Smartphone Use and Anxiety in College Students:

How Social Support and

Feelings of Connectedness Helps.

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Submitted in partial fulfilment of the requirements of the BA Hons in Psychology at Dublin

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March 2019

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'I declare that this thesis that I have submitted to Dublin Business School for the award of BA (Hons) Psychology is the result of my own investigations, except where otherwise stated, where it is clearly acknowledged by references. Furthermore, this work has not been submitted for any other degree.'

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Acknowledgements

I would like to express my sincere gratitude to Dr. Pauline Hyland for your patience, help and support.

I would like to thank Darrell, Sinead, Valerie, and Una for all of your support and encouragement.

Thank you to everyone who took the time to participate in the questionnaire.

Finally, thank you to everyone at DBS Library.

Abstract

A questionnaire was carried out on-line and in class to determine if rising anxiety levels amongst college students could be attributed to excessive smartphone use. Additionally, the study sought to explore if social support and levels of connectedness can positively impact mental health. One hundred and seven students (F=81, M=26) participated. The questionnaire employed a quantitative, cross-sectional design with opportunity and snowball sampling. Four scales were utilized; the 7-item Anxiety sub-scale from The Depression Anxiety Stress Scale, The Multi-Dimensional Scale of Perceived Social Support, The Smartphone Addiction Scale and The Social Connectedness Scale. Gender, age (groups), full-time/part-time/day/evening attendance/undergraduate/postgraduate study were recorded. Results indicated there were no differences in anxiety levels based on age. High smartphone use did result in higher anxiety. High levels of social support failed to predict lower levels of anxiety. Results found a correlation between high levels of smartphone use and lower levels of connectedness.

Introduction

Aim of Study

The aim of the current study is to examine rising anxiety rates amongst college students (Lavelle, 2016). An additional aim of the study is to examine how excessive smartphone use amongst students may potentially be a causal factor for this increase in anxiety (Rosenberg, 2018). Additionally, the study seeks to determine if high levels of perceived social support and higher levels of social connectedness may function as a buffer; reducing college students' mental distress (Hefner & Eisenberg, 2009; Van Zalk & Van Zalk, 2015). Anxiety was chosen specifically to be the main focus of this study because, unlike depression; anxiety is often viewed as less significant (O'Brien, 2018). Furthermore, anxiety has overtaken other mental health issues to be the most common mental health disorder amongst young adults (O'Brien, 2018). Moreover, the current study aims to encourage greater discourse and openness around mental health issues. With respect to young people and their mental health, research demonstrates that talking about their problems results in "lower mental health distress and higher positive adjustment", Dooley & Fitzgerald, (2012, p. 6.).

Arguably, young people today receive mixed messages from society. On some occasions they are actively encouraged to seek help and on other occasions their concerns are dismissed as insignificant (Grey, 2015). There is evidence on occasion that this particular cohort of young people are somewhat less stoic, less resilient, less hardy than the youth of previous generations; hence the term, snowflake generation (Gerardy, 2005).

Anxiety an Overview

"Anxiety can be defined as a state consisting of psychological and physical symptoms brought about by a sense of apprehension at a perceived threat" Burton, (2016). Anxiety responses are not pathological; they are in all likelihood simply an evolutionary response designed to protect us from harmful circumstances (Kolb, Whishaw & Teskey, 2016). "Anxiety is the body and mind's natural common reaction to threat or danger. Commonly referred to as the fight or flight response; the body releases hormones such as adrenaline, which in turn results in a number of physiological reactions occurring in the body. These emotions help us to survive by ensuring that we are alert and responsive to danger (St Patrick's Hospital)." However, if an individual persists in experiencing 'the fight or flight' response when such a response is not actually representative of a genuine threat to their safety; this disproportionate response can have a negative impact on one's health both physically and psychologically (Harvard, 2018). Anxiety is a normal response; it is only when it becomes disproportionate and/or pervasive that it begins to cause harm (O'Brian, 2018).

There are a number of anxiety disorders, for example, social anxiety, agoraphobia, post-traumatic stress disorder (PTSD), (Mayo Clinic, 2019). However, this study focuses specifically on Generalized Anxiety Disorder (GAD) which is defined as persistent worrying accompanied by three or more of the following features; inability to concentrate, tiredness, irritability, restlessness, difficulty sleeping and muscle tension (Schacter, Gilbert, Wegner & Hood, 2016).

GAD is often described as 'free-floating anxiety' as the excessive worrying is not specific and can be related to any number of issues (Rikels & Rynn, 2001). In the long-term anxiety can have negative implications for an individual's health, psychologically and physically (Harvard, 2018) and while an individual may not fulfil the criteria of a diagnoses of clinical anxiety their heath can still be impacted (Newman, 2018).

It is difficult to know if levels of anxiety have genuinely actively increased over previous generations. Certain factors may contribute to this apparent rise. For example, there is a possibility that there is simply less stigma in reporting mental health difficulties now than in previous generations and people are now more inclined to seek help (Grey, 2015). Furthermore, it is difficult to obtain data that accurately represents previous recorded rates of anxiety (Newman, 2018).

Anxiety & College Students

Ireland appears to be in the grip of a surge in young people experiencing issues around anxiety. "The number of people reporting a psychological, or emotional condition has surged, up from 96,004 to 123,515 since the last Census in 2011" (O'Regan, 2017, p.1). In addition, ReachOut Ireland, an online platform, dedicated to young people's mental health have experienced an increase in young people visiting their site to seek help for anxiety. They note that their media posts on anxiety receive far higher traffic content than other issues pertinent to young people such as depression or eating disorders (Lavelle, 2016). However, this study will focus exclusively on students' experience of anxiety and while these levels do not necessarily reach clinical levels, they can still impact on an individual's mental wellbeing (Newman, 2018).

The rates of anxiety levels experienced by college students is a cause for concern. In 2014 1, 187 students from NUI Galway presented at the university's counselling service, a rate of 1,143 more than presented in 2013. These figures compare with the 511 students who sought help in 2005-2006. Anxiety appears to be experienced on a greater level in comparison to depression with 72 % of students attending for help with anxiety versus 55% of students presenting with depression. (Crawford, 2015). "The educations system is struggling to cope with an upsurge in the number of young people presenting with anxiety and related disorders. The number of third-level students with mental health problems, including anxiety and related disorders has surged by about 270% since 2010, up from 473 to 1.750" (O'Brien, 2018).

"From a biological perspective the student demographic is especially vulnerable to mental health issues with 75% of mental distress emerging before the age of 25." (Loughran, 2016). With this in mind it was deemed appropriate to focus the study exclusively on student mental health with particular emphasis on the apparent rise in students experiencing anxiety Moreover the changeover from secondary school to university life for students during a critical point in their passage from adolescence to early adulthood and all the changes that it can entail, for example, greater responsibility, juggling college with a part-time job, further accentuates their vulnerability to experiencing mental distress (Talwar, Wah, Ghani & Yusoff, 2016).

Social Support as a Protective Factor

Social support "refers to the perception that one is cared for by others, is valued and esteemed, and is part of a social network of mutual assistance" Taylor (2011, p.189).   Individuals can receive social support from family members, friends, a significant other, work colleagues and peers. Social support can be "emotional and/or instrumental" (Semmer, Elfering, Jacobshagen, Perrot, Beehr, & Boos, 2008, p. 235). There is growing evidence to suggest that social support has tremendous benefits for mental health and there is a strong link between mental health and social support. Social support has the potential to act as a moderating factor against stressful life events and can even act as a means to foster a greater sense of wellbeing (Steese, Dollete, Phillips, Hossfeld, Matthews & Taormina, 2004). In addition, a lack of social support has been attributed to college students being at a greater risk of experiencing psychological issues, such as stress and anxiety (Teoh & Rose, 2001). Moreover, research carried out by Hefner & Eisenberg (2009) with 1,378 college students found that students who reported lower levels of social support were far more likely to experience mental health issues. Similarly, Farrer, Gulliver & Bennett, Fastnacht & Griffiths (2016) report that social support may have a moderating effect against anxiety and depression in college students.

