

Causality Orientations as Mediators between Smartphone Addiction  
and Daytime Sleepiness in Adults with Intellectual Disabilities

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## Declaration

### Declaration

'I declare that this thesis that I have submitted to Dublin Business School for the award of HDip 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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*And also, to my Father Chris, Grandad Alf and Grandad Ross – Rest in Piece x*

## Abstract

Extant research highlights the prevalence of smartphone addiction (SA) and associated psychopathologies, including daytime sleepiness, undergraduate or school-aged students, and how self-determination predicts these behaviours. However, sparse research investigates these phenomena in adults with intellectual disabilities. Online surveys were used to determine SA risk, daytime sleepiness and self-determination scores in adults with intellectual disabilities in education. Mediation analyses found a weak positive relationship between SA and daytime sleepiness was not mediated by controlled and impersonal orientations. Cross-sectional analysis highlighted no differences in SA scores between people aged under 22 and over 21. A moderate positive relationship was found between SA, controlled and impersonal, but not autonomous orientations. Contrary to previous research with general populations, interventions reducing controlled and impersonal orientations, rather than enhancing autonomy, may be effective in reducing SA. Findings may assist future research investigating SA in people with ID, and in the Irish context.

## 1. Introduction

In 2019 it was estimated that 3.3 billion people owned a smartphone globally, with 3.8 billion projected ownership worldwide by 2021 (O’Dea, 2019). This technology has revolutionised the way people communicate and conduct their everyday lives, and simultaneously triggered concern about overuse, misuse and behavioural addiction (Panova & Carbonell, 2018). In Ireland, the 2019 Deloitte Global Mobile Consumer Survey reports that 97% of the population have access to a smartphone, with 95% of people surveyed owning such a device. Of those surveyed 56% believe they check their smart phone too much, whilst 66% stated they are trying to limit phone usage. Further, 30% report smartphone overuse has contributed to; increased levels of distraction; not getting to bed on time; and feeling they constantly have to check their phone (Howard & Hanberry, 2019).

Consequently, new disorders such as nomophobia – the irrational fear of being without, or being unable to use, a smartphone – have been cited for inclusion into the next Diagnostic and Statistical Manual of Mental Disorders (DSM; Semerci, 2019). As a result of these growing concerns reported anecdotally and in empirical research, problematic smartphone use (PSU), including smartphone addiction (SA), is an area of psychological research that has grown substantially since 2012 (Thomé, 2018). However, there is still no formal diagnostic criteria for SA (Lin et al., 2016). Whilst much extant literature highlights the impact of SA on vulnerable groups such as children and undergraduate students, scant research investigates the impact on adult students with intellectual disabilities (ID; Jenaro et al., 2017). Since 97% of the Irish population has access to a smartphone, this may be a population that is significantly under-represented in literature. As a vulnerable group, it is imperative to understand the prevalence and impact SA may have populations pre-disposed to addictive behaviours (Shogren et al., 2007).

The current study will seek to investigate SA in adult students with ID, given the plethora of research using the general population (e.g. Bukhori, Said, Wijaya & Nor, 2019). In the following review, a rationale for studying SA in adults with disabilities, the impact on daytime sleepiness, and self-determination will be outlined. Moreover, the current review will outline the inclusion of self-determination theory as a potential future theoretical framework in developing behavioural interventions for people with and without ID whom may have SA (Enwereuzor, Ugwu & Ugwu, 2016).

### *1.1 Smartphone Use*

A smartphone is defined by its enhanced functionality over traditional mobile phones, including; phone-calls, camera, satellite navigation, internet connectivity, data storage, multimedia applications, social networking and online game play (Chen et al., 2017). These devices have made previously arduous tasks easier and less costly (Lachmann, Duke, Sariyska & Montag, 2019). Given these advantages, Panova and Carbonell (2018) stress the importance of ensuring everyday smartphone use is not pathologised. For example, Twenge (2019) found that non-users of digital media had on average lower levels of wellbeing than light users of digital media. Moreover, the majority of smartphone use is pro-social in nature, which may lead to positive outcomes for wellbeing (Sarti et al., 2019). However, smartphone use has been correlated with interrelated yet distinct technological behavioural addictions (Baggio et al., 2018), including; internet addiction (So et al., 2017), internet gambling addiction (Enwereuzor et al., 2016), online gaming addiction (Petry & O'Brien, 2013) and social media addiction (Tunc-Askan & Akbay, 2019).

With an increasing heterogeneity of smartphone users with different cultural, linguistic and neuropsychological profiles, new technologies exacerbate the rise of PSU in



vulnerable groups (Sarti et al., 2019). Whilst Lussier-Deroschers et al. (2017) assert digital media can promote equal citizenship, proliferate socialisation and participation in people with ID, they recognise a gap has emerged with the general population in part due to the perceived risk of Internet access and online victimisation. Further, increased smartphone use in young adults with ID has been associated with lower quality social relationships, lower life satisfaction and poor sleep quality (Sarti et al., 2017). Given the sparsity of research on smartphone usage in people with ID, and diverging thought on the impact of smartphone use on this group, it seems pertinent to evaluate the impact of SA in adults with ID.

### *1.2 Smartphone Addiction*

SA is defined as the compulsive use of a Smartphone that is detrimental to an individual's normal daily activities and psychological wellbeing (Bukhori et al., 2019). Further, SA is classified as a technological behavioural addiction, and therefore distinct from a substance addiction (Mitchell and Hussain, 2018). Technological addictions, including SA, have been broadly associated with behaviours including; excessive use, unsatisfied desire to use, neglect of functional activities due to excessive use, a tool to escape from real world stressors, problems reducing or giving up the technology, anxiety when there is no possibility to use, and the deception of others to use technology (Savci & Aysan, 2017). In developing the Smartphone Addiction Scale (SAS), Kwon et al. (2013a) highlighted the similarity between the symptoms of internet addiction and SA. The authors therefore developed the first self-diagnostic 48 item SAS, to distinguish people who may have SA. Kwon et al. (2013b) later developed the Smartphone Addiction Scale - Short Version (SAS-SV), a shortened 10-item scale significantly correlated with the SAS (.958), developed to measure high-risk populations, therefore may be a pertinent investigative tool to utilise in the present study.

Numerous phrases to describe addictive smartphone use have been developed as the mobile technology has evolved, with SA now commonly used (Al-Barashdi Bouazza & Jabur, 2014). However, some literature still refers to PSU, due to the lack of diagnostic clarity in the DSM-V (Panova and Carbonell, 2018). Lin et al. (2016) proposes candidate criteria for inclusion onto the next DSM, with six symptom criteria (e.g. Smartphone use for a period longer than intended), four functional impairment criteria (e.g. impairment of relationships) and three exclusion criteria (e.g. behaviours better explained by a pre-existing condition).

Given the nature of SA, the impact on mental health indicators has been the focus of much research. For example, a systematic review conducted by Elhai, Dvorak, Levine & Hall (2016) found that 23 peer-reviewed correlational papers consistently related depression severity, anxiety and stress with PSU, demonstrating at least medium effect sizes. Park and Lee (2012) also found associations between mental health indicators and motives for smartphone use in Korean undergraduates, indicating that smartphone use to fulfil caring and social motives show lower levels of loneliness and depression and maintain greater self-esteem. Furthermore, Bukhori et al. (2019) found that students with higher SAS scores were significantly associated with lower achievement motivation and academic achievement. Kim, Min, Ahn, An & Lee (2019), has built on earlier work using the SAS and SAS-SV, by investigating the relationship between SA and suicide attempts, whilst accounting for confounders, such as academic impairment, familial and friendship conflict. The study found that smartphone use was significantly associated with suicide attempts, after adjusting for confounding variables. Conflicts within family and friends, poor academic performance and daytime sleepiness were also associated with smartphone use.

