An investigation into the influence of impulsivity, anxiety, self-esteem and gender on self-reported problematic text messaging habits amongst undergraduates

Suzanna Cockrell

Supervised by: Dr Victoria Mason

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ABSTRACT

Text messaging, a service offered via mobile phone technology, has been enthusiastically adopted, particularly amongst adolescents worldwide. The potential impact for the development of self-identity is discussed (Tajfel, 1981), in addition to implications for the development of addictive type behaviours towards technology (Griffiths, 2005). The literature reveals the complexity of the debate. This study employs a measure of self-reported problematic text messaging habits (Rutland, Sheets & Young, 2007) with the aim of investigating links between personality traits, impulsivity, anxiety, self esteem and gender. The results do not replicate earlier research in terms of the predictive validity of certain traits for problematic use of text messages, however evidence is found to support the existence of problematic use within the sample, and suggestions are made for the direction of future research in the light of these findings.

KEY WORDS:	TEXT MESSAGING	SELF ESTEEM	NON-SUBSTANCE ADDICTION	ANXIETY	IMPULSIVITY

Introduction

Mobile phone technology over the last two decades represents a highly significant development in perpetual human communication mediation (Levinson, 2004), with psychology, sociology, and media and communications literature considering the technology from a range of perspectives. This study will attempt to investigate the communication medium of text messaging (SMS-short message service), an increasingly popular service available via mobile phone technology, and aim to examine the relationship between personality traits, impulsivity and anxiety, as defined according to Gray's theory of personality (Gray, 1982, cited in Fox, 2008), self-esteem (Rosenberg, 1965), gender, and self-reported problem use of text messaging (Rutland, Sheets & Young, 2007). It will explore the assertion that there appears to be an underrepresented set of detrimental consequences associated with existing in a perpetually switched on network, and the emotional and psychological responses elicited by that (Bianchi & Phillips, 2005; Ehrenberg, Juckes, White & Walsh, 2008; Igarashi, Motoyoshi, Takai & Yoshida, 2008; Ling, 2005; Subrahmanyam & Greenfield, 2008; Takao, Takahashi & Kitamura, 2009; Toda, Monden, Kubo & Morimoto, 2006). This includes the 24 hours a day accessibility or "perpetual connectivity" (Katz, 2008, p. 2) afforded to an increasing majority of society via text messaging (Castells, 2008). This perspective is mindful of the sometimes reactionary viewpoint which has pervaded the reception of previous new technologies, from radio to video games, particularly highlighting the generational divide between young people's enthusiasm and their parents' concerns and suspicions (Wartella & Jennings, 2000). It may be relevant to note that whilst much of the literature pertaining to mobile phone technology has been typically not theoretical in terms of psychological impact on the user (Katz 2006; Levinson, 2004), there is increasing interest from researchers who have shifted from a commercial technological bias to focus on emotional outcomes and informing policy around communication technologies (Srivastava, 2005, 2006, 2008; Turkle, 2008, 2009; Vincent, 2004, 2006). This would seem to lend support from within the industry itself to the significance of a lack of research into these areas.

Human life is centred on the formation and maintenance of relationships which depend upon communication, spoken, written, or via other sensory media (Katz, 2006; Lazarus, 2006). The development and enthusiastic uptake of mobile phone (US: cell phone) technology over the last few decades, which has had a direct impact on communication in all forms of relationships, is often described as a global phenomenon with a body of associated scholarly work emerging from 2000, according to Goggin (2006). This is indicative of the salience of communication, particularly a form of which is instant, private and portable, to people of all ages and socio-economic status, world-wide (Srivastava, 2008). Text messaging emerged as an unexpected by-product of mobile phone technology - according to Agar (cited in Goggin, 2006, p.65) it was conceived as a minor service, although the necessary terseness embodied by the messaging system, seen as both a constraint and a spur to communication, proved salient beyond the original intended business user application. In 2002 mobile phone subscriptions overtook fixed land lines with the result that mobile phones became the dominant global voice communication technology (Srivastava, 2005). By 2003 the mobile communications industry, (UMTS, 2003) recognised the uniquely emotional nature of the relationship between user and mobile phone, compared to all other communication technologies, attributed as a function of the social connectivity afforded, in addition to the content conveyed by the device (Srivastava, 2005). By the end of 2007, according to Castells (2008), mobile phone subscriptions reached 3.2 billion, representing a fifty

per cent penetration of the global population, and evidencing far less of a digital divide than other communication technologies (e.g. the Internet) (Srivastava, 2008). Whilst the handset has become an increasingly multipurpose device, text messaging has gained greater popularity than calling within a variety of user groups for a range of reasons, including economic, but also for motives of privacy and discretion (Katz, 2008).

Mobile phone technology has introduced the possibility of the individual operating within a technological network that is perpetually switched on, set against the backdrop of a society, or societies, that operate 24 hours a day. A direct consequence of mobile phone technology, the resulting potential for perpetual connectivity, by talk or text, afforded to those who do subscribe, an autonomy characterised by Castells (2008) as a "wireless skin overlaid on the practices of our life" (p. 448), sees users at once in themselves whilst embedded in their networks. This is an environment that is new, in evolutionary terms; requiring adaptations in behaviours and emotional functioning as users learn to cope with 'synchronous space' in their communications, the complexity of simultaneously managing two geographical and social environments (Srivastava, 2005). Levinson (2004) advocates the necessity for rules of engagement and customs of refusal in an increasingly 24-hour society, although this is an area for subjective interpretation and control issues (Walker, 2001), likely to be influenced by individual differences.

Background of Study

In the assessment of personality traits this study will consider Gray's theory of brain function and behaviour (Gray, 1972, 1981) which represents a parallel approach to Eysenck's dimensional model of human temperament and has been applied in clinical and forensic settings, including research into disinhinbition and psychopathology (Avila & Parcet, 2001), with a deficit of inhibition linked to self-regulation, in what is identified as a key executive function. Gray's theory considers introversion/extraversion and neuroticism (Eysenck & Eysenck, 1975, cited in Fox, 2008), and suggests that two motivational systems underlie affect and behaviour (Carver & White, 1994), the behavioural inhibition system (BIS) which responds to punishment and non-reward, the behavioural approach system (BAS) which processes reward and non-punishment. A third fight-flight system responds to unconditioned negative stimuli (Caprara & Cervone, 2000). Described as a conceptual 45° rotation of Eysenck's dimensions (Gray, 1981, cited in Carver & White, 1994), this has been disputed by some researchers as merely useful metaphor, as, according to Carver and White (1994), Gray's model conceives of emotionality very differently to Eysenck's. According to Fox (2008), behavioural inhibition predicts for emotional, particularly anxiety, disorders (Biederman et al, 1990, cited in Fox, 2008). Depending upon the circumstances, the excitement expressed by some when sending a text message (Vincent, 2004, 2006), the heightened sense of anticipation in awaiting an expected text message, and the surprise of receiving a message whether anticipated or not exert an effect on the BIS and BAS according to Gray's model, with subsequent effects on behaviour and affect.