In Ireland, a youth mental health study carried out by UCD amongst young people found that social support proved to be a significant protective factor in contributing to mental health (Dooley & Fitzgerald, 2012). The study highlighted the benefit of social support on mental health with the coining of the term "one good adult" showing how the presence of just one person can have a positive effect on a young person (Dooley & Fitzgerald, 2012)

When considering the role of social support for mental health it is important to be aware that cultural variations can occur with respect to how an individual evaluates the social support they receive (Jibeen, 2016). For instance, research has found that individualistic cultures appear to place greater emphasis on the social support they receive from their friends and peers (Pearson & Child, 2007). Conversely, collectivistic cultures appear to rate familial support as being of greater importance (Jibeen, 2016). In addition, Shelton, Wang & Zhu (2014) argue that a student's cultural affiliation will have a strong bearing on how social support effects their mental health. It is crucial that Irish colleges remain vigilant to these cultural sensitivities given that Ireland has experienced a growth in the number of international students visiting from abroad to further their education (O'Reilly, Ryan & Hickey, 2010). However, regardless of cultural variations in how social support can be evaluated differently depending on its source (family or friends), research demonstrates that nonetheless, social support remains a protective factor for mental health which transcends ethnicity (Brailovskaia, Schonfeld, Zhang & Bieda, 2018,) In addition, social connectedness, like social support has been shown to play a positive role in mental health. "The concept of connectedness is rooted in a wealth of previous theoretical and empirical work" that emphasizes its value for individual wellbeing (Foster, Horwitz, Thomas, Opperman, Gipson, Burnside & King, (2017, p. 321).

Social Connectedness as a Protective Factor

Social connectedness refers to an individual's capacity "to feel comfortable and confident within a larger social context than family or friends" (Lee & Robbins, 1995, p.233). Additionally, individuals can experience a sense of connectedness with social structures, such as college and universities (Foster et al, 2017). Sharing a sense of connectedness and a feeling of belonging with others has been found to have positive effects on mental health. Higher levels of social connectedness amongst college students has been found to be significantly positively related to lower levels of anxiety and mental distress (Blau, DiMino, DeMaria, MD, Beverly, Chessler, Drennan, 2016). Furthermore, student levels of connectedness can have a bearing on retention levels across colleges (Robbins, Casillas & Oh, 2008). O'Keefe (2013) argues that student level of connectedness impacts on student attrition rates.

Brief Overview of Smartphone Use in Ireland

"A smartphone is a mobile phone that performs many of the functions of a computer, typically having a touch screen interface, internet access, and an operating system capable of running downloaded applications" Oxford, (2016). "These features have made smartphone use a prevalent social phenomenon" Boumosleh & Jaalouk (2017, p.2). It appears people in Ireland have a strong attachment to their phones. A study carried out by Deloitte (2018) revealed some interesting facts with respect to Irish smartphone usage and it is clear that Irish people have some awareness of their smartphone use with 57% reporting that they believe they use their phone too much (Deloitte, 2018). However, there is evidence that Irish people are trying in some small ways to reduce their smartphone use.

A survey carried out by Deloitte into smartphone use around the world in 2015 reported that Irish people on average checked their phones 57 times a day. In 2018 this number had reduced to checking 55 times per day. Furthermore, in 2015, 27% of Irish people reported checking their smartphone within 5 minutes of awakening while in 2018; this figure had reduced to 20% checking their smartphone on wakening.

Smartphone Use as a Risk Factor

In 2012, University College Dublin (UCD) carried out the largest youth mental health study to date in Ireland. The study notes how Ireland as a society has experienced numerous changes economically, culturally and socially over the past number of decades (Whelan & Layte, 2006). "Few societies have changed so rapidly and radically as has the Republic of Ireland since 1960" (Breen, Hannan, Rottman & Whelan, 2016, p. 1). For example, there has been unprecedented changes to Ireland's familial structure (Nixon, Greene & Hogan, 2006). The study carried out by UCD explored some of the complex reasons for mental health issues amongst young people, such as, financial worry, alcohol misuse and concern over family and friends. (Dooley & Fitzgerald, 2012). However, the study did not look at the ubiquitous presence of smartphones today and its potential negative effects for mental health (Darcin, Kosse, Noyan, Nurmedov, Yilmaz & Dilbaz, 2016; Demirci, Akgonul & Akpinar, 2015). Thus, it was reasoned that this would make a relevant and additional feature to the research study. Ireland and society in general have undergone monumental changes as a result of technology in a relatively short period of time. In 1996, there were 140,000 mobile phone users in Ireland (Donavan, 1996).

In 2018 there were 3,000,000 people in Ireland described as having ownership or access to a smartphone (Deloitte, 2018). Given, the changes wrought, it is arguably imperative to seek to increase society's knowledge on how these changes may have negative repercussions for mental health. Particularly as emerging research has begun to link excessive reliance on smartphones as having negative consequences for psychological health. Therefore, the current study seeks to examine if the ubiquitous presence of smartphones can be attributed to mental health difficulties.

A study carried out with 313 Turkish students found that high levels of smartphone use has been linked to anxiety (Demirci, Akgonul & Akpinar, 2015). Furthermore, a study carried out with 1006 undergraduate students in China made some interesting links between smartphone dependence, anxiety levels and social support in students (Xiao Xiao, Jing Ping, Yao & Yue-Qi (2018). Xiao-Xiao et al (2018, p.65) argue that "a strong social support system is beneficial to the prevention of mobile phone dependence" and that phone communication does not in fact enable users to glean the psychological benefits of this social support. As a consequence, students appear to rely excessively on their phone in order to alleviate their anxiety and this in turn leads to their levels of social support being further reduced and a vicious circle entail leaving students even more vulnerable to anxiety (Xiao Xiao et al, 2018).

Some interesting research has emerged as a result of studies into excessive smartphone use. A study by Lee, Kim, Ha, Yoo, Han, Jung & Jang (2016) found that people who used their smartphones to engage with social networking sites were at a greater risk of developing smartphone dependency.

In addition, a study carried out with 375 college students also made a link between those who use social networking sites as being at greater risk of exhibiting smartphone dependency than those who used the internet purely for internet browsing or making calls (Darcin, Kose, Noyan, Nurmedov, Yilmaz & Dilbaz, 2016).

Arguably it could be assumed that technology helps bring people closer however, paradoxically, it appears that this is not the case (Jarvenpaa & Lang, 2005). Moreover, Pittman & Reich (2016) report that despite vastly improved interconnectivity it appears young people may indeed be experiencing greater loneliness than previous generations. Research has shown that the mere presence of smartphones can have negative consequences for relationships (Przybylski & Weinstein, 2013). A study by Rosenberg (2018) reports that an over reliance on smartphones can lead to individuals experiencing a sense of isolation. Furthermore, as a consequence of becoming heavily dependent on smartphones, social interaction can become undermined which can in turn further compound this sense of isolation (Rosenberg, 2018).

Thus, it may be conceivable to conclude that an over reliance on smartphones is not only linked with having negative consequences for mental health, but in fact may also be potentially damaging an individual's ability to relate to others on a meaningful level. Mounting research has clearly demonstrated the value of social support, the ability to connect and feel a sense of belonging with others as being significantly positively correlated with mental health Social support is a mediating factor for mental health (Brailovskaia et al, 2018). Social support is singularly one of the most beneficial measures for helping to manage stressful periods in an individual's life (Kim, Sherman & Taylor, 2008). Additionally, social connectedness in adolescence has been identified as a better predictor of mental wellbeing into adulthood than for example, academic achievement (Olson, McGee, Nada-Raja, & Williams, 2013).

If students struggle to connect with their peers, it is far less likely that they will reap these benefits.

Furthermore, if a student's capacity to reach out and connect with others has been reduced as a result of excessive use of technology, it means that the role of social support and connectedness and their value to mental health is suddenly all the more crucial in our technology driven world. Smartphones has unquestionably altered how people engage with one another (Yee, 2012). For "an individual's insufficient skill to express him/herself affects his/her relationships with others in a negative way and the individual has difficulty establishing satisfying relationships" (Eldeleklioglu, 2006, p.744).

In addition, the mental wellbeing of students has been linked with higher levels of student retention (Shelton, Wang, & Zhu, 2014). Third-level institutions could consider ways in which they can facilitate a greater health-seeking climate amongst students.