### *1.3 Prevalence of SA*

Literature utilizing the SAS and SAS-SV has allowed for good cross-cultural comparisons across East Asia, Europe and North America (Lopez-Fernandez, 2015). Initial studies of SA found that 19.3% of Korean participants conformed to a diagnosis of ‘abuse’ with 9.6% conforming to ‘dependence’ in the DSM-IV (Kwon et al, 2013a). An Indian study later found that 33% of a student population with 87% smartphone users had a high usage, measured by SAS scores. Using the SAS-SV, Kwon et al. (2013b) found that 24.8% of Korean students self-assessed as having signs of SA, with a further 17.4% uncertain. The study showed that adolescents and young adults are more vulnerable to SA, compare with the adult population. Chen et al. (2017) further found SA among participants at 29.8% in a sample of 1441 medical undergraduates, higher than previous Korean studies.

Findings in Asia may be higher than in west Europe, where SA levels were found to be 16.9% of 1519 students in Switzerland (Haug et al., 2015), 12.5% in Spanish students and 21.5% in francophone Belgians (Lopez-Fernandez, 2015). Lopez-Fernandez et al. (2017) conducted cross-cultural research exploring differences in SA prevalence across Europe. Findings indicate that highly dependent smartphone users are proportionately higher in countries where devices are used for maintaining communication, including social media. Results indicate young adults from Northern and Western countries (e.g. U.K. or Belgium) exhibit higher levels of smartphone dependence, as compared to eastern and southern European areas. No literature could be found studying SA in the Irish context.

There also seems to be converging cross-cultural evidence that rates of SA between genders are negligible. Bianchi and Phillips (2005) found no gender differences in the appeal of smartphone ownership, however supports evidence for differing uses. Al-Barashdi et al. (2014) notes that females smartphone use centres around pro-social applications, whereas

male usage is processional (e.g. gaming). Despite these differences, Mitchell and Hussain's (2018) study of British smartphone users found no gender differences in PSU, nor smartphone session lengths adding to an 'unequivocal' body of literature examining gender and smartphone use behaviours. A study on SA addiction in Chinese medical undergraduates by Chen et al. (2017) supports this position with similarities in the rates of SA (30.3% in males, 29.3% in females), and the symptoms of SA, such as anxiety and poor sleep quality.

#### *1.4 Differences in Smartphone Addiction by Age*

Whilst gender does not appear to have an effect on SA, research indicates that younger people, or 'digital natives' who have grown surrounded by smartphones, are most at risk of SA (Chen et al., 2017). Moreover, this age group is regarded as the most important target market and the largest consumer base of smartphone devices (Al-Barashdi et al., 2014). Haripriya, Samuel & Megha (2019) note that smartphone use during childhood is only just being understood, with people born after 2000 being more susceptible to adverse effects than people born prior. The authors state that smartphone use is antecedent to many behavioural addictions, with side effects including lower academic performance, decreased social interaction and disruption to normal sleep patterns. They conclude that because younger people spend much longer periods engaging with smartphones, they are more likely to engage in addictive smartphone behaviours.

A further study by Van Deursen, Hegner & Kommers (2015) investigating habitual and addictive smartphone behaviours in relation to age, emotional intelligence social stress and emotional regulation found older people are less likely to engage in addictive smartphone behaviours. The study asserts that because older people, on average, have higher levels of emotional intelligence than young adults, they therefore suffer less social stress and score

higher levels of self-regulation. The authors conclude that because age is negatively associated with the frequency of smartphone usage, and positively associated with self-regulation and emotional intelligence, they are less likely to develop SA. An earlier study by Bianchi and Phillips (2005) also established that older people are more suspicious of new technologies, and are therefore less inclined to engage with them. Demographic research by Berenguer et al. (2016) largely conform to this view, finding that 17% of people aged 45 to 54, and 20% of people aged 55 or more, were smartphone users in the European context. In the United Kingdom, people aged between 55 and 74 were far more likely to utilize traditional mobile devices (72%). The present review found no extant literature considering the relationship between age and SA on people with ID. Therefore, a focus of the present study is to determine whether age is a significantly correlated with SA.

### *1.5 Smartphone Addiction in People with ID*

The present review found scarce literature evaluating SA in people with ID. Lussier-Desrochers et al. (2017) define ID as a condition characterised by impairments to intellectual functioning and adaptive behaviours including learning disabilities and is present before the age of 18. A study comparing PSU in young people with and without ID, found higher rates of excessive internet and PSU in people with ID compared to people without (Jenaro et al., 2017). A cross sectional study by So et al. (2017) demonstrated differing levels of internet addiction (IA) between people with autism spectrum disorder (ASD), attention deficit & hyperactivity disorder (ADHD), or a co-morbidity of both disorders. These scores were significantly higher than a control group of typically developing adolescents.

Furthermore, a study by Sarti et al. (2017) found that adolescents with higher smartphone use were significantly associated with reduced perception of social supports and

a decreased understanding of challenging social situations. A study by Herrero, Torres, Vivas & Uruena (2019) supports these findings. The authors conducted a 3-year longitudinal study on SA and social supports, finding that participants with higher levels of SA had fewer perceived social supports. Given the strong associations between technological addictions such as SA (Baggio et al., 2018), as well as people with ID being an at-risk group for social isolation (Lussier-Desrochers et al., 2017), further research is needed to establish the nature of SA in adults with ID.

### *1.6 Smartphone use and Daytime Sleepiness*

Daytime sleepiness has numerous associations with technological addictions and can be defined as the subjective experience of difficulty sustaining alertness whilst awake, typically with quick onset during sedentary situations (Manzar et al., 2019). No research could be found implicating PSU or SA with daytime sleepiness in people with ID, despite the plethora of literature in the wider population (Thomee, 2018). For example, Haripriya, et al. (2019) found a moderately significant positive correlation between SA and sleep quality in Indian college students. Similar results were found in Turkish students, where SAS scores were positively correlated with depression, anxiety and poor sleep quality (Demirci, Akgonul & Akpinar, 2015). A further Indian study concluded that adolescents with high SAS scores are more likely to develop significant sleep and behavioural problems (Soni, Upadhyay & Jain, 2017). A Brambilla et al. (2017) study on sleep habits of one to 14-year olds determined that video devices, including smartphones, are a significant modifiable risk factor for improving sleep abnormalities during childhood. Similarly, prolonged social media usage, particularly using smartphones in bed, has been associated with elevated levels of daytime sleepiness in undergraduate students. (Nasirudeen et al., 2017).

Daytime sleepiness is distinct from fatigue, which refers more broadly to general or localised feelings of physical tiredness (Karuska, Mosaad & Kader, 2019). Nasirudeen et al (2017) highlights that behavioural factors, such as SA, can override homeostatic or circadian factors in the regulation of sleep, leading to an overall reduction of sleep hours. Bukhori et al. (2019) highlights the negative significant correlation of achievement motivation and SA on learning achievement, suggesting that reduced sleep hours may account for these effects. Kaur and Singh (2017) study of overall sleep hygiene on daytime sleepiness supports these findings. The authors attributed poor behavioural practices at bedtime to excessive daytime sleepiness, suggesting that behavioural interventions prior to sleep are vital to regulate and maintain a natural circadian clock, which regulates sleep. Daytime sleepiness is prevalent in people with ID, with estimated prevalence rates between 8.5% and 34.1% (van den Wouw, Evenhuis & Echteld 2012), as well as in older people (Hwangbo et al., 2015). Therefore, identifying potential antecedents, such as SA, may be crucial in future sleep interventions for this population.

### *1.7 Self-Determination Theory*

Self-Determination Theory (SDT) is a potential theoretical framework to develop behavioural interventions for SA and daytime sleepiness. SDT is a theory of motivation, which emphasizes an organismic-dialectic view of human behaviour (Deci & Ryan, 2004). The organismic perspective conceives of humans as growth-oriented organisms whom seek and engage environmental challenges, however social environments may enhance or block an individual's tendencies (Deci & Ryan, 2004). This dichotomy emphasizes autonomy versus control behaviour and establishes the degree to which behaviour is elective (Smith, 2011). Furthermore, SDT argues individuals must develop a sense of autonomy and competence in

order to self-regulate and sustain behaviours conducive to health and well-being (Smith, 2011).