In *Cellphone: The Story of the World's Most Mobile Medium and How It Has Transformed Everything!* Levinson (2004) refers to instant gratification now attainable since the advent of mobile phone technology. Generally discredited within western culture as childish, immature in terms of emotional and philosophical acceptance, and associated with undesirable and destructive influences, instant gratification, in the case

of communication, he argues is more complex. Considering a range of emotional responses in the context of immediacy mediated by the technology, both supportive and critical anecdotal evidence may be drawn. Mobile phones allow, or perhaps encourage via text messaging, instant responses, negating time that might have been taken to reflect upon strongly experienced emotions, both negative and positive, thus the potential for communication within an atmosphere of much more freely expressed high emotion is realised. The Digital World Research Centre identifies trends in impetuous and risk taking behaviours associated with mobile phone use, for example, making texts or calls to satisfy an impulse, or whilst driving fast (Vincent, 2004). High trait impulsivity (Carver & White, 1994), deficits in inhibition (Avila & Parcet, 2001), or disinhibition resulting from alcohol or drugs (Dawe, Gullo & Loxton, 2004) all have implications for behaviour, and are likely to translate into altered mobile phone usage. The inference would seem to be that mobile phones encourage connections to be made for continuous communication in circumstances that did not exist previously. Individuals are able to make direct vocal or text contact even at moments of extreme distraction, or disinhibition, with the effect that almost every location can become a social place.

According to Harper, Palen and Taylor (2005), the success of text messages within mobile phone telephony is due to its facilitation of 'micromanagement' (p.1), incorporating 'micro-coordination' (p.170) within a time scarce culture, wherein the value of saving time could be seen as having precedence over potential negative effects, whilst they report the strongest critics of the technology censuring it for the inarticulacy of adolescents and detracting from the skills of face to face engagement.
Although the benefits of ubiquitous and increasingly normative 24-hour availability seem obvious - a generation of users exist that could barely imagine life without it, there exist perhaps subtler costs in terms of loss of personal privacy and potential for withdrawal, however brief, from society. Given the increasing numbers of users and popularity of texting, an awareness of the potential negative impacts warrants further investigation (Laramie, 2007; Thomee, Eklof, Gustafsson, Nilsson & Hagberg, 2007), particularly for those in the formative years of adolescence who constitute the most enthusiastic adopters of the mobile phone and texting in particular (Igarashi, Motoyoshi, Takai & Yoshida, 2008; Subrahmanyam & Greenfield, 2008; Walsh, White & Young, 2009). According to the International Telecommunications Union, a majority of more than 80% of users aged below 25 were more likely to text than call (ITU 2004, p.13).

As a tool of personal perpetual communication the mobile phone represents a significant influencing form of mediation in interpersonal transactions, with particular relevance in adolescence - acknowledged as a critical period in the construction of self-identity (Harter, 1999; Shapka & Keating, 2005). The young seem particularly willing to identify openly with the mobile phone, strongly incorporating its ownership and use into their identity (Igarashi et al, 2008) along with seeking connectedness and sense of belonging (Walsh et al, 2009). Amongst adolescents there would appear to be strong evidence linking feelings of threat to identity and self esteem, and ostracisation associated with in-group, out-group behaviours, according to social identity and self-categorisation theory (Deschamps, 1982, cited in Stewart-Knox, Sittlington, Rugkasa, Harrison, Treacy & Abaunza, 2005; Tajfel, 1981), manifested in mobile phone ownership, calling and text messaging (Igarashi et al, 2008; Walsh et al, 2009). Choosing to text rather than call another person is a significant choice, requiring differential time and effort relative to voice calling (Reid & Reid, 2006). Benefits include

often comparative lower cost, but also an element of unobtrusiveness, and may represent a filler activity for idle moments (Reid & Reid, 2006). Walsh, White and Young (2009) considered the predictive validity of self- and prototypical identity from a theory of planned behaviours perspective and found that self-identity mediated planned high mobile phone use, implicating attitude and perceived behavioural control. Research in Japan, an early adopter of the technology, has investigated young people's relationship with their mobile, and their perceived dependence on text messaging, and concluded that higher rates of text messages are associated with psychological and behavioural symptoms (Igarashi et al, 2008). The effects were found to be mediated by self perception personality factors, however wider findings have been mixed in terms of the predictive validity of personality and other variables (Bianchi & Phillips, 2005; Takao et al, 2009).

Ling (2005) indicates the salience of SMS to young people with global relevance citing studies from Japan, the Philippines, UK, Europe, Finland and Norway, dating from 2000, whilst acknowledging the importance of peer groups in adolescence in the quest for emancipation. He refers to the degree of autonomy mobile telephony affords to young people in shaping their socialisation, text messaging, in particular lowering the 'threshold for social interaction' (p.176) as individuals are able to conduct their communications silently and independently of parental authority or approval. Conversely, he cites evidence of negative consequences of the easy spreading of information enabled by the technology, and the extent to which the juxtaposition can be an uneasy one, especially for young people who are subject to the paradox of desiring autonomy yet potentially surrendering control of their communication (Ling, 2005). It is clear that the technology is impacting on the experience of young people and affecting their social interactions worldwide.

Individual differences in ability to interpret and manage emotions are unlikely to remain unaffected in the process of prolonged or perhaps exclusive communication by text or mobile call, in preference to face-to-face communication. Srivastava (2005) claims that many teenagers make no distinction between face-to-face meeting and mobile phone contact. In the case of young people, who are acquiring emotional coping skills, or older individuals who are less adept, mobile telephony can represent a means of avoiding personal contact, but also may reduce opportunities for developing skills. According to Lazarus (2006), such avoidance of stressful situations may impact negatively on general emotional resilience and adaptability. Thus it may be argued that a possible consequence of mobile telephony may be a reduced ability to cope with difficult emotions due to increased ease of avoidance. Levinson (2004) cites William James' description of the universe as 'big booming, buzzing confusion' that the human brain has evolved to make sense of (p.114). He addresses the question of text messaging in preference to calling - the benefits of silence, precision and endurance of message, with young users representing particularly enthusiastic adopters of the medium, projecting (in 2004), that by 2006, 85% of 'youth spending' would be on text messaging (Levinson, 2004).

The interdisciplinary literature of the area known as computer supported cooperative work (CSCW), which considers the social shaping of technology and evolution of social practice, has sought new perspectives and insights. This growing body of knowledge informs awareness as the mobile phone, an increasingly highly personalised and widely adopted 24 hour instant communication medium, evolves, according to Srivastava (2005), from an object of technology to a significant and ubiquitous social

tool, with relevance to vast proportions of global societies in terms or facilitating and influencing both personal and public relationships. This is evidenced by the number and range of cross-cultural studies conducted since the upsurge in popularity was first noticed, particularly amongst the young in Finland ("teenagers have become the pioneers of text messaging" Agar, 2003, p. 161), followed swiftly by the young (especially girls) in Japan, and Asia, particularly the Philippines (Agar, 2003). Goggin (2006) refers to names for the mobile phone employed across different languages, and the implications of the technology for understanding culture, and the consistencies and differences between cultures.