Aim of Current Study

The aim of the research is to explore how anxiety appears to be on the rise, particularly amongst the college cohort and to explore how excessive smartphone use may potentially be contributing to this increase in levels of anxiety. The current college population is actively engaged and immersed in technology unlike any other generation in history (Jacobson & Forste, 2011). Additionally, the study seeks to highlight the role of social support and levels of connectedness in protecting mental health and mediating levels of mental distress. Furthermore, the study seeks to stress the value of social support and social connectedness in benefiting mental wellbeing and underscore the potential negative impact of excessive smartphone use for relationships and meaningful interaction. When society has reached a point where it has to develop a new word for this predicament, "phubbing", (Chotpitayasunondh & Douglas, 2016) the term used when an individual actively disengages with the person they are in company with in order to stay on their smartphone; and it appears to negatively impact on one's ability to engage (Chotpitayasunondh & Douglas, 2016) meaningfully with another; it may well be time to familiarize once more with the crucial benefits that can be accrued from meaningful interaction.

The study consists of four hypotheses;

1. It is hypothesised that there will be differences in anxiety levels based on age.

2. It is hypothesised that high levels of smartphone use will lead to greater levels of anxiety.

3. It is hypothesised that high levels of social support will predict lower levels of anxiety.

4. It is hypothesised that high levels of smartphone use will result in lower levels of connectedness.

Methods

Participants

The researcher set out to recruit a sample of approximately 100 students drawn from the college population. The 107 students (F=81, M=26) who took part in the questionnaire were from colleges throughout Dublin city; Dublin Business School, (DBS) UCD, Dublin Institute of Technology and Trinity College Dublin. Non-random opportunity and snowball sampling were employed for the study. The students were made-up of full-time and part-time, day and evening students, from a variety of undergraduate and postgraduate courses including, midwifery, psychology, economics, business, architecture and marketing. The students were aged between 18 to 45 years and older with a mean age-group of between 18-24. The students participated voluntarily and did not receive any renumeration.

Design

The questionnaire was based on a quantitative design. The study employed a cross-sectional, and correlational design. The independent variable was age and the dependent variable was anxiety. The predictor variables were smartphone use and social support. The criterion variables were anxiety, and levels of connectedness. The demographic variables employed in the study were gender, age, full-time or part-time study, day or evening attendance, undergraduate student or postgraduate student and were utilized to compare differences amongst the dependent, predictor and criterion variables.

Materials

The questionnaire was designed through Google Forms and consisted of 7 parts;

1. The cover sheet of the questionnaire formed the information sheet (see Appendix 1) and is discussed in detail under the ethics section of the methodology.

2. The second part of the survey (see Appendix 2) consisted of the demographic questions that each student was asked to record. These were;

-   Gender

-   Age Groups (18-24, 25-35, 36-44, 45+)

-   Full-time or part-time study

-   Day or evening attendance

-   Undergraduate or postgraduate study

-   Students were asked if they owned a smartphone

-   Age when received first smartphone

3. The third part of the questionnaire utilized the Anxiety sub-scale 7-item from the Depression Anxiety Stress Scale (DASS 21) developed by Lovibond & Lovibond (1995). The anxiety sub-scale is a self-report tool designed to measure anxiety levels over the previous week. "The anxiety scale assesses autonomic arousal, skeletal muscle effects, situational anxiety, and subjective experience of anxious affect" Lovibond & Lovibond, (1995, p. 339).

The participants received 7 statements; for example, 'I felt close to panic' and 'I was aware of dryness in my mouth' (see Appendix 3). Item responses were on a 4-point Likert-type scale from (0 "did not apply to me at all" to 3 "applied to me very much, or most of the time"). Participant responses were summed and then multiplied by 2. Multiplication is necessary as the DASS 21 is a shortened version of the original DASS 42-item scale. The scores range from 0 to 21. Higher scores indicate higher levels of anxiety. Using recommended severity cut off scores (Lovibond & Lovibond, 1995), participants' anxiety was categorized into five levels; normal/mild/moderate/severe/extremely). "The DASS 21 is a reliable (Cronbach's alpha:.89) and valid measure of the constructs it was intended to assess" Crawford & Henry, (2003, p. 111).

4. The fourth part of the questionnaire utilized the Multidimensional Scale of Perceived Social Support (MSPSS), (Zimet, Dahlem, Zimet & Farley, 1988). This self-report scale consists of 12 statements with 3 sub-scales designed to explore variants of social support received from friends (items 6,7,9,12,) family (items 3,4,8,11) and significant other (1,2,5,10). Examples include; 'I have friends with whom I can share my joys and sorrow', and 'I get the emotional support I need from my family' (see Appendix 4). Participants were instructed to rate each statement to the degree to which it best reflects their experience. Each statement is scored across a 7-point Likert-type scale which range from (1 "very strongly disagree" to 7 "very strongly agree").

The scores were calculated by summing each of the 12 items to gain an overall score. The scores range from 12-84. Each sub-scale can be scored separately, e.g., 'friends', by summing the scores and dividing by 4 (Zimmet et al, 1988). Higher scores reflect experiencing greater perceived level of social support. "The MSPSS has proven to be psychometrically sound in diverse samples and to have a good internal reliability (Cronbach's alpha: 0.91) and test-retest reliability and robust factorial validity" Wongpakaran, Wongpakaran & Ruktrakul, (2011, p.161).

5. The fifth part of the questionnaire, The Smartphone Addiction Scale (SAS-SV) (Kwon, Kim, Cho & Yang, 2013) was designed to explore levels of smartphone addiction based on 6 factors; "daily-life disturbance, positive anticipation, withdrawal, cyberspace-oriented relationship, overuse and tolerance" Kwon et al, (2013, p. 2). The self-report scale is a short version of the original 33-item scale (Kwon et al, 2013). The modified scale contains 10 items which are scored on a 6-point Likert-type scale ranging from (1 "strongly disagree" to 6 "strongly agree"). Examples of the statements include 'missing planned work due to smartphone use' and 'using my smartphone longer than I intended' (see Appendix 5). The scores range from 10 to 60 and simply require a summing of each score. Higher scores reflect a greater dependency on smartphones. "The SAS-SV showed a good reliability (Cronbach's alpha: 0.911) and validity for the assessment of smartphone addiction" Kwon et al, (2013, p. 1).

6. This part comprised of The Social Connectedness Scale (Lee & Robbins, 1995) and consists of 8 items designed to explore feelings of connectedness from "three aspects of belongingness; connectedness, affiliation and companionship" Lee & Robbins (1995, p. 236). The self-report scale was designed to represent some of the features of feeling connected and is not meant to embody the entire construct (Lee & Robbins, 1995). The 8 items are scored on a 6-point Likert-type scale ranging from (1 "strongly agree" to 6 "strongly disagree"). Examples of the items include 'I feel disconnected from the world around me' and 'I don't feel related to anyone' (see Appendix 6). The score ranges from 1 to 68. The scores simply require summing. Higher scores reflect a greater sense of connectedness. "Internal reliability estimates for the scale were (Cronbach's alpha: .91) and test re-test correlations revealed good test stability" Lee & Robbins (1995, p. 232).

7. The final part of the questionnaire consisted of the Debrief sheet (see Appendix 7). The debrief sheet is discussed in greater detail under the ethics section of the methodology.

Procedure

The majority of the students accessed the questionnaire online. For DBS students, a link to the questionnaire was uploaded to the DBS Psychology forum and the DBS Facebook page. Students were invited from other colleges in Dublin via a WhatsApp link and these students in turn invited their fellow peers to participate.

The remaining students took part in a paper version of the questionnaire which was distributed to the students during class time in DBS with prior permission sought from the relevant lecturer. The design of the online questionnaire and paper questionnaire followed the same order.

Each participant was introduced to the survey via an information sheet (please see ethics section for full details). The students were asked to record their gender, an approximation of their age from a list of four age-ranges and whether they were full-time or part-time students. The participants were also asked to report if they studied during the day or evening and if they were engaged in undergraduate or postgraduate study. The students were also asked to record if they owned a smartphone and the age they were when they received their first smartphone. After completing the demographic questions, the students filled out the rest of the questionnaire (items 3,4,5,6 as outlined in the materials section). The name and author of each scale were omitted from the questionnaire. Participants were simply asked to 'read each statement carefully and indicate via the Likert-type scale to the degree they felt each statement best represented them.

