The effect of mobile phone attachment on an attention task among secondary school and college students

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Submitted in partial fulfillment of the requirements of the Bachelor of Arts degree (Psychology Specialisation) at DBS School of Arts, Dublin.

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March 2014
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Acknowledgements

I wish to thank Dr. Jonathan Murphy for his advice, dedication and encouragement throughout my undergraduate research project. I would like to acknowledge the continuous support and love of my wife, Marie, who encouraged me to pursue my education in Psychology. And Jessica, for all your work I am very grateful.
Abstract

The aim of the present study was to investigate the relationship between mobile phone dependency and attention in a sample of 60 secondary school and college students (M=26, F=34). For students mobile phones are an integral part of their lives. Lecturers and teachers may have a different view, particularly when a student is attending to their phone during class time. Participants were primed to think about their mobile phone using a mobile phone involvement questionnaire (MPIQ) and selective attention was also measured using a dichotic listening task. Statistical analyses demonstrated that there was no positive correlation between mobile phone dependency and attention. However, interesting findings reveal that college students are more involved with their mobile phone than secondary school students and that mobile phone dependency is high in the female population. Therefore, it was concluded that investigating a link between mobile phone dependency and attention would provide an interesting area of research.
Introduction 1

In the early 1980’s the mobile phone was about the size of a small brief case. Today the smallest mobile phone has more computational power that the largest computers had a generation ago. Technology companies and mobile phone manufacturers are constantly pushing the boundaries in mobile phone development. When mobile phones first appeared in the mid 1990’s in Ireland they were a rare item to be seen. The physical size of the unit and the cost of purchase added with an expensive line charge and use, meant that mobile phones were only associated with business people. Today mobile phones are everywhere to be seen and are no longer a communication device for making and taking calls rather an advanced technology tool now referred to as the smart phone. Smart phones, the state of the art mobile phones, have been developed to the extent that the internet is available on this small handheld device. Over half of all users of mobile phones now own a smart phone (Baek, Jeong-Min & Kim 2012). It can connect to the Internet, take pictures, record video, send messages, and access custom made applications ("apps"). Running apps provides functionality the manufacturer did not initially deliver and differentiates a standard mobile handset from a smart phone.

There has been research on the impact of using a mobile phone while driving or while engaging in other motor activities of a similar nature (Strayer, Drews, & Johnston, 2003; Drews, Pasupathi, & Strayer, 2008; Charlton, 2009), however research investigating the influence of mobile phone use in other domains is sparse. Research has investigated mobile phone problematic behaviour (Motoharu Takao, 2009), mobile phone use and etiquette in college (Lipscomb, 2005) secondary school mobile phone use (Orthober, 2011) and cheating with a mobile phone (Campell, 2007). This is not surprising considering how involved students and younger people are with their phones. One area that seems
underrepresented in the literature regarding mobile phone use is the impact of this communication device in academic settings and the cognitive impact, in particular attention. Because teens aged 13-17 and young adults aged 18-24 are overwhelmingly the most prolific groups of mobile phone users ((Nielsen Wire, 2010), it is plausible that mobile phone use may have a significant effect on their attention. Additionally, in regards to mobile phone use in educational settings, the Pew Research Centre found that in spite of the fact that many schools prohibit the use of mobile phones, 65% of students who attend schools that ban mobile phones still bring them every day and 43% of students reported that they text message in class at least once per day (Pew Internet, 2010). These findings have led the present research to investigate the involvement that secondary school students and college students have with their mobile phones and whether involvement impacts on attention.

**Mobile Phone Usage**

Mobile phone designs have evolved with younger users in mind. The trend for miniaturisation of mobile phones has impacted on keypad size which has diminished significantly, resulting in a smaller physical interface. The size of the phone and the size of the key pad all are adaptable for a young person. For the older user there is the question of dexterity and the interface can restrict them, making it difficult to view the keys or move between them easily (Stedmon, 2006). More recent research confirms that dexterity and text messaging go hand in hand and is hugely popular with the younger generation (Loo, 2012), with Dufau,(2011) also noting that many smart phone users are the younger generation. Although voice calls at present account for about 80% of cell phone revenue, the extraordinary success of the short message service (SMS), particularly among younger mobile phone users has surprised network operators. Lenhart et al., (2010) report that in a
survey of 800 American young people between the ages of 12-17, half of the population surveyed send over 50 or more messages a day with older girls sending an average of 100 messages daily. SMS is now expected to dominate mobile messaging in both traffic volume and revenue well into the last quarter of the present decade (Crabtree, 2003).

Most adolescents consider mobile phone texting as their primary source of communication. They perceive texting to be a private and a direct way to communicate with others (Pettigrew, 2009). In 2009, the Pew Research Center surveyed over 800 adolescents and found that older teens are more likely than younger teens to have cell phones and use text messaging (Madden & Lenhart, 2009). An analysis of data gathered recently by the Nielsen Company revealed that young adults aged 14-18 exchange an average of 1,630 text messages per month, or approx 54 messages per day (NielsenWire, 2010). Texting and cell phone use allows users to communicate with multiple people at the same time, making mobile phones an embodiment of the nature of the multitasking adolescent media user (Auter, 2007). Furthermore, Ling (2010) proposed that social networking is part of the modern day smart phone and keeping up to date with friends, what they are doing, where they are going can be accessed continuously and particularly with female users.

