0.5	0.5	1	1	0.5	n/a	0.70	0.5	1	0.5	0.5	1	0.70	0.70
16	0.5	0.5	1	0.5	1	n/a	0.40	0	1	0	0.5	0.5	0.70	0.55
17	1	1	1	1	0.5	n/a	0.90	1	1	0.5	1	1	0.90	0.90
18	1	1	1	0.5	1	0.5	0.88	0.5	1	1	n/a	1	0.83	0.85
19	1	0.5	1	1	1	n/a	0.80	0.5	1	1	0.5	1	0.90	0.85
20	1	1	1	1	1	n/a	0.90	1	0.5	1	1	1	1.00	0.95
21	1	1	1	1	1	1	0.90	1	1	1	0.5	1	1.00	0.95
22	0.5	1	1	n/a	n/a	n/a	0.13	0	n/a	0	0	0.5	0.83	0.43
23	1	1	1	1	0.5	1	0.75	1	n/a	0	1	1	0.92	0.85
24	1	1	1	1	1	0.25	0.88	0.5	n/a	1	1	1	0.88	0.88
25	1	1	1	1	0.5	1	1.00	1	1	1	1	1	0.92	0.95
26	0.5	1	0.75	0.5	0.5	n/a	0.80	0.5	1	1	1	0.5	0.65	0.73
27	0.5	1	0.5	0.25	1	n/a	0.63	0.5	n/a	0.5	0.5	1	0.65	0.64
28	0.5	0	1	0.5	0.5	n/a	0.45	0.5	1	0.5	0.25	0	0.50	0.48
29	1	1	0	1	1	n/a	0.80	1	1	0.5	1	0.5	0.80	0.80
30	1	1	1	0.5	0.5	n/a	0.80	0.5	0.5	1	1	1	0.80	0.80

Note. KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control.

As previously discussed, the first half of the McKI focused on children's context-specific knowledge of their own metacognition and self-regulation during Practice 1 and Practice 2. In this half of the McKI, children scored highest on the question relating to Evaluation (E) – "Do you think you did a good job, an okay job or not so good job of practising the piano by yourself today? Why?" (N = 30, M = .9; SD = .24). Excluding question 5b (which only 12 children out of the 30 had the opportunity to answer), the question which children scored the lowest on related to Knowledge of Task (KoT) – "What did you practice today? I didn't see or hear your practice session, so please tell me about what you practised in as much detail as possible" (N = 30, M = .73, SD = .25). Table 66 reports descriptive statistics for mean scores from the context-specific metacognitive and self-regulatory questions in the McKI.

Table 66
Descriptive statistics for mean scores from questions in McKI measuring children's context-specific metacognitive knowledge, in rank order by mean score (from highest to lowest)

Metacognitive/self-regulatory category	N	Mean	SD	Skewness	Kurtosis
E (CS)	30	.90	.24	-2.50	6.06
KoP (CS)	30	.87	.30	-2.19	3.66
EMM (CS)	29	.84	.24	-.87	-1.35
KoS (CS)	27	.75	.27	-.20	-1.85
KoT (CS)	30	.73	.25	.141	-2.13
EMC (CS)	12	.67	.31	.07	-1.82

Note. CS = context-specific; KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control.

The second half of the McKI aimed to assess children's general metacognitive and self-regulatory knowledge about piano practice more broadly, with questions asked from the point of view of a puppet called Gogi. In this portion of the McKI, children scored highest on the question relating to Emotional/Motivational Control (EMC), "Gogi gets distracted easily. What could Gogi do to try and help him/her concentrate better whilst practising?" (N = 30, M = .78, SD = .28). The question on which children scored the lowest was the item relating to

Knowledge of Strategies (KoS), "What could Gogi do to make sure s/he does enough practice between his/her lessons?" (*M* = .63, *SD* = .31). Table 67 reports descriptive statistics for mean scores general metacognitive and self-regulatory questions in the McKI.

Table 67
Descriptive statistics for mean scores from questions in McKI measuring children's general metacognitive knowledge in rank order by mean score (from highest to lowest)

Metacognitive/self-regulatory category	N	Mean	SD	Skewness	Kurtosis
EMC (G)	30	.78	.28	-.89	-.17
KoT (G)	21	.76	.37	-.1.27	.17
KoP (G)	30	.70	.31	-.52	-.53
E (G)	28	.65	.31	-.26	-.73
KoS (G)	30	.63	.31	-.49	-.97

Note. G = general; KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control.

Across the entire McKI, the highest mean score was .95 and the lowest was .43 (*N* = 30, *M* =.76, *SD* = .15). Overall, children scored highest on the question relating to context-specific Evaluation (E) of their own piano practice (*N* = 30, *M* = .90, *SD* = .24) and lowest on the question relating to general Knowledge of Strategies (KoS) for piano practice (*N* = 30, *M* = .63, *SD* = .31). Excluding question 5 (context-specific EMC), which only 12 children were eligible to answer, children appeared to score higher in questions relating to self-regulation (EMM and EMC), in both context-specific and general settings. Descriptive statistics are reported in Table 68, with mean scores across all context-specific and general questions in the McKI compared in Figure 19.

Table 68
Descriptive statistics for all 11 questions in the McKI in rank order by mean score (from highest to lowest)

Metacognitive/self-regulatory category	N	Mean	SD
E (CS)	30	.90	.24
KoP (CS)	30	.87	.30
EMM (CS)	29	.84	.24
EMC (G)	30	.78	.28
KoT (G)	21	.76	.37
KoS (CS)	27	.75	.27
KoT (CS)	30	.73	.25
KoP (G)	30	.70	.31
EMC (CS)*	12	.67	.31
E (G)	28	.65	.31
KoS (G)	30	.63	.31

Note. CS = context-specific, G = general; KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control.
* = Question 5b, the follow-up question to 5a, which only 12 children were eligible to answer based on their response to 5a.

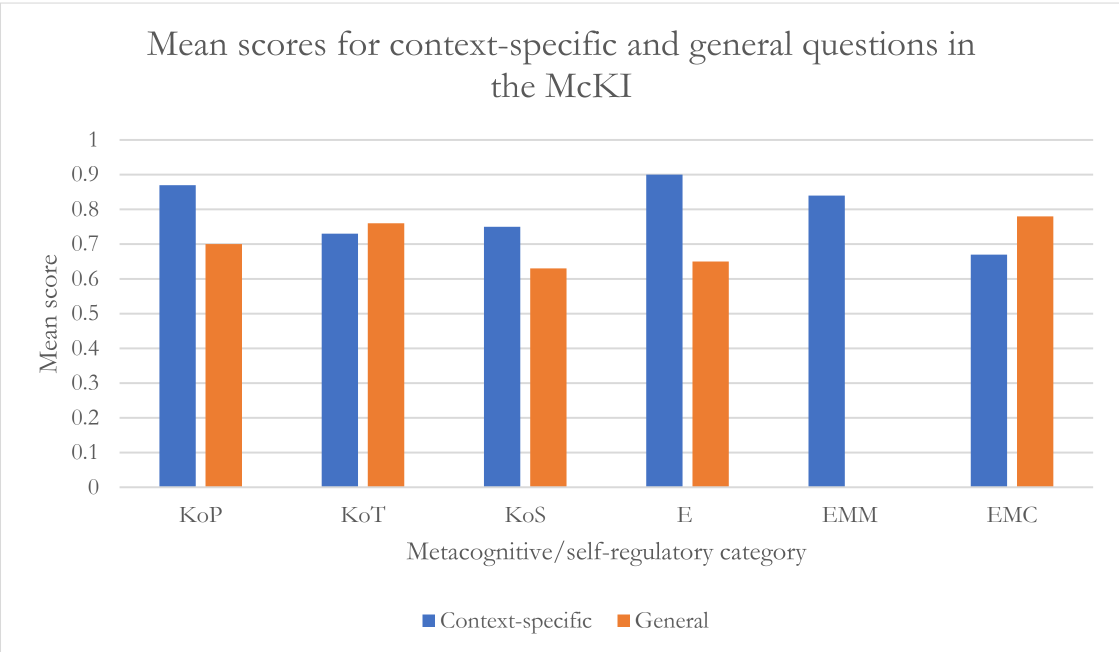


Figure 19
Comparison of children's mean scores for questions relating to context-specific and general areas of metacognition and self-regulation in the McKI

Note. KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC =

Emotional/Motivational Control. (No score for General EMM is indicated in Figure 19 because there was no General EMM in the McKI).

In order to investigate possible differences in children's context-specific and general metacognitive and self-regulatory knowledge, as measured through the McKI, a mean context-specific and general score was calculated for each child – as shown in Table 69.

Table 69
Mean scores for context-specific and general metacognitive and self-regulatory knowledge in the McKI

Participant	Context Specific	General
1	0.42	0.60
2	0.75	0.63
3	0.75	0.50
4	0.75	0.80
5	0.80	0.50
6	0.92	0.63
7	0.80	0.50
8	0.71	0.60
9	0.90	0.88
10	1.00	0.70
11	0.75	1.00
12	0.80	0.60
13	0.90	0.60
14	1.00	0.88
15	0.70	0.70
16	0.70	0.40
17	0.90	0.90
18	0.83	0.88
19	0.90	0.80
20	1.00	0.90
21	1.00	0.90
22	0.83	0.13
23	0.92	0.75
24	0.88	0.88
25	0.92	1.00
26	0.65	0.80
27	0.65	0.63
28	0.50	0.45
29	0.80	0.80
30	0.80	0.80

A Shapiro-Wilk test revealed that mean scores for both context-specific ($W(30) = .932$, $p = .054$) and general ($W(30) = .938$, $p = .083$) metacognition and self-regulation in the McKI were normally distributed and therefore met assumptions for parametric testing. Consequently, a two-tailed paired samples t-test was used to investigate possible differences in children's context-specific (*M* = .81, *SD* = .14) and general metacognition (*M* = .70, *SD* = .20). Analysis revealed a statistically significant difference in children's mean scores in context-specific and general questions during the McKI (t(29) = -2.98, *p* = .006, *d* = .64) – a result which suggests that children's metacognitive and self-regulatory abilities vary between context-specific and general questions.

In addition to comparing total mean scores for context-specific and general responses, a two-tailed Wilcoxon signed-rank test was used to investigate differences in children's mean scores for corresponding categories of questions relating to context-specific KoT (*Mdn* = .50), KoP (*Mdn* = .50), KoS (*Mdn* = 1.00), E (*Mdn* = 1.00) and EMC (*Mdn* = .50); and general KoT (*Mdn* = 1.00), KoP (*Mdn* = 1.00), KoS (*Mdn* = .50), E (*Mdn* = .50) and EMC (*Mdn* = 1.00) during the McKI. Unlike total mean scores for context-specific and general responses, mean scores for corresponding categories were found to be non-normally distributed – hence the use of a non-parametric test.

Table 70
Two-tailed Wilcoxon signed-rank test results for corresponding general and context-specific metacognitive and self-regulatory categories in the McKI

	KoT (CS) KoT (G)	KoP (CS) KoP (G)	KoS (CS) KoS (G)	E (CS) E (G)	EMC (CS) EMC (G)
Z	.00[b]	-1.71[c]	-1.30[c]	-3.30[c]	-1.84[d]
Asymp Sig. (2-tailed)	1.00	.09	.19	.001**	.07

Note. CS = context-specific, G = general. KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control;
Asymp sig. (2-tailed) =Asymptotic significance level (*p* value).
** *p* = <.001 (2-tailed)
[b] The sum of negative ranks equals the sum of positive ranks [c] Based on positive ranks [d] Based on negative ranks.

Wilcoxon's signed rank test revealed a statistically significant difference between responses to context-specific and general questions relating to Evaluation (E) (z = -3.30, p = .001, r = .060). No other statistically significant differences were found.

In order to investigate possible associations, and convergence, between children's responses to context-specific and general questions relating to metacognition and self-regulation during piano practice a two-tailed Kendall's tau-b correlation was also calculated. Results are reported in Table 71.

Table 71
Kendall's tau-b correlation co-efficients for context-specific and general metacognitive and self-regulatory categories from the McKI

	KoT (CS)	KoP (CS)	KoS (CS)	E (CS)	EMC (CS)
KoT (G)	-.02	-.27	.31	-.36	.27
KoP (G)	.35	-.08	.55**	.42*	.50
KoS (G)	.32	.01	.11	.17	.04
E (G)	.49**	-.06	.33	.36	.14
EMC (G)	.05	.24	.17	.25	.50

Note. CS = context-specific, G = general; KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control).
* p < = .05 (2-tailed) ** p < = .01 (2-tailed).

Kendall's tau-b calculated statistically significant positive correlations between Knowledge of Task (KoT) and Evaluation (E) (τ_b = .494, N = 28, p = .007); Knowledge of Strategies (KoS) and Persons (KoP) (τ_b = .552, N = 27, p = .004); and KoP and E (τ_b = .416, N = 30, p = .020).

6.4.1.4 Associations Between Children's Observed Metacognition and Self-Regulation (Practice 1) and Reported Metacognition and Self-Regulation (McKI)

Table 72 reports descriptive statistics for mean scores in corresponding categories of metacognition and self-regulation, as observed in Practice 1 and 2, and indicated through responses to context-specific questions (i.e., relating to practice undertaken during Practice 1 and 2) in the McKI. As discussed previously, scores for each category in both measures (practice sessions and McKI) were given out 1.

Table 72
Comparison of descriptive statistics for children's mean scores from six corresponding metacognitive and self-regulatory categories in Practice 1, Practice 2 and McKI

Corresponding metacognitive/self-regulatory category	**N**		**Mean**			**SD**		
	Prac 1 and 2	**McKI**	**Prac 1**	**Prac 2**	**McKI**	**Prac 1**	**Prac 2**	**McKI**
KoT	30	30	.	.05	.73	.	.09	.25
E	30	30	.02	.04	.90	.05	.04	.24
KoP	30	30	.01	.08	.87	.05	.10	.30
KoS	30	27	.	.09	.75	.	.11	.27
EMM	30	29	.02	.05	.84	.09	.09	.24
EMC	30	12	.48	.49	.67	.09	.06	.31

Note. McKI = Metacognitive Knowledge Interview; Prac 1 = Practice 1, Practice 2 = Practice 2; KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control).

In order to explore possible differences in children's metacognition and self-regulation online (practising the piano) and offline (reflecting on practising the piano in the context of an interview), a two-tailed Wilcoxon signed-rank test was used to compare mean scores from metacognitive categories in Practice 1 and 2 with their corresponding, context-specific categories in McKI (i.e., responses to questions relating to Practice 1 and 2). Table 73 reports the results of the Wilcoxon signed rank tests. Statistically significant differences at the p = <.001 level were found between Practice 1 and McKI scores for Knowledge of Task, Evaluation, Knowledge of Persons, Knowledge of Strategies and Emotional/Motivational Monitoring, with statistically significant difference between Practice 1 and McKI scores for Emotional/Motivational Control at the p = <.05 level (see Table 73 for exact p values). These findings suggest that there are considerable differences in children's metacognitive and self-regulatory abilities, depending on whether they are being measured online (as in Practice 1 and 2) or offline (as in an interview).

Table 73
Two-tailed Wilcoxon signed-rank test results for children's scores from corresponding metacognitive and self-regulatory categories in Practice 1 and McKI

	McKI (KoT) Prac1 (KoT)	McKI (KoP) Prac 1 (KoP)	McKI (E) Prac 1 (E)	McKI (KoS) Prac 1 (KoS)	McKI (EMM) Prac 1 (EMM)	McKI (EMC) Prac 1 (EMC)
Z	-4.93[b]	-4.96[b]	-4.97[b]	-4.67[b]	-4.85[b]	-2.11[b]
Asymp Sig. (2-tailed)	<.001**	<.001**	<.001**	<.001**	<.001**	.04*

Note. McKI = Metacognitive Knowledge Interview; Prac 1 = Practice 1, Practice 2 = Practice 2; KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control).
Asymp sig. (2-tailed) =Asymptotic significance level (*p* value).
[b] The sum of negative ranks equals the sum of positive ranks
*p < = .05 (2-tailed) **p < = .01 (2-tailed).

A two-tailed Kendall's tau-b correlation coefficient was used to explore associations between children's scores in Practice 1, Practice 2 and the McKI, in corresponding metacognitive and self-regulatory categories. As in previous analyses, Kendall's tau-b was favoured over Spearman's correlation in this instance because of the large number of tied-ranks in the data (Wilcox, 2005). Results are reported in Table 74.

Table 74
Kendall's tau-b correlation co-efficients for metacognitive categories from Practice 1 and corresponding context-specific metacognitive categories from McKI

	KoP (McKI)	KoT (McKI)	KoS (McKI)	E (McKI)	EMM (McKI)	EMC (McKI)
KoP (Prac 1)	.09	.20	-.18	.08	-.28	.
KoT (Prac 1)	.	.	.	.	.	.
KoS (Prac 1)	.	.	.	.	.	.
E (Prac 1)	.97	.93	.49	-.47**	-.21	.00
EMM (Prac 1)	-.42*	-.17	-.18	-.39*	-.28	-.14
EMC (Prac 1)	-.16	-.14	.12	-.15	-.23	.00

Note. McKI = Metacognitive Knowledge Interview; Prac 1 = Practice 1, Practice 2 = Practice 2; KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control).
*p < = .05 (2-tailed) **p < = .01 (2-tailed).

Kendall's tau-b found significant negative correlations between mean scores for Evaluation (E) in Practice 1 and McKI (τ_b = -.47, N = 30, p = .009); E in the McKI and Emotional/Motivational Monitoring (EMM) in Practice 1 (τ_b = -.39, N = 30, p = .03); and EMM during Practice 1 and Knowledge of Persons (KoP) in McKI (τ_b = -.42, N = 30, p = .02). No statistically significant correlations were found between mean scores for corresponding metacognitive and self-regulatory categories in Practice 2 and in the McKI.

Table 75
Kendall's tau-b correlation co-efficients for metacognitive categories from Practice 2 and corresponding context-specific metacognitive categories from McKI

	KoP (McKI)	KoT (McKI)	KoS (McKI)	E (McKI)	EMM (McKI)	EMC (McKI)
KoP (Prac 2)	-.16	.07	-.13	.16	-.08	-.39
KoT (Prac 2)	-.09	.07	.08	.27	-.07	.79
KoS (Prac 2)	-.05	.21	.33	.14	-.14	.21
E (Prac 2)	.08	-.00	.00	-.16	-.24	.43
EMM (Prac 2)	.01	.06	-.05	.05	.25	.59
EMC (Prac 2)	-.01	-.15	-.22	.02	-.15	-.24

Note - McKI = Metacognitive Knowledge Interview; Prac 1 = Practice 1, Practice 2 = Practice 2; KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control).

In addition to these analyses of category scores, a Kendall's tau-b correlation was used to investigate associations between children's overall mean scores across all categories in Practice 1 and the McKI.

Table 76
Kendall's tau-b correlation co-efficients for mean scores in Practice 1, Practice 2 and McKI

	McKI
Practice 1	-.14
Practice 2	.03

Note. McKI = Metacognitive Knowledge Interview

As shown in Table 76, no statistically significant correlations were found between indicators of children's metacognition and self-regulation in Practice 1 and the McKI (τ_b = -.14, N = 30, p = .31) and Practice 2 and the McKI (τ_b = .03, N = 30, p = .84).

6.4.1.5 Children's Musical Achievement

Table 77 reports children's musical achievement scores for 24 out of 30 participants, as reported by children's piano teachers in a musical achievement questionnaire. As discussed, scores for each question were given on a 5-point Likert scale, with total scores given out of 25. Due to some questions being left unanswered (*n/a*) by piano teachers, mean scores were calculated for each participant. Excluding participants for whom teachers left items unanswered, the highest total score as reported by the independent examiner in this sample (n = 21), was 24 and the lowest was 8 (M = 19.21, SD = 4.12). Within the full sample of teachers' scores (N = 24), the highest mean score (out of 5) was 4.8 and the lowest was 1.6 (M = 3.81, SD = .76).