Finally, the last page of the questionnaire consisted of the debrief sheet (see ethics section). For participants carrying out the paper questionnaire, the debrief sheet was distributed separately thereby enabling them to keep it. There was no specified time in which to complete the survey. The participants were instructed to take whatever amount of time they required. The survey took on average 5 minutes to carry out.

Ethics

The researcher consulted the Psychological Society of Ireland (PSI) code of ethics (2011) in order to examine some of the factors that needed to be addressed prior to designing and carrying out a questionnaire. It was decided that ethical issues pertaining to consent, voluntary participation, anonymity and confidentiality were relevant, and these issues were addressed via the information sheet. The information sheet advised the participants that the researcher was carrying out a study that would form part of a final year assessment in a BA (Hons) Psychology in Dublin Business School (DBS).

The information sheet advised participants that the questionnaire would be 'exploring the relationship between anxiety, smartphone use, social support and feelings of connectedness amongst college students.' The students were advised that participation was voluntary and that no one was under any obligation to take part. Participants were asked to tick a box to confirm that they consented to taking part in the study. Participants were reassured that all information collected would be anonymous and confidential. Participants were advised that as none of the responses could be attributed to them it would not be possible to withdraw from the questionnaire once the survey had been submitted.

Finally, the information sheet contained the contact details and email addresses for the researcher and the researcher's supervisor and participants were invited to contact either if they had any concerns, or questions relating to the questionnaire. Each student was debriefed following participation.

The students were thanked for their participation and were given some feedback as to the aim of the questionnaire; 'to explore how excessive use of smartphones may potentially contribute to rising anxiety levels amongst students and how social support and feelings of connectedness can act as a protective factor'.

The debrief sheet acknowledged the potential risk of distress to participants by including the telephone numbers for two support groups in the event that any aspect of the questionnaire may have given rise to minor negative feelings. Finally, the participants were advised once more that they were free to contact the researcher or the supervisor if they had any questions pertaining to the research.

Results

Sample Characteristics

Table 1 presents the sample characteristics. The total sample (N=107) were university students (100%), predominantly female (76%), aged 18-24 years (63%), full-time (77%), daytime (78%), undergraduate (76%), who all owned a smartphone (100%). The participants first got a smartphone when they were aged 16 (M=16.27, SD=6.50, range: 8-40 years).

Table 1

Sample characteristics (N=107)

Variable	Category	Frequency	Per cent
Gender	Male	26	24
	Female	81	76
Age group	18-24 years	67	63
	25-34 years	21	20
	35-44 years	14	13
	45+ years	5	5
Full or part-time student	Part-time student	25	23
	Full-time student	82	77
Day or evening attendance	Daytime	83	78
	Evening	24	22
Undergraduate or postgraduate	Undergraduate	81	76
	Postgraduate	26	24

Descriptive statistics and reliability

Table 2 presents the descriptive statistics and reliability (internal consistency) for the study scales. DASS anxiety had good reliability (α=.839), and this sample had mild anxiety severity, on average (M=9.01, SD=8.10). All four MSPSS social support scales had excellent reliability >.9, and the sample had low/moderate/high total social support, and support from significant other, friends, and family. The smartphone addiction scale showed good reliability (α=.886) and indicated low/moderate/high smartphone addiction in the sample (M=32.25, SD=11.47). Finally, the social connectedness scale had excellent reliability (α=.913), and this sample reported low/moderate/high social connectedness (M=38.87, SD=7.61). All nine scales showed skewness close to ±1, and kurtosis close to ±3, indicating normal distributions. Therefore, parametric statistics were appropriate (Field, 2009).

Table 2

Descriptive statistics and reliability for all measurement scales used in this study (N=107)

Scales	Reliability (α)	Mean	SD	Skewness	Kurtosis
DASS Anxiety	.839	9.01	8.10	1.007	.948
MSPSS Total social support	.929	5.78	1.00	-1.447	3.368
MSPSS Support - significant other	.934	5.98	1.28	-1.634	2.514
MSPSS Support - friends	.914	5.59	1.21	-1.062	1.125
MSPSS Support - family	.928	5.78	1.10	-1.032	.803
SAS Smartphone addiction	.886	32.25	11.47	-.050	-.531
SCS Social connectedness	.913	37.87	7.61	-.772	-.005

Note: SD=standard deviation, α = Cronbach's alpha for internal consistency scale reliability.

Independent samples t-tests (two-tailed) compared DASS anxiety scores between demographic subgroups. Results found females had higher anxiety (M=9.73, SD=8.77) than males (M=6.77, SD=5.06), t(74.688)=-2.127, p=.03) (Figure 1); undergraduates had higher anxiety (M=10.02, SD=8.52) than postgraduates (M=5.85, SD=5.71), t(105)=2.334, p=.021 (Figure 2); part-time students (M=7.92, SD=7.90) had similar anxiety as full-time students (M=9.34, SD=8.13), t(105)=-.766, p=.445; finally, day-time students (M=9.64, SD=8.33) had similar anxiety as evening students (M=6.83, SD=7.00), t(105)=1.502, p=.136.
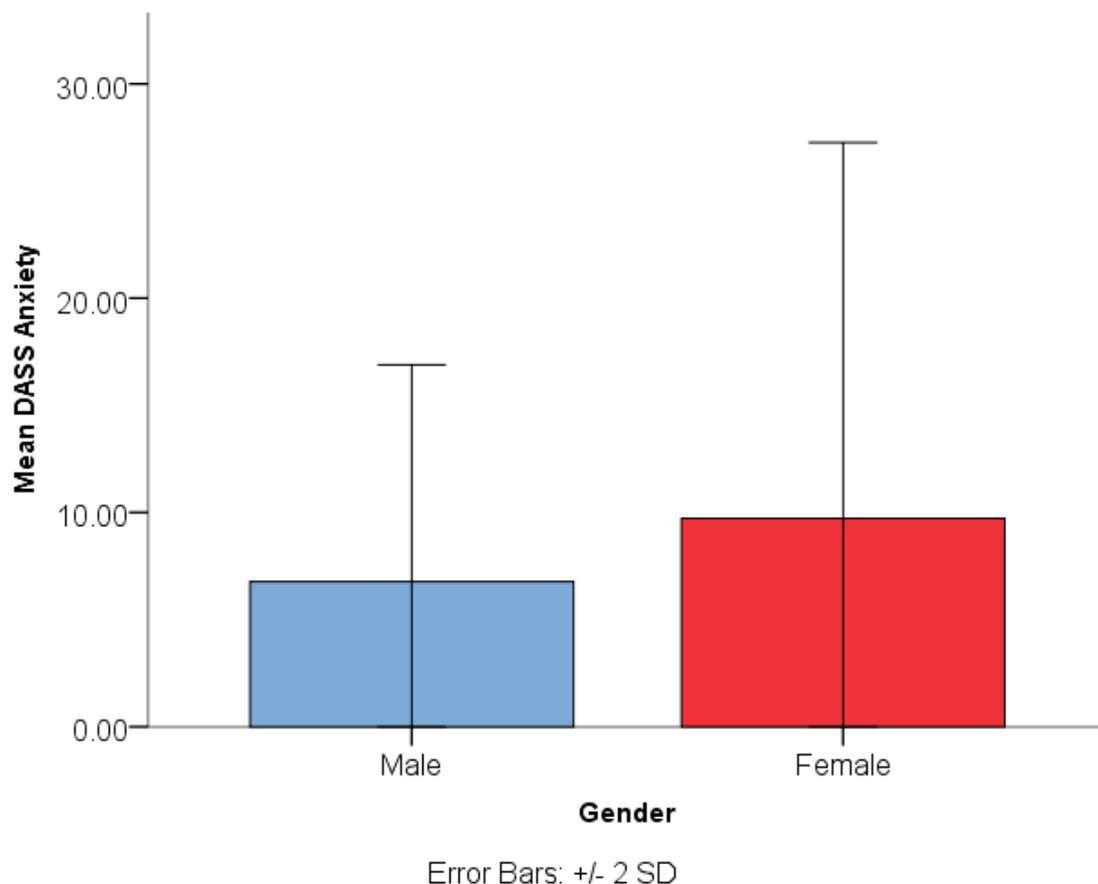

