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Socioeconomic status and executive functions: parental involvement as a mediating factor during middle-childhood

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ABSTRACT

Previous research has demonstrated the positive link between socioeconomic status (SES) and executive functions (EFs). However, limited studies have investigated the potential mediators which could explain this relationship, specifically during middle-childhood. As this is a period in which important changes in cognitive development take place, it is critical to understand the influencing factors. Since parental involvement has been linked with both SES and EFs, this study explores whether parental involvement mediated this relationship. Parents (N=34) completed SES and parental involvement questionnaires, while their children performed tasks to assess their EFs. This study found a positive relationship between SES and EFs but did not find parental involvement to be a mediator. Potential practical and theoretical implications of the findings are discussed.

Socio-economic status	Executive Functions	Parental Involvement	Middle childhood

Introduction

Executive functions (EFs) are frequently defined as a collection of cognitive processes, reliant on the prefrontal cortex (PFC), that are responsible for goal-directed behaviour (Miller & Cohen, 2001). EFs emerge during infancy and develop throughout childhood and adolescence (Huizinga, Dolan & van der Molen, 2006). They help children focus on work, ignore distractions, improve their organisation and they ultimately result in greater school-readiness and achievement (Best, Miller & Naglieri, 2011; Lawson, Hook, Hackman & Farah, 2016; Welsh, Nix, Blair, Bierman & Nelson, 2010). EFs continue to play a crucial role during adulthood and are linked to career success, positive mental health and an enhanced quality of life (Davis, Marra, Najafzadeh & Liu-Ambrose, 2010; Hall, Fong, Epp & Elias, 2008; Hofer & Clouston, 2014; Moritz et al., 2002). As EFs can have a substantial impact on everyday life (Moffitt et al., 2011), it is important to better understand the factors that may influence their development.

Generally, there are believed to be three distinct but correlated components of EFs (Miyake et al., 2000). The first component is inhibition, which is the ability to refrain from carrying out an otherwise automatic response (Stuss & Alexander, 2007). The second is updating, which uses working memory to retain information in the short-term (Diamond, 2013). Finally, shifting is the ability to flexibly switch between tasks, rules or mental states (Best & Miller, 2010). Although this three-factor structure is suitable when assessing EFs in adults, more recent studies believe only a two-factor structure is appropriate for children (Lee, Bull & Ho, 2013). This is because shifting and inhibition do not become distinct entities until adolescence and can, therefore, be combined when assessing children (van der Ven, Kroesbergen, Boom & Leseman, 2013).

Whilst the importance of EFs is clear, there is still uncertainty as to which factors are responsible for the individual differences in these functions (Friedman et al., 2008). Various studies suggest that genetic influences are the main determinant of individual disparities in EFs (Engelhardt, Briley, Mann, Harden & Tucker-Drob, 2015; Friedman et al., 2008). Further support comes from Miyake and Friedman (2012), who studied both identical and fraternal twins and found that genetic influences can have a substantial effect on EFs. However, the extent to which these studies focus on genetic factors has been criticised (Deater-Deckard, 2014). As EFs are reliant on the PFC, which undergoes significant postnatal development, they can also be influenced by environmental factors (Kishiyama, Boyce, Jimenez, Perry & Knight, 2009). One such factor that has been shown to be of importance is a family's socioeconomic status (SES) (Lawson & Farah, 2017).

The term SES refers to the access a family has to social and economic resources and is often measured using factors such as income, occupation and parental education (Lawson & Farah, 2017). Differences in SES have been shown to correlate with various childhood experiences (Bradley & Corwyn, 2002; Lawson et al., 2016). For example, children from low-SES families are more likely to be exposed to violence, have less responsive parents and live in crowded, chaotic households (Grantham-McGregor et al., 2007). They are also less likely to receive social support, have access to books and computers or be challenged academically (Jacob & Parkinson, 2015; McLoyd, 1998). These factors have been shown to have

a negative impact on various aspects of development, such as a child's language and memory (Brownell et al., 2016; Ursache & Nobel, 2016), and can have adverse effects on their attitude, behaviour and overall success at school (Sackett, Kuncel, Arneson, Cooper & Waters, 2009). The detrimental effects that may result from having a low-SES can extend into adulthood, with those from low-SES families being more likely to have dropped out of school, work shorter hours and earn a lower income (Duncan, Ziol-Guest & Kalil, 2010; Jury et al., 2017). Given the wide range of effects that SES appears to have on a child's environment and development, the differences in EFs of children could be linked to disparities in SES.