Table 77
Children's musical achievement scores (N = 24), as assessed by their piano teacher

Participant	Pitch	Time	Tone	Shape	Performance	Total	Mean
1	4	4	4	3	4	19	3.8
2	5	3	3	3	4	18	3.6
4	2	2	1	1	2	8	1.6
5	5	5	4	4	4	22	4.4
6	4	5	4	4	4	21	4.2
7	5	4.5	3.5	4	5	22	4.4
8	5	5	3	4	4	21	4.2
9	4	4	n/a	3	3	14	3.5
10	5	5	4	4	4.5	22.5	4.5
11	4	3	3	3	3	16	3.2
12	3	3	2	2	3	13	2.6
13	5	4	4	4	5	22	4.4
17	4	3	3	3	4	17	3.4
18	4	4	n/a	3	4	15	3.75
19	5	5	4	4	4	22	4.4
20	4	3	4	3	4	18	3.6
23	5	4	4	4	5	22	4.4
24	4	4	n/a	3	3	14	3.5
25	5	4	4	4	4	21	4.2
26	5	5	5	4	5	24	4.8
27	2	3	3	2	2	12	2.4
28	5	5	5	4	5	24	4.8
29	4	4	4	4	4	20	4
30	4	4	3	4	4	19	3.8

Table 78 reports musical achievement scores for all 30 participants as given by an independent music examiner. The highest total score as reported by the independent examiner in this sample (N = 30) was 22 and the lowest was 7 (M = 14.30, SD = 3.50). The highest mean score was 4.4 and the lowest was 1.4 (M = 3.00, SD = .70).

Table 78
Children's musical achievement scores (N = 30), as assessed by an independent examiner

Participant	Pitch	Time	Tone	Shape	Performance	Total	Mean
1	4	2	3	3	2	14	2.8
2	4	2	3	3	3	15	3
3	3	2	3	2	3	13	2.6
4	2	2	2	2	1	9	1.8
5	4	3	4	4	3	18	3.6
6	4	3	4	3	4	18	3.6
7	4	2	3	3	3	15	3
8	3	2	3	3	3	14	2.8
9	3	2	3	1	3	12	2.4
10	4	3	3	3	3	16	3.2
11	3	1	3	2	2	11	2.2
12	3	3	3	4	3	16	3.2
13	4	3	3	3	3	16	3.2
14	3	3	4	3	3	16	3.2
15	3	3	3	3	4	16	3.2
16	5	4	4	5	4	22	4.4
17	3	2	2	2	2	11	2.2
18	2	1	2	1	1	7	1.4
19	3	3	3	4	3	16	3.2
20	4	3	3	3	3	16	3.2
21	4	2	3	3	4	16	3.2
22	5	3	3	3	4	18	3.6
23	2	1	2	3	2	10	2
24	3	1	3	2	2	11	2.2
25	4	3	3	4	3	17	3.4
26	4	3	5	5	4	21	4.2
27	3	2	3	2	2	12	2.4
28	4	3	4	5	4	20	4
29	3	3	3	3	4	16	3.2
30	2	2	3	2	3	12	2.4

Table 79 reports musical achievement scores for the 24 participants who received musical achievement scores for their piano teachers, as reported by piano teachers and the independent examiner. Within the 24-participant sample, the highest mean score was 4.2 and the lowest was 1.4 (M = 2.86, SD = .70) (see Table 80).

Table 79
Comparison of children's mean musical achievement scores (n =24), as reported by children's piano teachers and an independent examiner

Participant	Teacher	Examiner
1	3.8	2.8
2	3.6	3
4	1.6	1.8
5	4.4	3.6
6	4.2	3.6
7	4.4	3
8	4.2	2.8
9	3.5	2.4
10	4.5	3.2
11	3.2	2.2
12	2.6	3.2
13	4.4	3.2
17	3.4	2.2
18	3.75	1.4
19	4.4	3.2
20	3.6	3.2
23	4.4	2
24	3.5	2.2
25	4.2	3.4
26	4.8	4.2
27	2.4	2.4
28	4.8	4
29	4	3.2
30	3.8	2.4

Table 80
Descriptive statistics for children's mean musical achievement scores, as assessed by their piano teachers and an independent examiner

	N	Mean	SD	Skewness	Kurtosis
Musical Achievement Score (teacher)*	24	3.81	.76	-1.25	1.72
Musical Achievement Score (examiner)*	24	2.86	.70	-.132	.381
Musical Achievement Score (examiner)	30	2.96	.70	-.122	-.096

** used for Wilcoxon signed-rank test*

A two-tailed Wilcoxon signed-rank test was used to explore differences between children's mean musical achievement scores (within the 24-participant sample) as reported by children's piano teachers (*Mdn* = 3.90) and by an independent examiner (*Mdn* = 3.00). Wilcoxon's test found that teachers' scores of their pupils' musical achievement were significantly different from those reported by the independent examiner (z = -4.04, p = <.001, r = .82).

6.4.1.6 Associations Between Children's Metacognition, Self-Regulation and Musical Achievement

In order to explore associations between children's metacognition and self-regulation whilst practising and children's musical achievement, a two-tailed Kendall's tau-b correlation co-efficient was calculated between mean scores of children's level of musical achievement (as reported by an independent examiner) and children's mean scores from Practice 1. Kendall's tau-b correlation coefficient found no statistically significant correlations between children's musical achievement and their Practice 1 scores (τ_b = -.14, N = 30, p = .31).

As children's mean scores in the McKI and mean scores for children's musical achievement level (as reported by the examiner) met assumptions for parametric testing, a two-tailed Pearson's product moment was used to investigate associations between children's metacognition and self-regulation as reported in the McKI with their musical achievement level. Pearson' r calculated a statistically significant negative correlation between children's metacognition, as measured through the McKI, and their musical achievement level (r = -.365, df = 28, p = .05) – a result which suggests that children who obtained higher musical achievement scores tended to score lower in the McKI, and vice versa.

6.4.2 RQ2a – Children's Metacognition/Self-Regulation and Age

A two-tailed Kendall's tau-b correlation was used to explore associations between children's age (M = 7.77, SD = .95) and their metacognitive and self-regulatory abilities (M =.75, SD = .15)., as measured in the McKI. As reported in Table 81, a strong positive correlation was found between children's age and mean scores in the McKI (τ_b = .39, p = .007), but not Practice 1 (τ_b = .21, p = .17) or 2 (τ_b = .11, p = .46).

Table 81
Kendall's tau-b correlations for children's age and Practice 1, Practice 2, and McKI scores

	Practice 1	**Practice 2**	**McKI**
Age	.21	.11	.39**

Note. McKI = Metacognitive Knowledge Interview
**p* < = .05 (2-tailed) ***p* < = .01 (2-tailed).

Kendall's tau-b was also used to test associations between children's age and different metacognitive and self-regulatory categories in Practice 1 (M = .12, SD = .04), Practice 2 (M = .14, SD = .04) and the McKI, as reported in Tables 82-84.

Table 82
Results for two-tailed Kendall's tau-b correlation test between children's age and Practice 1 scores across context-metacognitive and self-regulatory categories

	KoP	**KoT**	**KoS**	**P**	**M**	**C**	**E**	**EMM**	**EMC**
Age	-.031	.	.	-.10	.13	.30*	.16	.16	.17

Note. KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control).
**p* < = .05 (2-tailed) ***p* < = .01 (2-tailed).

Table 83
Results for two-tailed Kendall's tau-b correlation test between Children's age and Practice 2 scores across context-metacognitive and self-regulatory categories

	KoP	**KoT**	**KoS**	**P**	**M**	**C**	**E**	**EMM**	**EMC**
Age	.06	.01	.01	.06	.27	.08	.05	-.31	-.01

Note. KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control).
**p* < = .05 (2-tailed) ***p* < = .01 (2-tailed).

Table 84
Results for two-tailed Kendall's tau-b correlation test between children's age and McKI scores across context-specific and general metacognitive and self-regulatory categories

	KoT (CS)	KoT (G)	KoP (CS)	KoP (G)	KoS (CS)	KoS (G)	E (CS)	E (G)	EMC (CS)	EMC (G)
Age	.32	.10	-.13	.31	.45*	.241	.020	.40*	.33	.22

Note. CS = context-specific; G = general; KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control
* p < = .05 (2-tailed) ** p < = .01 (2-tailed).

Kendall's tau-b revealed positive correlations between children's age and context-specific Knowledge of Strategies ($\tau_b = .45$, $p = .011$), and children's age and general Evaluation ($\tau_b = .40$, $p = .020$) during the McKI. Additionally, a positive correlation was found between children's use of Control behaviours during Practice 1 and their age ($\tau_b = .30$, $p = .048$). No other statistically significant correlations were found.

6.4.3 RQ2b – Children's Musical Achievement and Age

A two-tailed Kendall's tau-b correlation was used to investigate the extent to which children's musical achievement (M = 14.30, SD = 3.5) is associated with age (M = 7.77, SD = .95). No statistically significant correlation was found ($\tau_b = -.094$, $p = .529$).

In order to control for possible associations between the length of time spent learning (M = 22.67, SD = 12.07) and children's musical achievement, Pearson's r was also used to test associations between months spent learning to play the piano. A Shapiro-Wilk test indicated that both time spent learning ($W(30) = .95$, $p = .112$) and musical achievement scores ($W(30) = .97$, $p = .510$) were normally distributed, hence the use of a parametric test. No statistically significant correlation was revealed (r =. 085, df = 29, p = .655).

6.4.4 RQ3 – Musical Achievement, Metacognition/Self-Regulation and Parental Support

6.4.4.1 Practice 2 - Observed Parental Support

Table 85 reports scores for parents' metacognitive and self-regulatory support of their children during Practice 2 (parent-supervised practice).

Table 85
Parents' observed metacognitive and self-regulatory support of their children during Practice 2 (parent-supervised practice)

Participant	KoP	KoT	KoS	P	M	C	E	EMM	EMC	Mean
1	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.01
2	0.00	0.00	0.00	0.25	0.08	0.04	0.00	0.00	0.00	0.04
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.01
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.13	0.00	0.13	0.04	0.14	0.05	0.00	0.00	0.05
7	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.02
8	0.13	0.00	0.33	0.06	0.21	0.25	0.10	0.25	0.13	0.16
9	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.04
10	0.13	0.00	0.42	0.19	0.17	0.14	0.00	0.00	0.00	0.12
11	0.25	0.13	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.06
12	0.00	0.13	0.00	0.00	0.17	0.07	0.10	0.00	0.00	0.05
13	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.01
14	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.01
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.01
18	0.00	0.13	0.00	0.19	0.08	0.14	0.00	0.00	0.13	0.07
19	0.00	0.00	0.17	0.00	0.08	0.04	0.00	0.00	0.00	0.03
20	0.00	0.00	0.08	0.06	0.00	0.00	0.00	0.00	0.00	0.02
21	0.00	0.00	0.00	0.06	0.00	0.04	0.00	0.00	0.00	0.01
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.33	0.00	0.13	0.00	0.05	0.00	0.00	0.06
24	0.00	0.00	0.08	0.13	0.00	0.07	0.00	0.00	0.00	0.03
25	0.00	0.00	0.25	0.06	0.21	0.04	0.00	0.00	0.00	0.06
26	0.00	0.13	0.08	0.25	0.04	0.14	0.10	0.00	0.00	0.08
27	0.00	0.00	0.00	0.13	0.00	0.04	0.00	0.00	0.00	0.02
28	0.00	0.00	0.00	0.06	0.00	0.04	0.00	0.00	0.00	0.01
29	0.00	0.00	0.00	0.19	0.04	0.00	0.00	0.00	0.00	0.03
30	0.00	0.00	0.08	0.00	0.04	0.07	0.00	0.00	0.00	0.02

Note. *KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control*

The behaviours parents supported most often during Practice 2 were related to Knowledge of Strategies (KoS), (*M* = .08, *SD* = .13). The metacognitive behaviours parents supported least often in Practice 2 were related to Knowledge of Persons (KoP), (*M* = .05, *SD* = .07). The metacognitive/self-regulatory behaviours (from all nine metacognitive and self-regulatory categories) parents supported the least were related to self-regulation; namely Emotional/Motivational Monitoring (EMM) (*M* = .01, *SD* = 0.5) and Emotional/Motivational Control (EMC) (*M* = .01, *SD* = .03). The highest mean score from participants in Practice 2 was .15 and the lowest was .00 (*M* = .03, *SD* = .04).

Table 86
Descriptive statistics for mean scores from nine parental metacognitive support categories, as observed in Practice 2, in rank order by mean score (from highest to lowest)

	Mean	SD	Skewness	Kurtosis
KoS	.08	.13	1.63	1.44
P	.07	.08	1.03	-.16
C	.05	.06	1.46	2.02
M	.05	.07	1.42	.87
KoT	.02	.05	1.88	1.66
KoP	.02	.05	3.43	11.88
EMC	.01	.03	3.66	12.21
EMM	.01	.05	5.48	30.00

Note. KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control

In addition to descriptive statistics, a two-tailed Kendall's tau-b correlation co-efficient was used to explore associations between areas of metacognition/self-regulation that parents support their children with during Practice 2. As shown in Table 87, a large number of statistically significant positive correlations were found. In particular, statistically significant positive correlations were found between Knowledge of Persons and Emotional/Motivational Monitoring (τ_b = .53, *p* = .004); Knowledge of Task and Evaluation (τ_b = .52, *p* = .005); Monitoring and Evaluation (τ_b = .48, *p* = .005); and Emotional/Motivational Monitoring and

Emotional/Motivational Control (τ_{b} = .70, p = <.001). For the complete list of p values for all correlated items, see Appendix M.

Table 87
Kendall's tau-b correlation co-efficients for mean scores for parental support of children's metacognitive and self-regulatory behaviours whilst practising (Practice 2)

	KoP	**KoT**	**KoS**	**P**	**M**	**C**	**E**	**EMM**	**EMC**
KoP									
KoT	.17								
KoS	.27	-.20							
P	.28	.35*	-.01						
M	.24	.23	.35*	.23					
C	.20	.33	.10	.32*	.37*				
E	.15	.52**	.20	.11	.48**	.37*			
EMM	.53**	-.08	.29	.06	.31	.30	.35*		
EMC	.34	.24	.11	.22	.35*	.39*	.26	.70**	

Note. KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control.
* p < = .05 (2-tailed) ** p < = .01 (2-tailed).

6.4.4.2 Parent Questionnaire - Reported Parental Support

Table 88 reports parent questionnaire scores (N = 28) for items relating to support of children's metacognition and self-regulation, across eight categories. As discussed, mean scores for two participants (9 and 18) out of the 30 were removed due large numbers of unanswered items and subsequent missing values for these respondents.

Table 88
Parents' scores for metacognitive and self-regulatory items in the parent questionnaire

Participant	KoP1	KoT1	KoS1	P2	M5	C1	E4	EMC1	Mean
1	7	7	7	7	7	7	7	7	5.88
2	7	7	7	6	7	7	7	6	6.13
3	4	2	3	1	6	5	4	6	3.88
4	7	7	7	6	6	7	7	7	6.88
5	6	4	4	3	5	3	4	7	4.75
6	6	6	6	6	7	7	6	7	6.00
7	7	6	7	6	6	6	6	7	5.38
8	7	5	6	6	7	7	6	7	4.50
9	n/a	n/a	n/a	n/a	6	n/a	5	7	n/a
10	6	5	6	6	6	7	5	7	6.14
11	6	5	6	6	6	6	6	7	6.13
12	6	4	5	5	5	6	5	7	4.88
13	6	5	7	6	5	6	6	7	5.25
14	6	6	6	6	6	6	6	6	5.25
15	5	5	6	5	4	6	4	6	3.75
16	5	5	6	5	4	6	4	6	3.75
17	4	5	4	6	6	6	6	7	6.25
18	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
19	5	5	6	7	7	7	7	7	4.00
20	6	5	6	5	5	5	5	7	5.88
21	6	n/a	5	7	5	4	3	5	5.00
22	7	7	7	2	7	7	7	7	5.13
23	2	2	2	2	2	2	3	2	4.13
24	4	4	3	4	5	3	4	5	5.75
25	7	7	7	7	7	7	7	7	2.88
26	5	3	5	5	7	7	5	7	5.38
27	7	6	6	6	6	6	6	7	6.88
28	5	5	4	5	6	6	6	6	5.25
29	5	5	4	5	6	6	6	6	5.25
30	4	2	3	3	5	4	4	6	6.25

Note - KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control). Numbers next to metacognitive/self-regulatory category labels indicate which specific item this question is based on from the full 32-item list (see Section 6.2.7.1).

Descriptive statistics for mean scores for each category are described in Table 89. The area of metacognition or self-regulation parents reported supporting their children with the most was Emotional/Motivational Control (EMC) – more specifically, supporting their child to "control their attention whilst practising, for example by encouraging my child to turn off the TV, radio, phone or any other distractions whilst practising, and/or persuading them to return to their practice after a momentary distraction" (*M* = 6.39, *SD* = 1.07). The area parents reported supporting their child with the least was Knowledge of Task (KoT) - more specifically, supporting their child to "be able to compare different kinds of tasks with each other, for example by encouraging my child to compare the experience of practising pieces with practising sight-reading or scales" (*M* = 5, *SD* = 1.47). Overall, the highest mean score in the parent questionnaire was 7 and the lowest was 2.13 (*M* = 5.5, *SD* = .1.08).

Table 89
Descriptive statistics for mean scores from nine parental metacognitive support categories, as reported in the parent questionnaire, in rank order (from highest to lowest)

	N	Mean	SD	Skewness	Kurtosis
EMC1	29	6.41	1.05	-2.91	10.70
C1	28	5.79	1.40	-1.34	1.11
M5	29	5.76	1.15	-1.29	2.63
KoP1	28	5.64	1.25	-.96	1.01
E4	29	5.41	1.24	-.39	-.89
KoS1	28	5.39	1.47	-.75	-.48
P2	28	5.14	1.60	-1.18	.74
KoT1	27	5.00	1.49	-.61	-.11

Note - KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control). Numbers next to metacognitive/self-regulatory category labels indicate which specific item this question is based on from the full 32-item list (see Section 6.2.7.1 Parental Metacognitive and Self-Regulatory Support).

A two-tailed Kendall's tau-b correlation test was used to calculate possible correlations between areas of metacognition and self-regulation parents reported supporting their children with during piano practice. Statistically significant correlations were found across all eight metacognitive items in the questionnaire, except for Knowledge of Task (KoT1) and Emotional/Motivational Control (EMC1). Spearman co-efficients for all inter-item correlations are reported in Table 90. For exact *p* values for all correlated items, see Appendix N.

Table 90
Spearman correlation co-efficients for parental support of children's metacognitive and self-regulatory behaviours, as reported by parents in the parent questionnaire

	KoP1	**KoT1**	**KoS1**	**P2**	**M5**	**C1**	**E4**	**EMC1**
KoP								
KoT1	.71**							
KoS1	.76**	.71*						
P2	.47**	.61**	.53**					
M5	.43**	.49**	.38*	.40*				
C1	.49**	.59**	.61**	.48*	.74**			
E4	.56**	.77**	.62**	.54**	.70**	.70**		
EMC1	.50**	.32	.48**	.34*	.44**	.53**	.47**	

Note - KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMC = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control).
$*p <= .05$ (2-tailed) $**p <= .01$ (2-tailed).

6.4.4.3 Observed Parental Support vs. Reported Parental Support

Table 91 reports parents' total scores from the parent questionnaire and parents' total scores from Practice 2 as percentages. In order to explore possible differences in observed and reported parental support, a Wilcoxon signed-rank test was conducted to compare parents' parental metacognitive and self-regulatory support scores in the questionnaire (*Mdn* = 78.57*)* and parental support scores from Practice 2 (*Mdn* = 1.79). Due to one parent (participant 18) preferring not to answer the questions in the Parent Questionnaire relating to parental metacognitive support, only 29 pairs were tested ($n = 29$). Analysis revealed a statistically significant difference between parents' reported metacognitive and self-regulatory support (as measured in the Parent Questionnaire) and metacognitive and self-regulatory support scores given by the researcher based on parents' observed behaviour in Practice 2 ($z = -4.70$, $p = <.001$, $r = .87$) – a result which indicates that parents' metacognitive/self-regulatory support scores on the questionnaire were significantly higher than scores for observed parental support during Practice 2.