SDT posits regulatory styles for extrinsic motivators, which can be used by researchers to predict performance and well-being (Deci and Ryan, 2004). These regulatory styles, or causality orientations, index aspects of personality integral to the regulation of behaviour (Deci & Ryan, 2004). Therefore, three causality orientations are proposed across a continuum (Deci & Ryan, 1985); the Autonomy orientation relates to behavioural regulation on the basis of self-interest and self-endorsed values; the Controlled orientation involves orienting behaviour towards external directives and control; and, the Impersonal orientation focuses on amotivation, suggesting an individual enacts behaviours despite perceiving no value in performing the behaviour, or experiences such a low sense of competence they disengage (Deci & Ryan, 2004).

Conversely, autonomy orientations refer to the extent behaviours are self-endorsed. Therefore, it is possible to act autonomously whilst still following social norms, requests or following demands (Ryan & Ryan, 2018). Shogren et al. (2007) highlights that an individual's perceptions and beliefs influence their capacity for self-determination. Moreover, Kuem, Khansa and Kim (2020) posit that high autonomy scores (GCOS-A) indicate fulfilment of autonomy, competence and relatedness, whereas high Controlled scores (GCOS-C) would indicate possible fulfilment of only competence and relatedness. SDT posits that causality orientations are not correlated, however relationships approaching significance have been found between impersonal (GCOS-I) and GCOS-A scores ( $p = .54$ , Stephens, Constantinescu, Ugur & Constantinescu, 2015). This supports the view within SDT research that causality orientations are largely disparate resulting from the differing sources of behavioural regulation (Deci & Ryan, 2004).



Furthermore, various studies have shown that people reporting higher levels of self-determination are less likely to engage in addictive or destructive behaviours. Lachmann et al. (2019) found a common personality structure linked to PSU, including low will-power within trait self-directedness, which may reflect 'core' technological addictions. Contrarily, autonomy-oriented people exhibited greater levels of self-regulatory behaviour, when compared to impersonal or controlled-oriented people, because the individual makes choices that cohere to one's needs, values and aspirations. For example, Kuem et al. (2020) found causality orientations dictate how people depict themselves in online communities, with autonomous individuals presenting a truer self-definition than those with controlled orientation. Cheng, Pan and Ni (2019) support this view, however, emphasize that the controlled orientation is the most frequently active among online communities. Ohly and Latour (2014) also found that autonomous motivations for smartphone use in the evening was positively related to recovery, psychological detachment and positive affect at smartphone disengagement.

People with ID use social networks to fulfil the need for relatedness and share their own personalities, without being labelled as 'disabled', as well as developing a sense of agency and social support (Chadwick and Fullwood, 2018). ICT's such as smartphones may fulfil autonomy, relatedness and competence within the framework of SDT. However, Bender and Gentile (2019) suggest that online video games may be too good at satisfying basic human needs compared with everyday life. They posit that an overreliance on video games, coupled with an impoverished satisfaction of needs in real life may be one of the mechanisms contributing to technological addictions. Shogren et al (2007) however asserts that there is still a paucity of research on ecological predictors that produce self-determination in students with ID. Additionally, deficits in self-regulation are found in a large number of psychological disorders, such as ADHD, addiction and impulse control disorders (Legault & Inzlicht, 2013).

### *1.8 Interventions using Self-determination Theory*

SDT has been used to develop numerous behavioural interventions, however Williams et al. (1996) asserts that behaviour change will only occur when autonomously oriented. Their study on weight loss interventions found that more autonomous participants attended the program more regularly, particularly with supportive clinical staff. Lee, Lee and Lee (2016) support this view regarding the mediation of smartphone usage in adolescents. They found parental restriction and school prevention programs tended to increase the likelihood of SA, suggesting that mediational strategies are weak in an adolescent population. A Korean PSU intervention program by Kwon and Yu (2020) found that promoting autonomous motivation, also improved relatedness and perceived competence, the three basic needs in the SDT framework. They suggest smartphone overdependence program based on SDT can improve participants basic psychological needs and their ability to self-regulate. Liu, Xiao, Yang and Loprinzi (2019) investigated an exercise intervention as an alternative treatment for SA, finding participants showed significantly greater reduction of SA scores when attending treatment programs for more than 12 weeks. Research into such interventions should incorporate SDT frameworks to understand the impact of intrinsic, autonomous motivation (Teixeira et al., 2012).

### *1.9 Rationale, Aims and Hypotheses*

The present study aims to investigate role of age and general causality orientations in SA risk and daytime sleepiness of adult students with ID. Empirical research sheds light on the impact of PSU in high risk groups such as adolescents and university students, however there is scant research on adult with ID engaged in education. Given the severe impact of SA in general population, it seems valid to explore SA in people with ID, who are susceptible to addictive and unhealthy behaviours, including daytime sleepiness (Sarti et al., 2017).

Furthermore, if a relationship can be found between Controlled and Impersonal causality orientations as mediators between SAS-SV scores and daytime sleepiness, and if there is a significant relationship between autonomy orientations and SAS-SV scores, such findings may offer insight into future interventions utilising SDT. Finally, whilst age is shown to be a significant factor in SAS and SAS-SV scores across general populations, there is scant empirical research known about whether age plays a factor in determining SAS-SV scores in people with ID.

Therefore, the present study will investigate the following hypotheses;

#### *Hypothesis 1*

- a. There will be a significant relationship between SAS-SV scores and Daytime Sleepiness in students with ID.
- b. There will be a significant relationship between Age and Daytime Sleepiness in students with ID.

#### *Hypothesis 2*

There will be a significant difference in SAS-SV scores between those aged 21 and under, and those aged over 21.

#### *Hypothesis 3*

- a. There will be a significant indirect relationship between SAS-SV scores, through GCOS-C, on Daytime Sleepiness scores in students with ID.
- b. There will be a significant indirect relationship between SAS-SV scores, through GCOS-I, on Daytime Sleepiness scores in students with ID.

#### Hypothesis 4

There is a significant relationship between GCOS-A scores as predictors of;

- a. SAS-SV scores
- b. Daytime Sleepiness scores.

## 2. Methodology

### 2.1 Design

This quantitative study utilised a simple mediation analysis to investigate the indirect relationship of SAS-SV scores, through GCOS scores, on daytime sleepiness (Sharma, 2015). A cross-sectional design was used to establish the relationships between SAS scores and people aged under or over 21. An online survey was employed, which comprised demographic questions on age and gender, and surveys to measure psychological variables, including the Smartphone Addiction Survey – Student Version (SAS-SV; Kwon et al., 2013), the Epworth Sleepiness Scale (ESS; Johns, 1991) and the General Causality Orientations Scale (GCOS; Deci and Ryan, 1985).

### 2.2 Ethics

Before research commenced, ethical approval was granted by Dublin Business School ethics committee and the Rehab Group board of ethics on the basis of processes protecting participant's wellbeing. The present study upholds the code of professional ethics of the Psychological Society of Ireland (PSI, 2019), Dublin Business School Ethical Guidelines for Research with Human Participants, and the Rehab Group Research and Ethics Policy. Careful attention to ethics is essential given the vulnerable nature of people with ID. Specifically, the researcher was not present whilst participant's completed surveys, to avoid the risk of coercion. However, the researcher was present to deliver pre-briefing to ensure all participants were aware of their right to informed consent, anonymity and withdrawal from participation at any stage before submission of results. Participants were made fully aware of psychological supports and multi-disciplinary team immediately available to them in their training centres, if they required support as a result of participating in the research.

### *2.3 Participants*

Non-probability purposive sampling was used to recruit participants from an Irish specialist training provider for people with ID. Participants were adults aged between 18 and 65 with ID engaged on a formal training program across County Dublin. Participants were recruited through in-class information sessions, where the researcher engaged with staff and students, whom subsequently gave consent to participate. Participants were instructed that participation was voluntary, anonymous and that no incentives were available. Moreover, several exclusion criteria were included, such as those unable to give consent, and those with a co-morbid mental health disorder or sleep disorder, identified by an in-centre multi-disciplinary team prior to survey collection. In total, 76 people responded via Microsoft Forms, of which 7 were omitted due to incomplete data (N=69). Participants age ranged from 18 to 54, with a mean age of 25.59 (SD=8.66). Of participants included, 63.2% were male (n=43), and 36.8% female (n=25), with 1 participant choosing not to say.