Clearfield and Niman (2012) carried out a longitudinal study and found that SES-related variances in EFs can be seen as early as infancy. Using the A-not-B reaching task, they assessed the infants' shifting abilities when they were 6, 9 and 12 months-old. While infants from high-SES families followed the typical developmental trajectories, those from low-SES families demonstrated delays at each stage of testing. These differences continue to be observed in pre-school children (Noble, Norman & Farah, 2005). Raver, Blair and Willoughby (2013) found that by the age of four, children from low-SES families performed significantly poorer in tasks assessing their inhibition, shifting and updating abilities. These findings, alongside various longitudinal studies (Hackman et al., 2014; Hackman, Gallop, Evans & Farah, 2015; Hughes, Ensor, Wilson & Graham, 2010; Lawson, Hook & Farah, 2018), suggest that the impact that SES inequalities have on EFs seemingly persists throughout childhood and maintains the SES-achievement gap (von Stumm, 2017). However, despite many studies showing this relationship between SES and EFs, there are others that contradict these findings.

Wiebe, Espy and Charak (2008) carried out various tasks that assessed EFs in pre-school children and did not find a significant correlation between the children's performance and their SES. This was supported by Engel, Santos and Gathercole (2008), who measured children's ability to update and also found no link with SES. Waber et al. (2007) also found that in a large sample of children aged 6 to 18, the children from low-SES backgrounds did not perform any worse compared to those from high-SES backgrounds. These results indicate that the relationship between SES and EFs may not be as strong as originally thought. Nevertheless, these contradictory studies have been criticised (Hackman, Farah & Meaney, 2010). For example, Wiebe et al. (2008) failed to use a reliable measure of SES while Waber et al. (2007) used strict exclusionary criteria, ensuring that their sample only included cognitively-able and healthy children from low-SES families. Such concerns, alongside the vast amount of research demonstrating the association between SES and EFs, have led to the relationship remaining widely accepted. It is therefore important to obtain more information about this relationship in order to appropriately channel resources that could help to reduce the negative impact that low-SES can have on a child's development. One way to achieve this is by investigating the possible mediating factors in order to identify what might be causing the SES-achievement gap.

There are several studies that have attempted to identify potential mediators between SES and EFs. He and Yin (2016) found that the quality of the home environment during early-childhood can have a significant influence on a child's overall development. As research has suggested that children from low-SES families

are less likely to be cognitively stimulated or have learning materials at home, this can have a negative effect on their EFs (Christensen, Schieve, Devine & Drews-Botsch, 2014) and could mediate the SES-EFs relationship. Other studies have focused on the impact that parents can have on a child's early development. Rhoades, Greenberg, Lanza and Blair (2011) found that the quality of parent-child interactions acted as a mediator. These positive relationships play a crucial role in a child's development and can influence the extent of cognitive progress (Hohenberger et al., 2012). However, a low-SES can be linked with higher parental stress, which can lead to reduced verbal communication, minimal maternal responsiveness and less positive interactions between the parent and child (Bernier, Carlson & Whipple, 2010; Meuwissen & Englund, 2016; Rochette & Bernier, 2014). Ultimately, these factors can result in a lower quality of parenting and delayed cognitive development (Hackman et al., 2010).