Walsh, White and Young (2008), argue that measuring mobile phone use is very difficult to capture, as users frequently check their phone for missed messages or missed calls without actually using the phone. To measure the frequency of mobile phone use Walsh et al (2008) devised a mobile phone involvement questionnaire (MPIQ) to adequately gauge the extent to which people are involved with their phones. The components of the MPIQ questionnaire were drawn from addiction literature which captures broader aspects of mobile phone behaviour and not just levels of use alone (Bianchi & Phillips, 2005; Jenaro et al., 2007). Technological addictions, a subset of behavioural addictions, develop when people depend on a technological device to produce favourable outcomes (Griffiths, 1998).
Behavioural addictions are characterised by a number of symptoms including withdrawal, euphoria, conflict with other people and daily activities, cognitive and behavioural salience, relapse and reinstatement. In studies Walsh et al (2008) also noted that participant’s ensured that withdrawal did not occur by ensuring that the mobile phone was always usable, suggesting that it is the thought of being without their phone may cause distress.

Social Impact

The widespread adoption of the cell phone as a communication tool for entertainment has revolutionised society, redefining patterns of social contact and relationships with family, friends and people in general. It has been argued that the mobile phone has transformed the daily lives of individuals to such an extent that it is an agent of social change (Nurullah, 2009). Although some social situations and venues seem inappropriate for texting, many younger users choose to text to fill time (Oksman & Turtianinen, 2004) and do not perceive their actions as unacceptable. For example, a participant in Pettigrew’s (2009) study of texting behaviour reported receiving a phone call while in a movie theatre and texting back her unavailability. In this instance, it is perceived that talking on the phone is unacceptable but texting is acceptable. There are understood rules or etiquette behind a teenager’s perception of the appropriateness of communicating via text. There are most likely, understood rules for when it is acceptable and when it is not acceptable to send text messages.

Mak and Nickerson (2009) also suggest that mobile phone use is changing how people behave in public places. Mobile phone users differ in the extent to which they feel comfortable making and receiving calls in different social contexts. They are less annoyed by others using mobile phones in locations where they themselves feel most comfortable making calls. Weilenmann and Larsson (2001) found that an individual in a social situation might
have three types of responses to a mobile phone call. The individual might move away from
the social situation, remain in place but removed from the social engagement, or stay engaged
socially. Murtagh (2001) noted that people try to create a private space in a limited public
space when receiving mobile phone calls. In many public places, people around the mobile
phone users may be annoyed by the use of the mobile phones (Ling and Haddon, 2003).
Common complaints included disturbance and irritation of the quietness caused by the loud
talk and the ringing of mobile phones in public places. Mobile phone users engaging in this
behaviour were regarded as discourteous, intrusive and arrogant. In addition people were
concerned about the use of mobile phones in public places that might divert attention or cause
an argument. To limit improper uses, several solutions have been suggested including
imposing penalties, asking users to exercise self-discipline, posting notices in public places,
providing structured guidelines on websites, and providing patrons with a list of areas in
which use is permitted (Lever and Katz, 2007). Most of the complaints about mobile phone
use in social settings focused on the loud talking and ringing associated with the voice
functions of mobile phones.

Identity

It has been suggested by Campbell (2007) that many individuals consider the mobile
phone an extension of their physical selves and symbolic representations of individual
identities. The mobile phone has moved from being a mere ‘communication object’ to a key
‘social object’ and has expanded and enhanced social networks with a new sense of identity
for teenager and young people. The mobile phone provides identity and prestige (android
phone versus a standard mobile) in comparison with their peers. It is argued that young
people have been instrumental in developing the potential of the mobile phone (Lorente,
2002). Younger mobile phone users have been at the fore front of initiating and popularising
lexical shortcuts in text messaging such as the abbreviation “u” for “you” or the acronym “LOL” for laughing out loud (Fortunati, 2002). Koskinen (2002) notes that peripheral features of the device for younger users include avoiding boredom by staying up dated and maintaining background entertainment while doing other things and creating a space of their own. Manufacturers are designing mobile phones with a wide array of services for users to personalise their phones (e.g. mobile wallpaper, ring tones, coloured phone covers) (Srivastava, 2005). Together with everyday use the mobile phone has become a fashion accessory, a gadget that shapes individuals identity, and has created a new subculture especially in the case of adolescents (Nurullah, 2009). The personalised nature of the mobile phone has meant that its form and use have become important aspects of the individuality of a phone user. Teenagers see the mobile phone as having many attributes and characteristics that make it very attractive, particularly with autonomy. The mobile phone is the first private communication device that has enabled contact with friends outside of parental supervision. The mobile phone is used to define boundaries and to create space in relationships with friends and peers (Turtiainen, 2004).

The older generation are often puzzled by the sight of teenagers gathered outside a shop or fast food restaurant, staring at their smart phones rather than their friends. The older generation may not understand that the smart phone has become a device for augmenting the experience and properties of physically co-located encounters rather than simply detracting from them. The smart phone through social networking sites such as Facebook brings the presence of other friends who are not able to make it to the physical gathering. A physical meeting of friends becomes extended through the use of mobile technology, before, during and after the actual encounter (Ito, 2003). Mobile phone voice calls are an expense to young users and they take advantage of technological resources, such as ‘missed calls’ or ‘bleeping’
that have a clear social and affective function. Calling and hanging up before the phone is answered. The phone rings or beeps when one calls, setting the display screen flashing. The sender then hangs up the phone half a second later before the receiver has time to answer the call. The idea is that the receiver sees the number on the "missed calls" list and calls back at his or her expense. It is a tactic born out of ingenuity and necessity that have tracked the explosion of missed calls by cash-strapped mobile phone users from Cape Town to Cairo (Donner, 2007).