### *2.4 Materials*

The questionnaire was distributed using a short-URL hyperlink that directed participants to the online survey designed using Microsoft Forms (Appendix A). The opening webpage displayed all information with regards research focus, the right of the participant to withdraw before completion, anonymity, and consent. Contact details of the researcher and research supervisor were also included (Appendix B). Compulsory questions including consent and being aged 18 plus were asked, before allowing access to the survey. The survey was comprised of four sections. The first section asked for age and gender, including 'prefer not to say' options. The next three sections comprised of statistically valid and reliable surveys, the

ESS, GCOS and SAS-SV. None of these surveys contain diagnostic thresholds and are therefore suitable for this study.

#### *2.4.1 Epworth Sleepiness Scale*

The ESS is a short 8-item self-administered questionnaire (Appendix C) that measures participant's general level of daytime sleepiness based on activities considered 'most sleepy' when encountered in daily life (Manzar et al., 2019). The most soporific examples on the survey include "*lying down to rest in the afternoon when circumstances permit*" and "*sitting quietly after lunch without alcohol*". Other situations were included where only sleepy people would be expected to doze off. For example, "*sitting and talking to someone*" or "*in a car whilst stopped for a few minutes in traffic*" (Johns, 1991). Participants were asked to rate how likely they were to doze off on a four-point likert scale; 0 "would *never* doze"; 1, "*slight* chance of dozing"; 2, "*moderate*" chance of dozing; 3, "*high*" chance of dozing. Scores range from 0 to 24 with scores exceeding 10 indicating abnormal levels of sleepiness (Kaur & Singh, 2017). The ESS has a high level of internal consistency ( $\alpha = .88$ ), with only one factor produced by factor analysis (Johns, 1992). This measure was chosen for its simplicity in view of challenges the participant group may have completing surveys.

#### *2.4.2 General Causality Orientations Scale*

The General Causality Orientations Scale (GCOS) is a 36-item scale incorporating three subscales of autonomy (GCOS-A), control (GCOS-C) and impersonal (GCOS-I) (Deci & Ryan, 1985). The present study utilizes the 12-vignette version, whereby 12 fictitious scenarios are presented (Appendix D). In each scenario an autonomy, control or impersonal oriented response is presented and participants must answer the likelihood they would respond to each situation on a 7-point likert scale; 1, "very unlikely"; midrange, "*moderately likely*"; to 7, "*very likely*". The vignettes vary across domains of achievement and interpersonal relationship. For

example, a new job, being a parent, attending a party and organizing a party are posed with potential responses including; (A) “*I wonder if the new work will be interesting?*”; (C) “*Will I make more in this position?*”; (I) “*What if I can’t live up to this new responsibility?*”. The internal reliability and validity of the GCOS has been demonstrated with Cronbach’s alpha values of .86 for autonomy, .71 for control and .76 for impersonal (Şen & Dağ, 2016). The test-retest coefficient for the total scale over a 3-week period was .81, with a total variance of 32.4% (Şen & Dağ, 2016). The GCOS was chosen because it is the most widely used scale to measure the causality orientations of behaviour within the framework of SDT (Dağ & Şen, 2018).

#### 2.4.3 Smartphone Addiction Scale – Short Version

The Smartphone Addiction Scale – Short Version (SAS-SV; Kwon et al., 2013) is a short self-evaluative 10-item version (Appendix E) of the 33-item Smartphone Addiction Scale (SAS; Kwon et al., 2013). The scale is designed for early screening of smartphone addiction in adolescents who are considered vulnerable to addiction and does not possess diagnostic criteria. Further, it can be used to identify high-risk groups susceptible to smartphone addiction (Kwon et al., 2013). Therefore, this scale is suitable for the present study, as research suggests people with ID are potentially a group vulnerable to addictive behaviours such as SA (Sarti et al., 2017).

Participants use a 6-point likert scale to rate the extent they agree or disagree with 10 items relating to smartphone use; 1, “*strongly disagree*”; 2-3, “*somewhat disagree*”; 4-5 “*somewhat agree*”; 6 “*strongly agree*”, with a total range from 10 to 60. Factors shown to be consistent with SA used in the SAS-SV include; craving of, or withdrawal from, a smartphone, daily-life disturbance, tolerance, and preference towards cyberspace-oriented relationships (Kwon, Yang & Kim, 2013). For example, “*missing planned work due to smartphone use*” exemplifies an instance of daily-life disturbance, and “*won’t be able to stand not having a*



*smartphone*” of the tolerance factor. The SAS-SV has good internal consistency and reliability ( $\alpha = .91$ ), with high concurrent validity with the SAS (.958,  $p < .001$ ).

### *2.5 Procedure*

Once approval was given at management level, staff in training centres were approached via email or telephone to conduct survey information briefs in class. Once access to individual classes was organised, the researcher attended centres to describe the purpose, nature and ethical considerations of the research with students and answer further questions. Students were then provided with an information page, and a further slip including the short-URL link to the Microsoft Forms survey (Appendix A). To ensure no coercion took place the researcher was not present for students whom wished to complete the survey during class time. Furthermore, the short-URL link was provided if students wanted to complete the survey outside of their centre. Participants utilising PCs in-centre were directed to use Microsoft Edge with assistive technology Immersive Reader for those with literacy needs. Centre staff were also available to assist with literacy needs where necessary. After completing the survey, the researcher returned to debrief students, highlighting the supports available in-centre, the anonymity and confidentiality of the research and the overall research goals (Appendix F). On average, participants took 16:31 minutes to complete the survey. In total the survey was open for seven weeks, across January and February 2020.

### *2.6 Data Analysis*

Data was collected using Microsoft Forms, collated in Microsoft Excel and transferred to SPSS 26 where data was prepared and statistical analysis were run. Descriptive and reliability analyses were first run. Next, Spearman’s Rho analysis assessed the associations between variables. Hayes & Rockwood (2020) Ordinary Least Squares regression analysis was run via the PROCESS macro for SPSS to conduct the mediational analysis. This analysis established

the indirect relationship between the independent and dependent variables (Sharma, 2015).

Finally, a Mann-Whitney U test was conducted to compare the rates of SAS-SV scores between adults 21 and under, and adults over 21.

### 3. Results

The results section will use descriptive statistics to summarize the demographic information and provide insight into how the participant group scored on the psychological measures. An evaluation of measure validity will also be described. Inferential statistics will describe the results of non-parametric testing and discuss whether the null hypotheses may be accepted or rejected based on the available data.

#### 3.1 Participant Demographics

Descriptive statistics were run to better understand the sample group surveyed, before inferential statistics were run to test the research hypotheses. In total, 69 participants responded to all questions on the online survey, with 43 males (62.3%), 26 females (36.2%), with one participant preferring not to say (1.4%). Two further respondents were under 18 and one participant did not answer sufficient survey questions, thus were excluded from the study. Table one outlines the demographic statistics of the participant group.

**Table. 1 Descriptive Statistics for Demographic Variables**

Variable	N	Valid				
		(%)	Mean	SD	Min	Max
<b>Gender</b>						
Male	43	63.2				
Female	25	36.8				
Total	68	100.0				
Missing	1					
Total	69					
<b>Age</b>						
Valid	68		25.59	8.66	18	54
Missing	1					
Total	69					

21 and Under	34	50
Over 21	34	50
Total	68	100

The mean age of participants is 25.59 years ( $SD=8.66$ ) with a range of 18-years-old to 54-years-old. An equal number of people were 21 and under, as were over 21, indicating the mean age lies toward the bottom of the range.