Vincent (2006) points out that using a mobile phone employs more senses than usual in communication (sight, hearing and touch), and thus is likely provoke a wide range of physiological responses. Whilst there has been research into the physiological and psychological effects of the various interfaces between technology and the individual (Lin & Peper, 2009; Thomee et al, 2007), literature has begun to emerge regarding the emotional impact, and possible costs - emotional, physical and psychological, of being available 24-hours a day, including potential influence on circadian rhythms (Parliamentary Office of Science & Technology, 2005), with implications for increased rates of obesity, especially in children (Taheri, 2006). This would seem an area of increasing significance for health psychology as children are owning mobile phones at younger ages, often due to parents' acknowledged increasing concerns for their children's security (Lester, Field, Oliver & Cartwright-Hatton, 2009; Nelson, 2008), but an unforeseen consequence is that some are using them throughout the night thereby disrupting their sleep patterns (Hafner, 2009; Turkle, 2009). It could also be argued that mobile phone ownership, from early childhood rather than increasing independence, as intended, can actually have the opposite effect in some, as they come to over-rely on the constant connection with others, and fail to develop self-reliance, and the adaptability that comes with encountering and coping with everyday challenges independently (Turkle, 2009).

There is growing recognition of the 'technological intimacy' (Srivastava, 2005) users have with their mobile phones, the extent to which they believe they help them enjoy life, and a potential over-reliance on mobile phones, and feeling that they have become almost too valuable to lose due to their capacity to not only receive and send, but to store information (Vincent, 2006). This has particular relevance for text messaging behaviours as many users store messages as a form of souvenir, and in some cases are unable to discard old phones when they are replaced due to their sentimental significance to them (Vincent, 2006). It has also been suggested that the huge increase in communication attributed to mobile telephony allowing individuals to be available anytime anywhere is characterised by the vast proportion of those communications, particularly texts, appearing largely irrelevant in terms of content (Van Dijk, 1999). Thus an indirect consequence of the technology may be that it's very convenience and portability renders it irresistible to users, they become accustomed to high volume communications largely for the sake of being in contact. This can produce a further consequence in feeling of loneliness or even rejection if they are out of touch or not being contacted, as the tool for potential communication is a permanent feature within their most personal possessions. The Digital World Research Centre, Surrey University aims to study the effects of technology on users, specifically regarding mobile phones and their research suggests that users show an attachment to the device which is unlike other technologies, it focuses on what the device enables them to do, the information received and stored on the phone, and the extent to which users

have come to rely heavily on the device (Vincent, 2004). They emphasise the importance of the mobile in person-to-person communication, and how that connectivity engenders emotion, whilst the discrete portable nature of the device results in the mobile phone remaining on the person of most users most of the time.
Vincent (2006) highlights a seemingly significant paradox in that some users seem reluctant to describe their phone attachment as emotional although they use them to achieve emotional goals, and utilise emotive language in describing their usage ('panic', 'thrill', 'need', 'desire', 'being cool', irrational behaviours', 'anxiety'). It would seem that, for some, the mobile phone represents more than it was initially intended, in terms of emotional links forged between it and what it represents to the user.

Concerning the developing relationship between young people's quest to pursue self-identity and their own families, mobile telephony is often cited as an important innovation allowing potential perpetual connectivity between parent and child. Levinson (2004) refers to the technology as the 'mobile hearth' (p.106), indicating a usurping of the traditional function of the fireside hearth as a central focus of communication in the home. However the obvious benefits, allowing the young person to establish their independence whilst within easy and convenient parental guidance, should perhaps be viewed in light of potential over-use, or over-reliance on either part. Research has indicated the availability of contact may engender in some an undermining of the breaking away necessary at adolescence, and may also cause conflict as parents may be seen as hypocritical for criticising young people's perceived over-use of the technology that they themselves appear reliant on (Turkle, 2009). Turkle (2008) coins the term 'tethered self' referring to the illusory nature of the freedom afforded by mobile phone technology. Keating (2005), citing evidence from 15 countries, refers to the apparently paradoxical centrifugal and centripetal effects of mobile phone technology. She identifies a conflict between autonomy and independence as users' freedom to roam is matched by an expectation to remain connected (Keating, 2005).

Van Dijk (1999) argues that this shrinkage of natural space for withdrawal and reflection impacts on the quality of the resultant communication, with much of it being irrelevant. This development in everyday life may have no relevance if the consequences are benign or insignificant, but this may not be so for all users, at all times. Rules of engagement continue to evolve around calling and text messaging, including intentionality of missing calls, and call screening (Donner, 2007). According to Elwood-Clayton (2005), delaying a reply, or not replying forms part of an evolved etiquette surrounding text messaging, with no response creating the feeling of 'present absent presence' (p.212), accompanied by feelings of ostracisation, the dismissal of one's gestures as insignificant, as the receiver is aware of their accountability and obligation to respond. A paradox of perpetual availability is revealed highlighting a potential for loneliness, or sense of isolation if one is not being contacted, or messages go unanswered, within a socially constructed context that expects a response whenever and wherever.

There exists a debate surrounding behaviours and addictions, with suggestions of similarities in brain reward responses to those found in psychoactive substances (Griffiths, 2005; Lemon, 2002). According to Griffiths' (2005) 'components' model of non-substance addiction an individual who fulfils the six criteria (salience, mood modification, tolerance, withdrawal, conflict and relapse) would be defined as an addict, although he recently qualified that assertion within the context of this study by saying

that he had not “come across” anybody who could be classified as addicted to mobile telephone use (M. Griffiths, personal communication, 30 October, 2009). The picture is complicated further by the identification of characteristics suggestive of an increased likelihood of an individual developing an addiction to technology. A recent study, focussing on Internet use, conducted with a non-clinical sample of alexithymics, defined as individuals experiencing a cognitive or affective disturbance in ability to recognise and describe their own feelings (Colman, 2006), identified links between an inability to identify feelings, low self esteem and high impulse dysregulation and their risk for developing technological addictions (De Berardis, et al, 2009).

Bianchi and Phillips (2005), were arguably the first researchers to publish findings based on their work devising a measure of problematic mobile phone use, from which the SMS Problem Use Diagnostic Questionnaire (Rutland et al, 2007) was adapted. Their predictor variables were age, gender, and low self-esteem, but they also measured extraversion and neuroticism. Their findings conclude problem use was a function of low self-esteem, extraversion and age, but not neuroticism; however they do qualify their own findings as limited by identifying symptoms but failing to address the underlying issues of deficits in impulse control (Bianchi & Phillips, 2005). Although researchers agree that it exists, operational definitions of what constitutes problematic use of mobile phone technology would seem to depend upon negative consequences experienced by the user, and have been interpreted differently by researchers. A Swedish study (Thomee et al, 2007) into the prevalence of perceived stress, symptoms of depression and sleep disturbances associated with mobile phone use, along with other information and communication technology (ICT), concluded there were sex differences. Females reported stress and symptoms of depression associated with high use of mobile phone, plus text messaging, combined with computer use, whilst males reported sleep disturbances associated with mobile phone and text messaging, and symptoms of depression with text messages (Thomee et al, 2007). The participants were assessed as free of psychological symptoms at baseline, and prevalence of symptoms was measured at follow-up. The authors conclude that mobile phone technology, as an element of ICT may have an impact on psychological health, although they are unable to infer causal mechanisms from this study (Thomee et al, 2007). A critical evaluation of the methodology employed in the study must question the validity of measuring participants as psychologically ‘symptom-free’ at baseline, when considering variables such as sleep disturbance, stress and symptoms of depression, which are likely to be naturally present to some degree.