Although the aforementioned studies are beneficial and could help explain the link between SES and EFs, there have been mixed results (Hackman et al., 2015). Furthermore, the majority of studies only focus on early-childhood experiences (He & Yin, 2016; Lawson et al., 2015; Rhoades et al., 2011) and have not investigated factors that could influence EFs in older children. Middle-childhood, which is the period between early-childhood and adolescence, is a significant period of change (Feldman, 2014). It is important to investigate what may influence cognitive development during this time. Middle-childhood experiences can maintain, amplify or reverse the benefits or shortcomings encountered during early-childhood (Huston & Ripke, 2006). Changes have been shown to not only strongly affect adult outcomes, but they can also outweigh the effects of cognitive development acquired earlier in life (Feinstein & Bynner, 2004). Importantly, as middle-childhood lays the foundations on which adolescence and adulthood are based (Schaffer, 2000), it is necessary to investigate which experiences may mediate the relationship between SES and EFs during this critical period.

One factor that has been investigated during middle-childhood is the quality of the home environment. Sarsour et al. (2012) used a modified version of the Home Observation for the Measurement of the Environment (HOME) inventory (Bradley & Caldwell, 1977) and found that the home environment was a potential mediator in the relationship between SES and EFs. While research into early-childhood demonstrates this link (He & Yin, 2016), the findings from Sarsour et al. (2012) suggest that the home environment continues to mediate the relationship between SES and EFs during middle-childhood. This is beneficial as specific interventions could be targeted to try and improve the home environment (Obradovic, Yousafzai, Finch & Rasheed, 2016). However, the HOME inventory consists of both material and psychosocial domains. Consequently, when reviewing suggestions to help reduce the SES-achievement gap, advising families to invest in more material resources, such as technology or books, may not always be feasible due to their economic constraints. Additionally, as the overall HOME inventory score combines both psychosocial and material domains, it is not clear which are the influencing factors. Specifically focusing on the psychosocial dimensions may be more beneficial, as these are less restrictive. Consequently, identifying which of the psychosocial factors mediate the relationship between SES and EFs would be

advantageous. One such factor that has yet to be systematically investigated during middle-childhood is the extent of parental involvement in a child's development.

Parental involvement is multidimensional and incorporates factors such as home-based involvement, school-based involvement and home-school communications (Manz, Fantuzzo & Power, 2004). These include factors such as the extent to which parents assist with homework, attend school functions and take part in activities with their children to help further develop their skills and knowledge (Chang, Park, Singh & Sung, 2009; LaRocque, Kleiman & Darling, 2011). As parental influences have been shown to play an important role in early-childhood development (Champagne & Cruley, 2009; Evans, Boxhill & Pinkava, 2008; Hackman et al., 2013), it is reasonable to predict that they continue to do so later in childhood. Additionally, research has shown how parental involvement may be associated with both SES and EFs separately. In the case of EFs, Wilder (2014) reviewed nine meta-analyses and found that higher parental involvement was linked with improved academic success, which was partially determined by the children's EFs. More specifically, Sosic-Vasic et al. (2017) found a positive relationship between parental involvement and EFs in school-aged children. When investigating the link between parental involvement and SES, Cetin and Taskin (2016) found that parents with a high-SES were more willing to participate in their child's education. Bower and Griffin (2011) found similar results and suggested that parental involvement could mitigate the achievement gap between high and low-SES groups.

While studies demonstrate the associations between parental involvement and both EFs and SES, it appears that no current research has investigated whether parental involvement mediates the relationship between SES and EFs during middle-childhood. Consequently, the purpose of this study is to explore the gap in the research as it is important to identify whether parental involvement is found to be a mediator. Interventions specifically aimed at middle-childhood parents could be provided to help reduce the SES-achievement gap. To investigate this, parents were asked to complete two questionnaires assessing their SES and parental involvement while their children took part in two activities to measure their EFs. Based on previous research, this study proposes the following hypotheses:

Hypothesis 1: There will be a positive correlation between family SES and EF scores.

While the majority of research in this area has been carried out during early-childhood (Lawson et al., 2018), this study predicts that the same correlation will remain during middle-childhood. It is, therefore, predicted that a higher household SES will be associated with better scores on tasks assessing EFs.

Hypothesis 2: Parental involvement will mediate the relationship between SES and EFs.