Table 91
Percentage scores for parental metacognitive and self-regulatory support, as reported by parents in the Parent Questionnaire and as observed in Practice 2

Participant	Observed Parental Support (Practice 2)	Reported Parental Support (Parent Questionnaire)
1	0.93	100.00
2	4.10	96.43
3	0.00	55.36
4	0.69	96.43
5	0.00	64.29
6	5.38	91.07
7	1.59	91.07
8	16.16	91.07
9	3.70	32.14
10	11.54	85.71
11	5.56	85.71
12	5.15	76.79
13	0.93	85.71
14	0.93	85.71
15	0.00	73.21
16	0.40	73.21
17	0.79	78.57
18	7.37	n/a
19	3.17	91.07
20	1.62	78.57
21	1.09	62.50
22	0.00	91.07
23	5.65	30.36
24	3.11	57.14
25	6.18	100.00
26	8.25	78.57
27	1.79	89.29
28	1.09	76.79
29	2.55	76.79
30	2.18	55.36

6.4.4.4 Associations Between Children's Metacognition and Self-Regulation, and Parental Support

A two-tailed Kendall's tau-b correlation was used to explore associations between children's observed metacognition (whilst practising the piano unsupervised in Practice 1, M =.12, SD = .04; and whilst practising supervised by a parent in Practice 2, M = .14, SD = .03), children's reported metacognition (McKI, M = .95, SD = .76), parents' observed support

(Practice 2, M = .03, SD = .04) and parents' reported support (Parent Questionnaire, M = 5.58, SD = 1.08). Correlations are reported in Table 92. Although children's scores in Practice 1 and 2 had relatively few tied-ranks, the large number of identical scores in the Parent Questionnaire and McKI made the use of Kendall's tau-b correlation preferable to Spearman's in this instance.

Table 92
Kendall's correlation co-efficients for mean scores for children's observed metacognition (Practice 1 and 2), children's reported metacognition (McKI), parents' observed metacognition (Practice 2) and parents' reported metacognition (Parent Questionnaire)

	Practice 1 (child)	Practice 2 (child)	Practice 2 (parent)	Parent Questionnaire	McKI
Practice 1 (child)					
Practice 2 (child)	.44**				
Practice 2 (parent)	-.32*	.04			
Parent Questionnaire	.35	-.05	.18		
McKI	-.14	.03	.28*	-.04	

Note. McKI = Metacognitive Knowledge Interview
*p < = .05 (2-tailed) **p < = .01 (2-tailed).

Kendall's tau-b indicated a statistically significant negative correlation between parental support in Practice 2 and children's metacognition and self-regulation, as observed in Practice 1 (τ_b = -.32, p = .023). Additionally, statistically significant positive correlations were observed between children's Practice 1 and Practice 2 scores (τ_b = .44, p = .001); and parents' support scores in Practice 2 and children's McKI scores (τ_b = .28, p = .033).

6.4.5 RQ3a – Metacognition/Self-Regulation and Parental Supervision

In order to investigate possible differences in children's metacognition and self-regulation while practising independently (Practice 1) and practising with the help of a parent (Practice 2), a two-tailed Wilcoxon signed-rank test was used to compare children's metacognition scores in Practice 1 (unsupervised practice, Mdn = .12) and their metacognition scores from Practice 2 (parent-supervised practice; Mdn = .15). Table 93 describes children's mean scores from Practice 1 and Practice 2.

Table 93
Comparison of children's mean scores from Practice 1 and Practice 2

Participant	Practice 1 (independent)	Practice 2 (parent-supervised)
1	0.26	0.20
2	0.12	0.13
3	0.12	0.17
4	0.10	0.09
5	0.08	0.10
6	0.14	0.19
7	0.12	0.15
8	0.10	0.13
9	0.13	0.16
10	0.10	0.15
11	0.11	0.17
12	0.11	0.17
13	0.12	0.08
14	0.13	0.15
15	0.17	0.18
16	0.20	0.17
17	0.15	0.16
18	0.01	0.10
19	0.12	0.13
20	0.14	0.16
21	0.10	0.13
22	0.13	0.13
23	0.09	0.14
24	0.09	0.15
25	0.10	0.13
26	0.11	0.17
27	0.11	0.12
28	0.11	0.09
29	0.15	0.14
30	0.09	0.09

Analysis revealed a statistically significant difference between Practice 1 and Practice 2 scores (z = -2.93, p = .003, r = .53) – a result which suggests that children tend to demonstrate more metacognition and self-regulation when practising with a parent, than when they practice on their own.

6.4.6 RQ3b – Parental Support and Parents' Previous Musical Experience

A two-tailed Mann-Whitney test was used to compare possible differences in parental metacognitive and self-regulatory support between parents with and without previous musical experience – as measured through mean scores in Practice 2 and the parent questionnaire. As discussed earlier, previous musical experience was decided on the basis of the experience of the parent who took part in Practice 2 and completed the questionnaire. Results of the Mann-Whitney test are reported in Table 94.

Table 94
Mann-Whitney U results for parental support scores from Practice 2 and the parent questionnaire, for parents with and without previous musical experience

	Practice 2	**Parent Questionnaire**
Mann-Whitney U	42.00	99.50
Z	-2.72	-.216
Asymp. Sig. (2-tailed)	.007	.829

Note. Asymp sig. (2-tailed) =Asymptotic significance level (*p* value).

Analysis revealed statistically significant differences in mean scores in Practice 2 between parents with (*Mdn* = .03) and without (*Mdn* = .01) previous musical experience (U = 42.00, p = .007, r = .50), but not between parents with (*Mdn* = 5.50) and without (*Mdn* = 6.00) previous musical experience in the parent questionnaire (U = 99.50, p = .829, r = .04) – a result which indicates differences in observed parental support, but not reported parental support.

6.4.7 RQ4 – Musical Achievement, Metacognition/Self-Regulation and Parenting Style

Table 95 reports parents' mean scores for questions relating to Rules and Respect (RR) and Affection and Attachment (AA) in the parent questionnaire, alongside children's mean scores from Practice 1 and the Metacognitive Knowledge Interview (McKI), and children's musical achievement scores (as assessed by an independent examiner) (N=30).

Table 95
Percentage scores for Rules and Respect, and Attachment and Affection dimensions of the Parent Questionnaire; and children's Practice 1, McKI and Musical Achievement scores (as reported by an independent examiner)

	Parent		Child		
Participant	**Rules and Respect**	**Attachment and Affection**	**Practice 1**	**McKI**	**Musical Achievement**
1	5.88	5.50	0.26	0.50	2.8
2	6.13	5.25	0.12	0.70	3
3	3.88	6.13	0.12	0.63	2.6
4	6.88	6.50	0.10	0.77	1.8
5	4.75	5.50	0.08	0.65	3.6
6	6.00	7.00	0.14	0.80	3.6
7	5.38	5.88	0.12	0.65	3
8	4.50	6.38	0.10	0.66	2.8
9	5.38	7.00	0.13	0.89	2.4
10	6.14	6.00	0.10	0.86	3.2
11	6.13	7.00	0.11	0.86	2.2
12	4.88	6.13	0.11	0.70	3.2
13	5.25	4.88	0.12	0.75	3.2
14	5.25	4.88	0.13	0.94	3.2
15	3.75	5.75	0.17	0.70	3.2
16	3.75	5.75	0.20	0.55	4.4
17	6.25	5.25	0.15	0.90	2.2
18	4.57	4.29	0.01	0.85	1.4
19	4.00	6.25	0.12	0.85	3.2
20	5.88	5.75	0.14	0.95	3.2
21	5.00	5.50	0.10	0.95	3.2
22	5.13	6.00	0.13	0.43	3.6
23	4.13	3.50	0.09	0.85	2
24	5.75	5.88	0.09	0.88	2.2
25	2.88	6.63	0.10	0.95	3.4
26	5.38	6.50	0.11	0.73	4.2
27	6.88	6.25	0.11	0.64	2.4
28	5.25	5.38	0.11	0.48	4
29	5.25	5.38	0.15	0.80	3.2
30	6.25	6.38	0.09	0.80	2.4

Note. McKI = Metacognitive Knowledge Interview

Scores for items in the parent questionnaire were given on a 7-point Likert scale. The highest mean score for RR items in the questionnaire was 6.88 and the lowest was 2.88 (M =

5.22, *SD* =.98). The highest mean score for AA items was 7 and the lowest score was 3.6 (*M* = 5.82, *SD* = .78). Descriptive statistics are reported in Table 96.

Table 96
Descriptive statistics for Parent scores for Rules and Respect, and Attachment and Affection dimensions of the Parent Questionnaire

	N	Mean	SD	Skewness	Kurtosis
Rules and Respect	30	5.28	.98	-.88	-.198
Attachment and Affection	30	5.82	.78	-.42	-1.477

A two-tailed Kendall's tau-b correlation coefficient was used to explore associations between parents scores in the RR (*M* = .5.28, *SD* = .98) and AA (*M* = .5.82, *SD* = .78) dimensions of the parent questionnaire; children's metacognition (as observed in Practice 1, *M* = .12, *SD* = .04; and in the McKI, *M* = .76, *SD* = .15); and children's musical achievement (as reported by an independent examiner, *M* = 2.96, *SD* = .70). Inter-item correlations are reported in Table 97.

Table 97
Kendall's tau-b correlation co-efficients for mean scores for Rules and Respect, and Attachment and Affection dimensions of the Parent Questionnaire; mean scores for children's metacognition in Practice 1 and McKI; and mean scores for children's musical achievement (as assessed by an independent examiner)

	Practice 1	McKI	Musical Achievement
Rules and Respect	.017	.083	-.270*
Attachment and Affection	-.061	.036	.005

Note. McKI = Metacognitive Knowledge Interview
* $p < = .05$ (2-tailed) ** $p < = .01$ (2-tailed).

A statistically significant negative correlation was found between musical achievement and RR ($\tau_b = -.270$, $p = .047$), a result which suggests that parents whose parenting style beliefs reflected a high level of demandingness had children who were assessed as having lower musical achievement.

In order to explore associations between parenting style beliefs and reported parental support in the parent questionnaire, a Pearson's product moment was also used. As discussed, Shapiro-Wilk' test indicated that data for AA ($W(30)$ = 947, df = 30, p = .139), RR ($W(30)$ = .968, df = 30, p = .482) and parental metacognitive support ($W(30)$ = 895, df = 30, p = .006) dimensions of the parent questionnaire were all normally distributed and therefore met assumptions for parametric testing. The results of the Pearson's correlation test are reported in Table 98.

Table 98
Pearson's correlation co-efficients for mean scores for Rules and Respect, Attachment and Affection and parental metacognitive and self-regulatory support dimensions of the Parent Questionnaire

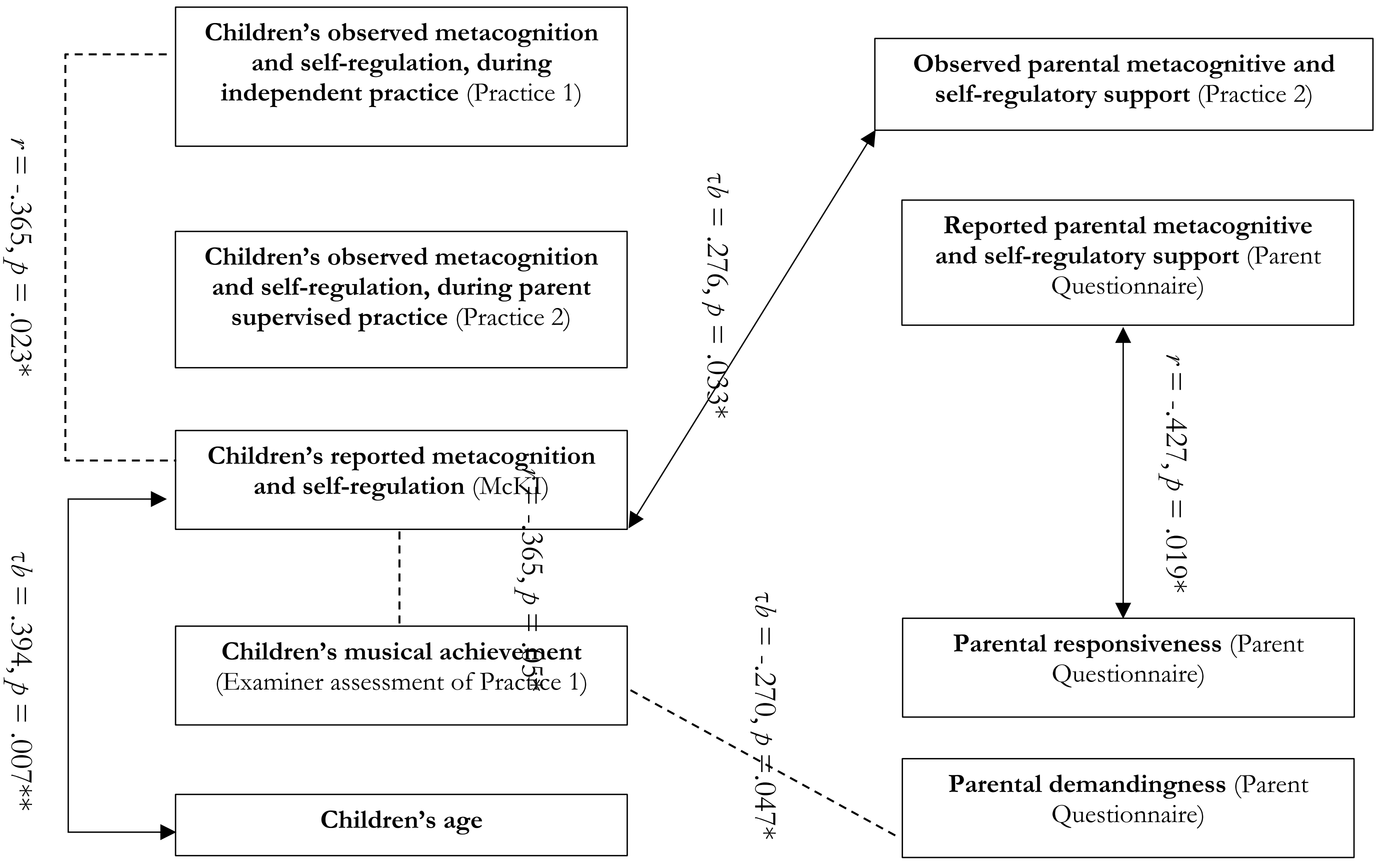
	Rules and Respect	**Attachment and Affection**	**Metacognitive and Self-Regulatory Support**
Rules and Respect	1		
Attachment and Affection	.183	1	
Metacognitive and Self-Regulatory Support	.231	.427*	1

*p < = .05 (2-tailed) **p < = .01 (2-tailed).

A statistically significant positive correlation was found between parents' AA scores and parental metacognitive and self-regulatory support as reported in the questionnaire (r = .43, N = 30, p = .02) – a result which suggests that parents who reported giving their children more metacognitive and self-regulatory support held parenting style beliefs which reflected a high level of parental responsiveness.

6.5 Discussion

The present study aimed to explore associations between parental support, parenting style beliefs, children's metacognition and self-regulation, and children's musical achievement. The results of this multi-method study paint a complex picture of the associations between parental support and children's musical learning (illustrated in Figure 20), with different measures (video data, interviews and questionnaires) producing contrasting results.



Key:

= positive correlation
= negative correlation

Figure 20
Overview of statistically significant correlations found in Study 2, with effect sizes and significance levels
Note. *p < = .05 (2-tailed) **p < = .01 (2-tailed).

The following section interprets the findings of this study, as well as discussing the study's limitations and implications for future research.

6.5.1 Indicators of Children's Metacognition and Self-Regulation in Practice 1

Findings from Practice 1 suggest that children were most likely to use behaviours related to Emotional/Motivational Control and Monitoring whilst practising on their own. In particular, although most children in the sample experienced momentary distractions whilst practising, all but a few were able to turn their attention back to practising afterwards – a key indicator of self-regulatory abilities. Similarly, the children frequently used Monitoring behaviours, such as detecting errors and correcting mistakes, to support their practice. These findings support the view that, contrary to the opinion that metacognitive abilities only emerge after the age of 9 (Veenman et al., 2006), even young children are able to employ metacognitive and self-regulatory techniques to support their learning.

The behaviours children used the least in Practice 1 (Knowledge of Task and Knowledge of Strategies) were related to metacognitive knowledge. Given that assessments of these behaviours largely rely on verbal demonstrations – for instance, explaining a task or talking about their strengths and weaknesses to someone else – it may be that assessments of children's abilities in this area were methodologically limited and may not reflect children's actual metacognitive knowledge. Unless children self-commentated (as in a Think-Aloud Protocol), it may not have been possible to observe these internal processes during Practice 1 – a limitation of observational methods, and a benefit of multi-method studies which combine observations with interviews.

In addition to descriptive statistics, analysis also revealed strong positive correlations between metacognitive regulation behaviours used by children during Practice 1 – namely, Monitoring (M) and Control (C), and Evaluation (E) and Control. This finding suggests that children who tended to use Monitoring and Evaluation behaviours to support their practice (for instance, correcting mistakes (M5) or testing the outcome or effectiveness of a strategy (E5)) also tended to use Control (C) behaviours (such as using non-verbal gestures (C6) or applying a previously learned strategy to a new situation (C3)).

6.5.2 Indicators of Children's Metacognition and Self-Regulation in Practice 2

In Practice 2, children employed Emotional/Motivational Control and Monitoring behaviours the most (as in Practice 1) and Evaluation behaviours the least. Children demonstrated more Knowledge of Strategies and Knowledge of Persons during Practice 2 as well, as observed through dialogues between children and their parents. It may also be that parents' presence encouraged children to engage in verbalisations of metacognitive knowledge. The tendency to use fewer Evaluation behaviours during Practice 2 could be due to children relying more on their parents to assess their progress for them, instead of doing so independently. Research suggests that although explicit metacognitive teaching is highly effective in improving children's metacognition (Wall et al., 2017; White & Frederiksen, 2005), adult interference may encourage children to rely on adult help and therefore hinder independent or scaffolded metacognitive thinking (Robson, 2010; Whitebread et al., 2007).

Correlational analysis suggests a strong positive relationship between Evaluation and Knowledge of Task – a finding which supports the view that knowing about a task and what to do, is a key part of being able to evaluate how well you did (Efklides, 2009). A strong negative correlation was found between Monitoring and Emotional/Motivational Monitoring – a surprising result which suggests that children who engaged in metacognitive Monitoring, tended not to monitor their emotions and motivation. Notwithstanding the possibility of a Type 1 error, this dissonance between children's metacognitive and self-regulatory monitoring may be an area which researchers may wish to investigate further.

6.5.3 Indicators of Children's Metacognition and Self-Regulation in McKI

In order to assess children's context-specific and general metacognitive and self-regulatory knowledge in the McKI, children were asked questions about the practice they did in Practice 1 and 2, and the nature of practising the piano more generally. Overall, children scored highest in questions relating to context-specific Evaluation, Knowledge of Persons and Emotional/Motivational Monitoring of the practice they had just completed. Although the use of puppet mediators has been found to help encourage children's responsiveness in interview settings (Cameron, 2005; Danby et al., 2011), children in the present study scored lowest in general questions relating to Evaluation and Knowledge of Strategies asked from the perspective of Gogi.

When mean scores for context-specific and general questions were compared, a statistically significant difference was found – a result which suggests that children may find it easier to metacognitively evaluate a task that they have recently taken part in, than to suggest ways of evaluating a hypothetical task involving someone else. When mean scores for corresponding categories were compared, a significant difference was found between responses to context-specific and general questions about metacognitive Evaluation. Further analysis of McKI scores revealed strong positive correlations between context-specific Knowledge of Task and general Evaluation, as well as between context-specific Knowledge of Strategies and general Knowledge of Persons – a result which suggests that possession of metacognitive knowledge from context-specific tasks may be associated with general knowledge about Evaluation behaviours.