Ling (2005) cites evidence that young females have been quicker to take up mobile telephony, in particular text messaging, alluding to much previous research supporting women’s enhanced aptitude for maintaining social lives via telephone, possibly resulting from stronger social networking and nurturing skills even in remote care giving. He refers to a Norwegian study (Skog & Jamtøy, 2002) which concluded that SMS use amongst young people surveyed, especially females, was far more common than voice calling, and suggested that SMS may be seen as a service for ‘immature and superficial’ individuals (p.184), although some might criticise that interpretation as somewhat pejorative. Extreme high users were identified within that 2002 study as sending more than 20 messages a day. It is interesting to compare that volume of communication with the extreme high usage reported by young US female users in 2009, which is estimated as an average of 2,272 text messages per month, almost 80 per day, and more than double the average of the previous year (Hafner, 2009), and

represents firm evidence for huge increases in text messaging volume, and possibly norms for young people, in less than a decade. The Norwegian study analysis reported a covariation between SMS or voice call use and reduction in feelings of loneliness, sense of popularity, and sense of time spent with friends. Despite expectations other studies have found gender to be a weak predictor of problematic mobile phone use (Bianchi & Phillips, 2005), and some suggest cultural issues around expected female behaviour to be influential (Takao et al, 2009).
In support of this interpretation, some research has reported users of text messaging as experiencing a different emotionally 'braver' self, indicating that it offers a form of romantic agency, perhaps especially to (young) women otherwise culturally denied them (Pertierra, 2002, cited in Elwood-Clayton, 2002). Other cross-cultural evidence supports the possibility that emotions are more freely expressed via text messaging (Rivière & Licoppe, 2005). In an interesting study concentrating on SMS use amongst deaf users Bakken (2005) emphasises Granovetter's (1973) network theory observation that weak social ties are preferable to no ties at all, with SMS allowing ties to be formed and maintained with remote social participants. Thus the benefits of the technology within perhaps otherwise marginalised groups is evidenced. Elwood-Clayton (2005) explores themes of perpetual contact (Katz, 2006) and absent presence (Gergen, 2002) with relevance to relationship infidelity and SMS use in the Philippines, which in 2002 was acknowledged as the text messaging capital of the world, with one hundred million texts sent daily (Pertierra, 2002, cited in Elwood-Clayton, 2002).

Whilst clear evidence exists to support the benefits and innovations associated with the technology, it appears from this emerging research that there are unpredicted and potentially unhelpful consequences linked to the ubiquitous mobile phone as a tool, and users' relationship with the technological artefact. This study will employ a scale designed by Rutland, Sheets and Young (2007) to assess and identify text messaging habits. The Problem Use SMS Questionnaire (Rutland et al, 2007) was devised using an undergraduate cohort, in order to fill a perceived gap in the resources to gain an understanding of non-substance addictive behaviour, as defined by Griffiths (2005).
Whilst there may be some consistency in the reporting of certain characteristics and demographic variables in predicting for problematic mobile phone use, there appears to be a generic difficulty in discerning negative consequences arising from problematic use (Choliz, 2010; Laramie, 2007; Thomee, 2007). Referring to addiction, defined as a move from impulsivity to compulsivity in behaviours, Laramie (2007) indicates that references to mobile phone addiction are increasing in the popular literature, whilst acknowledging a dearth of psychological research into the phenomenon. Impulse dysregulation and issues around control have implications for an individual's ability to cope with stress and adaptation, and have a significant role in well being. According to Walker (2001) a unifying theory of control in relation to the psychology of health range does not exist although the concept draws from personal and perceived control and encompasses self efficacy, locus of control, and learned helplessness. Some research findings from work conducted into users' attitudes towards text messaging based on expectancy-based constructs of self-efficacy and locus of control suggest that text messaging behaviours are influenced by these constructs (Mahatanankoon & O'Sullivan, 2008). Interestingly the authors indicate that the results are likely to be of interest to the technology providers and affect future applications and services, rather than reflecting on the consequences for the users.

The US has been slower than other parts of the world in adopting the mobile phone, preferring the personal computer as a communication technology, according to Baron and Ling (2007). Relatively recent pricing revisions and the promotion of unlimited texts plans is having a direct affect on huge increases in the volume of text messaging (Hafner, 2009). A negative consequence of this upsurge in mobile phone usage would appear to be an increase in road traffic accidents attributed to driving whilst sending a text message (White, Hyde, Walsh & Watson, 2010). One method of defining problematic use of mobile phone technology is to refer to legal regulations, particularly with reference to traffic safety, with many countries banning the use of mobile phones whilst driving, for calling, unless using a 'hands-free' kit (White et al, 2010). Sending text messages whilst driving is viewed as highly irresponsible and potentially dangerous in many cultures (Keating, 2005), with the US currently evidencing a surge in public opinion against drivers who breach their laws (White et al, 2010). It would seem likely that the US is set to become more involved in future research in this area, whilst countries that have had a longer history of text messaging, Japan, and some European countries in particular, are moving away from obvious public safety concerns, more towards research into addictive behaviours and text messaging habits. According to Takao et al (2009), who cite Keating's (2005) survey of 15 countries, other problems associated with excessive mobile phone use include debt accumulation, harassment and use of the technology for obscene motives.

As a result of current research, there is much scientific debate around the inclusion of a diagnostic entity of compulsive Internet use as an addictive behaviour (Choliz, 2010) within the proposed category of Addiction and Related Disorders (American Psychiatric Association, DSM5, 2010) in DSM-V, launching in 2013. Perceived, and identified similarities with the attributes and characteristics that make mobile phones strongly appealing, particularly to adolescents (Choliz & Villanueva, 2009; Toda, Monden, Kubo & Morimoto, 2006), have resulted in calls for mobile phone addiction to be considered for inclusion to DSM-V (Choliz, 2010).

Research questions to be considered include, whether mobile phone technology, in particular text messaging, encourages greater impulsivity in individuals with high trait impulsivity, conversely, could mobile phone technology induce more anxiety in individuals with high trait anxiety? Clearly, these questions are tempered by the effects of individual self-regulation with regard to the technology which has become an almost permanent feature in many lives - a recent Australian survey of more than 2000 households, and including ages from 15-over 55, reported that less than one-sixth of the respondents turn their mobile phone off at home (Bittman et al, 2007).

In the light of the extant research, and perceived gap in the literature concerning potential predictive validity of a possible link between sex, disinhibition, emotional dysregulation, and low self-esteem, particularly in younger people, and the over-use, or problematic use of mobile phone for text messaging, this study will consider the following hypotheses:

H1: Low self-esteem will be positively correlated with problematic text use.

H2: Females will report more problematic text use.

H3: High impulsivity will be positively correlated with problematic text use.

H4: High anxiety will be positively correlated with problematic text use.

Method

Design

The research design is a between groups, correlational study. The dependent variable is self-identified problematic text use, and independent variables are scores for measure of self esteem, scores on scales of impulsivity and anxiety, and gender.