**Connectivity**

One of the main advantages of the mobile phone for parents is that they can stay connected to their children. When parents allow their child to have a mobile phone they are conveying their beliefs about their child’s ability to handle distractions and problematic situations (Morrill, 2013). Many individuals believe that mobile phones provide a necessary emergency communication function. In an emergency, text messages can be sent directly to students’ phones informing them of the source of the emergency and giving instruction on how to respond. In a poll of high school principals in the United States, 73% indicated that they agreed that cell phones improve school safety (Obringer and Coffey 2007). Others argue that mobile phones only add to confusion in an emergency situation, and prevent a consistent message (National School Safety and Security Services 2010). Mobile phones may also provide a false sense of security to college students who may then be more likely to put themselves into a dangerous situation, feeling more confident while talking on their phone (Nasar, Hecht, and Wener 2007). Just the opposite might be true. However, as the phone offers no real protection and instead makes the student less aware of his or her surroundings making him or her more vulnerable.
**Gender**

It has been suggested that there are differences in mobile phone use between genders. Henderson, (2002) argues that girls tend to prefer the interpersonal connectivity and spend more time using their phones for voice calls. Faulkner and Culwin (2005) found in Finnish users that 70% of women kept their phones on all the time and about 50% of men turn their phones off at night. Interestingly, Davie et al. (2004) in their study of school children found that girls were more likely to keep their mobiles with them than boys. Furthermore, the girls were more likely to carry their phones at all times than the boys (63% vs. 48%). Gender differences emerge quite early on and are maintained as females average more text messages per day than males. Similarly Grellhesl and Punyanunt-Carter (2012) examined the texting behaviours of college students and found that females use text messaging for relaxation and escape more than males. Females were also more likely to use texting for access and mobility than were males, meaning female participants were using texting to connect with other individuals (Cupps & Thompson, 2010).

**Cognitive Distraction and Mobile phones**

Significant research has been conducted addressing the issue of mobile phone use, frequency of use and text messaging. However, these measures may not adequately gauge the extent of people’s interactions with their mobile phone given that using mobile phones as mobile computers is becoming more widespread and that some people are cognitively pre-occupied with their phone when not using it (Walsh and White, 2006, 2007). For instance, young people report thinking about their mobile phone when not using it, being distracted from other tasks when they have their phone with them, and prominently displaying the phone keeping it constantly in their awareness (Walsh & White, 2006). These activities indicate that mobile phone behaviour incorporates both cognitive and behavioural aspects.
The user is thinking about their phone in many different ways, (e.g., when to send a text, waiting to receive a text, accessing the internet, Facebook) while also attending to other things. Multi-tasking is a term used to describe the perceived act of performing two activities simultaneously. The potential problem of utilizing mobile phones during class and attempting multi-tasking activities lies in the distracting nature of the non-primary activity. The explanation for why this becomes a detriment can be explained by the bottleneck effect (Lien, Ruthruff, & Johnston, 2006). Although people usually think they are processing information simultaneously (e.g., reading and listening to music) also known as parallel processing, they are only processing one activity at a time due to a single channel processing area of the human mind known as working memory. The decreased speed of processing and errors that are associated with multi-tasking are due to the capacity issues of working memory (Buhner, König, Pick, & Krumm, 2006). Working memory capacity and attention carry out different functions in the processing of information, though they both operate under the umbrella of executive functioning (W.Engle, 2006).

**Executive Function**

The term executive function is used to describe the capacity that allows us to control and coordinate our thoughts and behaviours (Luria, 1966). These skills include selective attention, decision-making, voluntary response inhibition and working memory. Each of these executive functions has a role in cognitive control, for example filtering out unimportant information, holding in mind a plan to carry out in the future and inhibiting impulses. The executive control is understood to resolve conflicts; that is when two things demand the attention of the individual, the executive attention decides where the attention will be directed (Fan, 2002). This is a dilemma that a student may find themselves confronted with during class time, the distraction of the smart phone or attending to the topic. Executive
functioning is essential for school, work and everyday life as it mediates the ability to organize thoughts and behaviours in a goal directed manner (Alexander, 2000).

Attention

Attention can be described as a cognitive process of selectively concentrating on one aspect of the environment while ignoring other aspects, an example of this is reading a text while ignoring all noise in the background (Goldstein, 2011). Research has found that attention is positively related to academic performance (Gutiérrez-Rojas, 2009) and that attention problems contribute negatively to academic achievement (Jimmerson et al., 2006). Redick and Engle (2006) found that individual differences in working memory capacity are related to those in attentional control. Differences in working memory capacity were related to differences in the efficiency of the executive attention network, though no differences in the alerting or orienting network were identified. This means that individuals with high working memory capacity are better at controlling their attention.

To study the cognitive mechanisms underlying selective auditory attention, there is a long tradition of using the dichotic-listening model (e.g., Broadbent, 1958; Cherry, 1953). In dichotic listening, participants are required to attend to information presented to one ear while ignoring information presented to the other ear. For example, in a classic study, Cherry (1953) presented subjects with separate continuous speech messages in both ears. The task was to selectively listen and immediately repeat (“shadow”) the speech presented to one ear while ignoring irrelevant speech presented to the other ear. The speech in the irrelevant channel (i.e., ear) always began with English spoken by a male voice and ended with English, but the middle portion of the speech differed. After the shadowing task was completed, subjects were asked whether they could remember contents of the information presented at
the “rejected” ear, or whether they noticed anything “strange” about this information. Cherry (1953) found that subjects were usually able to identify the irrelevant information as speech, but they had surprisingly poor memory about the content, and they often failed to notice major changes in the middle portion, such as a switch from English to German or a switch to a backward speech condition. However, subjects usually noticed a change in the gender of the task irrelevant speaker. The task requirement in the dichotic-listening model is to maintain selective attention to the specified source.