Due to research demonstrating how parental involvement is associated with both EFs and SES (Cetin & Taskin, 2016; Sosic-Vasic et al., 2017) this study predicts that parental involvement will act as a mediator between these two factors.

Method

Design

This study used correlational and mediation analysis designs. The outcome variable was executive functions and the predictor variable was socioeconomic status. The mediating variable was parental involvement.

Participants

Thirty-four children (21 males, 13 females) aged 8 to 11 (*M*= 9.30, *SD*= .95) and their parents were recruited from two state primary schools in different regions of England. The proportion of parents who were in receipt of means-tested benefits was 26.4% and the percentage of parents from each income bracket can be seen in Table 1. Participants took part voluntarily and a monetary incentive (the chance to win a prize draw) was offered. Children with special educational needs were excluded.

Table 1

Percentage of parents in each combined family income bracket

Income brackets	Percentage (%) of parents
£0-£9,999	5.9
£10,000-£19,999	8.8
£20,000-£29,999	23.5
£30,000-£39,999	8.8
£40,000-49,999	14.7
£50,000+	38.2

Materials

Demographic information and SES questionnaire. To acquire demographic information and ascertain the participants' SES, a modified version (using UK specific benefits and currency) of the MacArthur Research Network on SES and Health Questionnaire (2002) was used (see Appendix A). This took around 5 minutes to complete. To measure SES, information relating to household income was used. Participants were required to select which category (see Table 1) best described their total household income for the year, which gave them a score between one and six.

Parental involvement questionnaire. To measure parental involvement, the Family Involvement Questionnaire for Elementary School (FIQ-E) was used (Manz et al., 2004) (see Appendix B). This consisted of 46 questions that were based on three factors of parental involvement: home-school communication, home-based involvement and school-based involvement. Parents were instructed to circle either: rarely, sometimes, often or always. This took between 10 and 15 minutes to complete. Parents received a score out of 146.

Executive functions task: keep-track. To measure updating, the keep-track task from Van der Sluis, Jong and van der Luji's (2007) study was used. This activity was presented on a computer and consisted of 8 blocks. In each block, the children were shown 10 images, presented one at a time, at two-second intervals. The images came from 5 possible categories: letters (A, E, S, D), digits (1, 2, 3, 4), objects (circle, square, triangle, diamond), animals (cat, dog, bird, fish) and vehicles (car, bike, train, aeroplane). The order in which the images were presented was randomly pre-determined and the same order was used for each participant. Before the activity began, control tasks were carried out which required the children to name all the images in the categories to ensure they recognised all possible answers. In the first four blocks, three categories were used and in the last four blocks, four categories were used. During each block, children were required to name each image as they appeared on the screen. Once each block was completed, the children were asked to verbally recall the last image from each category that had been presented. Their final score was the number of images they recalled correctly, with the highest possible score being 28. All images were black and white and were presented using the software programme 'psychopy2'.

Executive functions task: object shifting. To measure shifting, the object shifting task from Van der Sluis et al.'s (2007) study was used. This activity was presented on A4 paper which consisted of five rows, with each row containing eight images. The images were of a digit (1, 2, 3, 4) placed in the centre of a shape (circle, square, triangle, diamond). The images were coloured either blue or yellow. For each image, when the colour was blue the participants were instructed to name the shape and when it was yellow they had to name the digit. Each child's response times was recorded, and this was used as their score. Two control tasks were carried out before the activity which required the children to name all of the shapes and digits.

Procedure

Children were given participant information sheets (see Appendix C), and SES and parental involvement questionnaires to take home to their parents. They were asked to return the questionnaire to their class teacher within two weeks. The children whose parents completed the questionnaires and the consent form (see Appendix D) were then individually assessed at their respective schools. Firstly, children read the child information sheet (see Appendix E) and provided informed consent (see Appendix F). Before each task, the instructions were verbally explained, and a practice task was carried out. The first task was the object shifting activity, which took around one minute to complete and was timed by the researcher. Once finished, the participants were given a one-minute break before they took part in the keep-track task. During this task, the computer was placed in front of the child and they provided their answers verbally for the researcher to record. Between each round, the children had a 30-second break. When both activities were completed the children were thanked for their participation and returned to their classrooms. Each session lasted around 20 minutes and was administered by the same researcher. Debrief forms were sent home to the parents once their child had completed the tasks (see Appendix G) and the prize was given to a randomly selected participant.