Participants

A total of 100 questionnaire packs were distributed to participants who use a mobile phone for text messaging recruited as a mixed volunteer/opportunity sample, from undergraduates on the university campus. Fifty were delivered by e-mail to individuals who had agreed to participate, of which 27 were returned (response rate 54%). Usable questionnaires numbered 27 (23 female, 4 male). A further 50 questionnaire packs were distributed to be completed by participants during a lecture or in the library, of which 47 were returned (response rate 94%). Usable questionnaires numbered 47 (31 female, 16 male). The total was 74 usable questionnaires (overall response rate 74%) and therefore 74 participants in the study (54 female, 20 male), with a mean age of 21.32 years (SD=5.23). Ages ranged from 18-55.

Materials

The Short Message Survey Problem Use Diagnostic Questionnaire (SMS-PUDQ) (Rutland, Sheets & Young, 2007) (Appendix A) is a survey of short message service (SMS), or text messaging use. It was used with the approval of the authors (T.Sheets, personal communication, 29 October, 2009), and comprises 8 items: 5 characterised as identifying pathological SMS use (Items 3, 4, 6, 7, 8), 3 identifying problem use (Items 1, 2, 5). It is scored on a Likert-type scale (Very Inaccurate-Very Accurate), and reports internal reliability via Cronbach's alpha of 0.84 for items loading on the first factor (pathological use), and 0.87 for the second factor (problem use). SMS-PUDQ scores have been found to correlate highly with the Mobile Phone Problem Use Scale (Bianchi & Phillips, 2005). The Preliminary IPIP Scales Measuring the Constructs in Gray's Behavioural Inhibition and Activation Systems (BIS/BAS: Carver & White, 1994) (Appendix B) consist of 36 items divided into 4 subsections (Cronbach's alpha): anxiety (0.84), and impulsivity comprising fun-seeking (0.79), drive (0.77), and reward-responsiveness (0.68). Scoring is on a Likert-type scale (Very Inaccurate-Very Accurate). There are no norms available. The Rosenberg Self-Esteem Scale (Rosenberg, 1965) (Appendix C) is a commonly used measure of global self-esteem. It consists of 10 items, and is scored on a four-part Likert-type scale (Strongly Agree-Strongly Disagree). Possible scores range from 10-40, with a normal range suggested from 15-25. Research examining the reliability of the Rosenberg Self-Esteem Scale has reported Cronbach's alpha of 0.88 (Marcotte, Fortin, Potvin & Papillon, 2002).

Demographic information was collected via a questionnaire (Appendix D) consisting of 10 questions concerning background information; participant gender, age, and mobile phone ownership and usage, including indications, if any, of numbers of mobile phone calls, and texts that the participant would consider excessive, and situations where mobile phone use, for text messaging or calling, would be considered inappropriate.

Procedure

Ethical procedure was followed via submission of the draft study proposal to the University of Worcester Ethics Committee, with clearance granted May 2009.

The participants were introduced to the study topic at a brief presentation during lectures, and invited to sign up with an e-mail address if they wished to proceed with participation. On a second occasion participants were invited to complete the questionnaire pack at the end of a lecture, thirdly a group of male participants were recruited in the library (in order to increase the low number of male participants in the sample). Anonymity of responses was assured, and reference was made to the consent form which would constitute part of the procedure if conducted by e-mail (Appendix E). The groups of potential participants were also advised that the nature of one questionnaire (Rutland, Sheets & Young, 2007) appears to problematize text messaging, and that this was not intended to reflect the opinions of the researcher, nor cause offence.

The questionnaires delivered both by personal e-mail address to the participants or face to face, were accompanied by a letter of thanks which also outlined the necessary ethical issues, confirming that all responses were anonymous, and kept strictly confidential (Appendix F). Participants were reminded of their right to withdraw at any time (up to March 12, 2010), and that their consent was inferred by completion and return of the questionnaires. Time necessary for completion was indicated as 15 minutes. Participants were instructed to read and complete the four elements by giving the most appropriate response to each item. Participation concluded with a short debrief letter (Appendix G) which thanked that participant for their contribution. A contact e-mail address for the Student Counselling Service was included, as an appropriate source of support, due to the potential sensitivity of the issues discussed in the questionnaires.

Pilot study

A small pilot study was necessary to confirm comprehensibility of the questionnaires and completion times, and establish the most efficient means of delivering the constituent elements of the questionnaire pack, consent and debrief material by email. The time indication of 15 minutes was concluded as accurate.

Data preparation

Each participant's total score for the SMS-PUDQ was calculated by summing the scores of each item. Scores were awarded as follows; Very Accurate=5, Moderately Accurate=4, Neither Accurate nor Inaccurate=3, Moderately Inaccurate=2, Very Inaccurate=1. The possible score ranges from 8-40. The BIS/BAS scales were scored as above, but with some items reversed (Appendix B), producing a total for anxiety, and three subsets of impulsivity (fun-seeking, drive & reward-responsiveness). The possible score ranges from 10-50 (anxiety), 10-50 (fun-seeking & drive), 6-30 (reward-responsiveness). An aggregate score for impulsivity was calculated by totalling the three subset scores for each participant resulting in a final score from 26-130. Self-Esteem scores were calculated for Items1, 2, 4, 6 & 7 as; Strongly Agree=3, Agree=2, Disagree=1, Strongly Disagree=0, with Items 3, 5, 8, 9 &10 scoring the reverse (Appendix C). The possible score ranges from 0-30, with 15-25 considered the normal range, and below 15 suggestive of possible low self esteem. The chosen level of significance was an alpha level of 0.05.

Results

The multivariate data collected from participants included a score (8-40) indicating problem use of text messaging (dependent variable), plus 3 independent variables comprising a self-esteem score (0-30), and scores on trait anxiety (10-50) and impulsivity (26-130, formed from 3 subsets). Demographic information included age, gender, identification as a majority user of text messaging or calling, number of actual daily texts and excessive number of daily texts.

The totals, means and standard deviations of self esteem, anxiety, impulsivity and problem texting were calculated, along with the minimum and maximum scores. This was done for the total sample (A), and with the data split by gender (B). The results are presented in Tables 1 & 2 respectively.

Table 1

Means and standard deviations, minimum, maximum, and skew of scores on anxiety, impulsivity, self esteem, actual daily texts, potential daily texts and problem texting

Independent variable	*n*	Minimum statistic	Maximum statistic	*M*	*SD*	Skewness statistic
Anxiety	74	10	46	31.4	7.2	-.47
Impulsivity	74	54	106	82.9	11.8	-.26
Self esteem	74	10	30	20.8	4.8	.32
Actual daily texts	73	2	300	26.0	38.0	5.5
Potential daily texts	70	10	1000	94.4	135.8	28.8
Problem texting	74	8	38	16.0	6.9	.97

Inspection of the skew of the predictor variables reveals that self esteem and problem texting score were positively skewed in both males and females indicating a general trend towards lower scores, whilst anxiety and impulsivity were negatively skewed in both genders indicating the opposite.