A number of distracters have been used in selective attention studies. Shelton, Elliott, Lynn and Exner (2009) conducted a study on the distracting effects of a ringing cell phone in a laboratory and classroom setting. Other distracters were also used such as irrelevant tones and an instrumental song commonly encountered by participants on performance were examined. Students enrolled in undergraduate psychology courses were exposed to the ringing mobile phone of a confederate seated in the classroom and were later tested on their memory for information presented during the ringing, relative to other information presented in the lecture. The results revealed extremely low accuracy levels on questions pertaining to the portion of the lecture when the ringing occurred. In another study End, Wothman, Mathews & Wetterau, (2010) demonstrated that students were less likely to record information in their notes when interrupted by a mobile phone ringing. Moreover, those distracted students performed significantly worse on a test relative to students who were uninterrupted by a ringing mobile phone. Regardless of whether a mobile phone rings, vibrates or is on silent mode in the classroom, a student’s mobile phone is never far from their thoughts and it requires attention.
Current Research

The aim of the present research is to investigate the issue of mobile phone dependency and attention, particularly in a classroom and lecture hall setting where student’s attention is most required. This research will provide valuable information and feedback to schools and colleges now struggling with an implementation policy regarding mobile phone use. The results of this study and similar studies may assist college and school policy makers to consider taking action to ban the use of mobile phones or to block signals at particular times of the day, during class, lectures and exams. Campbell (2006) found in a study on the perception of mobile phones in the classroom that college students and faculty have a negative attitude toward the use of mobile phones in the classroom are in favour of formal policies governing their use. Mason (2009) has also found that the policy of mobile use in colleges is left to the discretion of the individual faculty, who have inconsistent policies and are unsure how to manage this problem. The research will investigate the following hypotheses:
• **Hypothesis 1** It is hypothesized that there will be a significant relationship between mobile phone dependency and attention between secondary school and college students.

• **Hypothesis 2** It is hypothesized that there will be a significant difference in attention scores between participants who are primed MPIQ test vs. participants who are not.

• **Hypothesis 3** It is hypothesized that there will be a significant difference between younger and older participants in terms of attention scores.

• **Hypothesis 4** It is hypothesized that there will be a significant difference between males and females in terms of their attention scores.

• **Hypothesis 5** It is hypothesized that there will be a significant difference in mobile phone dependency (MPIQ) between younger and older students.
Methods

Participants

Sixty secondary school and college students were voluntarily recruited to participate in the study using convenience sampling methods. Secondary school participants consisted of 14 females and 15 males aged between 15-17 years old from a south side Dublin co educational school. There were 15 participants in the experimental group (8 female and 7 males) and 14 participants in the control group (8 males and 6 females) for secondary school students. The college student population consisted of 12 males and 19 females aged between 18-25 years of age taken from Dublin Business School. There were 15 participants in the college experimental group (5 males and 10 females) and 15 participants in the college control group (7 males and 9 females). It was arranged for the researcher to visit the secondary school and the college to distribute hard copies of the questionnaire to participants and to conduct the experiment. Participants were randomly allocated to the experimental group or the control group. Parental consent was obtained for participants under 16 years of age and informed consent was obtained from the college students. Participants were informed that they would have the right to withdraw at any time if they so wished. All Participants took part in the study as a contribution to the advancement of research. All details of age and gender were deleted to maintain anonymity. 60 participants completed the study.

Design

This study is an Experiment which incorporates aspects of a true experimental design, Quasi-Experimental design with a partial correlational of between groups. The experimental nature of the design involved the order in which the MPIQ the independent variable was
administered. Participants who were presented with the MPIQ as their first questionnaire were automatically assigned to the experimental group, primed to think about their mobile phone. Participants who received an alternative questionnaire (filler) were automatically assigned to the control group.

The dichotic listening task attention scores is the dependent variables. The independent variable was the order in which the MPIQ was administered (pre or post the attention task). Age and gender are also independent variables. A pilot study was conducted in advance to ensure the accuracy of the experimental design.

**Materials**

Three questionnaires were used in the study. A mobile phone involvement questionnaire (MPIQ), a dichotic listening task questionnaire, and a filler questionnaire (see appendix A B C). The MPIQ is an 8-item measure of mobile phone involvement based broadly on Brown’s behavioural addiction components (1993, 1997). The descriptions of mobile phone behaviour reported by participants in Walsh, White & Young (2008) study were adopted to form an initial pool of 25 items, scored on a 7-point Likert scale, 1 (strongly disagree) to 7 (strongly agree). Reliability analyses revealed that the MPIQ had moderate reliability (x=.78).

The attention task conducted was a dichotic listening task taken from Cherry’s 1959 ‘the cocktail party problem’. For the dichotic listening task participants were required to use a set of headphones to listen to the narrative played simultaneously in each ear. Participants were required to answer 10 questions relating to the narrative that was played in the left ear only. Participants were scored on a true or false answer. 1 for a correct score and 0 for an incorrect score.
Apparatus

A Dell standard desktop computer was used to play the audio dichotic attention task in both the secondary school and college classrooms. A USB was provided to each student with 10 seconds of the audio recording of the dichotic listening task. A set of standard earphones were also required. A pen and paper was provided to each student to answer questions relating to the dichotic listening task.