6.5.4 Convergence Between Practice 1, Practice 2 and McKI

One of the aims of the present study was to explore the convergence of results gathered using multi-method measures of children's metacognition and self-regulation. Significant differences were found between scores across categories in the McKI and Practice 1 – measures intended to assess children's declarative context-specific and general metacognitive knowledge and observed metacognition and self-regulation during practice respectively. No correlations were found between children's mean scores in Practice 1, Practice 2 or the McKI. These results replicate findings from other studies which found little or no concordance between results collected using different measures (Pintrich, 2002).

6.5.5 Associations Between Children's Metacognition and Self-Regulation, and Musical Achievement

Analysis revealed no correlation between children's metacognition and self-regulation, as observed whilst practising independently (Practice 1) and their musical achievement (H2). However, children with higher musical achievement scores were found to have lower scores in the McKI – a finding which suggests that the most musically able children were less able to talk about what they did during their practice when interviewed.

There are a number of possible explanations for this. The first is simply that the most musically successful children in the group had the least metacognitive and self-regulatory knowledge. However, given the body of research which supports the view that musical achievement is strongly associated with metacognitive and self-regulatory competence (Bathgate et al., 2012; Hallam et al., 2012; McPherson & Renwick, 2001; Mornell et al., 2018; McPherson et al., 2019), it seems highly unlikely that this is the case. Another possible explanation is that the highest musical achievers in the group tended to be more introverted and struggled to verbalise their thoughts during the interview (Marchant-Haycox & Wilson, 1992; Kemp, 1996). Kemp (2000) suggests that "the preference for solitude is clearly beneficial in those who are required to spend long periods in practice rooms on a daily basis" (p. 96). Moreover, Kemp (2000) argues that the introspective nature of music and the need for musicians to "think in sound", may contribute to musicians' tendency towards introversion (p. 96). More recent studies have found conflicting results. Butkovic and Dupodj (2017) found both classical and heavy metal musicians to be higher in extraversion that the general norm. Similarly, in their study of personality traits between professional musicians and the general workforce in Norway, Vaag, Sund and Bjerkeset (2017) found no evidence to support Kemp's finding of higher introversion scores, except amongst string players. Vaag and colleagues suggest that given string players practiced the most out of the professional musicians in the group, introversion may help you practice for longer – a possibility for children in the present study too. Finally, as discussed in the review of the literature, it may be that some children, introverted or not, felt shy in the presence of the researcher and without their parent, resulting in limited verbal responses to questions (Folque, 2001). Further consideration may be needed of the ways in which different interviewing techniques affect assessments of children's abilities, as discussed in detail in Chapter 7.

6.5.6 Associations Between Children's Metacognition and Self-Regulation, Musical Achievement and Age

An important consideration for research around young children's metacognition and self-regulation is the developmental impact of age. As predicted in H2a, positive associations between children's McKI scores and age, particularly in the areas of Knowledge of Strategies and Evaluation, replicate previous research, suggest that young children's ability to verbalise their thinking improves with age (Whitebread et al., 2015). No significant correlation was found between children's mean Practice 1 scores and children's age. However, a positive correlation was found between children's use of Control behaviours whilst practising and their age. As discussed in section 6.1.5, unlike Monitoring behaviours which appear to develop chronologically with age, there is evidence to suggest that Control behaviours (particularly children's ability to choose appropriate learning strategies) are strongly influenced by children's external experiences (Eme et al., 2006; Puustinen, 1998). In the present study, the older children in the group were most able to use Control behaviours, choose strategies and evaluate their learning – perhaps reflecting that the older children in the group were also the ones with the most musical and metacognitive experience. Children's ability to use other aspects of metacognition and self-regulation (especially those assessed whilst on-task) did not appear to be related to how old they were.

As predicted in H2b, unlike certain aspects of children's metacognition and self-regulation, musical achievement did not increase with children's age, with many young children's abilities well above those of older musicians in the sample. No correlation was found between length of time spent learning and children's musical achievement. It remains unclear why some children are more musically successful than others, particularly in the case of younger children whose abilities overtake that of older musicians where both have begun musical learning at a similar age (see McPherson, 2007). Further research is needed to clarify the complex associations around environmental factors which affect children's musical development and achievement.

6.5.7 Indicators of Parental Support in Practice 2

Findings from Practice 2 suggest that parents supported children's Knowledge of Strategies the most, and Emotional/Motivational Monitoring and Emotional/Motivational Control behaviours the least. A large number of positive inter-item correlations were found between different categories of parental metacognitive and self-regulatory support, indicating (as in Study 1) that parents who were observed supporting certain metacognitive and self-regulatory behaviours also supported others (see section 6.4.1.2 for all inter-item correlations).

6.5.8 Indicators of Parental Support in the Parent Questionnaire

In the parent questionnaire, parents reported supporting their children with Emotional/Motivational Control behaviours the most and Knowledge of Task behaviours the least – an almost opposite result to that of Practice 2. Analysis revealed a statistically significant difference between parents' observed and reported metacognition, with parental support scores from the questionnaire considerably higher than those given by the researcher in Practice 2.

Given that researcher's scores of parental support during Practice 2 were based on only 10-minutes of practice, it may simply be that this was not enough time for parents to demonstrate the full range of metacognitive and self-regulatory support behaviours they use with their children. It may be that the kinds of parental support given to children during their practice generally (as reported in the questionnaire), and the support they gave their child during Practice 2 are separate constructs and not comparable – in which case, one would expect to find different scores. However, it also possible that parents were affected by social desirability bias and overreported what they considered to be "good behaviours" in the questionnaire (Grimm, 2010). The stark differences in observed and reported parental support scores highlights the limitations of using only questionnaires as behavioural measures and the risk to validity posed by unreliable self-report (see section 6.6 Limitations).

6.5.9 Associations Between Parental Support, Children's Metacognition and Self-Regulation, and Musical Achievement

Correlational analysis of children's Practice 1, Practice 2 and McKI scores, and parents' Practice 2 scores, paints a complex picture of the associations between parental support and children's metacognition and self-regulation. Parental support in Practice 2 was positively correlated with children's scores in the McKI. Given that the McKI occurred immediately after Practice 2, it stands to reason that parents' input during Practice 2 and the opportunity to verbalise their thinking to someone else may have helped children to express themselves to the researcher in the McKI.

Children's metacognition and self-regulation in Practice 1 was negatively correlated with the level of parental support given to children in Practice 2 – a finding which suggests that lower scores in Practice 1 were associated with higher parental support scores in Practice 2, and vice versa. One possible explanation is that parents' level of parental support was contingent on their children's level of need. Children who struggled to apply these learning behaviours on their own may have received more help from parents who detected they were struggling. Children who were more metacognitively able, on the other hand, perhaps required (and therefore received) less support from their parents during Practice 2. Given that Practice 2 scores can only provide an indicator of the parental metacognitive and self-regulatory support given during those 10 minutes of piano practice, it is unclear whether children usually receive different levels of parental support in their piano practice as well other areas of learning.

6.5.10 Differences in Children's Metacognition and Self-Regulation During Independent and Parent-Supervised Practice

As predicted in H3a, children demonstrated significantly higher levels of metacognition and self-regulation when practising with a parent than when practising alone. As well as facilitating opportunities for dialogue and demonstrations of declarative metacognitive and self-regulatory knowledge, it may be that children wanted to "show off" to their parents. Research suggests that the presence of adults in children's activities (such as play) may help to confer importance to these events in the eyes of children (Robson, 2010). Given the lack of correlation between children's metacognition and self-regulation, and parental support during Practice 2, it may be that a parent's presence during practice encourages children to use more metacognitive and self-regulatory strategies, irrespective of the level of support given.

6.5.11 Differences in parental support between parents with and without previous musical experience

Comparison of parental support scores of parents with and without previous musical experience indicated no difference in parental metacognitive and self-regulatory support (as reported in the parent questionnaire) between parents with and without previous musical experience – a result which replicates the findings of Study 1.

However, when parental support scores from Practice 2 were compared, parents with previous musical experience were found to give more support to their children than musically untrained parents. Given the disparity between parents' reported parental support and parental support observed by the researcher in Practice 2, and the possible influence of social desirability bias on parent questionnaire responses, the latter result was used to accept the null hypothesis for H3b – that parents with previous musical experience may give more metacognitive and self-regulatory support to children during musical learning. The implications of these findings are discussed in detail in Chapter 7.

6.5.12 Associations Between Parenting Style Beliefs, Children's Metacognition and Self-Regulation, and Musical Achievement

Parental demandingness, measured through responses to Rules and Respect questions in the parent questionnaire (Hembacher & Frank, 2016), was negatively correlated with children's musical achievement. This result suggests that parents whose parenting style beliefs were characterised by high levels of demandingness tended to have children with lower levels of musical achievement, and vice versa. Similar findings have been encountered by Valcan et al., 2017, who found that high levels of parental control (particularly in the context of authoritarian parenting) was associated with diminished executive function in young children, which in turn may have an impact children's academic and socialisation outcomes.

The other dimension of parenting style beliefs explored in the present study was parental responsiveness, as measured through Affection and Attachment items in the parent questionnaire. Responsiveness was found to be positively associated with parental metacognitive and self-regulatory support, as reported by parents in the questionnaire. However, there was no correlation between Affection and Attachment and parents' Practice 2 scores (the latter of which represents the support actually given to children by parents whilst practising). An alternative reading of these results is that parental responsiveness was associated with parents' perception of their own parental metacognitive and self-regulatory support – an interpretation which suggests that parents who view themselves as providing a high level of metacognitive and self-regulatory support also tend to hold parenting style beliefs characterised by high levels of responsiveness.

6.5.13 Children's Attitudes Towards Parental Assistance During Their Practice

Although not included as part of the formal analysis, during the McKI, children were also asked about their attitudes towards their parents' involvement – specifically, whether they found it helpful when their parent practiced with them, and what behaviours they found particularly helpful or unhelpful.

Table 99

Children's views on parental assistance during piano practice, as reported by children in the metacognitive knowledge interview

	Parental assistance		
Participant	**Did you find it helpful when mummy/daddy practiced with you?**	**Helpful behaviours?**	**Unhelpful behaviours?**
1	Y	Supervising me	Putting pieces I don't know
2	n/a	N	Just watching me and not helping
3	Y	He said I did some wrong notes and I started again	N
4	Y	He taught me how to hold down and release so I could play it better	N
5	Y	N	N
6	Y	She like told me like where I got things a bit wrong; she told me what I could and asked me questions	N
7	Y	When she played it for me and it helped me to know how to play it	N
8	Y	She told me what to do and not what to do	N
9	Y	N	N
10	Y	Everything	N
11	Y	She helped me a bit	N
12	Y	She pointed out some things to me that I didn't get right and some things that I did get right	

13	Y	N	N
14	Y	N	N
15	N	N	N
16	Y	N	N
17	Y	He told me where to put my thumb under	He wasted a bit of time by saying I got something wrong but then he found out I was correct
18	Y	She told me it was A and not E	She tells me to do stuff more than I play
19	Y	It was all quite helpful	N
20	Y	Telling me to do it different times	N
21	Y	It was quite helpful because I feel less nervous	She's looking at me - it's like the audience and they watch
22	Y	N	N
23	Y	To sit back whilst I was practising and try to remember and see how the music goes	N
24	Y	Because my mummy can show you how to do it and tell you if you do it wrong; she showed me	Repeats
25	Y	Not really just all of it	N
26	Y	We kept repeating [hums tune]	N
27	Y	She tells me to say 'you can do better'	N
28	Y	N	N
29	Y	She told me where some of the mistakes were	N
30	Y	She did tell me about things that Robert didn't tell me	N

Note. Y = yes, N = no.

These comments provide fascinating insight into children's perceptions of parental support, with 93.3% of children reporting that they found it helpful "when mummy/daddy practiced with [them]". Future research may wish to consider qualitative investigations of McKI transcripts with children in order to explore not only the effects of parental support on children's musical learning, but also children's views on the help offered.

6.6 Limitations

Participants in the present study were 30 predominantly middle-class children and parents from a wide range of ethnic backgrounds. In particular, a large number of parents were of Chinese descent, two of whom were from working-class backgrounds. As discussed in section 6.1.3, there is evidence to suggest that parenting practices and attitudes vary widely across different cultures (Taylor et al., 2004). Parenting style beliefs of immigrant Chinese and African parents, in particular, appear to differ largely from European and American populations (Chao, 2000; Wu & Chao, 2005), though there is general agreement on the cross-cultural benefits of authoritative parenting style on children's socialisation and learning outcomes (Querido et al., 2002). Research has also provided consistent evidence of the role of socioeconomic status (SES) in influencing parenting, with low child SES and childhood adversity associated with lower executive function and cognitive functioning in adulthood (Hoff, Laursen & Tardif, 2002; Liu & Lachman, 2019; Roubinov & Boyce, 2017). Consequently, the ethnic diversity and level of economic privilege of children and parents in the sample, in addition to the relatively small number of participants, limits the possibility of making any generalisations beyond this particular group.

Another design limitation of this study relates to measures of musical achievement. The significant differences found between teachers' and the independent examiner's scores highlight the complexity of attempting to assess children's musical achievement and the variability between assessors. Whereas piano teachers were originally considered best placed to provide an indicator of their pupils' musical achievement given longstanding and regular contact with the children, the lack of a moderator between different children and extremely inflated scores for some pupils posed a significant threat to reliability. The independent examiner on the other hand could only make an assessment of playing based on watching 10 minutes of independent practice – a period of time unlikely to encapsulate the full scope of a child's musical abilities. Given that the videos used by the examiner to assess children's musical achievement were of piano practice rather than complete performances, the videos may not convey the full extent of what they are able to do once their pieces are entirely learnt. To address this issue, future research may wish to explore multi-method assessments of children's musical achievement which allow for measurement of children's musical abilities in multiple contexts by the same assessor over a longer period of time.

As discussed previously, it may be that social desirability bias affected parents' self-report of self-regulatory and metacognitive behaviours in the parent questionnaire (Grimm, 2010). There is considerable sensitivity around the issue of parenting. Given that all metacognitive and self-regulatory support items were phrased as "positive" behaviours that parents might encourage their children to do during musical learning, where parents reported their level of agreement with statements, it may be that the design of the questionnaire reinforced over-reporting of positive behaviours. In order to minimise the possibility of order effects and social desirability bias, parental support items and parenting style belief statements (50% of which were reverse coded) were randomised. Given the way in which parental support items were constructed (based on descriptors from C.Ind.Le, Whitebread et al., 2009), it was considered that wording some metacognitive and self-regulatory support items backwards ("I don't not encourage my child to…") was unlikely to mislead respondents and improve the reliability of results. Future research may wish to investigate ways of improving the reliability of self-report measures aimed at assessing parental metacognitive and self-regulatory support, as well as exploring other measures that may help to characterise the kinds of parental support children receive on a regular basis.

In addition to self-report measures, this study used observational methods to explore children and parents' behaviours during piano practice. Every effort was made to create a naturalistic setting and reduce respondent reactivity to video equipment. Examples of adjustments made include allowing children to play with the camera and help set up the tripod before the practice sessions, placing the camera in an unobtrusive place and leaving the room whilst children practised. Similar techniques were used to minimise threats to the validity of interview data, such as allowing children to choose where McKIs took place (such as in the living room or garden), sitting side by side and at eye level with the children and using a puppet mediator for part of the interview. By creating a relaxed atmosphere and allowing the child to make decisions about the location of the interview, the researcher hoped to reduce any feeling of power imbalance between the researcher and child and encourage natural and unbiased responses. Nevertheless, it is important to acknowledge that some reactivity towards the situation generated by the study remained. Indeed, when asked how they felt whilst practising (question 5a in the McKI), several children responded that they felt nervous because of the camera. In future studies, it would be both methodologically and ethically beneficial for researchers to spend some time with children and parents prior to data collection, in order to build trust and rapport with participants in advance of the study.

Another important consideration is the relatively small sample of participants. Although large samples sizes are not necessary to reach statistical significance, larger numbers of participants provide more accurate mean values and avoid errors arising from testing a small number of potentially atypical samples by helping to identify outliers (Biau, Kenéis & Porcher, 2008). The relatively small number of child-parent dyads ($N = 30$) in this study often meant that non-parametric tests were used in analysis. Though appropriate in cases where data are non-normal, non-parametric tests have less statistical power than their parametric equivalents and may increase the risk of Type 2 errors. The process of travelling to and visiting 30 families spread across the UK, as well as coding all practice and McKI videos multiple times, proved to be significantly effortful and time-consuming for a single researcher and limited the number of families that could take part in the study. Future projects of a similar design may wish to consider the participation of a team of researchers and coders, in order to increase the number of participants involved.

The biggest limitation of the present study is the reliability of McKI protocol. Following the main data collection, analysis was used to assess the interrater reliability of results gathered during the McKIs (as with the coding schemes – see section 4.3.2). Graham, Milanowski and Miller (2012) recommend that, "given no one method is best under all circumstances", it is often appropriate to calculate interrater reliability using more than one measure (p. 7). Cronbach's alpha was found to be at $\alpha = .660$. As discussed in Section 4.3.2, Kline (1999) suggests that Cronbach alpha scores of below .70 can realistically be expected when dealing with psychological constructs, due to the diversity of the constructs being measured. However, Cohen's kappa was found to be at $\varkappa = .451$, $p = .001$ – a score well below the generally accepted minimum level of agreement (.61 – see McHugh, 2012). It should be noted that that the percentage of absolute agreement between McKI interraters was 71.9%, with scores of between 75-90% generally considered as representing an acceptable level of agreement (Stemler, 2004). There are a number of possible explanations for this low level of interrater reliability. The first relates to the choice of rater – a professional pianist and piano teacher, but not a psychologist. Rater training was limited and took the form of a short meeting to discuss and answer any questions about the scoring protocol. It may be that this was not sufficient to ensure proper understanding of indicators of children's metacognitive knowledge. Additionally, it may be that the scoring rubric was not detailed enough to ensure consistent scoring across different raters. Secondly, despite the use of a detailed interview script and pre-determined prompts, it may be that variations in the researcher's behaviour in response to emerging difficulties and the needs of children complicated possible interpretations of behaviour as being either independent or scaffolded. In particular, several children struggled to understand the word "characteristics", as used in the question "what makes a good pianist and what characteristics do you have" – resulting in the researcher needing to rephrase or omit this question for certain participants. A developmentally sensitive and flexible approach was considered a necessary compromise to ensure the engagement and comfort of the children but may also have resulted in variations in the delivery of the McKI. Given these issues, the findings of the McKI and analyses involving scores from the McKI should be treated with caution and validated in future studies.

6.7 Conclusion

Study 2 addressed three main research questions, and four sub-questions, relating to associations between parental support, parenting style beliefs, children's metacognition and self-regulation during musical learning and children's musical achievement. The main findings of this chapter in relation to this study's hypotheses are summarised below:

- Children's musical achievement scores (as assessed by an independent examiner) increased as their McKI scores decreased, indicating a negative correlation between children's musical skills and their ability to talk about their practice during the interview. It may be that the examiner's scores, which were based on only 10 minutes of piano practice, did not reflect the full extent of children's abilities. Further work is needed to develop more sophisticated and balanced measures of musical achievement, as well as to improve the reliability of the McKI protocol.
- Children's McKI scores were also positively correlated with age, with older children most able to comment on their practice and explain how to practice piano to Gogi. As predicted, no correlation was found between musical achievement and age.
- Parental support in Practice 2 was positively associated with children's McKI scores – a finding which suggests that children who received the most metacognitive and self-regulatory guidance in Practice 2 were most able to talk about it in the subsequent interview. Although one would not necessarily expect children's metacognition and self-regulation whilst practising alone to be associated with parental help received in a later session, it is unclear why children's Practice 1 scores were negatively correlated with parents' Practice 2 scores. Further research is needed to unpick and better understand possible reasons behind this result.
- Children demonstrated more metacognition and self-regulation whilst practising with a parent (Practice 2), than when practising alone. Given that parental support in Practice 2

was not associated with children's metacognition and self-regulation in the same session, it may that a parents' presence alone is enough to encourage more displays of metacognitive and self-regulatory behaviours from children.