Table 2

Means and standard deviations, minimum, maximum, and skew of scores on anxiety, impulsivity, self esteem, actual daily texts, potential daily texts, and problem texting, by gender (G)

Independent variable	G	*n*	Minimum statistic	Maximum statistic	*M*	*SD*	Skewness statistic
Anxiety:	male	20	10	37	25.5	6.7	-.49
	female	54	19	46	33.5	6.1	-.35
Impulsivity:	male	20	54	100	82.0	13.1	-.42
	female	54	55	106	83.2	11.4	-.17
Self esteem:	male	20	15	30	22.3	4.4	.28
	female	54	10	30	20.2	4.8	.42
Actual daily texts:							
	male	20	2	100	19.8	23.1	2.7

female	53	2	300	28.3	42.3	5.3
Potential daily texts:						
male	19	15	250	63.4	67.9	1.8
female	51	10	1000	105.9	152.7	4.4
Problem texting:male	20	8	31	15.1	5.4	1.3
female	54	8	38	16.4	7.4	.97

The interrelationships between variables were examined and inferential statistics produced by one-tailed multiple regression analysis for self esteem and impulsivity.

Two standard multiple regressions were performed on the total dataset (A), and the data split into male and female groups (B), to analyse the combined and relative unique contribution of the independent variables on the dependent variable. Normal distribution and linearity of the data were checked by reference to the residuals scatterplot (Appendix H), and Normal P-P Plot of Regression Standardised Residual (Appendix I), and found to conform. Initial checking of the assumptions also included multicollinearity, which revealed the degree of correlation between the independent variables and dependent variable, for the total and files split by gender (Appendix J).

Examination of the collinearity diagnostics by reference to the Coefficients table, revealed no evidence of multiple correlation in either set of statistics indicating a lack of significant relationship between any independent variables, or any single independent variable representing a combination of other variables (Appendix K).

Inspection of the residuals scatterplot (Appendix H) and the Normal Probability Plot (Appendix I) for both sets suggest no deviations from normality and few outliers. The outliers were checked further by inspection of the maximum Mahalanobis distance which was found not to exceed the critical chi-square value for 3 IVs (16.27) (Pallant, 2005, p. 151). One unusual case (case number 24/A) was indicated by the Casewise Diagnostics table (Appendix L), although Cook's Distance (.249) confirms that this does not present a problem as it is less than 1.0 (Pallant, 2005) (Appendix M).

In evaluating the model, the R Square figure in set A (.06) indicates that 6% of the variance in problem texting use may be accounted for by the predictor variables (anxiety, impulsivity and self esteem) (Appendix N). The R Square figure in set B males (.16), females (.05) indicate 16% and 5% may be accounted for respectively (Appendix N). The ANOVA tables shows that in set A, problem texting may not be significantly predicted by anxiety, impulsivity and self esteem together (F (3, 70) = 1.37, p= .26) (Appendix O).

In set B problem texting in males was not significantly predicted by the independent variables (F (3, 16) = 1.0, p= .42), nor in females (F (3, 50) = .78, p= .51) (Appendix O).

Inspection of the demographic information revealed 81% of participants identified themselves as texters rather than callers, 27% had owned a mobile phone more than 10 years, and 46% never turned their mobile phone off.

As no statistical significances were found in the data analysis no differences may be reported, however impressionistic results may be formed from inspection of the descriptive statistics (Appendix P), which reveal that females within the sample scored noticeably higher than males on anxiety, both as a minimum and maximum score. Female scores on impulsivity were only slightly higher than males, and whilst both gender groups had similar scores for self-esteem, the female group included 6 participants (9%) indicating a score of less than 15 (suggesting low self-esteem). Females indicated higher actual daily texts compared to males (300/100), and higher potential daily texts (1000/250). Problem texting scores for both genders ranged from

the minimum (8), but females scored closer to the maximum compared to males (38/31).
The items most frequently responded to (positively) on the SMS-PUDQ were Item 1 ('I feel preoccupied with used SMS'-problem use), which was indicated Moderately Inaccurate/Very Accurate in 25 cases (34%), & Item 8 ('I use SMS as a way of escaping from problems, or of relieving a bad mood-pathological use), which was indicated Moderately Inaccurate/Very Accurate in 28 cases (38%). Item 5 ('I use SMS longer than originally intended') was responded to by 43% of participants.
The lowest number of responses (6) was to Item 4 ('I feel restless, moody, depressed or irritable when attempting to cut down or stop SMS use'); Item 7 ('I have lied to family members, therapists, or others to conceal the extent of involvement with SMS') was responded to by 8 participants. Item 6 ('I have jeopardized or risked the loss of a significant relationship, job, educational or career opportunity because of using SMS') was responded to by 12 participants. Item 2 ('I feel the need to use SMS with increasing amounts of time to achieve satisfaction'), and Item 3 ('I have repeatedly made unsuccessful attempts to control, cut back, or stop SMS use') were both responded to by 15 participants.

Discussion

The aim of this study was to attempt to identify variables which may predict problematic self-identified text message use, and to test the hypotheses that low self-esteem will be positively correlated with problematic text use, females will report more problematic text use, high impulsivity will be positively correlated with problematic text use, and high anxiety will be positively correlated with problematic text use. Standard multiple regression analyses failed to find a significant association between the independent variables (impulsivity, anxiety, self-esteem and gender) and the dependent variable (problem texting score) in each case, and therefore all four hypotheses must be rejected according to these results.

Whilst within the literature there does not seem to be any exact equivalent research in terms of the dependent and independent variables employed by this study, the non-significant findings are contradictory to the relevant extant research into problematic or compulsive mobile phone use, personality traits, and self esteem (Bianchi & Phillips, 2005; Ehrenberg et al, 2008; Igarishi et al, 2008; Keating, 2005; Reid & Reid, 2006; Rutland et al, 2007; Skog & Jamtøy, 2002; Takao et al, 2008; Thomee et al, 2007; Walsh et al, 2009). However, the findings do provide some insight into young undergraduate attitudes towards mobile phone technology, and text messaging habits in particular. Participant responses to the Short Message Survey Problem Use Diagnostic Questionnaire (SMS-PUDQ) (Rutland et al, 2007) produced a spectrum of scores, including four in the top quartile for total score, with 34% of participants responding to items which may be indicative of problematic, and 38% responding to items which may be indicative of pathological use of text messaging, according to the interpretation intended by Rutland, Sheets and Young (2007).

Evidence to support the age at which young people obtain their first phone is found in this study with 95% indicating ownership in excess of 10 years, implying a commencement at 9 years on average. In line with the literature, the ubiquity of mobile phone ownership may be evidenced by the 100% result from those groups approached to participate in the study (Castells, 2008), additionally this sample evidenced 46% of participants never turn their mobile phone off (Bittman et al, 2009). The results also

lend support for the continuing popularity of sending a text over calling, with 81% identifying as a text message sender rather than a caller. Of most interest from the measure in this instance are those items most frequently responded to as Moderately or Very Accurate on the SMS-PUDQ. Item 1 ('I feel preoccupied with used SMS') was responded to by 34% of participants. This item is defined as indicative of problem use, according to the authors (Rutland et al, 2007). Item 8 ('I use SMS as a way of escaping from problems, or of relieving a bad mood') was responded to be 38% of participants, and it is considered indicative of pathological use according to this measure (Rutland et al, 2007). Item 5 ('I use SMS longer than originally intended') had been considered an ambiguous item, and clarification was sought from the authors but was not forthcoming, however 43% of participants responded to this item.