Procedure

Secondary school and college students were asked to take part in a study that looked at lifestyle choices of both secondary school and college students. It was qualified that none of the participants had hearing impairments. Students in the classroom and lecture hall were randomly administered 3 hard copy questionnaires, stapled together, a mobile phone involvement questionnaire (MPIQ), a dichotic listening task questionnaire and a filler questionnaire. A USB key and a standard set of earphones were provided to each student. The order in which students received the questionnaires decided which group they were assigned. Students who randomly received the MPIQ as the first questionnaire followed by the dichotic listening task and the filler questionnaire were automatically assigned to the experimental group. Students on receiving the filler questionnaire, the dichotic listening task questionnaire followed by the MPIQ were automatically assigned to the control group.

Participants in the experimental group were first to receive the MPIQ, in this way they were being primed to think about their mobile phone. A filler questionnaire was used to counterbalance the groups. Participants in the control group first received a filler questionnaire and no priming was involved. On completion of the MPIQ (experimental
group) and the filler questionnaire (control group) both groups were requested to attend to the dichotic listening attention task. Participants then connected the USB key and the ear phones into the desktop computer and set the volume on the computer to zero before putting on their ear phones. Each participant when ready then set the volume on the computer to level 70 and proceeded to listen to the narrative/story played in each ear. The dichotic listening task requires that a narrative is played in the right ear for 10 seconds and a similar yet different narrative is played in the left ear simultaneously for 10 seconds. Each participant was instructed to attend to the narrative in the left ear only. On completion each participant was then asked to answer 10 questions pertaining to the narrative in the left ear only. The remaining final questionnaire whether a filler questionnaire (experimental group) or the MPIQ questionnaire (control group) was then completed. Participants were then thanked for their contribution and debriefed on the experiment.

Data Input

Responses were entered in SPSS version 21. To ensure completeness, the data was checked and validated. The distribution types for variables of interest were checked. All tests were two signed and significance was set at the level P < 0.05.
Results

Descriptive Results

Sixty individuals participated in the study. The majority were female (n=34, 56.7%) while 26 were male (43.3%). The numbers from second and third level were similar (second level; n=29, 48.3%, third level; n=31, 51.7%).

Table 1  Descriptive Statistics

<table>
<thead>
<tr>
<th>Groups</th>
<th>Mobile Phone Dependency Score</th>
<th>Attention score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
</tr>
<tr>
<td>Control</td>
<td>30</td>
<td>33.03</td>
</tr>
<tr>
<td>Experimental</td>
<td>30</td>
<td>33.53</td>
</tr>
<tr>
<td>15-17 years</td>
<td>29</td>
<td>31.90</td>
</tr>
<tr>
<td>18-25 years</td>
<td>31</td>
<td>34.58</td>
</tr>
<tr>
<td>Male</td>
<td>26</td>
<td>29.88</td>
</tr>
<tr>
<td>Female</td>
<td>34</td>
<td>35.88</td>
</tr>
</tbody>
</table>

The distribution type for mobile phone dependency and attention scores were checked. The attention score was not normally distributed (Shapiro Wilks test, p< .05). The mobile phone dependency score was normally distributed (Shapiro Wilks test, p> .05).

Inferential Results

Hypothesis 1

It is hypothesized that there will be a significant relationship between mobile phone dependency and attention between secondary school and college students. A Spearman’s Rho correlation coefficient was used to investigate this relationship.
The relationship between mobile phone dependency and attention score was further analysed to investigate the group effect. A Spearman’s correlation coefficient found that there was no significant relationship between mobile phone dependency and attention for all participants (rs(60) = 0.21, p = 0.12). Furthermore, the Spearman’s Rho found no significant association for either the control group (rs(60) = 0.23, p = 0.24) or the experimental group (rs(60) = 0.18, p = 0.35).

Hypothesis 2, 3 and 4 investigate differences in attention scores for participants age, gender and experimental/control groups. As attention score is not normally distributed a non-parametric Mann-Whitney test was used.

Hypothesis 2

It is hypothesized that there will be a significant difference in attention scores between participants who are primed MPIQ test (Mean=7.53, SD=1.91) vs. participants who are not (Mean=6.73, SD=2.65). The results of the Mann-Whitney test reveal that attention scores do not show any significant difference between the experimental group and control group (U = 374.5, p=0.26).

Hypothesis 3

It is hypothesized that there will a significant difference between younger (Mean=7.38, SD=2.58) and older participants (Mean=6.90, SD=2.07). The results of the Mann-Whitney test reveal that attention scores do not show any significant difference between younger and older age groups (U = 360.5, p=0.18).
Hypothesis 4

It is hypothesized that there will be a significant difference in attention scores between males (Mean=7.42, SD= 1.88) and females (Mean=6.91, SD= 2.62). The results of the Mann-Whitney test reveal that attention scores do not show any significant difference between younger and older age groups (U = 415.0, p=0.68).

Table 2  Mann-Whitney test results for Attention Scores

<table>
<thead>
<tr>
<th>Variable</th>
<th>Groups</th>
<th>U</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attention Score</td>
<td>Control</td>
<td>374.5</td>
<td>.26</td>
</tr>
<tr>
<td></td>
<td>Experimental</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>15-17 years</td>
<td>360.5</td>
<td>.18</td>
</tr>
<tr>
<td></td>
<td>18-25 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>415.0</td>
<td>.68</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Significant at .05 level

Hypothesis 5

It is hypothesized that there will a significant difference in mobile phone dependency (MPIQ) between younger and older students. An independent T-test reveals that the MPIQ Score does not show any significant difference between age groups (t (58) = -1.155, p = 0.25).