Figure 1. Mean DASS anxiety scores between male and female university students.
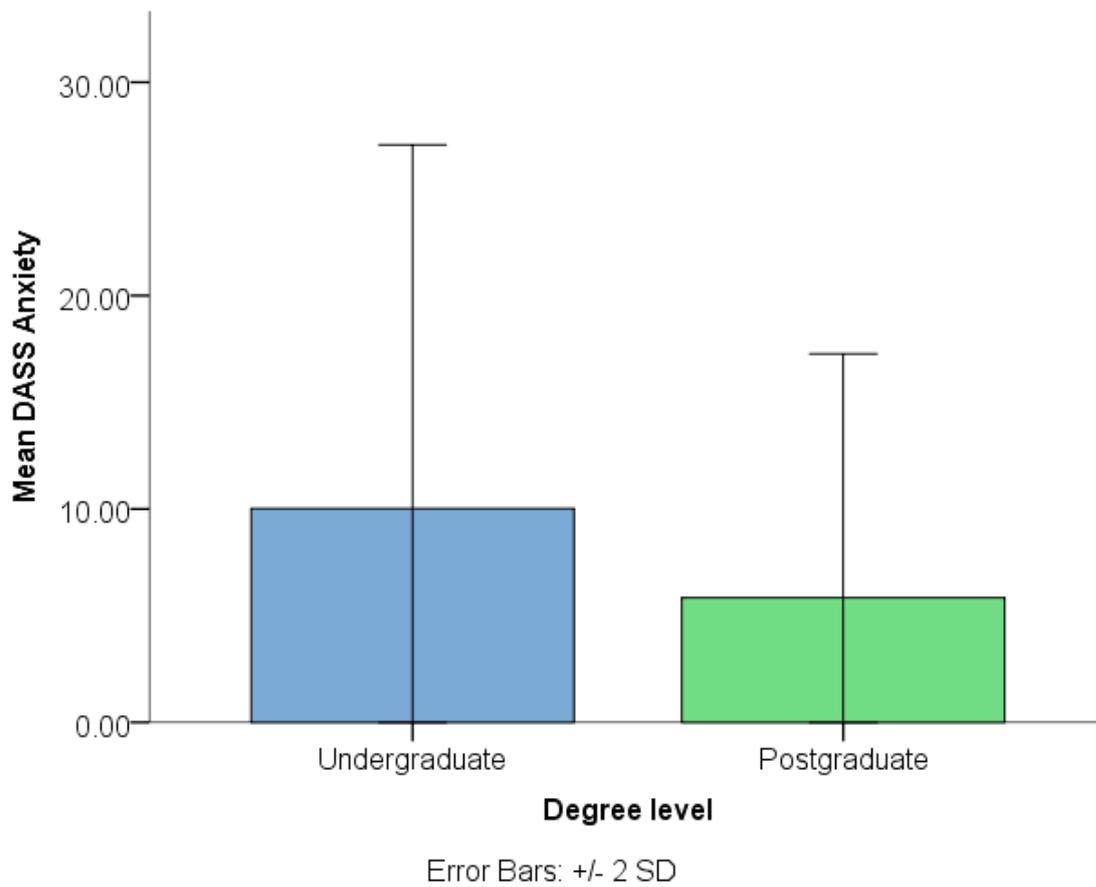
Figure 2. Mean DASS anxiety scores between undergraduate and postgraduate students.

Anxiety Severity Levels

DASS-21 classified the participants' scores into five anxiety severity levels. Based on this classification, the frequency of anxiety severity found in the sample, included: normal (44%), mild (11%), moderate (25%), severe (9%), and extremely severe (10%) (Table 3, Figure 3).

Anxiety Severity Levels between Demographic Subgroups

Crosstabs analysis with Pearson Chi-square test found that anxiety severity levels did not differ significantly between any demographic subgroup, including gender, $X2(4)=7.06$, $p=.132$, four age groups $X2(12)=12.21$, $p=.429$, full-time/part-time $X2(4)=1.89$, $p=.755$, daytime/evening $X2(4)=1.97$, $p=.741$, or undergraduate/postgraduate $X2(4)=7.04$, $p=.134$.

Table 3

DASS anxiety severity in the sample (N=107)

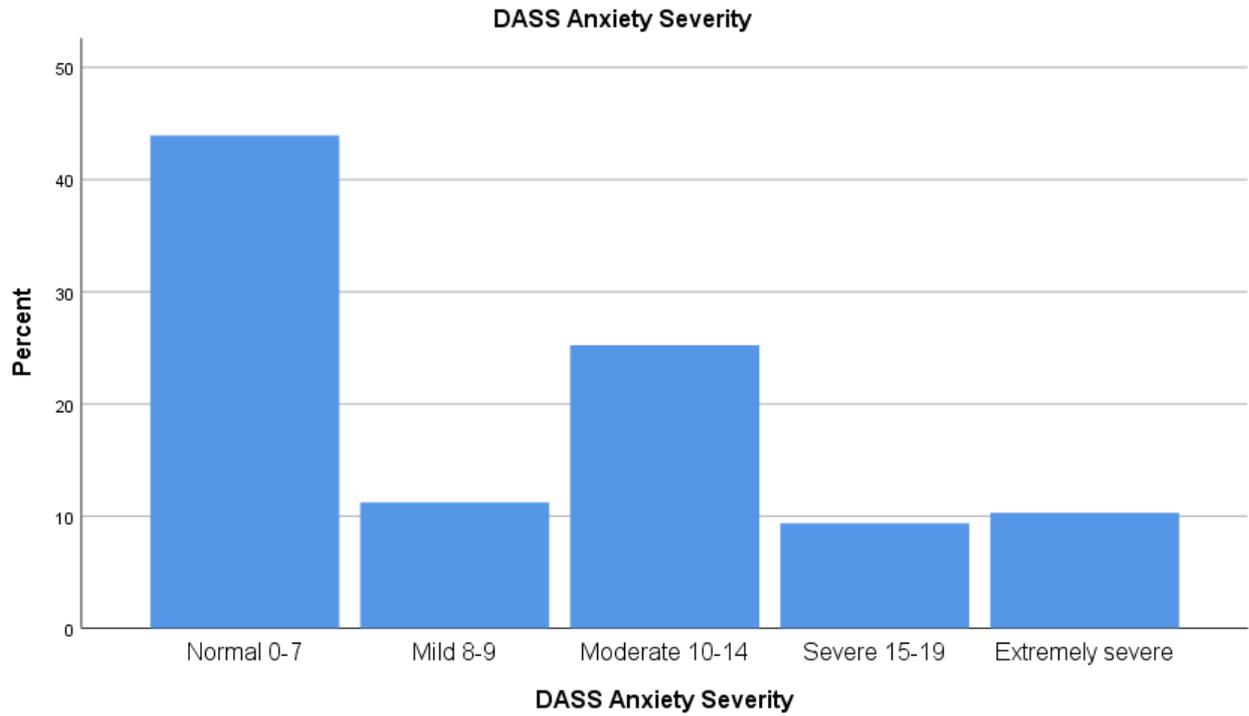| DASS anxiety severity (score range)	Frequency	Per cent
Normal (0-7)	47	43.9
Mild (8-9)	12	11.2
Moderate (10-14)	27	25.2
Severe (15-19)	10	9.3
Extremely severe (20+)	11	10.3
Total sample	107	100.0

Figure 3. Breakdown of DASS anxiety severity levels in the sample (%).