### 3.2 Descriptive statistics of Psychological measures

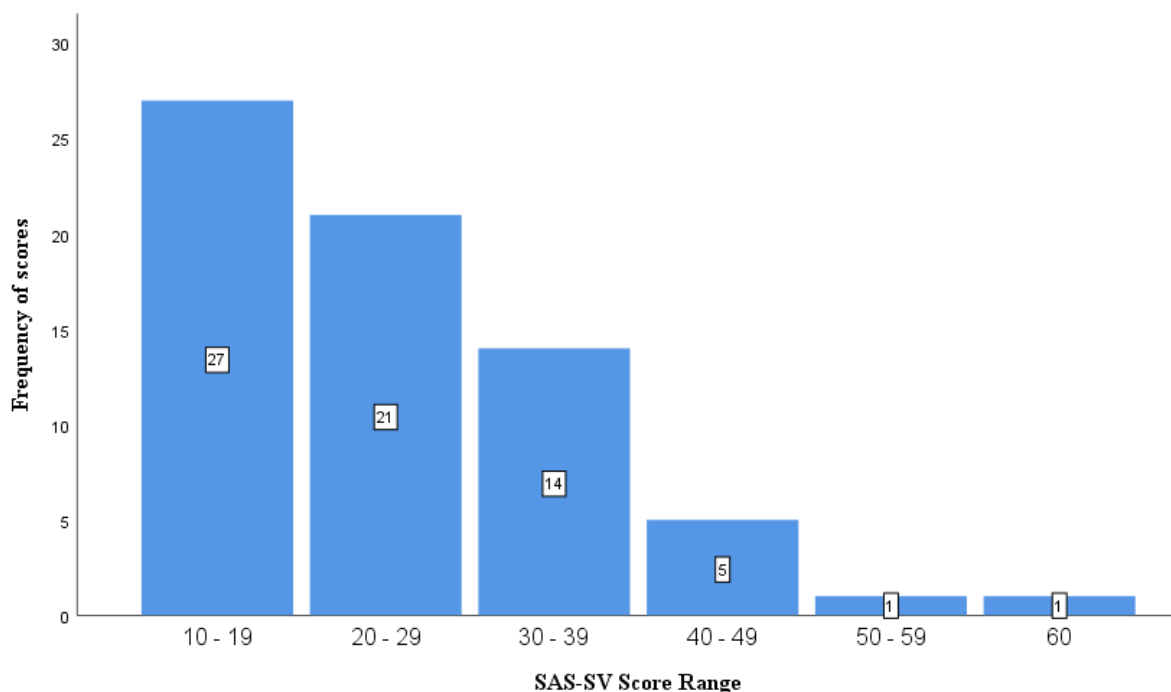
Three psychological measures were used, including the SAS-SV, ESS and the GCOS scale broken into three subscales for three distinct causality orientations; Controlled, Impersonal and Autonomous. Descriptive data is presented below in Table 2.

**Table. 2 Descriptive statistics for Psychological Variables**

Variable	Valid					
	N	(%)	Mean	SD	Min	Max
<b>SAS-SV</b>	69	100.0	24.61	11.36	10	60
<b>ESS</b>	69	100.0	5.51	4.22	0	18
<b>GCOS-C</b>	69	100.0	49.03	11.97	13	75
<b>GCOS-I</b>	69	100.0	44.58	12.79	12	73
<b>GCOS-A</b>	69	100.0	57.83	12.97	12	80

The mean scores for GCOS show that participants have higher scores for Autonomy orientation ( $M=57.83$ ,  $SD=12.97$ ), than both Controlled ( $M=49.03$ ,  $SD=11.97$ ) and Impersonal ( $M=44.58$ ,  $SD=12.79$ ) orientations, indicating that participants are generally more Autonomously motivated, than Controlled or Impersonal. The range for each orientation further showed that some participants scored lowest (12) and close to maximum possible

score (84) for each orientation. The mean scores indicate mid-range scores in each causality orientation for this participant group. ESS scores of daytime sleepiness indicate mean scores ( $M=5.51$ ,  $SD=4.22$ ) fall below the threshold for abnormal daytime sleepiness, in which eight participants scored above (10, Kaur and Singh, 2017), however the maximum score in the range (18) indicates a prevalence of daytime sleepiness. The mean score for SAS-SV (24.61,  $SD=11.36$ ) provides evidence that on average the current participant group falls below the threshold of 31 for presence of SA risk (Kwon et al., 2013). Figure 1 shows frequency of scores in multiples of 10 from minimum to maximum scores (10 – 60).



**Figure 1: Column Graph showing frequency of SAS-SV scores across the Range**

In total 69.6% of participants (48) scored below the threshold, indicating a prevalence of potential SA Risk of 30.4% in the sample. Two participants scored 50 or more, with the highest frequency of scores occurring in the lowest range; 10-19 (27 participants).

### 3.3 Measure Validity

Table 3 shows internal reliability for each measure, found using reliability analysis in SPSS to determine Cronbach's alpha.

**Table. 3 Internal Reliability of Psychological Measures**

Variable	N	$\alpha$
<b>SAS-SV</b>	10	.87
<b>ESS</b>	8	.73
<b>GCOS-C</b>	12	.78
<b>GCOS-I</b>	12	.79
<b>GCOS-A</b>	12	.83

All the alpha values, calculated with scores from participant data (N=69), indicate at least satisfactory internal reliability for each scale, for the ESS ( $\alpha=.73$ ), GCOS-C ( $\alpha=.78$ ) and GCOS-I ( $\alpha=.79$ ). SAS-SV scores ( $\alpha=.87$ ) and GCOS-A ( $\alpha=.83$ ) scores were found to have high internal consistency. Results verify previous findings of internal reliability for each scale (Johns, 1992; Sen & Dağ, 2016; Kwon et al., 2013).

### 3.4 Inferential Statistics

A Shapiro-Wilk test found data for ESS and SAS-SV violated test for normal distribution ( $p<.01$ ) and therefore Spearman's Rho and Mann-Whitney U non-parametric tests were used to evaluate whether null hypotheses could be rejected or accepted. Because distribution of scores for each dependent variable is non-normal, a causal relationship could not be inferred from these analyses. Figure 2 and 3 shows the non-normal distribution of ESS and SAS-SV respectively.

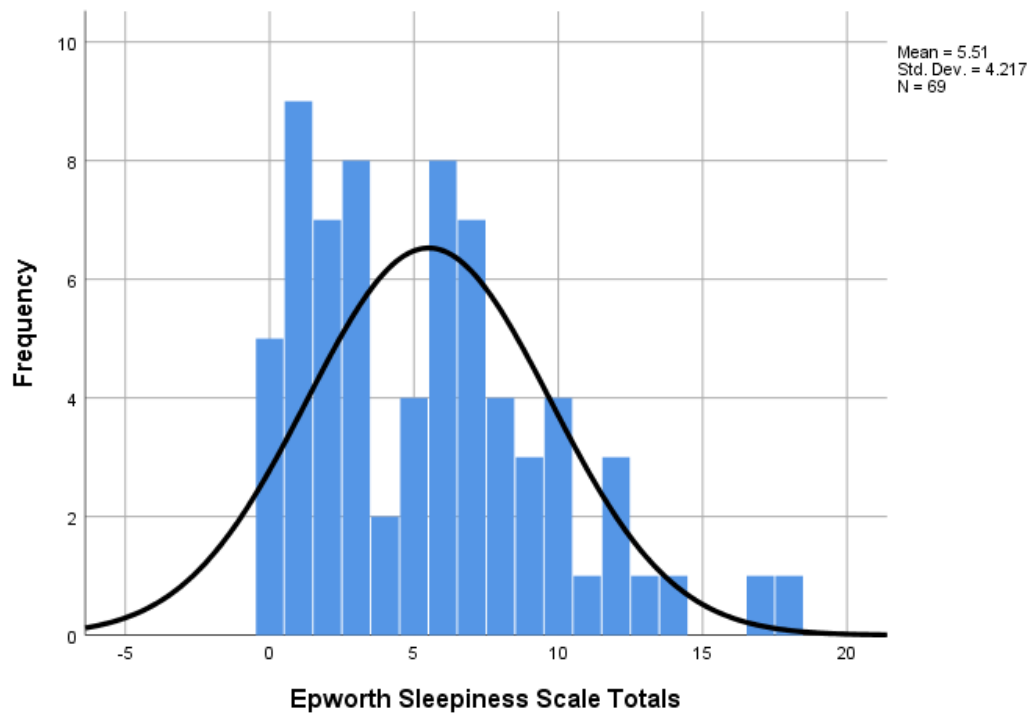


Figure 2. Histogram and normal distribution curve highlighting the non-normal distribution of ESS scores.