Table 3                  Mobile phone Involvement Questionnaire Table

<table>
<thead>
<tr>
<th>Variables</th>
<th>Groups</th>
<th>Mean</th>
<th>SD</th>
<th>t</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPIQ Score – Age group</td>
<td>15-17 years</td>
<td>31.90</td>
<td>7.19</td>
<td>-1.155</td>
<td>58</td>
<td>.25</td>
</tr>
<tr>
<td></td>
<td>18-25 years</td>
<td>34.58</td>
<td>9.72</td>
<td></td>
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</tr>
</tbody>
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Note: Significant at .05 level
Discussion

Findings

The aim of the present research was to investigate the relationship between mobile phone dependency and attention between male and female secondary school students and college students aged between 15-25 years old. It was found that there was no significant relationship between mobile phone dependency and attention ($r_s (60) = 0.20, p = 0.12$). There was a true experimental element to the design. The research involved priming participants’ relationship with their mobile phone and analysing the effect it had on attention scores. Students who were primed to think about their mobile phone scored slightly higher on the attention task ($\text{Mean}=7.53, \text{SD}=1.91$) than students who were not ($\text{Mean}=6.73, \text{SD}=2.65$).

Walsh et al., (2008) devised a mobile phone involvement questionnaire (MPIQ) using Brown’s (1993, 1997) behavioural addiction components as the basis for measuring mobile phone involvement. They sought to build on previous mobile phone behaviour, specifically the relationship between the younger population, their frequency of mobile phone use and their mobile phone involvement. The personalised nature of the mobile phone has meant that its form and use have become important aspects of the individuality of a phone user (Nurullah, 2009). Research has suggested that some mobile phone users report feeling loved and valued when they receive contact on their mobile phone (Walsh, White, & Young, 2009). Positive messages are stored on mobile phones so they can be re-read when the user is feeling low (Srivastava, 2005). Separation from something that is extremely personal may cause distress. In this case the ethical issue of asking students to part with their mobile phone was taken in to consideration by the researcher as it may have caused distress to some participants. Initially, measuring student mobile phone attachment in this attention task
required that each participant have their mobile phone present in the experimental group and absent in the control group. This was revisited when it became apparent that students were apprehensive in parting with their mobile phone for the duration of the experiment. Though this may not seem significant to the older generation (Ito, 2003), this is very much a reality for students to whom the mobile phone is very much a part of their everyday lives. Though the phone in not necessarily in use or being used the phone is ever present in the minds of the younger user. Walsh, White & Young (2010), in an Australian study notes that teenagers and young adults check their phone for missed messages or calls and keep their phone in close proximity without using them. Participants in the experimental group were primed, however this priming did not result in a lower attention level score, a slightly higher result occurred (M=7.53, SD=1.91) to that of the control group (M=6.73, SD=2.65). This suggests that the MPIQ may not have been a good diagnostic tool in this experiment and is more suited to the psychological measure of problematic mobile phone use. The actual presence of a mobile phone may hold individual and unique value, security, personalisation, connectivity, to each participant. The MPIQ may not have the same affect on priming participants in this way.

There was no significant difference found between mobile phone dependency and attention scores for secondary school students and college students. Findings suggest that secondary school students scored higher (Mean =7.38, SD=2.58) on the attention task than college students (Mean= 6.90, SD=2.07). While 61.3% of college students received a score of 7 or lower, the percentage for secondary school students was 34.5%. On the other hand 65.5% of secondary school students scored 8 and above while this percentage for college students was 38.8%. In this research it has been found that college students 18-25 year olds have the freedom to use their mobile and smart phones whenever they felt the need to do so. This includes the classrooms and lecture halls within the college with no formal mobile phone policy imposed. The policing of mobile phones in college lectures was left to the
discretion of the lecturer. Secondary school students 15-17 year olds in this study were restricted from using their mobile phones during class though this rule was often broken. Mathews (2004), notes though their may be some restriction for secondary school students living at home with their parents on mobile phone use, college students living on their own have no restriction (White, 2006).

There was no significant difference found between males (Mean=7.42, SD=1.88) and females (Mean=6.91, SD=2.62) in terms of their attention scores. In the experimental group 16.7% of males received an attention score of less than 7, 33.3% of female participants received a score of less than 7. 61.1% of females in the control group scored 8 and above to that of 66.6% for males. As earlier literature suggests that females tend to use their smart phones to stay in touch with others, males are more interested in games on their phones, applications and generally gadgets that are applicable to the smart phone (Henderson, Taylor & Thomson, 2002). No significance difference was found for mobile phone dependency between secondary school and college students. In this hypothesis the dependency level scores were measured using the MPIQ which was specifically devised by Walsh et al., (2008) as discussed earlier in the literature. This MPIQ gives a strong psychological indication of how involved participants are with their mobile phone. College student’s (Mean= 34.58, SD=9.72) scored higher on the MPIQ than secondary school students (Mean= 31.90, SD=8.13). These findings suggest that students that are older are more involved with their mobile phone. The College environment provides students with the freedom and opportunity to use their mobile and smart phones. The population of secondary school students who partook in this research did not have permission to use a mobile phone during class times though this rule was often broken.
A dichotic listening task was conducted to measure participant’s selective attention. This 10 second audio narrative may not have been a sufficient cognitive challenge to this age group as research in this area has shown that students can study while listening to music. Etaugh & Ptasnik (1982) conducted an experiment that supported the idea that background music is not a distraction when one is used to having sounds playing while studying. Researchers tested the effects of study in silence vs. the effects of studying with familiar music as well as the effects of relaxing or participating in an activity after studying. The participants were randomly divided into two groups: music or no music, and then each group studied a passage from a Law School Admission Test booklet for 10 minutes either with or without music. Following the test, one group had 10 minutes of relaxation while the other group read an article from Newsweek. Finally, the participants were given a five-question multiple-choice test. Overall, the study found that participants did better in the silence as well as with the post studying relaxation condition. However, individually, participants who were used to having background music while studying did better with the music than in silence. Angel, Polzella & Elvers (2010) also found that music was positively correlated with memory. This may have been a significant factor in the current research as students scored high on the dichotic listening attention task.