Results

A Shapiro-Wilk test was carried out to check if the data was normally distributed. Shifting (p= .204) and parental involvement scores (p= .498) were normally distributed while the keep-track (p= .042) and SES scores (p <.001) were not normally distributed.

Table 2 demonstrates the mean scores and standard deviation for set-shift, keep-track, parental involvement and SES scores.

Table 2
Basic descriptive statistics

Variable	*M*	*SD*
Set-shifting	60.21	8.54
Keep-track	19.68	2.56
SES	4.32	1.67
Parental involvement	101.88	14.81

Hypothesis 1:

As SES scores were not normally distributed, Spearman's rho was used to assess the relationship between SES and EFs. There was a significant positive correlation between SES and shifting scores (r_s= .47, p=. 006). However, no significant relationship was found between SES and keep-track scores (r_s=.046, p= .798). Therefore, only shifting scores will be included in the mediation analysis.

Hypothesis 2:

Regression analysis was used to investigate whether parental involvement mediated the relationship between SES and EFs. The results indicated that SES was a significant predictor of EFs, b= 2.52, t= 2.59, p= .015, and that 21.6% of the variance in EFs can be explained by SES. However, SES was not found to be a significant predictor of parental involvement, b= 2.96, t= 1.99, p= .055, and parental involvement was not found to be a significant predictor of EFs, b= 0.061, t= 0.56, p= .580. The mediation analysis was tested using a bootstrap estimation approach with 1000 samples. There was no significant indirect effect of SES on EFs through parental involvement, b= 0.18, 95% BCa CI [-0.4668, 0.9138]. It does not, therefore, appear that parental involvement mediates the relationship between SES and EFs (see Figure 1).

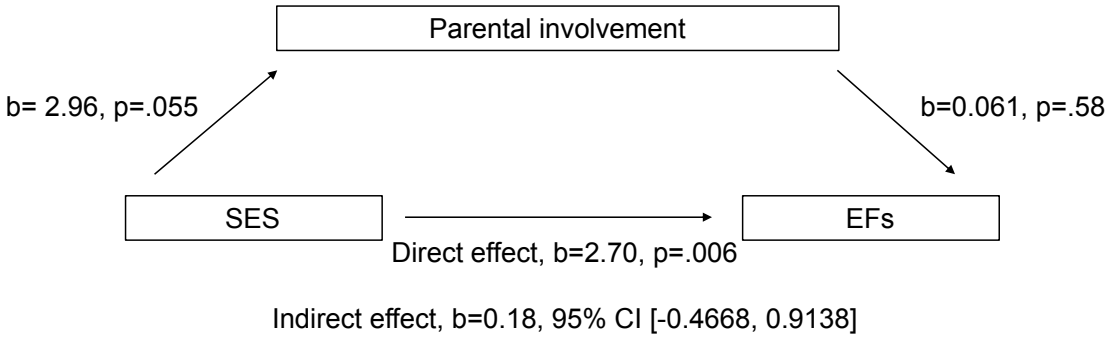

Figure 1. Model of SES as a predictor of EFs, mediated by parental involvement.

Discussion

The aim of the study was to investigate whether there is a relationship between SES and EFs during middle-childhood, and to determine whether parental involvement is a mediator. It was hypothesised that there would be a positive correlation between SES and EFs and that parental involvement would significantly mediate this relationship. As predicted, the results found a positive correlation between SES and EFs, which suggests that children from high-SES families are more likely to have better EFs compared to children from low-SES families. However, parental involvement was not found to be a mediating factor and thus does not appear to explain the relationship.