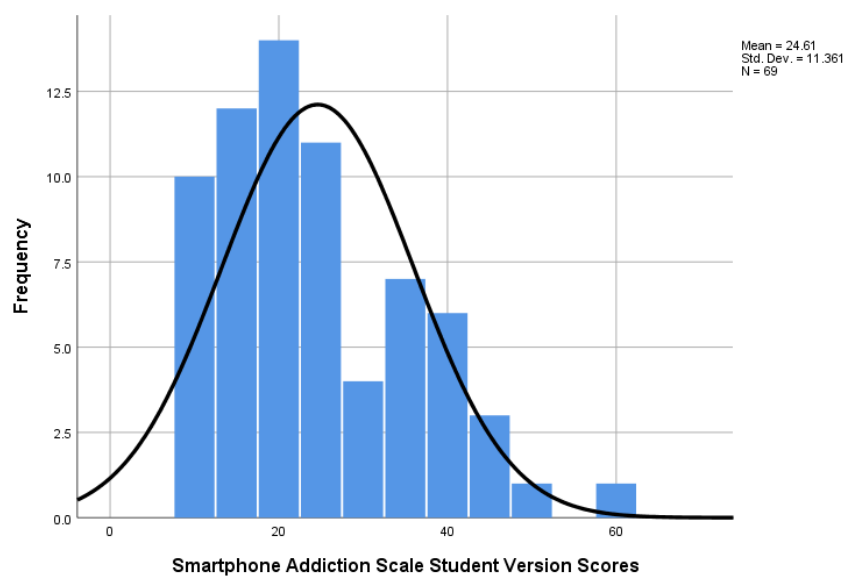


Figure 3. Histogram and normal distribution curve highlighting the non-normal distribution of SAS-SV scores.

The non-normal distribution of dependent variables shown in Figures 2 and 3, meant that mediation analysis for hypothesis 3 was conducted with Haye's PROCESS macro for SPSS, with unstandardized indirect effects computed for 5000 bootstrapped samples.

### *Hypothesis 1*

Hypothesis 1a stated that there would be a significant relationship between SAS-SV scores (M=24.61, SD=11.36) and daytime sleepiness (M=5.51, SD=4.42). Hypothesis 1b stated there would be a significant relationship between Age (M=25.59, SD=8.66) and daytime sleepiness. Spearman's Rho tests were conducted to determine the nature of the association between each variable. Table 4 highlights the correlation coefficients and significance for the relationship between each variable.

**Table 4. Correlations between ESS, SAS-SV scores and Age.**

Variable	SAS-SV scores	Age
ESS scores		
Correlation	.261	.138
Sig. (2-tailed)	.031	.258
SAS-SV scores		
Correlation		.197
Sig. (2-tailed)		.105

Results of Spearman correlation indicate that there was a significant positive association between SAS-SV scores and ESS scores ( $r_{s(69)} = .26$ ,  $p = .031$ ), therefore the null can be rejected for hypothesis 1a. However, age did not significantly predict ESS scores ( $r_{s(69)} = .138$ ,  $p = .258$ ), or SAS-SV scores ( $r_{s(69)} = .197$ ,  $p = .105$ ). Therefore, the null cannot be rejected for hypothesis 1b. Results indicate a small to moderate positive correlation between SAS-SV scores and ESS scores.

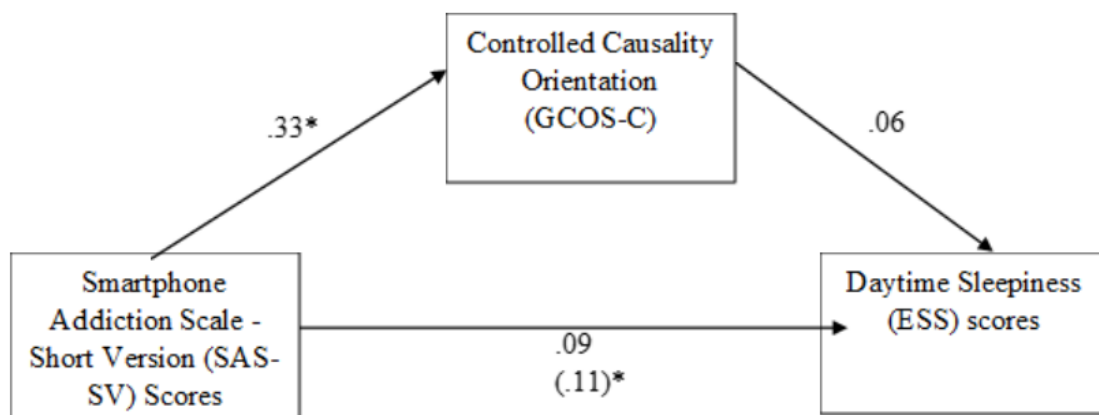


### *Hypothesis 2*

Hypothesis 2 stated there would be a significant difference in SAS-SV scores between those aged 21 and under, and those aged over 21. A Levene's test for homogeneity was conducted and found variances for SAS-SV scores between groups was not statistically significant,  $F(1,66) = .132, p = .718$ . Next, A Mann-Whitney U test indicated that SAS-SV scores do not significantly differ between participants aged 21 and under (Mdn= 21) and participants aged over 21 (Mdn=25),  $U=716, p=.09, r=1.694$ . Therefore, the null cannot be rejected.

### *Hypothesis 3*

To investigate Hypothesis 3a, the indirect relationship between smartphone addiction scores, through controlled orientation, on daytime sleepiness, a simple mediation analysis was performed using the PROCESS macro for SPSS. Figure 4 highlights that there was a small standardised indirect effect approaching significance of,  $(.33)(.06) = .02$ , CI  $(-.05, .14)$ . Therefore, the null cannot be rejected.



*Figure 4.* Standardised regression coefficients for the relationship between SAS-SV scores and ESS Scores as mediated by CCOS-C. The standardised regression coefficient between SAS-SV and ESS scores, controlling for GCOS-C is in parenthesis.

\* $p < .05$ .

To investigate Hypothesis 3b, the indirect relationship between smartphone addiction scores, through Impersonal orientation, on daytime sleepiness, a simple mediation analysis was performed using the PROCESS macro for SPSS. Figure 5 shows there was a small standardised indirect effect approaching significance of,  $(.35)(.03) = .01$ , CI  $(-.04, .12)$ . Therefore, the null cannot be rejected.

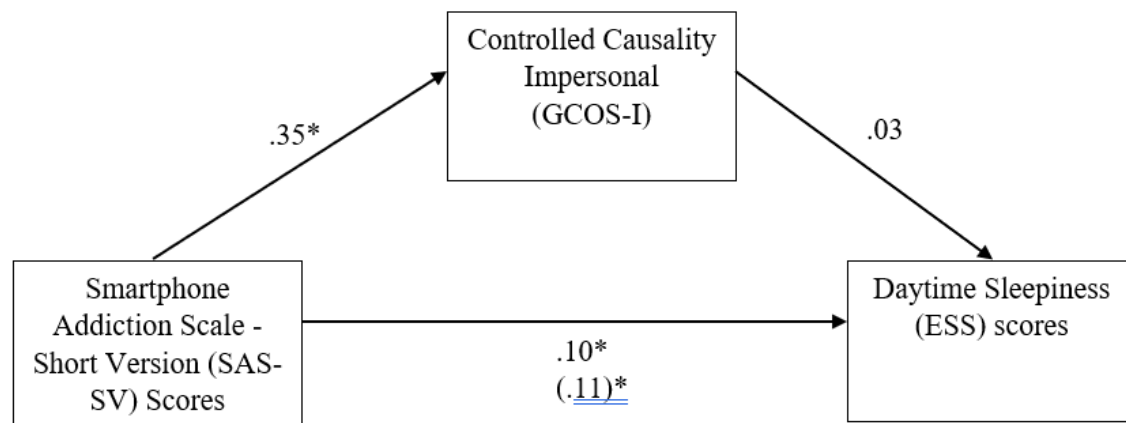


Figure 5. Standardised regression coefficients for the relationship between SAS-SV scores and ESS Scores as mediated by CCOS-I. The standardised regression coefficient between SAS-SV and ESS scores, controlling for GCOS-I is in parenthesis.