- Children's musical achievement was negatively associated with parental demandingness – a result which suggests that parents who scored higher in Rules and Respect items in the parent questionnaire tended to have children with lower musical achievement scores. Additionally, parental responsiveness was found to be positively correlated with parents' metacognitive and self-regulatory support scores in the questionnaire. As in the early childhood literature, these findings indicate clear associations between parenting style and aspects of parental support and children's learning.
- Finally, parents with previous musical experience gave more parental support to children in Practice 2 than parents without. This result was not replicated with parents' self-reported parental support scores, suggesting a disconnect between what parents do and what parents think they do.

From a methodological perspective, this study has also demonstrated that it is possible to measure children's metacognition and self-regulation, and parental support, across multiple contexts and that this kind of analysis may help to provide a broader and more detailed picture of the relationship between children and parents' behaviours. However, methodological limitations remain, despite these contributions, with further refinements needed to improve the reliability of measures used in this study.

The findings presented in this chapter provide evidence of complex relationships between parental beliefs and behaviours and children's musical learning. Some of the constructs explored are more closely related than others – parental support, for instance, appeared to be related to children's declarative metacognitive and self-regulation knowledge (measured through the McKI) but not the use of these behaviours whilst practising (as observed in Practice 1). The former also appeared to be negatively related to children's musical achievement. The implications of these findings are discussed in greater detail in the Final Discussion (Chapter 7).

CHAPTER 7

Final Discussion

7.1 Introduction

The aims of this final chapter are to a) summarise and discuss the main findings of Study 1 and Study 2 in the context of the whole thesis; b) to acknowledge the limitations of results gathered from Study 1 and Study 2; and c) to discuss this thesis' contributions to the fields of music education and psychology, as well as implications for future research and practice.

This section is structured into six sections, including this introduction (section 7.1). Section 7.2 summarises the findings of Studies 1 and 2 within the context of the whole thesis and its research questions. Section 7.3 states the limitations of this thesis in relation to the design of its studies and issues emerging from the research process. Section 7.4 discusses the implications of findings from the perspective of theory, followed by a discussion of implications for practice in section 7.5. The sixth section of this chapter and final section of this thesis (section 7.6) presents the final summary.

7.2 Summary of Findings

The following section is divided into four subsections that cover the main findings related to each of the study's over-arching research questions. In preparation for the discussion of these results, Tables 100 and 101 recap the research questions and hypotheses underpinning Study 1 and Study 2 of this thesis. Forthwith, short-form research question names are used.

Table 100
Research Questions and Hypotheses for Study 1: Trends in Parental Metacognitive and Self-regulatory Support during Children's Musical Learning

	Question	Hypothesis
RQ1	What is the nature of parental support of children's metacognition and self-regulation in musical learning and what are its	H1 – The amount of metacognitive and self-regulatory support children receive from their parents during

	associations with parents' previous musical experience?	piano practice is positively correlated with parents' previous musical experience.
RQ1a	To what extent is metacognitive and self-regulatory support and frequency of parental supervision during their children's practice associated with parents' previous musical experience?	H1a – How frequently parents supervise their children's piano practice is positively correlated with parents' previous musical experience.
RQ1b	To what extent is frequency of children's practice associated with parental metacognitive and self-regulatory support and frequency of parental supervision during children's practice?	H1b - The frequency of children's practice is positively correlated with parental metacognitive and self-regulatory support and frequency of parental supervision during practice.

Table 101

Research Questions and Hypotheses for Study 2: Associations between Parental Support and Parenting Style, Children's Metacognition and Self-Regulation during Musical Learning and Children's Musical Achievement

	Question	**Hypothesis**
RQ2	What are the indicators of children's metacognition and self-regulation in musical learning, and what are their associations with musical achievement?	H2 – Children who demonstrate higher levels of metacognition and self-regulation experience higher levels of musical achievement.
RQ2a	To what extent is children's metacognition and self-regulation in musical learning associated with their age?	H2a – Children's ability to use metacognition and self-regulation in musical learning increases with their age.
RQ2b	To what extent is children's metacognition and self-regulation associated with their age?	H2b – There is no association between children's age and their level of musical achievement
RQ3	What are the associations between parental support of children's metacognition and self-regulation, children's metacognition and self-regulation in musical learning and children's musical achievement?	H3 - Children who receive more parental support demonstrate higher levels of metacognition, self-regulation and musical achievement.
RQ3a	Is there a difference in children's metacognition and self-regulation when practising independently and when practising with a parent?	H3a – There is a difference in children's metacognition and self-regulation when practising independently, and with a parent.
RQ3b	Is there a difference in the level of parental metacognitive and support given to children by parents with and without previous musical experience?	H3b - There is no difference in the level of parental support given to children by parents with and without previous musical experience.
RQ4	What are the associations between parenting style, children's metacognition and self-regulation in musical learning and children's musical achievement?	H4 - Children whose parents report higher levels of responsiveness in their parenting demonstrate higher

	levels of metacognition, self-regulation and musical achievement

7.2.1 RQ1 – Parental Support and Previous Musical Experience

Overall, the findings from Study 1 indicate that parents reported being most involved in their children's Emotional/Motivational Monitoring and supported Evaluation behaviours the least. Strong correlations were found between the amount of support parents reported giving their children and how often they reported supervising their practice. Positive associations were also revealed between children's frequency of practice and the amount of parental metacognitive and self-regulatory support they received but not frequency of parental support (H1b), as reported in the parent questionnaire.

No associations were found between quality or frequency of parental support, and parents' previous musical experience in Study 1 (H1a). Although RQ1 was mainly used to structure Study 1, it is also possible to draw comparisons between indicators of parental support from Study 1 (as reported in the questionnaire) and Study 2 (as reported in a subsequent questionnaire and observed during parent-supervised practice). As in Study 1, no correlation was found between parents' reported metacognitive and self-regulatory support and their previous musical experience in Study 2 (H3b). Crucially, however, when measures of observed parental support were compared with parents previous musical scores in Study 2, positive associations were revealed. Although it is important to acknowledge the limitations of a measure of parental support based on only 10 minutes of video observation, taking into consideration the possible effect of social desirability bias, the lack of convergence between parents' self-report and observed support suggests that the latter may provide a more valid indicator of parental support behaviours – and their association with parents' previous musical experience.

7.2.2 RQ2 - Children's Musical Achievement and Metacognition/Self-Regulation

When observed practising, both on their own and with a parent, children most often used behaviours related to Emotional/Motivational Control and Monitoring. Differences in demonstrations of metacognitive knowledge (Knowledge of Strategies and Knowledge of Persons) emerged between the independent and parent-supervised practice sessions – likely due in part to the increased opportunities for reflective dialogue when parents were present. During the Metacognitive Knowledge Interview(s), children were on the whole most able to use context-specific metacognitive knowledge related to the practice they had just completed and struggled more to apply this knowledge to other people or hypothetical situations. As discussed in Chapter 3 (section 3.2.3), it may be that these questions were dependent on developmental abilities related to Theory of Mind (Lockl and Schneider, 2006), which may explain the improvement in McKI scores as age increased.

No positive correlations between children's metacognition and self-regulation, and musical achievement were found (H2). However, negative associations between children's observed metacognitive and self-regulatory abilities during independent practice, and their McKI scores, were revealed – a finding which conflicts with previous research that has demonstrated clear associations between children's use of metacognition and self-regulation, and their musical abilities (Bathgate et al., 2012; Hallam et al., 2012; McPherson & Renwick, 2001). As discussed in Chapter 6 (section 6.5.5), in addition to simply feeling shy, one possible explanation could be to do with introverted personality tendencies in musicians (Kemp, 2000) – although more recent research suggests that to be unlikely (Vaag et al., 2017). Another possible reason for this unexpected finding could be related to the difficulty of talking about music, itself a non-verbal "language". In the context of communication in joint musical performance, Keller (2008) suggests that "to produce a cohesive ensemble, the pianists must hold a common goal; a shared representation of the ideal sound" (p. 205). Kurosawa and Davidson (2005) argue that non-verbal behaviours play an important part in conveying musical meaning to audiences. Similarly, Schiavio and Høffding (2015) suggest that over the last 30 years, philosophy of mind and cognitive science have increasingly embraced an understanding of musical experience as being "embodied and enacted […] distributed across the whole body of the agent and the environment, rather than 'skull-bound and immersed in a sequential, causal process of events" (p. 368). These comments help to highlight the highly abstract nature of mental representations of embodied musical cognition (Kim, 2020) – cognitive, physiological and emotional states which many professional adult musicians may struggle to communicate to others, let alone young beginner pianists. Further research is needed understand the role of metacognition and self-regulation in helping young musicians to communicate these subjective experiences, developments which may have important implications for music education (as discussed in section 7.5).

As mentioned, a positive correlation was found between children's McKI scores and age, with older children most able to describe their metacognitive knowledge (H2a). In contrast to research which suggest that Monitoring competencies develop chronologically with age whereas Control behaviours develop through experience (Eme et al., 2006; Puustinen, 1998), children's metacognitive Control during independent practice and the McKI were also positively correlated with age. This finding suggests that oldest children in the present study were the most able to use Control behaviours to support their practice and may reflect the lack of teaching directed at improving these competencies in children. As predicted, no association was found between children's musical achievement and age (H2b) – a result which may reflect possible differences in time spent learning piano, amount of piano teaching and parental support, as well as individual differences in musical ability between children in the sample.

7.2.3 RQ3 - Musical Achievement, Metacognition/Self-Regulation and Parental Support

As in Study 1, parents' questionnaire scores in Study 2 indicate that parents were most concerned with supporting their children's Emotional/Motivational Control competencies.

However, observation of parental support behaviours during children's practice indicated that parents supported Emotional/Motivational Monitoring and Emotional/Motivational Control behaviours the least. The large discrepancy between parents self-reported and observed behaviours found in the present study adds further weight to Veenman et al.'s (2006) recommendation to use multi-method approaches to data collection and analysis involving measurement of participant behaviour where possible. The significant differences between these scores may also in part be due to the kinds of data being collected – with questionnaire scores perhaps reflecting parental beliefs about the kinds of metacognitive and self-regulatory behaviours they feel they should be supporting generally (rather than behaviours they actually use).

Positive correlations between parents' observed support during practice and children's McKI scores were in line with previous research (H3) which has frequently demonstrated links between children's metacognition and self-regulation, and parental scaffolding (Pino-Pasternak, 2014). As discussed, it is unclear why children's metacognition and self-regulation during independent practice were negatively correlated with the support they (subsequently) received when practising with a parent, particularly given that children demonstrated more metacognitive and self-regulatory behaviours when their parent practiced with them (H3a). In some cases, it may be that certain kinds of adult intervention actually dispossess children of opportunities to regulate themselves (Robson & Rowe, 2012) – a line of inquiry deserving of further investigation.

7.2.4 RQ4 – Musical Achievement, Metacognition/Self-Regulation and Parenting Style

In addition to parental support behaviours, parenting style beliefs were used to explore parental attitudes about socio-emotional support. In the present study, parental demandingness was negatively associated with children's musical achievement, indicating that children who experienced the highest levels of demandingness from their parents had the lowest musical achievement scores. Another way of expressing this result is that children who experienced the least demandingness from their parents had the highest levels of musical achievement – a finding in line with research that suggests that low levels of parental control may help to confer confidence in children's abilities and support better learning outcomes (Valcan et al., 2017). This result is particularly interesting in light of the large body of literature on authoritative parenting, which suggests that the best socialisation outcomes for children are achieved through parenting characterised by high levels of both demandingness and responsiveness (Darling & Steinberg, 1993). It may be that the lack of unifying definitions of parental demandingness and control (as discussed in Chapter 6 section 6.1.2) have contributed to these conflicting results.

Finally, in this study, parental responsiveness was associated with higher levels of parental metacognitive and self-regulatory support, as reported in the parent questionnaire (H4). Given the aforementioned discrepancies between parents' reported and observed support, this finding should be interpreted with particular caution. However, it is nonetheless significant that parents who expressed the most affection and attachment in their parenting style beliefs, also reported the most parental support of their child – an indication that, even if not acted on, that they considered these behaviours to be important.

7.3 Limitations of the Studies

This thesis has uncovered a number of valuable findings which contribute to the existing literature on parental support, children's metacognition and self-regulation and children's musical achievement. However, as with all empirical research, these results must be considered in light of a number of limitations, discussed in the following section.

7.3.1 Design Limitations

In addition to the limitations discussed in Study 1 (section 4.6) and Study 2 (section 6.6), a key limitation of the design of the present thesis is the lack of directionality indicated by results.

Findings gathered using correlational tests were bi-directional and they cannot determine the direction of the relationships they indicated. Moreover, analyses conducted as part of Studies 1 and 2 are unable to offer causal explanations for the findings uncovered. Although this thesis has established clear associations between different dimensions of parental support and children's learning, it is not clear where these relationships originate from – does children's enthusiasm and commitment to music encourage further parental support, or do parents instigate children's learning and achievement? An important next step for future research would be to design studies which allow for direction of these relationships to be explored further, as well as in the context of more longitudinal studies.

The second limitation of the present thesis is the lack of qualitative analysis of children and parents' responses. In both studies, qualitative feedback was collected in the form of comments about parental support in practice (Study 1) and children's views on parental support (Study 2, McKI) – comments which, even without formal analysis, demonstrate complex thoughts and opinions which lie outside the scope of the measurement instruments being used. Moreover, a large body of practice and video interview data were collected as part of Study 2 which has so far only been analysed in terms of the number of occurrences of particular behaviours or questionnaire score, according to existing frameworks. More work is needed to understand the character and quality of individuals' experiences and perspectives, and how these might affect the decisions they make around musical learning or parental support. The addition of qualitative methods of analysis in future research (including video data from the thesis) would provide further insight into the nature of parental support and children's learning in participants' own words and extend the current breadth of understanding.

A third design-related limitation of this thesis is its reliance on behaviours listed within the existing coding schemes, which were originally intended for use in observations of young children aged 3-5 during play (Whitebread et al., 2009). New behaviours, or behaviours perhaps specific to music practice, may not have been identified. Future research might consider the use of exploratory study designs which allow for the creation of new instruments, specifically designed with the intention of identifying and analysing metacognitive and self-regulatory behaviours specific to instrumental practice in children aged 6-9. In order to avoid future reliability and validity issues, such as those encountered with the McKI in Study 2 (see section 6.6), it is strongly recommended that new measurement instruments are piloted first, as well as being tested by multiple interraters. Additionally, given C.Ind.Le's focus on early years, thought should be given to the developmental differences in children aged 6-9 and those aged 3-5 and how the use of C.Ind.Le may affect measurements of older children's behaviours. It should be noted that in the case of the children (aged 6-9) who participated in Study 2, no children exhibited all behaviours in the same observation or interview. This suggests that the list of metacognitive and self-regulatory behaviours listed in C.Ind.Le did underestimate older children's abilities, despite originally being intended for much young children. It should also be noted that C.Ind.Le has been widely used including in studies involving adults (e.g., Colombo & Antonietti, 2017), as well as children. Nevertheless, it may be that new coding schemes tailored to specific age groups may allow for fuller exploration of metacognitive and self-regulatory behaviours relevant to participants' specific stages of development.

Finally, it is important to acknowledge that explanations for children's metacognition, self-regulation and musical achievement cannot be restricted to parent-child interactions. There are a large number of other mediating factors besides parents (for instance, teachers and siblings) which may affect children's musical progress. Additionally, there is evidence to suggest that children's musical learning and achievement is strongly tied to other psychological constructs such as self-determination (Evans, 2015; Niemiec & Ryan, 2009; Valenzuela et al., 2018), self-efficacy (McPherson & McCormick, 2006; Ritchie & Williamon, 2011; Zimmerman, 2000) and mastery motivation (Evans & Bonneville-Roussy, 2016; Hallam et al., 2016; Ryan & Deci, 2000). Given these possible associations, future research may wish to consider these in addition to the specific areas explored here.

7.3.2 Issues Emerging During the Studies

Due to the complex and involved nature of the research conducted, a number of unanticipated issues emerged during Study 2 in relation to the researcher's visits and the consistency of the environments in which practice sessions were filmed.

As discussed in Chapter 6 (section 6.2.7), practice sessions in Study 2 were filmed in participants' homes with the researcher out the room whilst child and parents practiced. This was done in order facilitate an environment and atmosphere as similar as possible to the one the children usually practice in. Consequently, the placement of the piano or keyboard in participants' homes varied between families, with some families residing in extremely limited accommodation. One family's piano was located in the kitchen, with little privacy from other members of the family who needed to access the kitchen in between sessions – although this arguably added to the naturalism of the setting. Additionally, on one occasion, the house in which two of the children lived (two siblings) consisted of only one room on the ground floor, resulting in the researcher having to wait in the same room. Although every effort was made to be as discreet as possible on these occasions, it likely that these circumstances increased the chance of respondent reactivity.

In addition to issues with varying instruments (piano and electronic keyboards) and practice rooms, on one visit to a participants' home, the researcher forgot to bring Gogi – the puppet used as part of the McKI. Due to the considerable distance travelled to reach the participant and time limitations, it was not possible to schedule an alternative time with the family later. In order to be able to continue with the data collection process, the researcher asked the permission of the parent to borrow one of the children's lesser used toys as a stand-in puppet mediator. Needless to say, the child recognised the toy instantly and was a little confused – an oversight which may potentially have affected their responses to questions in the McKI.

It is important to acknowledge that these inconsistencies in approach may have led to reliability issues in the data, which require the findings of Study 2 to be interpreted cautiously. Nevertheless, positive appraisals of the researcher's approach from participants, who largely expressed enthusiasm and interest in the project and its topic, suggest that these issues did not negatively affect participants' experience, and that children and parents found their participation rewarding.

7.4 Implications for Future Research

The findings emerging from this study open a number of potential areas for further research into parental support and children's musical learning, as listed below:

- *Assessing the generalisability of research findings:* Given the relatively small samples of participants involved in Studies 1 and 2, and the possible effects of the different family backgrounds and learning contexts in which children were taking piano lessons, an important next step is to trial studies in families with different SES and cultural backgrounds. This would enable investigation of the extent to which findings from the present study are specific to the present sample of participants, or whether these patterns of behaviour hold true in different populations.
- *Exploration of issues of directionality:* As discussed, future research should also explore the directions of associations between parent and child behaviours found in Studies 1 and 2 of this thesis – findings which would help to establish the relative validity of results drawn from different measures, as well as help to refine appropriate measurement methodologies.
- *Qualitative Analysis of Parent-Child Interactions:* In addition to further replication and exploration of quantitative results, this area of research would greatly benefit from qualitative analysis of parent-child interactions in the context of musical learning. In

particular, given the focus on adult (parent and teacher) perspectives, it may be particularly intriguing to develop developmentally appropriate methodologies which allow for in-depth investigation of young children's views on parent and teacher support, in addition to their own reflections on learning.

- *Longitudinal Impact of Parental Support on Metacognitive and Self-Regulatory Development:* The results of this thesis are based on assessments made as part of one data collection session for each family. Findings are necessarily limited to those results collected during this brief period – less than 20 minutes of children's practice, and only 10 minutes of parent supervision. Longitudinal study designs may help to illuminate the nuances of parent-child interactions over a longer period, as well as provide a broader and more in-depth picture of how parents and the home environment impact children's metacognitive and self-regulatory development in the context of musical learning.
- *Metacognitive/Self-Regulatory Interventions for Young Musicians:* Finally, having surveyed existing patterns of parental support and children's metacognition and self-regulation in musical learning, it would be highly beneficial for future research to consider developing metacognitive and self-regulatory interventions targeted at young children. Given the recent global health crisis and the increased focus on remote learning, technology-based interventions (such as mobile applications and online resources) may provide innovative solutions to supporting the development of metacognitive and self-regulatory approaches to musical learning. Researchers from the Royal College of Music in the UK (Cooper, Aufegger & Williamon, 2014) developed a smart phone application targeted at improving conservatoire students self-regulated practice. Similar efforts could be highly beneficial for young children and their parents, helping to establish healthy practice habits from the earliest stages of musical development, as well as facilitating the collection of further data on young children's practice and parental support habits.