Hypotheses 1

Hypothesis 1 predicted that the youngest age group would have significantly higher DASS anxiety scores than the older participant age groups. Levene's test indicated equal variances (Levene $(3,103)=1.202$, p=.3.13). A one-way between-groups ANOVA found that mean anxiety scores were highest in the youngest 18-24 age group (M=10.45, SD=8.73), as compared with three older age groups: 25-34 years (M=7.62, SD=6.62), 45+ years (M=7.60, SD=5.55), and 35-44 years (M=4.71, SD=1.63). However, this difference was not statistically significant, $F(3,103)=2.36$, p=.076. See Figure 4. The null hypothesis is supported.
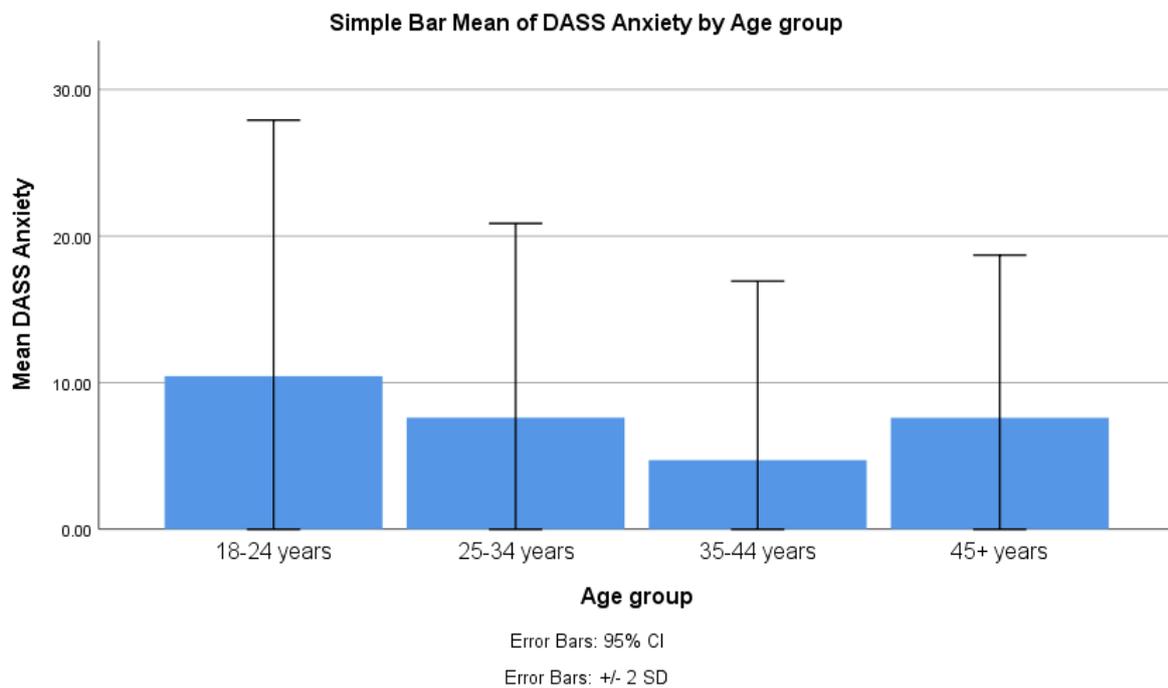

Figure 4. Mean DASS anxiety scores between age groups. Error bars are standard deviation.

Hypotheses 2

Hypothesis 2 that higher smartphone use predicts higher anxiety was tested using linear regression. The model was significant, smartphone use explained approximately 18.3% of variance in DASS anxiety scores in the sample, and 17.5% of variance in the population, R2=.183, Adj. R2=.175, F(1,105)=23.451, p=.001. Higher SAS smartphone addiction scores predicted significantly higher DASS anxiety scores (B=.302, Beta=.427, p=.001, CI (95%) of B .178, 426). For every one unit increase in SAS smartphone addiction score, DASS anxiety score increased by .302 points (based on the unstandardized B regression coefficient). See Figure 5. The null hypothesis is rejected.
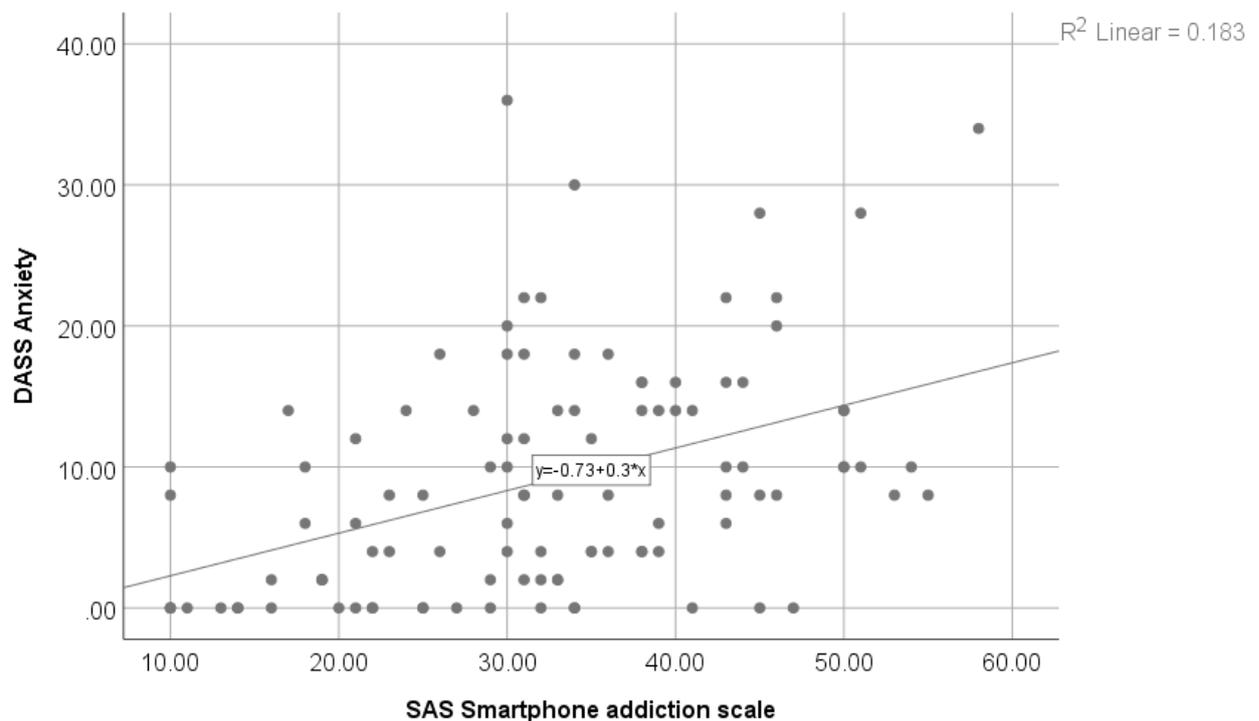

Figure 5. Scatterplot illustrating the significant positive linear relationship between SAS smartphone addiction scale scores and DASS anxiety scores, with regression equation.

Hypotheses 3

Hypothesis that high MSPSS social support predicts lower DASS anxiety scores was tested using linear and multiple regression.

Total Social Support: The linear regression model of total social support predicting DASS anxiety scores was non-significant. Total support explained approximately 1.9% of the variance in anxiety scores in the sample, and 1% of variance in the population, R^2=.019, Adj. R^2=.010, $F(1,105)$=2.077, p=.153. Total support scores were unrelated to anxiety scores (B=-1.134, beta=-139, p=.153, CI (95%) of B: - 2.694 ->-.426). The null hypothesis is accepted.

Social Support Subscales: The multiple regression model of MSPSS significant other, family, and friends social support predicting DASS anxiety scores was non-significant. Together, the three subscales explained approximately 4% of the variance in anxiety scores in the sample, and 1.2% of variance in the population, R^2=.040, Adj. R^2=.012, $F(3,103)$=1.434, p=.237. DASS anxiety scores were not significantly influenced by significant other support (B=-.910, beta=-144, p=.234, CI (95%) of B: -2.418 ->.597); or friends support (B=-.959, beta=-143, p=.248, CI (95%) of B: -2.594 ->.677); or family support (B=.881, beta=.120, p=.331, CI (95%) of B: -.908->2.670). The null hypothesis is accepted.