**Other Findings**

Though a hypothesis was not postulated for males and females in terms of mobile dependency, females (Mean 35.88.25, SD= 9.10) were found to have scored higher on the MPIQ than males (Mean 29.88, SD= 7.84). It was found after the fact, on conducting a two tailed independent t-test that there was no significant difference between males and females in terms of their mobile phone dependency (t (58) = -2.682, p = 0.10). Females are more
involved with their mobile phone than males and they use their mobile phone to stay connected as discussed in the earlier literature. This connectivity does not only relate to younger teenage girls and young female adults, it also encompasses older females ensuring that they stay in communication with their children. (Davie et al., 2004). Faulkner and Culwin (2005) suggest that Finnish women use the mobile phone for security and safety reasons as women keep their mobile phones on at night. Creating a formal one tailed hypothesis to investigate the significant difference between males and females in terms of mobile phone dependency would provide valuable information and the rational for mobile phone dependency with females.

**Strengths and Limitations of the Study**

This research builds on previous studies conducted by Walsh et al., (2010) giving a strong indication of how involved teenagers and young adults are with their mobile phone. Secondary school students had a higher mean (Mean=7.38, SD= 2.58) than college students (Mean=6.90, SD= 2.07) in terms of attention scores. The difference in scores could be due to a number of factors such as the time of day, or the novelty of the study for this age group. However, of importance is that secondary school students in this research did not have permission to use or access their mobile phones during class time though this rule was often broke. This would indicate that a curtailment of mobile phone use in the classroom would produce positive outcomes such as increasing concentration and attention .The MPIQ gave a strong indication of mobile phone dependency particularly with college students, suggesting as teenagers get older the mobile phone becomes a bigger part of their lives.
The materials and tools used to measure selective attention and to prime participants’
may have fallen short in this research. The MPIQ was used in the place of a mobile phone as it was
deemed that difficulties may arise in asking students to part with their mobile phone. This was a
considerable limitation in this research, as discussed the MPIQ does not hold the same attachment
or engagement as the actual physical presence of a mobile phone. Deeper research in the area of
measuring selective attention may have been more beneficial in this study. Measuring audio
selective attention using the dichotic listening task was innovative though the 10 second audio
recording may have been too short considering students and young adults engage with listening
devices regularly and may be practised at this task.

Future Research

Teenagers and young adults in this age group 15-25 years old who have grown up
with the mobile phone since their introduction in the mid 1990’s are part of a collective
group. Ito et al., (2005), report that before the explosion of mobile phone use in the United
States, international research has documented the pervasive use of mobile phones by
tenagers and young adults in other parts of the world. As teenagers move into young
adulthood their ability to text each other in a particular style does not stop or change. As young
teenagers develop a style of mobile phone language it becomes part of normal texting
language used in communicating and continues into young adulthood. In the present study
there was no significance to be found between these two particular age groups. Further
research in the area of mobile phone and attention could be considered to look at participants
in different age groups. The age range to consider is 16 years to 50 years of age and broken
into these different demographics. This population would provide considerable information
when comparing a more mature population to whom the mobile phone was not available in
their youth. Understanding the divide between the younger population and the older population would bare significant results.

**Conclusion**

In conclusion, this research does not show any significant results in mobile phone dependency and attention among secondary school and college students. However, it does give a significant insight into mobile phone dependency among this grouping. This research combined with previous literature reveals that the mobile phone is a regular and integral part of many young people’s lives, particularly in schools and colleges. The mobile phone whether ringing in a class, silent or switched off, students have a preoccupation with this communication device. Findings in this research point to college students having a stronger mobile phone dependency than secondary school students. Secondary school students performed better on the attention task, this would indicate that as students move into college education their mobile phone dependency will increase. The information obtained in this examination of mobile phone dependency and attention among this population highlights the importance of the mobile phone to students. It also highlights the importance of putting some boundaries and some rules on mobile phone use in colleges which may assist in aiding student’s attention.
References


Walsh, S. P., & White, K. M. (2010). *Needing to Connect: The Effect of Self and Others on Young People’s Involvement with Their Mobile Phone*. Australian Psychological Society, 194-203.


APPENDICES

Dear Participant,

My name is Joe Flynn and I am a final year psychology student in Dublin Business School. This research is about examining lifestyle among secondary school and college students. It is being conducted as part of my final year project and will be submitted for examination.

You are invited to take part in this experiment / study and participation involves answering some questions and undertaking a listening task. Participation is completely voluntary and you are not obliged to take part. Participation is anonymous and confidential. Therefore, it will not be possible to withdraw from participation after the questionnaire has been collected.

The data collected from the questionnaire will be transferred from paper record to electronic format and stored securely on a password protected computer. Data will then be destroyed approximately one year after the data has been collected. It is important that you understand that by completing and submitting the questionnaire that you are consenting to participate in the study.

If you would like further information on this study or have any questions regarding this research study please contact me at . My supervisor can be contacted at

Thank you for taking time to complete this survey

Please circle whether you are male or female. M / F

Please state your age in the box provided.