Having highlighted a number of directions future research, the following section discusses the implications of these studies for educational practice.

7.5 Implications for Practice

The results of this thesis have important implications for music education. The present studies have established key differences in the use of metacognition and self-regulation during independent and parent-supervised practice. Although some teachers are reluctant to involve parents in their children's practice (Macmillan, 2004), findings suggest that parental presence during practice sessions may be beneficial in improving the quality of children's practice by enabling opportunities for reflective discussion and dialogue. Additionally, given the link between language skills and metacognitive and self-regulatory strategy use (Whitebread et al., 2015), the results of Study 2 further support the view that music educators should consider the ways in which they explicate learning processes and the terminology they use to describe them. Given the subjectivity of musical experience, teaching children how to talk about their own thinking processes and equipping them with the language with which to do so may be a particularly important factor in enabling children to be able to monitor and evaluate their practice, as well as talk about their emotional/motivational states during learning. Finally, it would be invaluable for music educators to be trained to support parents in their role as mediators of their children's instrumental learning at home. In addition to developing children's metacognition and self-regulation, it is just as important that parents are metacognitively aware of their own behaviours in relation to helping to children. As recommended by Macmillan (2004), parents may benefit from sitting in on their children's lessons, as would teachers from encouraging parents to stay and watch – giving parents a model from which to imitate and a benchmark from which to monitor and evaluate their own support behaviours. Given the tendency for parents to overrate the amount of metacognitive and self-regulatory support they gave their children in this study, teachers might consider ways of involving parents in lessons –

for instance by providing opportunities for parents to practice scaffolding their children's musical learning under supervision and receive professional feedback. These learning opportunities would be particularly invaluable to musically inexperienced parents and their children, or indeed any parents who may feel a little underconfident about their ability to assist with music practice at home.

7.6 Final Summary

The aims of the present thesis were to determine the extent to which parents were able to act as mediators of their children's metacognition and self-regulation in the context of instrumental practice and to identify close relationships between specific dimensions of parental support, parenting style beliefs, children's metacognition and self-regulation, and children's musical achievement.

The findings emerging from this study indicate that these associations are highly complex and context dependent. On the one hand, children demonstrated greater use of metacognitive and self-regulatory strategies whilst practising in the presence of a parent than when practising alone. Similarly, children who received more support from their parent whilst practising together demonstrated higher levels of metacognition and self-regulation when interviewed about their experiences afterwards. This ability to discuss their metacognitive and self-regulatory knowledge appeared to increase with age.

On the other hand, children's ability to talk about their metacognition and self-regulation was negatively associated with their musical achievement. Given the highly idiosyncratic nature of musical learning, and the particular demands of instrumental practice, it may be that there are other factors affecting this result such as individual personality differences (Kemp, 2000) or the difficulties associated with accurately describing musical experiences in words (Schiavio & Høffding, 2017).

In addition to parental support behaviours, this thesis also examined associations between parents' and children's behaviours, and parenting style beliefs. As replicated in the literature, high levels of parental responsiveness were associated with parental metacognitive and self-regulatory support. High levels of demandingness, however, were associated with lower levels of musical achievement – a finding supported by previous research into the effects of parental control (Whitebread & Pino-Pasternak, 2010) and with important implications for parents and children.

One of the key findings of this thesis can be summarised by Desoete (2008) – "how you test is what you get" (p. 204) – an adage which holds not only for measures of children's behaviours, but also measures obtained from parents and teachers. Significant differences were found between both examiner's and teachers' scores of children's musical achievement, and reported and observed parental metacognitive and self-regulatory support. Similarly, little or no convergence was found between children's metacognition and self-regulation as observed during practice, and as explored during an interview – indicating conceptual differences between online and offline indicators of internal learning behaviours.

Perhaps most significantly, associations between parents' previous musical experience and parental support were only present in analysis conducted using observational measures of parental support, but not self-reported scores. From a methodological standpoint, the lack of convergence between different behavioural measures points to the importance of choosing appropriate methodological tools, as well as the need for further examination of context-based differences in psychological constructs assessed in different settings.

The findings from this thesis, though preliminary, are intriguing and open a number of exciting possibilities for future research into the role of parents in children's metacognition and self-regulation during musical learning. Importantly, the value of this research lies not only its theoretical contribution, but in its potential to enhance parents' and teachers' understanding of young children's metacognitive, self-regulatory and musical competencies, and their role in supporting their development.

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Appendices

Appendix A

Ethics approval certificate for Study 1

RNCM
ROYAL NORTHERN COLLEGE of MUSIC

This is to confirm that the application made by Jo Yee Cheung to the Royal Northern College of Music Research Ethics Committee was APPROVED.

Project title: The role of parents in the development of metacognition during children's piano practice

Date approved: 19 February 2018

Signed: Jane Ginsborg Date: 19 February 2018

Prof. Jane Ginsborg (*Chair of RNCM Research Ethics Committee*)

Appendix B
Ethics approval certificate for the pilot study

RNCM
ROYAL NORTHERN
COLLEGE of MUSIC

This is to confirm that the application made by Jo-Yee Cheung to the Royal Northern College of Music Research Ethics Committee was APPROVED.

Project title: Observing the role of parental support on children's metacognition during instrumental music practice: a pilot study

Date approved: 28/06/2018

Signed: Jane Ginsborg Date: 28/06/2018

Prof. Jane Ginsborg (*Chair of RNCM Research Ethics Committee*)

Appendix C
Ethics approval certificate for Study 2

RNCM
ROYAL NORTHERN
COLLEGE of MUSIC

This is to confirm that the application made by Jo Yee Cheung to the Royal Northern College of Music Research Ethics Committee was APPROVED.

Project title: The relationship between parental behaviours and the development of metacognition in children during musical learning

Date approved: 5 June 2019

Signed: Jane Ginsborg Date: 5 June 2019

Prof. Jane Ginsborg (*Chair of RNCM Research Ethics Committee*)

Appendix D
Parent questionnaire used in Study 1

The role of parents in the development of metacognition during children's piano practice

Page 1: Introduction

Jo Yee Cheung (Royal Northern College of Music) is investigating the different ways in which parents assist their children to develop metacognition (the awareness and regulation of one's own thinking) whilst practising the piano, as part of a PhD in music education at the RNCM.

Parents play a key role in the development of metacognition in their children. The purpose of this questionnaire is to identify and observe patterns in different kinds of metacognitive techniques and behaviours (e.g. planning, evaluation, emotional/motivational monitoring) used by parents to assist their children whilst their children are practising the piano. The questionnaire is entirely non-judgemental, and intended to survey general trends in parental involvement in children's piano practice across the UK.

The results of this questionnaire will help inform further research into the role of parents in the development of children's metacognition during musical learning, as part of Jo's PhD study. In particular, the results of this observational questionnaire will help to form the basis of a later experiment exploring the *effects* of different kinds of parental involvement on children's metacognition. The results will primarily be viewed by the researcher and her supervisors (Dr Michelle Phillips and Dr John Habron), and may also be shared in conferences and publications.

This exploratory study asks for the views on this topic of parents with children aged 6-8 learning to play the piano in the UK. All respondents, and their responses, will remain anonymous.

This questionnaire has been reviewed and approved by the RNCM Ethics Committee and has 44 (mainly multiple-choice) questions. It should take no longer than 15-20 minutes to complete. By completing and submitting this questionnaire, you confirm that you are a parent of a child aged 6-8 taking piano lessons in the UK and consent to take part in this research. If there is a question you wish to omit, please select 'prefer not to answer'. Should you change your mind about taking part, you may stop at any time. If you have any questions, please email the researcher at jo-yee.cheung@student.rncm.ac.uk.

Your assistance with this research is gratefully received - thank you for your participation.

1. What city do you currently live in?
(If you prefer not to say, please type 'prefer not to answer'). ✱ *Required*

2. Please select your sex. ✱ *Required*

3. How old are you?
(If you prefer not to say, please type 'prefer not to answer'). ✱ *Required*

4. What is your occupation?
(If you prefer not to say, please type 'prefer not to answer'). ✱ *Required*

5. How many of your children are learning to play the piano (i.e taking formal lessons)?
✱ *Required*

6. What is the age of your child learning to play the piano? If you have more than one child learning to play the piano, please state their ages too.
(If you prefer not to say, please type 'prefer not to answer'). ✱ *Required*

7. On average, how long does your child spend practising the piano per week?
(If you have more than one child learning to play the piano, please select 'other').

7.a. If you selected 'other', please describe on average on how much each of your children (in no particular order, including their age) practices a week using the descriptions provided in question 42, as follows:

(example)
child 1 aged 9 practices 1-2 hours, child 2 aged 7 practises 30-45 mins, child 3 aged 6 practises less than 10 mins

On a scale of 1-7, to what extent do you agree with the following, with 1 being 'not at all' and 7 being 'completely':

8. I help my child to be able to evaluate their own strengths or difficulties during their practice, for example by encouraging my child to talk about what they feel they are very strong at, and which things they find more difficult during their piano practice. ✱ *Required*

9. I help my child to be able to talk about general ideas about learning by encouraging my child to describe what the experience of learning the piano is like for them and how it might be for others. ✱ *Required*

10. I help my child to be able to compare different kinds of tasks with each other, for example by encouraging my child to compare the experience of practising pieces with practising sight-reading or scales. ✱ *Required*

11. I help my child to be able to judge the relative difficulty of a task, for example by encouraging my child to compare how difficult they find practicing their pieces with how difficult they find practicing sight-reading or scales. ✱ *Required*

12. I help my child to be able to define or explain how she/he has done or learned something, for example by encouraging my child to verbalise the strategies they used to overcome a tricky passage in a piece of music they are learning. ✱ *Required*

13. I help my child to be able to explain procedures involved in a particular task, for example encouraging my child to describe the different stages of learning a new piece of music. ✱ *Required*

14. I help my child to be able to evaluate the effectiveness of different strategies for achieving their practice goals, for example by encouraging my child to consider if their practice is most effective when undertaken before, during or after school. ✱ *Required*

15. I help my child to be able to set or clarify task demands and expectations, for example by encouraging my child to discuss the possible challenges of preparing for a graded exam, and what they will need to do in order to prepare in time. ✱ *Required*

16. I help my child to be able to set themselves targets, for example by encouraging my child to devise regular goal-posts, such as memorising a scale or being able to perform a piece confidently by the end of a practice session. ✱ *Required*

17. I help my child to be able to decide on ways of proceeding with a task, for example by encouraging my child to explore different ways of practising a difficult passage of music, and deciding on the best method. ✱ *Required*

18. I help my child to be able to seek and collect necessary resources, for example by encouraging my child to find Youtube videos of the pieces they're currently learning or to attend performances by other pianists. ✱ *Required*

19. I help my child to be able to self-commentate, for example by encouraging my child to verbalise their thought processes as they're working through a problem. ✱ *Required*

20. I help my child to be able to review their progress during a task, for example by encouraging my child to keep a practice record of what they have already done and what they have left to do in preparation for their next lesson. ✱ *Required*

21. I help my child to be able to assess their own effort and/or performance, for example by encouraging my child to rate themselves on different aspects of their

22. I help my child to be able to assess their current memory retrieval, for example by encouraging my child to rate how well they were able to play a scale they were trying to memorise, after they closed the scale book. ✱ *Required*

23. I help my child to be able to detect errors in their practice, for example by encouraging my child to check their posture, or by pointing out differences between how your child's teacher has suggested they practice and how your child is actually practising. ✱ *Required*

24. I help my child to be able to correct themselves, for example by encouraging my child to identify and correct their mistakes whilst practising. ✱ *Required*

25. I help my child to be able to change their approach when things aren't working, for example by encouraging my child to try new practice strategies when they find themselves 'stuck' on a difficult section of music, without improvement, for an extended period of time. ✱ *Required*

26. I help my child to be able to suggest and use strategies which may help them to solve a task more effectively, for example by encouraging my child to think about different ways of improving their practice and testing which ones are most effective. ✱ *Required*

27. I help my child to be able to apply a previously learned strategy to a new situation, for example by encouraging my child to think about what they learnt in their last practice session that worked well, and apply it in their next practice session. ✱ *Required*

28. I help my child to be able to check the accuracy of the outcome of their work, for example by encouraging my child to play through their scales or pieces a second time, following a successful rendition, to see if they can perform them again with the same level of accuracy as the first time. ✱ *Required*

29. I help my child to be able to seek help, for example by encouraging my child to ask their teacher for help with a problem they experienced whilst practising during the week. ✱ *Required*

30. I help my child to be able to use non-verbal gestures as a strategy to support their own cognitive activity, for example by encouraging my child to clap the rhythm of a piece out loud to help them work out a tricky rhythm, or remember to adjust their posture when practising to ensure they're sat in the correct position. ✱ *Required*

31. I help my child to be able to copy or imitate a model, for example by encouraging my child to listen to recordings of other pianists and attend concerts.

32. I help my child to be able to review their own learning or explain the task, for example by encouraging my child to keep a practice diary or chart and record their achievements, and use it to look over and reflect on their learning outcomes over the course of several weeks/months. ✱ *Required*

33. I help my child to be able to evaluate the strategies they've used, for example by encouraging my child to reflect on whether a strategy they used in a practice session helped them to achieve their goals (e.g. - does using a metronome help them to play with a steadier beat?) ✱ *Required*

34. I help my child to be able to rate the quality of their performance, for example by encouraging my child to regularly rate their performances at the end of a practice session when learning a new piece of music. ✱ *Required*

35. I help my child to be able to observe and comment on task progress, for example by encouraging my child to make judgements about how well they feel their practice is going during a practice session. ✱ *Required*

36. I help my child to be able to test the outcome or effectiveness of a strategy in achieving a goal, for example by encouraging my child to test themselves on their memory of their scales at the end of a practice session, after using a new strategy for learning scales. ✱ *Required*

37. I help my child to be able to express how they feel whilst practising, for example by encouraging my child to talk about what they find frustrating when their practice is not going well. ✱ *Required*

38. I help my child to be able to monitor their emotional reactions to different practice tasks, for example by encouraging my child to talk about how they are feeling at different points in their practice. ✱ *Required*

39. I help my child to be able to control their attention whilst practising, for example by encouraging my child to turn off the TV, radio, phone or any other distractions whilst practising, and/or persuading them to return to their practice after a momentary distraction ✱ *Required*

40. I help my child to be able to encourage themselves whilst practising, for example by encouraging my child to remain optimistic and give themselves positive encouragement when they are experiencing difficulties during their practice. ✱ *Required*

41. Have you ever had formal music lessons, and if so, on what instrument and for how long?
(If you prefer not say, please type 'prefer not to answer'). ✱ *Required*

42. Do you currently play/sing/compose (formally or informally) and if so, for how long have you been doing so? Please give details.
(If you prefer not to say, please type 'prefer not to answer'). ✱ *Required*

43. Which of the following statements best describes how often you help your child(ren) with their piano practice? ✱ *Required*

44. Please feel free to add any extra comments you feel are relevant, and/or any feedback you might have about this questionnaire.

Page 8: Thank you

Thank you for your participation! Your contribution to this research is gratefully received.

Appendix E

P values for all correlations in Table 8

	KoP1 (Q8)	KoP2 (Q9)	KoT1 (Q10)	KoT2 (Q11)	KoS1 (Q12)	KoS2 (Q13)	KoS3 (Q14)	P1 (Q15)	P2 (Q16)	P3 (Q17)	P4 (Q18)	M1 (Q19)	M2 (Q20)	M3 (Q21)	M4 (Q22)	M5 (Q23)	M6 (Q24)	C1 (Q25)	C2 (Q26)	C3 (Q27)	C4 (Q28)	C5 (Q29)	C6 (Q30)	C7 (Q31)	E1 (Q32)	E2 (Q33)	E3 (Q34)	E4 (Q35)	E5 (Q36)	EMM1 (Q37)	EMM2 (Q38)	EMC1 (Q39)	EMC2 (Q40)
KoP1 (Q8)																																	
KoP2 (Q9)	<.001																																
KoT1 (Q10)	<.001	<.001																															
KoT2 (Q11)	<.001	0.02	<.001																														
KoS1 (Q12)	<.001	<.001	<.001	<.001																													
KoS2 (Q13)	<.001	<.001	<.001	<.001	<.001																												
KoS3 (Q14)	<.001	<.001	<.001	<.001	<.001	<.001																											
P1 (Q15)	<.001	0.01	<.001	0.14	<.001	<.001	<.001																										
P2 (Q16)	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001																									
P3 (Q17)	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001																								
P4 (Q18)	0.59	0.96	0.30	0.88	0.10	0.31	0.77	<.001	0.04	0.06																							
M1 (Q19)	<.001	0.01	<.001	0.02	<.001	0.01	<.001	0.18	<.001	<.001	0.11																						
M2 (Q20)	<.001	0.01	<.001	<.001	<.001	<.001	<.001	0.05	<.001	<.001	0.18	<.001																					
M3 (Q21)	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	0.22	0.01	<.001																				
M4 (Q22)	<.001	0.01	<.001	0.01	<.001	<.001	<.001	<.001	<.001	<.001	0.01	0.01	<.001	<.001																			
M5 (Q23)	0.05	0.13	0.03	0.18	0.01	0.02	0.04	0.01	0.01	<.001	0.01	0.02	0.03	0.02	<.001																		
M6 (Q24)	0.02	0.08	0.04	0.21	<.001	0.01	0.11	0.02	0.02	<.001	0.05	<.001	0.04	0.02	0.03	<.001																	
C1 (Q25)	<.001	0.01	<.001	0.02	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	0.01	<.001	<.001	<.001	<.001																
C2 (Q26)	<.001	0.01	<.001	0.04	<.001	<.001	<.001	0.02	0.01	<.001	0.05	<.001	<.001	0.01	0.01	0.01	<.001	<.001															
C3 (Q27)	0.01	0.02	<.001	0.08	0.01	<.001	0.03	0.01	0.01	<.001	0.01	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001														
C4 (Q28)	0.19	0.25	0.16	0.20	0.05	0.07	0.18	0.05	0.02	0.01	<.001	0.02	0.08	0.11	<.001	<.001	<.001	<.001	0.02	<.001													
C5 (Q29)	0.25	0.23	0.60	0.81	0.22	0.53	0.66	0.06	0.53	0.11	0.02	0.15	0.06	0.05	0.08	<.001	<.001	<.001	0.52	<.001	<.001												
C6 (Q30)	0.09	0.32	0.03	0.24	0.04	0.01	0.69	0.02	<.001	<.001	0.08	0.05	<.001	0.01	<.001	<.001	<.001	0.01	0.04	<.001	0.01	0.01											
C7 (Q31)	0.26	0.33	0.19	0.33	0.33	0.41	0.89	0.03	0.08	0.07	<.001	0.10	<.001	<.001	<.001	0.01	0.07	0.03	0.18	<.001	0.03	<.001	<.001										
E1 (Q32)	0.01	0.01	<.001	<.001	0.03	0.07	0.01	0.10	0.02	0.09	0.68	0.01	<.001	<.001	0.01	0.86	0.92	0.28	0.11	0.07	0.85	0.10	0.31	<.001									
E2 (Q33)	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	0.89	<.001	<.001	<.001	<.001	0.04	0.08	<.001	<.001	<.001	0.21	0.66	0.04	0.03	<.001								
E3 (Q34)	<.001	<.001	<.001	<.001	<.001	<.001	<.001	0.01	<.001	<.001	0.21	0.04	0.02	<.001	<.001	<.001	<.001	<.001	0.15	0.01	0.01	0.01	0.11	0.01	0.01	<.001							
E4 (Q35)	<.001	<.001	<.001	<.001	<.001	<.001	0.01	0.02	<.001	<.001	0.77	0.01	<.001	<.001	<.001	0.01	0.01	<.001	0.07	0.02	0.64	0.21	0.07	0.22	0.01	<.001	<.001						
E5 (Q36)	<.001	<.001	<.001	<.001	<.001	<.001	<.001	0.01	<.001	<.001	0.46	<.001	<.001	<.001	<.001	0.01	0.08	<.001	<.001	<.001	0.09	0.50	0.03	0.08	<.001	<.001	<.001	<.001					
EMM1 (Q37)	0.01	0.02	0.08	0.30	<.001	0.03	0.02	<.001	0.04	0.01	0.18	0.04	0.01	<.001	0.01	0.01	<.001	0.02	0.14	0.01	0.35	<.001	0.01	0.01	0.01	0.01	0.02	0.01	0.01				
EMM2 (Q38)	<.001	<.001	0.01	0.03	<.001	<.001	0.02	0.07	<.001	<.001	0.78	0.04	<.001	<.001	<.001	0.31	0.39	0.12	0.13	0.08	0.81	0.10	0.02	0.08	<.001	<.001	0.01	<.001	<.001	<.001			
EMC1 (Q39)	0.20	0.50	0.08	0.36	0.03	0.19	0.26	0.04	<.001	0.01	<.001	0.03	0.15	0.28	<.001	<.001	<.001	<.001	0.17	<.001	<.001	0.01	<.001	0.05	0.74	0.11	0.02	0.02	0.04	0.07	0.63		
EMC2 (Q40)	0.10	0.04	0.15	0.09	0.01	0.27	0.11	0.31	0.02	0.01	0.03	0.01	0.52	0.41	0.09	<.001	<.001	<.001	0.05	<.001	0.02	0.10	0.07	0.17	0.54	0.07	0.03	0.01	0.03	0.02	0.23	<.001	

Note - KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control). Numbers next to metacognitive/self-regulatory category labels indicate which specific item this question is based on from the full 32-item list (see Section 6.2.7.1).