The SMS-PUDQ is unique in its aims and applications, and, although correlated with Bianchi & Phillips (2005), it appears not to feature in any published research. Some concerns were raised in assessing its suitability for use within this study, and subsequent to its use there appears to be an issue of ambiguity in interpreting responses to some items. It was considered as potentially seeking to problematize SMS use although this did not provoke any reaction feedback from participants, possibly due to the disclaimer included in the instructions. It was also considered that many of the items were unlikely to be relevant for many participants. This concern did appear to be unfounded in the light of the results which indicate responses to all of the items; however the issue of ambiguity in interfering meaning from those responses may reveal an important limitation of the accuracy of possible interpretation of the results. The SMS-PUDQ is scored by assigning 1-5 according to which response is indicated (1=Very Inaccurate, 2= Moderately Inaccurate, 3= Neither Accurate nor Inaccurate, 4= Moderately Accurate, 5=Very Accurate). In the course of interpreting the results the ambiguity of responses indicating Moderately Inaccurate (score=2) to items of the complexity of those in the scale added to a deal of uncertainty in interpretation. Although the scores were unlikely to erroneously reflect level of problematic use, they fell short of providing any further insight into users' experiences or feelings towards their text sending habits, particularly in those cases which responded Moderately Inaccurate or Neither Accurate or Inaccurate. Consequently it is felt that the issue of what constitutes problematic use of text messaging has not been fully or accurately explored by this methodology.

It could be argued that a qualitative approach would add immeasurably to the richness to the data, and the validity of interpretation of the results. Ritchie and Lewis (2003) discuss the issue of generated data versus that which is naturally occurring, and the importance of context in data collection, which is likely to reflect some relevance within this study as the data relied on self-report, and estimations of use. Valuable alternative approaches could include observation and discourse analysis, as the numbers of texts given by participants may be inaccurate, and investigation into positive responses to the items in the SMS-PUDQ would provide a great deal of illumination into perceived problematic habits. It may be argued that the use of empirical data collection only in this study has limited the possibilities for developing understanding and exploring the links that seem to be indicated by other empirical research (Igarishi, Motoyoshi, Takai & Yoshida, 2008; Takao, Takahashi & Kitamura, 2010; Walsh, White & Young, 2009).

In accordance with the literature which suggests that (young) women are most likely to develop problematic levels of text messaging (Skog & Jamtøy, 2002; Thomee et al, 2007), the range in numbers of daily texts reveals a great diversity with females to males reporting a 4:1 relationship in terms of maximum numbers of actual and potential or permissible daily texts. Self-reported problematic text use habits within the study sample reveal some gender similarities. Both range from the minimum possible score, but 3 female scores approach the maximum, and one male, whilst mean results are similar. The results also indicate similarities between the mean scores of males and females in self esteem and impulsivity (when considered as an aggregate score), although 9% of females indicate a low self esteem score. Anxiety scores were notably higher, although not significantly so, for females.

Many studies in this area have employed personality measures, such as the NEO PI-R (Costa & McCrae, 1992), identifying participants according to their scores on such measures of the Big Five personality traits, extraversion, neuroticism (relating to emotional stability), openness, conscientiousness and agreeableness (Ehrenberg et al, 2008). Others have used the Eysenck Personality Questionnaire (Bianchi & Phillips, 2005). It may be relevant to draw parallels between the measure of anxiety in this study and neuroticism in the literature. In a recent study, which considered mobile phone use as part of a subset of young people's use of communication technology, within an undergraduate sample (*n*=200), Ehrenberg, Juckes, White and Walsh (2008) found that high extraversion and neuroticism predicted for increased use of text messaging. Ehrenberg et al (2008) posited that individuals who scored highly on neuroticism are more likely to use higher numbers of text messages, and do so because that medium allows more time for reflection on message content. They also speculated, in line with others (Reid & Reid, 2006) that more socially anxious individuals may prefer to communicate via text rather than face to face, that they may seek reassurance frequently (Takao et al, 2009), and that they also report more addictive tendencies towards the technology. The results indicate that females within this sample evidence higher anxiety than males, and further investigation might develop an understanding of any causal links between text messaging and general anxiety which are evidenced by physiological research (Lin & Peper, 2009).

High proportions of the general population experience feelings of paranoia and social isolation at times (Wiles, Zammit, Bebbington, Singleton, Meltzer & Lewis, 2006). It is also acknowledged that adolescence is potentially a period of particular social anxiety for some (Harter, 1999; Shapka & Keating, 2005), and as stated previously, this group represents highly committed users of text messaging (Igarishi, Motoyoshi, Takai & Yoshida, 2008; Walsh, White & Young, 2009). Whilst it is acknowledged that the etiquette surrounding mobile phone use is evolving (Castells, 2005; Goggin, 2008), the potential for experiencing a sense of being ignored, or even ostracised, as messages go unanswered, could promote anxiety and unhappiness, especially in young or vulnerable people. In this context, the recruitment of an undergraduate sample offers good face and ecological validity, as it could be argued as representative of young people, who are often cited as the most enthusiastic adopters of mobile phone technology (Igarishi, Motoyoshi, Takai & Yoshida, 2008; Walsh, White & Young, 2009), and "potentially susceptible" (p. 739) to developing problematic patterns of use (Ehrenberg, Juckes, White & Walsh, 2008). Accordingly, another question for future research might focus on the extent to which high trait anxiety is provoked, exacerbated or maintained by mobile phone technology.

Although it should be noted that there are no norms available for the BIS/BAS scores, it may be argued that an undergraduate cohort is not representative of levels of impulsivity (part-characterised by subset as 'fun-seeking') or self-esteem in a general population. As a group they could be generalised to represent a section of the population who are young, eager for self-fulfilment, relatively affluent, self-motivated and ambitious. The results from this sample would appear to lend some support for that assertion. Scoring on the Self-Esteem Scale (Rosenberg, 1965) ranges from 0-30, with totals 15-25 considered within the normal range, and below 15 suggesting low self-esteem. This study reports mean self-esteem results well within the normal range for the male and female combined mean score, with males reporting slightly higher scores than females although the range was similar. However, examination of individual scores reveals some notable exceptions to generally normal range responses. The 6 lowest scores were all reported by females, whilst simultaneously failing to correlate with high scores on the SMS-PUDQ. It may be relevant to note that two of these low self esteem scoring participants concurrently indicate the minimum possible SMS-PUDQ score, and one a little higher, thus indicating the opposite of H1. The participants do however show some trend in attitude to high numbers of daily texts, with the lowest in reported self esteem also indicating the highest number of acceptable daily texts compared to actual daily texts. Although widely used, it may be relevant to note that the Rosenberg Self Esteem Scale is subject to on-going validity reassessment by researchers, and whilst this sample comprised a large majority of white British participants, its universality has been questioned for use with certain groups (Hatcher, 2007).
The lack of replication of other findings in the predicted direction may reveal some anomaly within the method of data capture, or more significantly, an inconsistency in the attitudes of (high) users of text messaging with that level of use representing a problem for them. Clearer information about volume of communication via text might be gathered by using forced choice questions - by categorising sets of numbers from which to select (e.g. 0-5, 5-10, 10-15), although this may avoid the problem of missing data it may still provide unreliable data as participant accuracy cannot be guaranteed. Future research question design might further develop these ideas by distinguishing between texts sent and received; it might also consider alternatives samples drawn form a wider demographic group, to include low socio-economic and underprivileged or marginalised groups.