Please turn over the page when you are ready to do so.
Questionnaires

Appendix A

Mobile Phone Involvement Questionnaire

Please answer the questions below by circling the number 1 to 7 which mostly describes your answer. The number 1 strongly disagree to the number 7 strongly agree. Only one number should be circled on each line.

1. I often think about my mobile phone when I am not using it.

   (Strongly disagree) (disagree) (slightly disagree) (neither agree nor disagree)
   1 2 3 4
   (slightly agree) (agree) (strongly agree)
   5 6 7

2. I often use my mobile phone for no particular reason.

   (Strongly disagree) (disagree) (slightly disagree) (neither agree nor disagree)
   1 2 3 4
   (slightly agree) (agree) (strongly agree)
   5 6 7

3. Arguments have arisen with others because of my mobile phone use.

   (Strongly disagree) (disagree) (slightly disagree) (neither agree nor disagree)
   1 2 3 4
   (slightly agree) (agree) (strongly agree)
   5 6 7
4. I interrupt whatever else I am doing when I am contacted on my mobile phone.

(Strongly disagree) (disagree) (slightly disagree) (neither agree nor disagree)
1  2  3  4
(slightly agree) (agree) (strongly agree)
5  6  7

5. I feel connected to others when I use my mobile phone.

(Strongly disagree) (disagree) (slightly disagree) (neither agree nor disagree)
1  2  3  4
(slightly agree) (agree) (strongly agree)
5  6  7

6. I lose track of how much I am using my mobile phone.

(Strongly disagree) (disagree) (slightly disagree) (neither agree nor disagree)
1  2  3  4
(slightly agree) (agree) (strongly agree)
5  6  7

7. The thought of being without my mobile phone makes me feel distressed.

(Strongly disagree) (disagree) (slightly disagree) (neither agree nor disagree)
1  2  3  4
(slightly agree) (agree) (strongly agree)
5  6  7
8. I have been unable to reduce my mobile phone use.

(Strongly disagree) (disagree) (slightly disagree) (neither agree nor disagree)

1  2  3  4

(slightly agree) (agree) (strongly agree)

5  6  7

Appendix B

Questionnaire on the Dichotic listening task

Please set the sound level on the computer in front of you to zero. When you have set the sound level to zero you will be given a USB key. Plug the USB key into the back of the computer. If you are having difficulty please ask for assistance. Click on my computer and then double click on the removable disk. The word dichotic will appear, proceed to double click on the word dichotic and a small screen will appear. Put on your headphones and set the computer to a volume level of 75. Please ask for assistance if you are having difficulty. The left earphone into the left ear and the right earphone into the right ear. The audio file will play two different spoken dialogues, one story in one ear and one story in the other ear at the same time. Please listen to the narrative (story) in the left ear only. The audio file takes 10 seconds to listen too. When ready click on the audio file arrow play in the blue screen and once again listen in the left ear. When finished listening to the audio take the headphones out of your ears and put them on the desk infront of you. Please minimise the screen and answer the questions below.

Having listened to the audio on your computer please answer the 10 questions below.

Please circle true or false

1. John ate breakfast with his father. True or false

2. A man shook his head and frowned. True or false
3. Birds were singing when John awoke. True or False

4. Miles Davis was singing when John awoke True or False

5. An ambulance screamed by the crowd. True or False

6. A woman prayed. True or False

7. John put on his slippers. True or False

8. John awoke at 7.30 am. True or False

9. John had breakfast with Miles Davis. True or False

10. John blended easily into the crowd. True or False

Appendix C

**Filler Questionnaire**

Please answer the following 8 statements below by circling the number 1 to 7 which mostly describes your answer. The number 1 strongly disagree to the number 7 strongly agree. Only one number should be circled on each line.

1. The weather in this country is not severe.

   (Strongly disagree) (disagree) (slightly disagree) (neither agree nor disagree)
   1                2                3                4

   (slightly agree) (agree) (strongly agree)
   5                6                7
2. To my knowledge the bus service in Ireland is very good.

(Strongly disagree)  (disagree)  (slightly disagree)  (neither agree nor disagree)
1                       2                        3                                     4
(slightly agree)  (agree)  (strongly agree)
5                 6                    7

3. Education creates opportunities for the future.

(Strongly disagree)  (disagree)  (slightly disagree)  (neither agree nor disagree)
1                       2                        3                                     4
(slightly agree)  (agree)  (strongly agree)
5                 6                    7

4. Sport is more fun to watch than to play.

(Strongly disagree)  (disagree)  (slightly disagree)  (neither agree nor disagree)
1                       2                        3                                     4
(slightly agree)  (agree)  (strongly agree)
5                 6                    7

5. I enjoy reading more than watching television.

(Strongly disagree)  (disagree)  (slightly disagree)  (neither agree nor disagree)
1                       2                        3                                     4
(slightly agree)  (agree)  (strongly agree)
5                 6                    7
6. **Music is a wonderful escape from the world.**

   (Strongly disagree)  (disagree)  (slightly disagree)  (neither agree nor disagree)
   1                        2                       3                                      4

   (slightly agree)  (agree)  (strongly agree)
   5    6                   7

7. **I enjoy watching a film in the cinema rather than at home in my house.**

   (Strongly disagree)  (disagree)  (slightly disagree)  (neither agree nor disagree)
   1                        2                       3                                      4

   (slightly agree)  (agree)  (strongly agree)
   5    6                   7

8. **I enjoy the summer months of the year more than any other season of the year.**

   (Strongly disagree)  (disagree)  (slightly disagree)  (neither agree nor disagree)
   1                        2                       3                                      4

   (slightly agree)  (agree)  (strongly agree)
   5    6                   7