Hypothesis 1:

The positive link found between SES and EFs supports previous studies that investigated this association in younger children (Hackman et al., 2015; Noble et al., 2005; Raver et al., 2013). Similarly, support has also been given to the limited studies that have been carried out with older children (Hackman et al., 2014; Lawson et al., 2018). This suggests that, during middle-childhood, children from high-SES families continue to have improved EFs compared to those of low-SES families. However, the keep-track task used to assess updating was not found to be significantly correlated with SES. One explanation for this could be due to the risk of task impurity when assessing EFs (van de Sluis et al., 2007). This means that, as EFs control lower-level processes (Friedman & Miyake, 2017), it is possible that tasks used to assess EFs could be influenced by these non-executive functions. This can be problematic for accurate hypothesis testing and could explain why the keep-track task did not demonstrate a significant finding. Despite this, the results show that the association between keep-track scores and SES was positively correlated, although not significant. It is therefore possible that the sample size may have lacked statistical power, which could potentially explain why there was not a significant finding.

Hypothesis 2:

Despite previous studies showing parental involvement to be linked with both SES and EFs separately (Cetin and Taskin, 2016; Sosic-Vasic et al., 2017), this study did not find parental involvement to mediate the SES-EFs relationship. A potential reason for this could be due to there being no standardised definition or method of measuring parental involvement, as it is a complex concept which is difficult to determine. Definitions vary between studies with some focusing on a single behaviour, such as homework assistance (Dumont et al., 2012), while others use a multidimensional definition encompassing a wide range of behaviours (Hanz et al., 2004). The definition of parental involvement adopted in a study can influence the results that they achieve (McNeal, 2014). For example, Wilder (2014) found that when parental involvement was defined as school-based participation, it was positively linked to academic success. Alternatively, Hill and Tyson (2009) found that when it was defined as home-based involvement or homework assistance, there was either no significant correlation or even a negative association with academic performance. As academic achievement is partly determined by EFs (Samuels, Tournaki, Blackman & Zilinski, 2016), it is possible that these findings could apply to EFs. As this study used a multidimensional measure of parental involvement, it may

not have been assessed using precisely the same concepts as previous studies, which could explain the inconsistent findings.

Furthermore, considerable variations in methodology are used to measure parental involvement, with studies utilising different questionnaires and interviews (Hanz et al., 2004). Research has found that the method chosen can also influence whether the findings are significant or not (Wilder, 2014). Similarly, the participant who responds to the questions can have an impact on the results. For example, Young, Austin and Growe (2013) found that the extent of parental involvement reported varied depending on whether a parent, teacher or child completed the assessment. This in turn influenced whether there appeared to be a significant influence on the child's development. Given that this study used questionnaires completed by parents, this could potentially explain the contradictory findings.

When separating the components of the mediation, it was found that parents with a higher SES did not appear to demonstrate higher levels of parental involvement. Previous research suggested that it was financial pressures, leading to psychological stress, that diminished low-SES parents' ability to be more involved (Cooper, Crosnoe, Suizzo & Pituch, 2010). Nevertheless, more affluent parents also experience pressures that could negatively impact the extent of their involvement. For example, Finch and Obradović (2017) stated that parents with a higher SES experience greater work demands, leading to limited leisure time and increased stress. This could in turn reduce the level of parental involvement in high-SES parents and explain why no significant difference was found when compared with low-SES parents. However, when considering the data in more detail, it appears that this link was very close to significance. Consequently, a lack of statistical power could potentially explain why no significance was found. Perhaps if a larger sample size was used, the findings may have been significant. Alternatively, the lack of significance in the mediation analysis may be primarily due to the link between parental involvement and EFs.