Young females, who were overrepresented in the sample have been cited as highest users of texting and most likely to display problematic over-use of the technology (Ling, 2005), although some of the research has concentrated on younger groups (Skog & Jamtøy, 2002). It was amongst the female participants that most notable high numbers of daily texts were both reported as actual and permissible, with several reporting average daily texts three times greater in number than males.
Although the sample size (n=74) fulfilled the criteria for 3 IVs, according to Tabachnick and Fidell (cited in Pallant, 2005, p142), the split file data introduced the dichotomous predictor variable of gender, increasing the appropriate sample size to 90, thereby reducing the generalisability of the results. Meanwhile, an argument might be made for further studies to be selective in sampling in order to target participants who indicate elements of problematic usage. It might also address the imbalance of female to male participants in this sample. Although the relatively low instances of missing data suggest that participants found the questionnaire pack clear, future studies employing the SMS-PUDQ might consider the level of literacy, and sophistication of thought

required to complete the items, particularly if used with younger age groups, or individuals with lower levels of literacy.

Whilst the SMS-PUDQ may not have revealed all that might be relevant to the debate, given the subjective nature of how participants have been seen to characterise their texting habits, typically as not problematic, and given the wide ranging levels of daily usage considered therefore 'normal'. The results appear to fail to support the concept that texting habits may be problematic for some people, at certain times, although the literature indicates that this may be so (Bianchi & Phillips, 2005; Ehrenberg et al, 2008; Igarishi et al, 2008; Keating, 2005; Reid & Reid, 2006; Rutland et al, 2007; Skog & Jamtøy, 2002; Takao et al, 2008; Thomee et al, 2007; Walsh et al, 2009), and, anecdotally, participants in this study made similar assertions.

It is interesting to note that numbers of self-reported actual daily texts is roughly a third of the number of texts that each participant would consider excessive, although this is negatively skewed by one very high figure. Only one participant indicated a higher number of actual texts to excessive. The numbers of texts in this example are relatively low, and may have been erroneously indicated. It would seem from those data that no participant would characterise their use as excessive on an average day. Four participants did not indicate an excessive number of daily texts but made a remark (e.g. "no limit", "as many as you need", "n/a"). This would seem to lend support to the notion that what constitutes excessively high use is a fluid concept. These remarks indicate that use is influenced by circumstances and perceived requirements, whilst further investigation into these remarks and the SMS-PUDQ items which had positive responses, using qualitative techniques, such as semi-structured interviews, or focus groups, could add greatly to our understanding. The disparity between actual, and what are considered by participants to be excessively high numbers of daily texts, may also indicate other factors such as socially desirable responding, and possibly defence mechanisms, such as denial or projection (Hughes, 1999) - anecdotally several participants remarked that they were aware of others whose use of text messages they characterised as "obsessive". More in-depth investigation of such issues with participants might reveal aspects of attributional bias. If this is the case, individual interviews with future participants may be the most effective means of gaining accurate information, and more useful insight into a truer understanding of users' relationships with the perpetual connectivity afforded them by their mobile phone. This approach might partly overcome the paradoxical nature of the apparent participant enthusiasm and interest in the study topic, but lack of significant statistical findings, although the relationship for some would seem to be complex.

The theme of this study generated some wide interest amongst participants; with many expressing both interest, asking questions concerning the hypotheses being tested, and occasionally concern regarding their own text use habits. Perhaps, as a consequence of this, initial take-up numbers were high, at around 80-90% in groups which reported 100% mobile phone ownership. This enthusiasm however was not reflected in the numbers of questionnaires returned by e-mail. It would appear that this may be accounted for in some way by a technical problem of document compatibility for some potential participants. Aside from some technical difficulties, and although a convenient means of distributing large numbers of questionnaires, e-mail may prove a threat to participant confidentiality, as data is linked to identity via the participant's e-mail address. In order to overcome this potential breach of anonymity and ensure confidentiality all e-mail responses were kept in a secure folder on a password-

protected laptop. Qualitative research methods, interviewing or focus groups, would overcome these issues of quantitative data collection.

The literature lends support to the media fascination with society's increasing compulsive reliance on communication technologies (Hafner, 2009; Spicer, 2009), and intuitive sense strengthened by empirical evidence, that text messaging has had a profound effect on intimate personal relationships (Elwood-Clayton, 2005). It is clear that whilst much text communication is relatively empty, in terms of informative content (Van Dijk, 1999), it can be highly relevant in the arena of intimate personal relationships, both in their formation, maintenance, and, most controversially, ending, as demonstrated by the 2001 divorce-by-text scandal in the Muslim world (Hameed, 2008). It seems that text messaging etiquette has developed in this particular area, as evidenced by this study - in response to the question: 'When is it not acceptable to use texting?' roughly 25% of participants mentioned "when splitting up with a partner".
One area that this study did not address was relationship status, and that may be an important limitation. This demographic question, had it been included, could have illuminated the differential significance of mobile phone numbers contacted by participants on a daily basis. Within a qualitative approach, the use of semi-structured interviews with participants could allow the investigation of this more personal area, provided there was time allowed to develop sufficiently trust between participant and researcher. However, it should be borne in mind that text messaging is increasingly cited as a contributing, or even causal factor in infidelity (Elwood-Clayton, 2005; Goggin, 2008), and thus represents an area within which self-disclosure may prove unlikely.

Clearly participant numbers in this study indicating the highest scores of problematic use of texting are small, and could perhaps be dismissed as outliers; however the aims of this study were to add to the understanding of predicting for problematic use of a recent technology which enjoys in excess of 60% uptake globally (Castells, 2008), particularly amongst young people. It may be that 'pathological' use of text messaging (Rutland et al, 2008), defined as use which is characterised by elements in common with non-substance addiction, according to Griffith's (2005) "components" model, will only apply to the few. Meanwhile recent research has concluded that, contrary to claims, mobile phone technology is not impinging on leisure time and home life (Bittman et al, 2009). However an increasing number of researchers (Choliz, 2010; Ehrenberg et al, 2008; Rutland et al, 2008) including those in the Far East who have been at the forefront of work in this area, influenced by the early introduction of the technology, who now recognise problematic mobile phone use as an "addiction-like behaviour" (Takao et al, 2009, p.501), are calling for more investigation to be conducted in order to develop interventions and education programmes to help prevent increasing numbers of young, and or, vulnerable users experiencing over-reliance on the technology.

In conclusion, although the measures employed by this study did not produce statistically significant findings, the results, in particular participants' varied responses to the items of the SMS-PUDQ reveal some indications of text use which does give concern to the user. Meanwhile participants' comments have revealed a level of interest and concern regarding their texting habits, and participation in this study increased the salience of the topic for those individuals. Future research is therefore indicated on the grounds that for some this is clearly an area of confusion and concern, and would be strengthened by targeted sampling and qualitative techniques which

would allow for more detailed investigation of the concerns of those who identify themselves as at risk of developing problematic text messaging habits. Insights gained from such groups could help to inform interventions and education programmes for younger users in a preventative approach

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