Appendix F

P values for all correlations in Table 16

	KoP	KoT	KoS	P	M	C	E	EMM	EMC
KoP									
KoT	<.001								
KoS	<.001	<.001							
P	<.001	<.001	<.001						
M	<.001	<.001	<.001	<.001					
C	.007	.007	.002	<.001	<.001				
E	<.001	<.001	<.001	<.001	<.001	<.001			
EMM	<.001	.013	<.001	.002	<.001	.005	<.001		
EMC	.102	.038	.046	.001	.001	<.001	.012	.079	

Note - KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control).

Appendix G

P values for all correlations in Table 17

	KoP	KoT	KoS	P	M	C	E	EMM	EMC
KoP									
KoT	<.001								
KoS	<.001	<.001							
P	<.001	<.001	<.001						
M	<.001	<.001	<.001	<.001					
C	.002	.006	.001	<.001	<.001				
E	<.001	<.001	<.001	<.001	<.001	<.001			
EMM	<.001	.017	<.001	.003	<.001	.003	<.001		
EMC	.037	.043	.012	.002	.002	.001	.009	.066	

Note - KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control).

Appendix H

Metacognitive Knowledge Interview (McKI) script used in the pilot study

Pilot study 2018 - McKI script

Thank you doing some great practice! I would like to talk to you about the practice you did and about your thinking whilst you were practising. My job is to learn about how kids learn and think during their piano practice and I have a few questions for you, okay? [Child assents] **Thank you! Remember, there are no right or wrong answers; I only want to know what you think. Just give *your* best answer.** [If they don't agree, try to prompt them by saying: 'I really need your help and want to learn about how kids think when they're practising the piano'.]

1) **Do you think you did a good job, an okay job or not so good of a job of practising the piano today?**

2a) If they say they did a good job, ask '**What did you do to help you do a good job?'**

2b) If they answer okay or not so good, ask '**What do you think would have helped you do an even better job?**'

3) **What do you feel that you are particularly good at practising and why?**

4) **Which parts of practice did you find more difficult and why?**

5) **What would have made the difficult parts easier?**

6) **How did you feel when you were practising?**

8) **Did you find it helpful when mom/dad practised with you? Why?**

9) **What do you feel mom/dad could have done to help you practice even better?**

Now, I would like you to be the teacher! This is Gogi, and I would like to pretend that you are Gogi's piano teacher. Gogi is from another land. S/he does not have a piano teacher or know anything about the piano. I would like you to teach Gogi about how to learn the piano. Will you help him/her? Wait for child to assent and say: **Thank you**. (If they don't agree, try and prod them by saying that 'Gogi really needs your help and wants to learn about how to play the piano').

10. **What should Gogi do if s/he's having trouble with the practising their scales? What about if they're having trouble reading the notes or struggling with their pieces?** (KoT; KoS; C)

11. **Would it be helpful for Gogi to talk to herself/himself about the practising while practising? Why would/wouldn't that be a helpful thing to do?** (KoS; M; C)

12. **What kinds of things could Gogi do to make sure s/he does enough practice between his/her lessons?** (P)

13. **Gogi often gets distracted easily. What could Gogi do to try and help him/her concentrate whilst practising?** (E/M M; E/M C)

Thank you for sharing all of your ideas and how you think with me and Gogi!

Appendix I

Marulis et al.,'s (2016) Metacognitive Knowledge Interview (McKI) protocol and "annotated scoring notebook" (pp. 359-365)

Appendix B. Metacognitive Knowledge Interview (McKI)

Once the Wedgits puzzle task is complete, tell child: "**Thank you for working on those puzzles! I would like to talk to you about the puzzles you just did and about your thinking. My job is to learn about how kids learn and think and I have a few questions for you, Okay**?" Once child assents, say: "**Thank you. Remember, there are no right or wrong answers; I only want to know what you think. Just give *your* best answer**." (If they don't agree, try to prompt them by saying: "I really need your help and want to learn about how kids think".)

1. "**Do you think you did a good job, an okay job or not so good of a job on the puzzles**?" Circle child's response. If they say they did a good job, ask "**What did you do to help you do a good job**?" If they answer okay or not so good, ask "**What do you think would have helped you do an even better job**?
2. "**Did you think anything was hard**?" If no, ask: "**Why not**?" If yes, ask "**Why**? **What would have made it easier**?"
3. "**Would these puzzles be hard for another kid your age**? **Why/why not**?"
4. **How did you know if you were getting the puzzles right**?"

Show child the 'alien' finger puppet and say: "**I have another friend to show you. This puppet's name is Gogi and he/she** (use same gender as the child) **is from another land. S/he does not go to a school like yours or have a teacher like yours and doesn't know anything about puzzles like the ones you just did. Will you help Gogi learn about these kind of puzzles**?" Wait for child to assent and say: "**Thank you**." (If they don't agree, try to prod them by saying that 'Gogi really needs your help and wants to learn about these kind of puzzles'.)

5. "**Would these puzzles be easier for Gogi or you**? **Why**?"
6. "**What should Gogi do if s/he is having trouble with the puzzle**?"
7. "**Would it be helpful for Gogi to talk to herself/himself about the puzzle while doing the puzzle**? **Why would/wouldn't that be a helpful thing to do**?
8. "**Gogi has some questions for you about puzzles like this one. Okay**?" Have Gogi 'speak' directly to the child and ask the following:
9. **Would the puzzle be easier with bigger or smaller pieces**? **Why**?"
10. "**If all of the puzzle pieces were the same color, like in this picture** (show the Wedgits booklet of all purple Wedgits) **will the puzzle be easier**? If yes, ask: "**Why**?" If no, ask, "**Why not**?"
11. "**If I think about how the pieces would fit together before I try, will the puzzle be easier**? If yes, ask: "**Why**?" If no, ask, "**Why not**?"
12. "**If I close my eyes while I do the puzzle, will it be easier**? If yes, ask: "**Why**?" If no, ask, "**Why not**?"

"**Thank you for sharing all of your ideas and how you think with Gogi**!

Appendix C. Wedgits Puzzle Scoring

1. Rate the accuracy of the child's performance on the Wedgits task. These coding categories are designed to match the Metacognitive Knowledge Interview

(McKI) in which the child is asked how well she or he did on the puzzle (Question #1).

a. **Good** = Child accurately (e.g., the puzzle looked exactly like the picture card) finished the first and second puzzles within the time allotted (4 min). The child may have started (or completed) a third or even fourth puzzle, but this is not required to receive a score of "Good".
b. **Okay** = Child accurately (e.g., the puzzle looked exactly like the picture card) finished the first puzzle within the time allotted (4 min) and accurately completed at least half of the second puzzle (i.e., completed the bottom half—that looks like a pyramid—and the green piece that is placed vertically in the pyramid).
c. **Not so good** = Child accurately (e.g., the puzzle looked exactly like the picture card) finished the first puzzle within the time allotted (4 min) and started the second puzzle but did not accurately complete half of the second puzzle (i.e., did not complete the bottom half that looks like a pyramid).

Appendix D. Metacognitive Knowledge Interview (McKI) Annotated Scoring Codebook

The Metacognitive Knowledge Interview (McKI) is used to assess children's metacognitive knowledge (or knowledge about individuals, tasks and strategies) individually using a series of 11 questions related to the Wedgits task [in which children are shown design cards of increasing difficulty and are asked to make the Wedgits building blocks look exactly like the picture on the card.

TO SCORE:
Rate responses to questions on a 0–2 scale for each question where:

- 0 = Not at all metacognitive

– Response does not refer to knowledge about the child's thinking or cognitive ability/capability; the difficulty of the task itself or the efficacy/efficiency of a strategy.

E.g., child disagreed that talking to oneself can be helpful in solving a task without an appropriate explanation (e.g., said "I don't know" or "because I don't like to do it". *NOTE: child could receive the full score (2 points) for a negative response to this question IF she or he provided a metacognitive explanation such as talking to oneself is not helpful because it will distract their thinking or make them not be able to attend to the task. The full points refer to an "appropriate metacognitive response"; thus yes OR no could be a fully metacognitive response depending on the explanation.

- 1 = Partially metacognitive

– Response refers to knowledge about the child's thinking or cognitive ability/capability; the difficulty of the task itself or the efficacy/efficiency of a strategy but not completely/fully or without an explanation that backs up the response.

0 points would be given if the child was metacognitively inaccurate about his/her performance along with a non-metacognitive follow-up response.

2. “Did you think anything was hard?” If no, ask: “Why not?” If yes, ask “Why? What would have made it easier?” *My brain focuses when I’m doing puzzles*

1 point. He said nothing was hard but other comments he made during the third puzzle (see notes below) indicated that there were parts he found very difficult. However, he verbalized metacognitive knowledge regarding why it didn’t seem difficult-he was aware that by being able to concentrate and maintaining focus (with your brain), the task will likely be/seem easier.

2 points. A child whose response to whether anything was hard matches his/her comments/emotional response to the puzzle would get a full point for that part of the question and another full point for why he/she didn’t find it hard-e.g., the type of response given here. If the child said something was difficult (and this matched his/her response to the puzzle) and also responded with a metacognitively aware answer regarding what would have made it easier-e.g., having help from an adult/older child or getting a hint, she/he would receive 2 points.

A score of 0 would be given if the child was metacognitively inaccurate about his/her performance along with a non-metacognitive follow-up response to Why/Why not.

3. “Would these puzzles be hard for another kid your age? Why/why not?” *No, I don’t know.*

1 point. His answer matches the one above as to whether the task would be difficult depending on age but didn’t give a response as to why he thought this.

In order to receive 2 points, a child would have to either match the response to Question #2 (e.g., if they said the puzzle was/wasn’t difficult for them) and follow with a metacognitively aware response as to why such as “these puzzles are hard for 4 year olds” or “we have these in our classroom so they’re not hard for us” OR, the child could have a different response with a metacognitively aware answer as to why such as “Yes, they would be hard for other kids my age because they don’t have them at home like I do” or “No, they wouldn’t be hard for other kids my age because they are better at puzzles than me”.

0 points would be given if the child gave an answer that didn’t match #2 and gave a non-metacognitive follow-up response to Why/Why not.

4. “How did you know if you were getting the puzzles right?” *I looked at the picture*.

2 points. He was aware not only of what strategy would be helpful in accurately completing the task but of which strategy he actually used while doing the task (this can be discerned by watching the video or noting whether the child actually used this strategy during the task).

A child would be given 1 point if gave a partially metacognitive response such as “I thought about it hard”.

0 points were given for non-plausible/non-metacognitive responses such as “I just knew” or “because I’m smart/good”.

E.g., child agreed that talking to oneself can be helpful in solving a task but their reason was not related to cognition (e.g., because it's fun) or they didn't know why.

- 2 = Appropriately Metacognitive

– Response refers to knowledge about the child's thinking or cognitive ability/capability; the difficulty of the task itself or the efficacy/efficiency of a strategy in a complete/full way or with a metacognitive explanation that backs up the response.

E.g., child agreed that talking to oneself can be helpful in solving a task because it helps them remember how to do the task/helps their brain think better, etc.
OR child disagreed that talking to oneself is helpful because it would distract them.

The full set of questions is below including example responses and scoring. The actual scores given for this child are indicated along with what would qualify for the other levels of scoring.

Metacognitive Knowledge Interview_CODED SAMPLE

Once the Wedgits puzzle task is complete, tell child: "Thank you for working on those puzzles! I would like to talk to you about the puzzles you just did and about your thinking. My job is to learn about how kids learn and think and I have a few questions for you, Okay?" Once child assents, say: "Thank you. Remember, there are no right or wrong answers; I only want to know what you think. Just give *your* best answer." (If child doesn't agree, try to prod by saying "I really need your help and want to learn about how kids think".)

1. "Do you think you did a good job, an okay job or not so good of a job on the puzzles?" Circle child's response. If they say they did a good job, ask "What did you do to help you do a good job?" If they answer okay or not so good, ask "What do you think would have helped you do a better job?" *My brain-that controls my whole body and helped me think about the puzzle.*

2 points. His knowledge of how well he performed on the task was accurate. He performed above his age level by completing the second challenging puzzle accurately and quickly and nearly completed the 3rd puzzle (designed for children older than preschool and chosen to pose a challenge sufficient enough for children this age to be unable to complete accurately, particularly within four minutes). Further, he showed metacognitive knowledge about himself and what helped him/would help him do a good job on puzzles-his brain.

1 point. A score of 1 would be given either for an inaccurate assessment of one's performance on the puzzle or an accurate response to this with a non-metacognitive response to what would help do a good/better job such as "being good" or "doing a good job" (it's a 2 part question). If a child accurately assessed his/her Wedgits performance and gave a partial metacognitive response (such as: "liking the puzzle" because it is possible that higher enjoyment/interest in a task leads to higher performance but this response does not fully spell this out. Or responding to the question "What did you to do help you do a good job" with: "I tried hard" without elaboration), he/she could get 1.5 on this question.

"Gogi has some questions for you about puzzles like this one. Okay?" Have the puppet 'speak' directly to the child and ask the following:

For the last 4 questions, there was an intended 'correct' answer in that one response would make the puzzle task easier (as confirmed by adults answering these same questions). Thus, the child would get 1 point for answering correctly/metacognitively accurately and another 1 point for giving a metacognitively aware response as to why this was true. *However*, it became apparent after conducting several interviews that children sometimes viewed the strategies differently than adults. Thus, if they responded differently than the adults to which situation would make the puzzle easier but gave a metacognitive response that appropriately made the first response defensible, he/she received the full 2 points (if there was no response given to back up their answer or a non-metacognitive response given, the score would be 0. In contrast, if the child responded as adults did to the first part but did not respond to the second part or responded non-metacognitively, she/he would receive 1 point).

8. "Would the puzzle be easier with bigger or smaller pieces? Why?" *Easier to hold in your hands*.

2 points. He responded like adults for bigger pieces and gave a response that, while not as cognitively related as adults answered-e.g., "less pieces to have to figure out how to fit together or less intricate designs", it was a plausible reason as to why bigger pieces make doing a puzzle easier.

1 point would have been given if there was no response to "Why" or he had said something like "It's better".

0 points would have been given if he had said smaller was easier and given no response to "Why" or he had said something like "It's better". However, 2 points would have been given if he had said "smaller" along with a metacognitive response such as "Smaller pieces would be easier for Gogi to hold/see" (Gogi is a small hand puppet).

9. "If all of the puzzle pieces were the same color, will the puzzle be easier? If yes, ask: Why? If no, ask, "Why not?" *I can't figure out which one goes where*.

2 points. He responded like adults and gave a metacognitive response to "Why not".

1 point would have been given if there was no response to "Why" or he had said something like "It's harder like that".

0 points would have been given if he had said "Yes" with no response to "Why" or he had said something like "It's just easier". However, 2 points would have been given if he had said "Yes" along with a metacognitive response such as "Then you would be able to sort by size" (indicting less cognitive load because you don't have two dimensions on which to sort).

10. "If I think about how the pieces would fit together before I try, will the puzzle be easier? If yes, ask: Why? If no, ask, "Why not?" *Because it is (demonstrated 'thinking' and putting the pieces in the right places*).

1 point. He responded as adults would but did not give a metacognitive response to "Why" (though his demonstration came close, but even after being prompted after this enactment, he did not respond with any indication of metacognitive awareness.

Show child the ‘alien’ finger puppet and say: “I have another friend to show you. This puppet’s name is Gogi and he/she (use same gender as the child) is from another land. S/he does not go to a school like yours or have a teacher like yours and doesn’t know anything about puzzles like the ones you just did. Will you help Gogi learn about these kind of puzzles?” Wait for child to assent and say: “*Thank you.*” (If they don’t agree, try to prod them by saying that ‘Gogi really needs your help and wants to learn about these kind of puzzles’.)

5. “Would these puzzles be easier for Gogi or you? Why?” *A lot; I focus a lot*

1 point. He indicated metacognitive knowledge in asserting that he (would had experience with puzzles and was from a school/had teachers who taught about puzzle and puzzle-related tasks) but not in his response as to why. It is metacognitive to understand that focusing helps improve performance, but in this instance, the question was about *why he would have an easier time than Gogi*.

In order to receive 2 points, a child would have to say something like “I have already done those puzzle” or “I know all about puzzles and Gogi doesn’t know about them at all”.

0 points would be given if the child chose Gogi without a metacognitive explanation. The child could receive 1 point by choosing Gogi but giving a metacognitive response as to why such as “He looks smarter with that big brain (the toy had a brain external to his head).”

6. “What should Gogi do if s/he is having trouble with the puzzle?” *Ask someone*.

2 points. He his answer reflected metacognitive awareness of a good strategy to use when encountering trouble (i.e.., help-seeking).

To receive 1 point, a child could respond with an answer that indicates some awareness of cognitive states but not of a (potentially) successful strategy, such as “Try it” (if the child had added “harder” or “again” after “Try”, she/he would receive the full 2 points indicating that he/she is aware that trying again, using a different strategy, or putting forth more effort may result in more success).

A score of 0 would be a response such as “Be good” which is not at all indicative of awareness of cognitive strategy.

7. “Would it be helpful for Gogi to talk to herself/himself while doing the puzzle? Why would/wouldn’t that be a helpful thing to do? *Yes-he has to focus and get concentration. Talking to yourself does that*.

2 points. He verbalizes metacognitive knowledge that talking to oneself about a task while performing it is likely to be cognitively helpful as well as why (because it helps you focus and concentrate).

1 point would be given if the child answered Yes but didn’t know why or gave a non-metacognitive response as to why such as “It helps” or “It’s good”.

0 points would be given for an answer of No without a metacognitive explanation. The child could receive 1 point by responding “No” but giving a metacognitive response as to why such as “Because if you talk you might get distracted and do a bad job on the puzzle”.

2 points would have been given if his second response was something like “because it helps me focus on the puzzle” or “I’d have more time to figure out the right place”.

0 points would be given for a response of “No” with no response as to “Why not” or a non metacognitive response such as this one “Because it isn’t”.

11. “If I close my eyes while I do the puzzle, will it be easier? If yes, ask: Why? If no, ask, “Why not?” *No, he can’t see what he’s doing! He couldn’t see if he had the right piece or the right place on the card (pointed to the design picture card*)”.

2 points. He responded like adults and gave a metacognitive response to “Why not”.

He would have been given 1 point for not responding to “Why not” or giving a non metacognitive response such as this one “Because it isn’t easier”.

0 points would be given for a response of “Yes” with no response to “Why” or without a metacognitive response to defend this (see above-adults were unable to come up with a way to metacognitively defend this answer except possibly by discussing how other senses may become more acute, but this still wouldn’t make the puzzle easier though a case may be able to be made for equally easy”).