The apparent weak link between parental involvement and EFs suggests that higher parental involvement does not influence a child's EFs, which contradicts previous findings (Sosic-Vasic et al., 2017). A potential reason for this could be due to the majority of studies being carried out during early-childhood (Hohenberger et al., 2012; Rhoades et al., 2011). As the children in this study were of school age, they may have less direct interactions with their parents and spend more time with their peers and teachers (Bornstein, 2002). Therefore, as parent-child interactions change significantly during this period, they may not be as important in the development of EFs during middle-childhood. It is possible that other factors could play a more important role and counterbalance the negative impact that limited parental involvement can have on EFs. For example, Burrage et al. (2008) demonstrated the impact that attending school can have on a child's cognitive development. Using a school cut-off design, they compared the EFs of children of a similar age who had either a year with or without schooling. It was found that those who attended school significantly outperformed other children on tasks assessing their EFs. Taking this into account, it is possible that other factors, such as the quality of education, may play a more important role than parental involvement in a child's cognitive development during middle-childhood.

Another potential reason for the unexpected findings could be explained by the reactive hypothesis, which suggests that increased parental involvement may sometimes be a reaction to a problem rather than the actions of a proactive parent (McNeal, 1999). This has been supported by various studies that have shown that problematic behaviour and lower levels of achievement can lead to parents becoming more involved (Samuels et al., 2016; Vernon-Feagans, Willoughby & Garrett-Peters, 2016). Therefore, when a child is not developing as expected, parents are more likely to set rules, improve communication with teachers and ultimately demonstrate behaviours that would be associated with increased parental involvement (McNeal, 2012). It is possible that during middle-childhood, children with better EFs do not require as much parental involvement, which could explain the findings.

There are a number of strengths in the current study. While there are numerous ways to measure parental involvement, this study adopted a specifically adapted multidimensional questionnaire for assessing SES differences in primary school children (Manz et al., 2004). As research has shown that low-SES parents are less likely to report involvement on the single dimension of school-based involvement (Park & Holloway, 2017), using only this factor could give an inaccurate representation of parental participation in the child's education. Instead, as this study's questionnaire encompassed multiple dimensions, this had the potential to have led to more accurate results. Similarly, this study shows various strengths over previous studies in the choice of tasks utilised to assess EFs. This is because there are a limited number of studies that have acknowledged that the methods used to measure EFs in adults may not be suitable when assessing children. As recent research has shown that a two-factor structure, rather than a three-factor structure, is more appropriate (Lee et al., 2013), this method was adopted, with the aim of gaining more accurate results.

The current findings may have various practical implications when developing strategies to improve cognitive development during middle-childhood. As this study has shown, lower SES can have a negative impact on EFs. This highlights the importance of implementing effective interventions to reduce this negative impact. However, this study has also shown that simply improving parental involvement may not be the most effective approach. Despite schools using strategies to improve parental involvement throughout primary school (Goodall & Montgomery, 2014), it may be more beneficial to focus on other methods to reduce the effects of the SES-achievement gap.

Despite the strengths and implications of this study, there are various limitations that could have had an impact on the results. As previously mentioned, the small sample size could have led to insufficient explanatory power, which may have contributed to the unexpected findings. Furthermore, there may have been inaccuracies caused by certain biases. As the questionnaires were self-reported and included various personal questions, they could have been subjected to social desirability biases. For example, parents may have over-emphasised their extent of parental involvement or inaccurately reported their yearly income. Participation bias could have also had an impact on the findings. As this study required completion and return of two questionnaires, it is possible that those who did take part were more involved parents, irrespective of their SES. Hence, a monetary incentive was

provided to reduce the risk of participation bias and encourage a greater variety of parents to take part. One further limitation was that this study only used income as a measure of SES. While income is a common measure of SES and sometimes preferred (Duncan & Magnuson, 2012), it does not take into account other determinants such as parental education and occupation. This could have led to an inaccurate representation of the SES of participants.

Due to these limitations, future research could modify this study to reduce the concerns and assess whether these findings are replicated in a larger sample size. Furthermore, future research could also focus on identifying other potential mediators in the relationship between SES and EFs during middle-childhood, as studies have yet to properly investigate this area. One potential mediator that should be explored is the impact that education, specifically schooling, has on EFs. Overall, this study has added to the limited research assessing the factors that impact EFs during middle-childhood. It has demonstrated that SES and EFs continue to be linked during this period and indicates that parental influences may not be as important on cognitive development as compared with early-childhood.

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