\* $p < .05$ .

Mediation effects of both Controlled and Impersonal orientations were found to be approaching significance, as seen in Table 5.

Table 5. Results of standardised significance tests for GCOS-C and GCOS-I as mediators between SAS-SV and ESS scores.

	Coeff	p-value (95%)	LLCI	ULCI
<b>GCOS-C</b>				
Total Effect	.11	.015	.02	.20
Direct Effect	.09	.051	-.001	.18
Indirect Effect	.02		-.05	.14
<b>GCOS-I</b>				

Total Effect	.11	.015	.02	.20
Direct Effect	.10	.038	.01	.19
Indirect Effect	.01		-.02	.19

---

Table 5 highlights standardised significance indicators for both mediation tests. Confidence Intervals for Indirect effects in both tests include zero, indicating that GCOS-C and GCOS-I are not mediating variables between SAS-SV and ESS scores. However, linear regression test for the causal relationship between SAS-SV and ESS Total effects between were shown to be significant, when controlling for both mediators. The slope coefficient was .11 ( $p < .015$ ) between SAS-SV and ESS. Regression analysis also revealed a significant positive medium relationship between SAS-SV scores and GCOS-C scores, with a slope coefficient of .33 ( $p < .008$ ), as shown in Figure 4. A significant positive medium relationship was also found between SAS-SV scores and GCOS-I scores, with a slope coefficient of .35 ( $p < .009$ ), as shown in Figure 5.

#### *Hypothesis 4*

Hypothesis 4a stated there would be a significant relationship between GCOS-A ( $M = 57.83$ ,  $SD = 12.97$ ) and SAS-SV scores. A Spearman's Rho test found GCOS-A did not significantly predict SAS-SV scores ( $r_s(69) < .01$ ,  $p = .993$ ). No relationship could be inferred; therefore, the null cannot be rejected. Hypothesis 4b stated there would be a significant relationship between GCOS-A and ESS scores. A Spearman's Rho test indicates that GCOS-A is not significantly correlated with ESS scores ( $r_s(69) < .01$ ,  $p = .981$ ), therefore the null cannot be rejected.



## 4. Discussion

The purpose of this study was to investigate the role of age and causality orientations in smartphone addiction (SA) risk and daytime sleepiness in adult students with intellectual disability (ID). People with ID are a potential high-risk group to behavioural addictions such as SA. Despite this, and given the widely reported prevalence of SA in the general population, there is scant research in this area surrounding this population. A further research question drawn from the literature focused on determining the prevalence of SA in people with ID in the Irish context. Recent empirical studies of interventions for SA in the Korean context have utilised Self-determination Theory (SDT), which posits regulatory styles for extrinsically motivated behaviours can be used by researchers to predict performance and wellbeing (Deci & Ryan, 2004).

### *4.1 Research Findings and Implications*

Results of Hypothesis 1a indicate a weak-to-moderate positive correlation between SAS-SV and ESS scores in adults with ID, suggesting that as SAS-SV scores increase, levels of daytime sleepiness increase. These findings support research in Indian college students, where a significant moderate correlation was found between SA and daytime sleepiness (Haripriya et al., 2019). Similarly, Demirci et al. (2015) found significant differences in daytime sleepiness between high-use, low-use and non-smartphone user groups. Results are concurrent with Nasirudeen et al. (2017), whom implicate prolonged smartphone use at bedtime with elevated levels of daytime sleepiness. This finding may be significant because behavioural factors like PSU or SA can override biological circadian factors in sleep regulation (Kaur and Singh, 2017). Furthermore, PSU is a significant modifiable risk factor for improving sleep abnormalities (Brambilla et al., 2017). Thus, future interventions for

abnormal sleep and daytime sleepiness may consider the impact of smartphone use as an antecedent behaviour.

Results for Hypothesis 1b did not find a significant relationship between age and daytime sleepiness, therefore the null could not be rejected. Results suggest age does not significantly contribute to daytime sleepiness in adult students with ID. This finding contradicts previous research exploring general populations such as Hayley et al. (2013) who found the prevalence of excessive daytime sleepiness increased by age, with over 80's experiencing rates approaching one-third of the Australian population. Further, this research has been supported by Hwangbo et al. (2015), who found the prevalence of daytime sleepiness was 15.5% of 60-year-olds compared to 9.7% of 29-year-olds. Both studies considered the general population, therefore contrary findings may be the specificity of the current sample. For example, van de Wouw et al. (2012) suggest that impaired sleep is common in people with ID. Moreover, they assert previous prevalence rates have been established via subjectively derived data thus further objectively derived research is needed. The current study may indicate prevalence rates of daytime sleepiness in adults with ID are different to the general population.

Next the present study sought to establish differences in SAS-SV scores in people with ID who were 21 and under, or, over 21. Hypothesis 2 utilised a cross-sectional design finding no differences in SAS-SV scores between the age groups. Results of Spearman's Rho analysis conducted for Hypothesis 1 also indicate that age and SAS-SV scores are not significantly correlated. Much prior research has focused on adolescents (e.g. Kwon et al., 2013) and young adults such as undergraduates (Chen et al., 2017), who are seen as high-risk groups for SA and associated psychopathologies. Results are contrary to Van Deursen et al. (2015) whom found that older people generally have higher levels of self-regulation than younger people, therefore will be less prone to SA. Present findings suggest that people over

21 with ID may be as likely to present high SAS-SV scores as those aged 21 and under. This may support the conclusions of Jenaro et al. (2017) who assert that the framework of support needs to be considered for all people with ID's, regardless of age, for safe access to ICTs such as smartphones.

Hypothesis 3 investigated the relationship between SA and daytime sleepiness, when mediated by causality orientations. The effects of Controlled and Impersonal causality orientations were examined in a simple mediation model. Results indicate that neither Controlled or Impersonal orientations mediate the relationship between SA and Daytime sleepiness. However, causal relationships in the mediated pathway were approaching significance in both the Controlled (Figure 4) and Impersonal mediation models (Figure 5). When controlling for mediator variables, regression analysis showed a significant weak causal relationship between SA and Daytime Sleepiness. Although there was a small effect size the present results support previous literature, that indicate SA and PSU are antecedent behaviours to sleep disorders (Brambilla et al., 2017).

An important factor in understanding future programs of intervention, is identifying the causal relationship between causality orientations and the ecological factors like SA (Shogren et al., 2007). Results suggest that SAS-SV scores had a significant positive medium effect on both Impersonal and Controlled causality orientations. Participants reporting higher SA risk were more likely to be a-motivated, or extrinsically motivated. This suggests that levels of SA in the current population may reduce the sense of autonomy needed to sustain self-regulating behaviours conducive to well-being (Smith, 2011).

The present study found sparse literature considering the impact of SA on causality orientations in the framework of SDT. Findings may support Lachmann et al. (2019) who found PSU was linked to lower trait will-power, which may explain the causal relationship

between SA and Impersonal orientations. Furthermore, deficits in self-regulation have been found across a large number of psychological disorders, including people with ID (Legault & Inzlicht, 2012). The increase in Controlled orientations with increased SA scores may further support conclusions of Kuem et al. (2020) and Chadwick and Fullwood, (2018), who found that people with ID who regularly access ICTs have a greater sense of relatedness and are able to present themselves without being labelled as ‘disabled’ to their social environments. However, this may be behaviour controlled by the social environment, as opposed to self-directed, autonomous behaviour (Cheng et al., 2019).

Hypothesis 4 sought to establish the relationship between autonomous causality orientations, SAS-SV scores and Daytime Sleepiness. Spearman’s Rho test found no significant relationships between GCOS-A scores and SAS-SV scores or ESS scores. Results indicate that there is no correlation between the level of self-endorsed autonomous behaviours on SA and daytime sleepiness. Findings suggests the level of intrinsic motivation has no impact on SAS-SV scores. Results further suggest that causality orientations have no relationship on daytime sleepiness. This may indicate that sleep abnormalities occur regardless of the causality orientation of an individual’s behaviour. Such findings may have implications on the theoretical frameworks behavioural interventions designed to improve daytime sleepiness utilise, as suggested by Kaur and Singh (2017). Instead targeting antecedent behaviours to improve daytime sleepiness may prove more fruitful for intervention research in this area (Nasirudeen et al., 2017).