“Thank you for sharing all of your ideas and how you think with Gogi!

Notes: While he was building the puzzle, he made a lot of metacognitive (evaluative) comments such as “*I built this one before so I’m good at it.*” *And for the most challenging puzzle, he said* “*OOOh, I can’t do that one! It’s so hard!!*” *Then as he worked on it, he said* “*I’m having trouble with this part*” *(he didn’t successfully complete it but was close*).

Appendix J

Participant information sheet, consent forms and children's certificates for Study 2

ROYAL NORTHERN COLLEGE of MUSIC

Royal Northern College of Music,
124 Oxford Road,
Manchester,
M13 9RD.

Participant Invitation

Associations between parental behaviours and children's metacognition during piano practice

June 2019

Dear Parent/Guardian/Teacher,

Your child/pupil has been invited to participate in a research project led by Jo Yee Cheung, a PhD researcher in Music Education at the Royal Northern College of Music. This project has been approved by the RNCM Research Ethics Committee.

The aim of this project is to learn more about the relationship between parental behaviours and children's metacognition (their ability to regulate their own learning) whilst practicing the piano. Research indicates that children's metacognitive abilities may contribute to their musical achievement – the purpose of this research is to explore the extent to which certain parental behaviours may help to develop these metacognitive abilities in children during piano practice.

Attached to this letter, you will find an information sheet and consent form, to ensure that all families are fully informed about the research project. I would greatly appreciate it if you could take time to consider this invitation. If you are willing for you and your child to participate, please complete and return the attached forms to your piano teacher, or to the principal researcher when you meet her.

If you have any further questions about the research at any stage, please contact the project's Principal Investigator, Jo Yee Cheung, at jo-yee.cheung@student.rncm.ac.uk or on 07809532354. Alternatively, please feel free to email Jo's supervisor, Dr Michelle Phillips at michelle.phillips@rncm.ac.uk.

Yours sincerely,

Jo Yee Cheung
Principal Investigator

Participant Information Sheet

Metacognition is the awareness and regulation of one's own thinking, and an essential part of learning to play an instrument. Parents play an important role in supporting children's metacognitive development. Research suggests that particular parenting behaviours may be more likely encourage the development of children's metacognition than others. Given the importance of metacognition in musical learning, parental behaviours which support metacognition in children may have significant implications for children's musical achievement too. This study uses a combination of **questionnaires, interviews and observational methods** to investigate the relationship between parental behaviours and children's metacognition during musical learning and asks for the participation of children aged 6-8 learning to play piano in the UK, as well as their parents and piano teachers.

Nature of participation

Teachers will be asked to fill out a questionnaire about the relevant child's musical ability. Children will be videoed practicing for a total of 20 minutes: 10 minutes on their own, and 10 minutes with the help of a parent. Children will then take part in a 5-minute interview with the researcher about their practice. During this time, parents will be asked to complete a short questionnaire about things they do to help with their child's practice. All participants will be debriefed at the end of the study, which will take a total of 30 minutes plus set up time:

10 minutes of independent practice (child)
10 minutes of assisted practice (child and parent)
5-minute interview (child) / 5-minute questionnaire (parent)

It is recommended that **practice sessions and interviews take place in families' homes**, in order to allow children to feel as comfortable as possible and reduce inconvenience to parents. However, the researcher is happy for anyone who would prefer for practice sessions/interviews to take place externally to take part in the study at her home in Central Manchester instead.

What are the potential benefits?

The results of this study will help inform research into parental behaviours which may help to develop children's metacognition during musical learning, as part of the researcher's PhD thesis. The results will primarily be viewed by the researcher and her supervisor (Dr Michelle Phillips), and may also be shared in conferences and publications. Direct benefits to your child and you involve:

-Positive and stimulating activities in a non-judgemental environment, which may help participants to reflect on behaviours which may help to support effective musical learning and practice.
- A certificate of recognition for your child.
- Receiving information about the findings of the project through articles, conference papers and email newsletters.

How have ethical issues and confidentiality been considered?

Great care will be taken to protect your own and your child/pupil's confidentiality. All personal information will be de-identified (replacing personal names by number codes), while task scores and videos will be kept on a hard-drive with access restricted only to the Principal Investigator. All data will be destroyed five years after the completion of the project. Data collected from you and your child will be used in Jo Yee Cheung's PhD. In the event that the researcher wishes to use video clips from the study in conferences or other research outputs, relevant participants will be contacted directly and asked for their consent before use.

Jo has over five years' experience working with young children - she is fully DBS checked and possesses Level 1 safeguarding training from the NSPCC. Every effort will be taken to ensure your child is happy and comfortable throughout their participation. However, in agreement with the Ethical Conduct of Research, you and your child can decide not to continue your involvement in the study at any time and with no need to provide any explanation. This will not affect you and your child in any negative way. If your child decides to stop practising and/or withdraw from the interview at any point, his/her wishes will be respected at all times and without questioning. In the event that the project is terminated for any reason and your participation is no longer required for the research, you will be informed and told why.

If you have any further questions about the research at any stage, please contact the project's Principal Investigator, Jo Yee Cheung, at jo-yee.cheung@student.rncm.ac.uk or on 07809532354. Alternatively, please feel free to email Jo's supervisor, Dr Michelle Phillips at michelle.phillips@rncm.ac.uk.

If you agree to your child participating in the study, please complete and return the attached consent form to your child's piano teacher no later than 10th June 2019.

Thank you for taking the time to consider this invitation!

The relationship between parental behaviours and the development of metacognition in children during musical learning – Consent Form (parents and teachers)

Jo Yee Cheung (Principal Investigator)

Participant identification code for this project:

1. I confirm that I have read and understood the participant information sheet dated [insert date] for research project in which I have been asked to take part and have had the opportunity to ask questions. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason. ☐
3. I give the researcher(s) permission to collect information about me and from me for the purposes of the research project provided all information about me will be kept confidential, stored securely and destroyed after 5 years. ☐
4. I DO/ DO NOT [delete as appropriate] give permission for information from me to be attributed to me by name. ☐
5. I DO/ DO NOT [delete as appropriate] give permission for audio- or video-recordings of me to be played in the course of reporting the research. Explicit permission ☐
6. I agree to take part in the above-named project. ☐

____
Name of child/pupil (delete as appropriate)

________________________________	____________________	____________________________
Name of parent/teacher (delete as appropriate)	**Date**	**Signature**
________________________________	____________________	____________________________
Researcher	**Date**	**Signature**

Copies
One copy for the participant, and one copy for the researcher / supervisor.

CONSENT FORM (child)

Dear Parent/ Guardian,
Please explain this information to your child. If he/she agrees to take part in the study, please encourage him/her to write his/her name to indicate his/her consent.

Hello!

My name is Jo and I am doing some activities to learn more about how parents can help their children practice the piano better!

Your participation is very important and will include being videoed practicing the piano for 10 minutes by yourself, and for 10 minutes with your mum or dad.

After practicing, I will ask you to have a little chat with me so that you can tell me all about your practice. At the end of the study, you will receive a certificate and small prize to say thank you for your help!

If you want to take part in this study, please sign below and return this letter to your piano teacher.

Your name in capital letters (written by your parent/guardian):

____

Your Signature or your name written by you

____

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CERTIFICATE OF PARTICIPATION

This is presented to

for taking part in an RNCM research project about piano practice,
and for teaching Gogi all about the piano!

JO YEE CHEUNG
Principal Investigator (RNCM)

Appendix K
Parent questionnaire used in Study 2

Parent Questionnaire

Name of parent		
Previous musical experience of each parent if applicable e.g., formal music lessons, singing in a choir, playing in a band	Parent 1 (i.e., the participant)	Parent 2 (if applicable)
Name of child		
Age of child		
How long has your child been taking piano lessons (in months)?		
Who usually supervises your child's practice?		
How often do you supervise your child's practice?		
How long have you been supervising your child's practice for (e.g., since your child started a year ago; 2 months ago)?		

Main questionnaire items

1 = completely disagree
2 = strongly disagree
3 = somewhat disagree
4 = neither agree nor disagree
5 = somewhat agree
6 = strongly agree
7 = completely agree

If you prefer not to answer, please mark "X".

Parents do not need to worry if their child misbehaves a lot	
It is very important for young children to do as they are told, for example, waiting when they are told to wait	
I help my child to be able to evaluate their own strengths or difficulties during their practice e.g., by encouraging my child to talk about what they feel they	

are very strong at, and which things they find more difficult during their piano practice	
Young children should be allowed to make their own decisions, like what to play with and when to eat	
Too much affection, such as hugging and kissing, can make a child weak	
Children should be grateful to their parents	
I help my child to be able to compare different kinds of tasks with each other e.g., by encouraging my child to compare the experience of practising pieces with practising sight-reading or scales	
It is very important that there are consequences when a child breaks a rule, big or small	
I help my child to be able to define or explain how she/he has done or learned something e.g., by encouraging my child to verbalise the strategies they used to overcome a tricky passage in a piece of music they are learning	
It is okay if young children boss around their caregivers	
I help my child to be able to set themselves targets e.g., by encouraging my child to devise regular goal-posts, such as memorising a scale or being able to perform a piece confidently by the end of a practice session	
It's important for parents to help children learn to deal with their emotions	
I help my child to be able to detect errors in their practice e.g., by encouraging my child to check their posture, or by pointing out differences between how your child's teacher has suggested they practice and how your child is actually practising	
It is okay if children see adults as equals rather than viewing them with respect	
A child who has close bonds with his or her parents will have better relationships later on in life	
I help my child to be able to change their approach when things aren't working e.g., by encouraging my child to try new practice strategies when they find themselves 'stuck' on a difficult section of music, without improvement, for an extended period of time	
Parents should not try to calm a child who is upset, it is better to let children calm themselves	

Children who receive too much attention from their parents become spoiled	
I help my child to be able to observe and comment on task progress e.g., by encouraging my child to make judgements on how well they feel their practice is going during a practice session	
Children and parents do not need to feel emotionally close as long as children are kept safe	
It is very important that children learn to respect adults, such as parents and teachers	
Parents should pay attention to what their child likes and dislikes	
I help my child to be able to control their attention whilst practising e.g., by encouraging my child to turn off the TV, radio, phone or any other distractions whilst practising, and/or persuading them to return to their practice after a momentary distraction	
Children should be comforted when they are scared or unhappy	

Appendix L
Metacognitive Knowledge Interview (McKI) script and coding guidelines for Study 2

Child – McKI (model 2)

Thank you for doing some great practice! I would like to talk to you about your thinking whilst you were practising by yourself, and when you practiced with mummy/daddy's help. My job is to learn about how kids think whilst practising and how their parents can help them. Would you be happy to answer some of my questions? [Child assents]

Thank you! Remember, there are no right or wrong answers; I only want to know what you think. Just give *your* best answer. [Child assents. If they don't agree, try to prompt them by saying: 'I really need your help and want to learn about how kids think when they're practising the piano'.]

(Context-specific: KoT, KoP, KoS, E, EMM)

1. **What did you practice today? I didn't see or hear your practice session, so please tell me about what you practised in as much detail as possible.** (KoT)
   (Prompt: For example, did you practice your pieces and scales today?)
2. **Do you think you did a good job, an okay job or not so good job of practising the piano by yourself today? Why?** (E)
   (Prompt: What things did you do that make you feel did a good/okay/not so good job in your pieces, for example)
3. **Which parts did you find most difficult? Why?** (KoP)
   (Prompt: For example, where there any bits where you had to move around a lot, which you found difficult?)
4. **With these difficult parts, what could you do to make them become easier?** (KoS)
   (Prompt: Does playing difficult parts more slowly make them easier to play? Why)

5a. How did you feel when you were practising today? Why? (E/M M)
(Prompt: For example, did you feel happy, or maybe frustrated?)

5b. (If negative emotion) What could you do to help yourself feel happy/calm again? (E/M C)
(Prompt: Is it helpful, for example, to tell yourself you can do it, or take a short break?)

(Parental assistance)

6. **Did you find it helpful when mummy/daddy practised with you?**
   (Prompt: Or maybe was it easier when you practised alone?)
7. **Is there anything that did mummy/daddy did that you found particularly helpful?**
   (Prompt: For example, is it helpful when mummy/daddy gives you encouragement?)
8. **Is there anything that did mummy/daddy did that you found less helpful?**
   (Prompt: For example, is it unhelpful when mummy/daddy talk over you?)

Now, I would like you to be the teacher! This is Gogi, and I would like to pretend that you are Gogi's piano teacher. Gogi is from another land. S/he does not have a piano teacher or know anything about the piano. I would like you to teach Gogi about how to learn the piano. Will you help him/her? Wait for child to assent and say: **Thank you**. (If they don't agree, try and prod them by saying that 'Gogi really needs your help and wants to learn about how to play the piano').

(General: KoP, KoT, KoS, EMC)

9. What makes a good pianist? What characteristics do you have? (KoP)
(Prompt: For example, is it important for good pianists to be able to able to play in time? Why?)

10. Could you explain to Gogi how practising pieces is different from practising sight-reading? (KoT)
(Prompt: Should you spend a lot of time practising sight-reading exercises before you play them? What about with your pieces?)
11. What could Gogi do to make sure s/he does enough practice between his/her lessons? (KoS)
(Prompt: Would it be useful, for example, for Gogi to make a practice chart? What else could s/he do?)
12. How will Gogi know when s/he's done enough practice? (E)
(Prompt: How do you know when *you've* done enough practice? Might this be the same for Gogi?)
13. Gogi gets distracted easily. What could Gogi do to try and help him/her concentrate better whilst practising? (E/M C)
(Prompt: What do you do when you get distracted? How might this help Gogi?)

Thank you for sharing all of your ideas and how you think with me and Gogi!

Metacognitive Knowledge Interview (McKI)
Coding scheme (Jan 2020)

Instructions taken from Marulis *et al*. 2016:
TO SCORE:
Rate responses to questions on a 0–2 scale for each question where:

0=Not at all metacognitive
– Response does not refer to knowledge about the child's thinking or cognitive ability/ capability; the difficulty of the task itself or the efficacy/efficiency of a strategy.

E.g., child disagreed that talking to oneself can be helpful in solving a task without an appropriate explanation (e.g., said Idon't know or because I don't like to do it). *NOTE: child could receive the full score (2 points) for a negative response to this question IF she or he provided a metacognitive explanation such as talking to oneself is not helpful because it will distract their thinking or make them not be able to attend to the task. The full points refer to an appropriate metacognitive response; thus yes OR no could be a fully metacognitive response depending on the explanation.

1=Partially metacognitive
– Response refers to knowledge about the child's thinking or cognitive ability/capability; the difficulty of the task itself or the efficacy/efficiency of a strategy but not completely/fully or without an explanation that backs up the response.

E.g., child agreed that talking to oneself can be helpful in solving a task but their reason was not related to cognition (e.g., because it's fun) or they didn't know why.

2=Appropriately Metacognitive
– Response refers to knowledge about the child's thinking or cognitive ability/capability; the difficulty ofthe task itselfor the efficacy/efficiency of a strategy in a complete/full way or with a metacognitive explanation that backs up the response.
E.g., child agreed that talking to oneself can be helpful in solving a task because it helps them remember how to do the task/helps their brain think better, etc. OR child disagreed that talking to oneself is helpful because it would distract them.

	0	0.5	1
Q1 **What did you practice today? I didn't see or hear any of your practice session, so please tell me about what you practised in as much detail as possible.** (KoT)	No or irrelevant response (based on video)/'I don't know', even with prompt	Identifies what items they practised (e.g. names of pieces), but not what they did/how they practised them *or requires prompt*	Identifies what items they practised, what they did/ how did they practised them and/or characteristics of those pieces

Q2 **Do you think you did a good job, an okay job or a not so good job or practising today? Why?** (E)	No response/'I don't know', even with prompt	Makes a judgement about how well they practised but can't explain why they think that *and/or requires prompt*	Makes a judgement about how well they practised and explains why they think that
Q3 **Which parts of your practice did you find most difficult? Why?** (KoP)	No response/'I don't know', even with prompt	Identifies difficult parts or says they didn't find anything difficult but doesn't explain why *and/or requires prompt*	Identifies difficult parts and explains why they're difficult
Q4 **With these difficult parts, what could you do to make them become easier?** (KoS)	No response or irrelevant response/'I don't know', even with prompt	General/non-specific answer e.g. 'practice more' without explanation *and/or requires prompt*	Suggests specific strategy(s) to tackle the specific problem(s) or explains why a more general/non-specific strategy (e.g. 'practising more') would help
Q5a **How did you feel when you were practising today? Why?** (E/M M)	No response/'I don't know', even with prompt	Identifies how they felt but can't explain why e.g. 'just relax' *or requires prompt*	Identifies how they felt and why they felt that way
Q5b (If negative emotion) **What could you do to help yourself feel calm and happy again?** (E/M C)	No response/'I don't know', even with prompt	Suggests strategies without explanation *Requires prompt*	Suggests strategies and explains why they would help
Q6 **Did you find it helpful when mummy/daddy**	n/a	n/a	n/a

practised with you?			
Q7 **Is there anything that mummy/daddy did that you found particularly helpful?**	n/a	n/a	n/a
Q8 **Is there anything that mummy/daddy did that you found less helpful?**	n/a	n/a	n/a
Q9 **What makes a good pianist? What characteristics do you have?** (KoP)	No response or irrelevant response /'I don't know', even with prompt	Suggests characteristics of good pianists but not how that applies to them *and/or requires prompt*	Suggests characteristics of good pianists and how that applies (or doesn't apply) to them
Q10 **Could you explain to Gogi how practising [x] is different from practising [x]?** (KoT)	No response or irrelevant response/'I don't know', even with prompt	Describes or explains one task, but not both or how they are different from each other, or only partially correct answer *and/or requires prompt*	Identifies difference(s) between two kinds of practice activities and why they're different
Q11 **What could Gogi do to make sure s/he does enough practice between his/her lessons?** (KoS)	No response or irrelevant response/'I don't know', even with prompt	Identifies a strategy for ensuring enough practice is done in between lessons but doesn't explain why they would help *and/or requires prompt*	Identifies strategies for ensuring enough practice is done in between lessons and explains why they would help
Q12 **How will Gogi know when s/he's done enough**	No response or irrelevant response /'I don't know', even with prompt	Identifies ways of evaluating when enough practice has	Identifies multiple strategies for evaluating when enough practice has

practice? (E)		been done but not doesn't explain why *and/or requires prompt*	been done and/or explains why they would be helpful
Q13 **Gogi gets distracted easily. What could Gogi do to try and help him/her concentrate better whilst practising?** (E/M C)	No or incorrect response /'I don't know', even with prompt	Identifies a strategy for resisting distractions, but doesn't explain why they would help *and/or requires prompt*	Identifies multiple strategies for resisting distractions, and/or explains why they would help

Appendix M

P values for all correlations in Table 87

	KoP	KoT	KoS	P	M	C	E	EMM	EMC
KoP									
KoT	.36								
KoS	.27	.26							
P	.10	.04	.95						
M	.16	.19	.03	.15					
C	.23	.05	.52	.04	.02				
E	.39	.005	.23	.53	.005	.03			
EMM	.004	.06	.10	.71	.07	.08	.02		
EMC	.07	.20	.54	.20	.04	.02	.16	<.001	

Note - KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control).

Appendix N

P values for all correlations in Table 90

	KoP1	KoT1	KoS1	P2	M5	C1	E4	EMC1
KoP								
KoT1	<.001							
KoS1	<.001	<.001						
P2	.004	<.001	.001					
M5	.008	.003	.02	.02				
C1	.002	<.001	<.001	.004	<.001			
E4	<.001	<.001	<.001	.002	<.001	<.001		
EMC1	.002	.06	.003	.048	.008	.002	.004	

Note - KoP = Knowledge of Persons; KoT = Knowledge of Task; KoS = Knowledge of Strategies; P = Planning; M = Monitoring; C = Control; E = Evaluation; EMM = Emotional/Motivational Monitoring and EMC = Emotional/Motivational Control).