Hypotheses 4

Hypothesis 4 that excess smartphone use predicts low social connectedness was tested using linear regression. The model was significant. Excess smartphone use explained approximately 10% of the variance in social connectedness scores in the sample, and 9.2% of variance in the population, R^2=.101, Adj. R^2=.092, $F(1,105)$=11.781, p=.001. Excess smartphone use was significantly related to lower social connectedness (B=-.211, Beta=-.318, p=.001, CI (95%) of B -.333, -.089). See Figure 6. For every-one unit increase in smartphone addiction scores, social connectedness scores decreased by .211 points (based on the unstandardized B regression coefficient). Therefore, the null hypothesis is rejected.
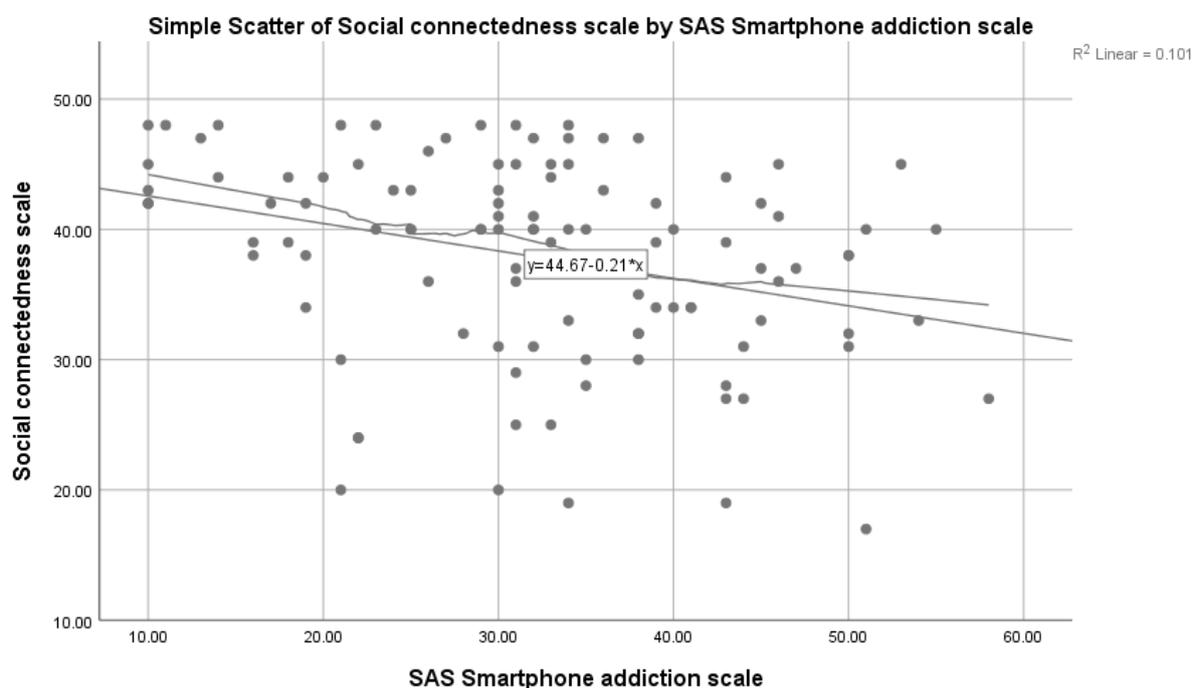

Figure 6. Scatterplot illustrating the significant negative linear relationship between SAS smartphone addiction scale scores and social connectedness scores, with regression equation.

Discussion

The aim of the current study was to explore the issue of rising anxiety levels in college students (Crawford, 2015). The study wanted to acknowledge how technology has come to be a large part of students' lives (Jacobsen & Forste, 2011) and sought to examine how its mere presence may be a contributing factor to growing psychological issues amongst the college cohort. Another purpose of the study was to examine the value of perceived social support as a protective factor for mental health (Brailovskaia, 2018). Additionally, the study set out to explore how levels of connectedness can also play a mediating role in levels of anxiety (Blau et al, 2016). Given that relating and interacting socially with others has proved to have much value for mental wellbeing; these two issues were considered especially pertinent (Hefner & Eisenberg, 2009; Dooley & Fitzgerald, 2012).

The first hypotheses set out to explore if there would be differences in anxiety levels based on age. The first hypotheses was not supported and there were no significant differences found in anxiety levels based on age. The second hypotheses stated that high levels of smartphone use would lead to greater levels of anxiety. As anticipated higher levels of smartphone use did lead to greater levels of anxiety and so support for the second hypotheses proved conclusive.

The third hypotheses stated that higher levels of perceived social support would predict lower levels of anxiety. The results did not support the hypothesis and high levels of social support did not predict lower levels of anxiety. Finally, the fourth hypotheses stated that higher levels of smartphone use would result in lower levels of connectedness. This hypothesis was supported with higher levels of smartphone being positively correlated with lower levels of connectedness.

Although hypotheses 1 found no significant age difference, of significantly higher anxiety in the youngest 18-24 age group, this group did report the highest mean anxiety score, on average, which is in the direction of the hypothesis, although not statistically significant in this sample. A possibility for this is a type 2 error; failing to identity a significant result in the data, due to an insufficient sample size for hypotheses 1. Future research should conduct an a priori power analysis to determine minimum required sample sizes, to increase statistical power (Field, 2013). Post hoc power analysis indicated a total sample of N=280 is required to compare 4 groups in one-way ANOVA (at 95% power, medium effect size, p<.05). An additional limitation was unequal sample sizes between age groups. An additional aim for future study would be to include a more even spread of age-groups.

Hypotheses 2 was supported, and it was found that greater use of smartphones did result in students experiencing greater levels of anxiety. This result supports mounting research that there is a link between higher smartphone use and higher levels of mental distress (Lee et al, 2016; Demirci et al, 2015; Darcin et al, 2016). As discussed in the introduction, how students engage with their smartphone appears to have a bearing as to whether they are at risk of being exposed to mental issues. There is a greater likelihood that students who engage more with social media in particular leave themselves more vulnerable to greater mental distress (Lee et al, 2016; Darcin et al, 2016).

The results for hypotheses 3 run contrary to previous research which has found a strong correlation between greater social support and lower levels of anxiety (Van Zalk & Van Zalk, 2015; Jibeen, 2016;).

The study may have benefited from a greater representation of age-spread across the four age-groups. Younger students, those in the 18-24 age-group were overwhelmingly represented in contrast to students from the 25-34 age-group, the 35-to 44 age-group and finally the 45+ age-group. It is also plausible to deduct that the sample simply did not, overall, record significantly higher levels of anxiety that would warrant the need for social support to act as a protective factor. Moreover, the students that participated in this study may well represent a generalizable sample of the young student cohort of today (and this is a positive sign if that is the case) that while on occasion experience some degree of anxiety; on the whole are capable of managing and overcoming difficult circumstances in their lives.

The results of hypotheses 4 proved conclusive and there is a link between higher levels of smartphone use and lower levels of connectedness. This result of hypotheses 4 are in line with research demonstrating that the ability to connect and feel a sense of belonging is impaired where there is excessive reliance on smartphones (Przybylski & Weinstein, 2013).

Although the younger students are reporting greater anxiety, it is important to note that it is not within clinical anxiety levels. However, nonetheless, it is something that colleges need to be mindful of as it is clear from the results that there appears indeed be a trend for increased risk of anxiety in the youngest student cohort. Furthermore, it is evident that it appears to be the undergraduate students and not the postgraduate students that are struggling with mental health issues. This finding is unsurprising as postgraduate students have already moved through undergraduate studies and therefore have had time to adjust to all of the changes that adjusting to college life can bring (Secuban, 2012).

It is evident from the study that it is likely that the undergraduate students would benefit from greater support during the transition from secondary school to college. Colleges could give consideration how they might offer greater support to students during this transition. Colleges could apply some of the findings from this study in useful ways to support these students in their adjustment. For example, there appears to be a trend in many universities that much emphasis tends to be placed on engaging with students regularly to glean their feedback with respect to how they perceive the tuition they receive in college. Perhaps it would be timely given the rates of rising anxiety and other psychological issues for colleges to initiate greater engagement with students around issues concerning their emotional and psychological well-being. Colleges might consider how they could utilize wellbeing surveys in the same way as they monitor students' feedback and their experiences of studying in the college. A recent study has demonstrated that students would in fact be receptive to engaging with colleges in this manner (Farrer et al, 2016). Furthermore, if colleges can glean greater knowledge of some of the issues that students struggle with; they can implement methods that can help to address these specific concerns (Farrer et al, 2016). However, it is worthwhile to note that with respect to students' mental health issues; the Department of Education has stressed that it is acutely aware of the necessity to take steps to highlight issues around mental health and wellbeing and put in place procedures to help those young people that struggle psychologically (O'Brien, 2018).

Furthermore, another aspect that colleges in Ireland could focus on is the concept of 'campus connectedness' (Mondisa &McComb, 2014; Lee, Keogh & Sexton, 2002) and how they might implement practices that would facilitate connectedness amongst students on a collective level. Although it has been researched minimally to date the concept of campus connectedness may yet gain traction (Hagenauer & Volet, 2014)

The psychological benefits of experiencing a sense of connectedness can be experienced, not only when relating exclusively to another on an individual level, but can be nurtured from a collective perspective also, where students can experience a sense of belonging and identification with the college they attend (Mondisa & McComb, 2014).

In conclusion, one of the aims of the current study was to explore how technology may be impacting on students' mental health and it appears there is evidence that demonstrates that there is indeed a link between excessive smartphone use and higher levels of anxiety. However, the objective of this study is not to imply that technology use is fundamentally negative. Crucially, it is excessive reliance and overuse on smartphones that can impact on an individual's mental health (Zulkefly & Baharudin, 2009; Darcin et al, 2016). The objective is to simply bring an awareness to how some aspects of student engagement with technology can negatively impact on their wellbeing. With greater awareness and knowledge these findings can be used in such a way as to how we can avail of all of the benefits of technology without compromising mental health.

Finally, it is worth mentioning that there is in fact research that demonstrates that there are ways in which technology can influence mental health positively, increasing perceived levels of social support and facilitating connectedness (McLoughlin, Spears & Taddeo, 2018; Grieve, Indian, Witteveen, Tolan & Marrington, 2013). Perhaps, it is simply a case that society is still coming to terms with the ubiquitous presence technology has in contemporary life (Rosenberg, 2018) and it is simply necessary for there to be greater awareness and mindfulness of how students' engagement with technology can be to the benefit, or to the detriment of their mental health and wellbeing and it is certainly worthwhile to engage in further research that facilitates society's understanding of how to interact with technology in such a way as to gain the positive effects.

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Appendices

Appendix 1 - Information Sheet (p.1 of survey)

Effects of Smartphone Use on Anxiety in College Students and how Social Support and Feeling Connected Helps

My name is Anne Marie Kelly and I am a full-time final year student of the BA in Psychology in Dublin Business School (DBS). As part of my final year project I am required to carry out a research project. This research will form part of my final year assessment.

You are invited to participate in this survey. The survey consists of a number of questions designed to explore the relationship between anxiety, smartphone use, social support and feelings of connectedness to others amongst college students.

These questions have been widely used in research. However, in the event of the questions causing some minor negative feelings to arise; please refer to the final page of the survey which lists some numbers of some relevant support groups. The survey is completely voluntary, and you are under no obligation to take part. Participation is anonymous and confidential. The survey will take approximately five minutes to complete. It is necessary to inform you that because the collected responses cannot be attributed to any one person, you will be unable to withdraw your participation once the survey has been submitted. The survey will be securely stored on a password secure laptop.

It is important that you understand that by completing and handing up the survey that you are consenting to participate in this research.

If you have any questions, or concerns please feel free to contact me, or my supervisor.

Student Researcher: Anne Marie Kelly

Email address: xxxxxxx@mydbs.ie

Supervisor: Dr Pauline Hyland

Email address:

Appendix 2 - Demographic Questions (p. 2 of survey)

Please tick the appropriate answer for the following questions

1. Please indicate your gender

   Male   Female

2. Please indicate the age-group nearest to you.

   - 18-24 years
   - 25-34 years
   - 35-44 years
   - 45 years or older

3. Are you a full-time or part-time student?

   Full-time   Part-time

4. Do you attend college during the day or evening?

   Day   Night

5. Are you an undergraduate student or post-graduate student?

   Under-graduate   Post-graduate

6. Do you own a smartphone?

   Yes   No

7. If the answer is Yes, what age where you when you got your first mobile phone?
   _____.

Appendix 3 - Anxiety Sub-scale 7 items (Depression Anxiety Stress Scale - DASS 21) (p.3 of survey)

Please read each statement and tick the response which indicates how much the statement applied to you over the past week.

Statement(s)	Did not apply to me at all	Applied to me to some degree, or some of the time	Applied to me to a considerable degree, or a good part of the time	Applied to me very much, or most of the time
I was aware of dryness of my mouth				
I experienced breathing difficulty (e.g., excessively rapid breathing, breathlessness in the absence of physical exertion)				
I experienced trembling (e.g., in the hands)				
I was worried about situations in which I might panic and make a fool of myself				
I felt I was close to panic				
I was aware of the action of my heart in the absence of physical exertion (e.g., sense of heart rate increase, heart missing a beat)				
I felt scared without any good reason				

Appendix 4 - Multidimensional Scale of Perceived Social Support (MSPSS)
(p.4 of survey)

I am interested in how you feel about the following statements. Read each statement carefully. Indicate how you feel about each statement by ticking the appropriate answer.

Statement(s)	Very Strongly Disagree	Strongly Disagree	Mildly Disagree	Neutral	Mildly Agree	Strongly Agree	Very Strongly Agree
There is a special person who around if I need them.							
There is a special person with whom I can share my joys and sorrows.							
My family really tried to help me.							
I get the emotional help and support I need from my family.							
I have a special person who is a real source of comfort to me.							
My friends really try to help me.							
I can count on my friends when things go wrong.							
I can talk about my problems with my family.							
I have friends with whom I can share my joys and sorrows.							
There is a special person in my life who cares about my feelings.							
My family is willing to help me make decisions.							
I can talk about my problems with my friends.							

Appendix 5 - Smartphone Addiction Scale (SAS-SV) (p.5 of survey)

I am interested in how you feel about the following statements. Read each statement carefully. Indicate how you feel about each statement by ticking the appropriate answer.

Statement(s)	Strongly Disagree	Disagree	Weakly Disagree	Weakly Agree	Agree	Strongly Agree
Missing planned work due to smartphone use						
Having a hard time concentrating in class, while doing assignments or while working due to smartphone use.						
Feeling pain in the wrists or at the back of the neck while using a smartphone.						
Won't be able to stand not having a smartphone.						
Feeling impatient and fretful when I am not holding my smartphone.						
Having my smartphone in my mind even when I am not using it.						
I will never give up using my smartphone even when my daily life is already greatly affected by it.						
Constantly checking my smartphone so as not to miss conversations between other people on Twitter or Facebook.						
Using my smartphone longer than I had intended.						
The people around me tell me I use my smartphone too much.						

Appendix 6 - Social Connectedness Scale (p.6 of survey)

Please read each statement and tick the response which indicates how much the statement applied to you over the past week.

Statement(s)	Strongly Agree	Agree	Slightly Agree	Slightly Disagree	Disagree	Strongly Disagree
I feel disconnected from the world around me.						
Even around people I know, I don't feel that I belong.						
I feel so distant from people.						
I have no sense of togetherness with my peers.						
I don't feel related to anyone.						
I catch myself losing all sense of connectedness with society.						
Even with my friends, there is no sense of brother/sisterhood.						
I don't feel I participate with anyone or any group.						

Appendix 7 - Debrief Sheet (final page of survey)

Thank you very much for taking the time to complete this survey.

The aim of the questionnaire was to examine how an over-reliance on smartphones may be contributing to rising anxiety levels amongst students and to also explore how social support and feelings of connectedness can act as a protective factor in mental health.

If any issues have arisen as a result of filling out this questionnaire, please find below some contact details of support groups which can help.

AWARE 1800 80 48 48 (free phone) or 01 6617211

The Samaritans 116113

Should you have any questions or concerns relating to the survey please feel free to contact me through my student email address xxxxxxxx@mydbs.ie, or alternatively you can contact my supervisor at xxxxxxx@dbs.ie

Thanks again. Your participation is greatly appreciated.