#### *4.2 Prevalence of Smartphone Addiction Risk in People with ID*

Anecdotal research suggests that 97% of the Irish population has regular access to a smartphone (Howard & Henry, 2019). Despite this scant research in the Irish context exists, similarly in people with ID (Thomee, 2018). A key research question investigated the



prevalence of SA risk in people with ID in the Irish context. Further cross-cultural reliability of the SAS-SV and SAS allows for cross-cultural comparison in the present study (Lopez-Ferdinand, 2015). Findings tentatively suggest SA risk prevalence of 30.4% in the present population of adults with ID engaged in education. This is higher than Korean rates of 24.8% found in the original studies using the SAS-SV (Kwon et al., 2013b). However, a study of Chinese medical students found a similar SA risk prevalence of 29.8% (Chen et al., 2017). In Europe SA prevalence rates appear to be lower. SA risk levels were found at 16.9% in Switzerland (Haug et al., 2015), 12.5% in Spanish students and 21.5% in francophone Belgians (Lopez-Fernandez (2015)).

Prevalence rates of SA have largely used general populations, often targeting younger people, perceived to be at higher risk. The present study appears to be novel as it proposes SA risk prevalence in adults with ID. Whilst there are similarities in findings with eastern cultures, there appears to be significantly higher rates in the present population sample, compared with findings from west European countries. This may be due to previous studies using typically developed people. Results may draw comparisons with Jenaro et al. (2017) cross-sectional study, which found higher rates of PSU and excessive internet use in people with ID, in comparison to a typically developed control group. Findings may also support Lussier-Deroschers et al., (2017) whom assert that people with ID are an at-risk group, particularly when more socially isolated, and prone to addictive behaviours, such as technological addictions (Husarova et al., 2016).

#### *4.3 Limitations*

Whilst the study suggests several key findings, it would be pertinent to evaluate the limitations present in the current design. Perhaps most importantly, the small sample size (N=69) means that the research findings must be treated with caution and may not be

extrapolated to all people with ID. The small sample further restricted design for cross-sectional analysis. There were as many people aged 21 and under, as were over 21. Therefore, people over 21 were much less well represented compared with people 21 and under. As a result, the cross-sectional study grouped together 22-year-olds with participants much older. However, the design was chosen based on previous literature omitting adults with ID, and instead focusing on people engaged in mainstream education up to undergraduate level. A larger sample would have allowed for a more representative demographic split for the target population, i.e. age categories of 10 years.

Moreover, the present sample only considers people with ID engaged in education, as opposed to people with ID in general, therefore problematic to translate findings to general populations of people with ID. People engaged in training may have environmental advantages when considering the research topic. For example, students' general levels of self-determination may be greater than those not engaged on training. SDT posits that autonomy, relatedness and competence are necessary for intrinsically motivated behaviours to occur (Deci & Ryan, 2004). People with ID engaged in training may have enhanced levels of competence through the development of skills, and are engaged in a community of people with shared experience, therefore increasing levels of relatedness. Indeed, much research on people with ID supports ICT use to counteract social isolation and engage in their communities (Lussier-Deroschers et al., 2017). If the current sample are gaining basic psychological needs from their day-to-day lives, present findings may be restricted to people with ID engaged on training programs, as opposed to the wider population.

The broadly defined nature of the term ID must also be discussed. All participants have been diagnosed with an intellectual disability; however, the current study does not determine the nature of disabilities represented in the overall sample. So et al. (2017) determined that differing levels of internet addiction prevail in people with ADHD and ASD,

however the present study cannot determine the impact to which these distinct ID's impact findings of the current study. Ethical obligations to protect participants psychological wellbeing have implications for identifying disabilities in the sample; however, study can suggest the nature and extent of SA and daytime sleepiness in people with ID as a whole rather than cross-sections of the sample.

The limitations of self-report are common across psychological literature. Self-report is prone to error, misunderstanding and can lead participants to answers that they think researchers 'want' to see. This may be particularly prescient in the current study, as some participants with ID may have deficits in concentration, comprehension and attentional regulation (Legault & Inglitz, 2012). Despite this limitation it is important for people with ID to be represented in scientific research (Lussier-Desrochers et al., 2017), with self-report tools empowering people to be part of the scientific process. Moreover, the implementation of assistive technology was used in an attempt to factor the comprehension needs of the participant group.

#### *4.4 Strengths*

Several potential strengths must be discussed. Perhaps most importantly, this study tentatively suggests several novel findings for people with ID engaged in education in the Irish context. Because a dearth of literature examining SA in both contexts may exist, the research findings may represent an initial analysis of the relationships between SA, daytime sleepiness and causality orientations for this group. More broadly, very little research could be found establishing the prevalence of SA in people with ID. Whilst evaluating a narrower group than people with ID generally, the prevalence rate of 30.4% determined in the present study may be used as the basis for future research in this area.

Furthermore, whilst literature focused mainly on younger people in the general population, the present study targeted people up to 65 years (the average Irish retirement age), to explore the gap left in literature. The study found that there may be no differences in SA between people over 21, and 21 or under. Future research may expand on present findings by incorporating more age categories into cross sectional analysis of the current population. This may have implications for the way people with ID of any age manage smartphone use, including the implementation of interventions where necessary.

With smartphone ownership, and access to smartphones, approaching 100% (Delloite, 2019), problematic smartphone use, such as SA, is a contemporary societal issue that is poorly understood. Currently SA is not included in the DSM-V, with few regulatory guidelines around healthy smartphone use available for health practitioners or patients. Equally, despite the link between SA in relation to daytime sleepiness (e.g. Brambilla et al., 2017), replicated in the present study, there are few intervention programs in Ireland that target this public health issue. Thus, current findings may add to the growing body of literature used to inform policy makers and decision making in this regard.

Additionally, the present study aimed to investigate the relationship between SA and daytime sleepiness in relation to causality orientations. One research aim was to support early intervention studies of SA being conducted in Korea (Kwon & Yu, 2020), and in particular on the role of autonomous behaviour (Teixeira et al., 2012) in relation to exercise as a replacement for PSU (Liu et al., 2019). Whilst no direct relationship could be found between Autonomy orientation and SAS-SV, the present study did find moderate effects between SAS-SV scores on both Controlled and Impersonal orientations. Such findings may help inform future researchers using SDT as a theoretical framework for providing interventions to alleviate SA in the general population and in people with ID (Enwereuzor et al., 2016).

#### *4.5 Recommendations for Future Research*

Given the novel study design, several key directions for future research must be discussed. Firstly, future research might address the studies limitations. For example, cross-sectional studies might include more specific age categories to determine SA risk across age ranges, as opposed to broad categories in the present design. Furthermore, cross-sectional analyses may seek to understand the differences between people with different diagnoses of ID. It is important for health professionals and educators working with this cohort to understand the nature and magnitude of the impact of SA on different groups of people with ID. Assessing cases of comorbidity may extend research around the interactions of SA and different intellectual disabilities.

Future research may elaborate the differences in people with ID engaged in training, and people not in training. This will further understanding of the impact on self-determination scores through engaging in education. If future research can determine the extent to which people with ID garner a sense of these needs through training, then future designs can control for these differences when exploring the relationships between SA and daytime sleepiness. This can present a more representative sample of people with ID. No previous research investigates the prevalence of SA in the general population of Ireland. Studies of SA worldwide have determined that the measures used are cross-culturally valid and can produce comparable results between nations. Therefore, exploring differences between people with ID and the general population can further demonstrate the impact that ID's might have on the risk and prevalence of SA and daytime sleepiness.

Findings suggest that future interventions focus on people with ID, whom are a group vulnerable to technological addictions. Recent longitudinal studies in Korea have successfully used the theoretical framework of SDT as a means of reducing PSU behaviours that lead to SA. Similar studies may be unavailable in a European context, therefore finding correlations between impersonal and controlled causality orientations in the current study warrants further investigation on the way interventions approach self-determined behaviour in therapeutic settings.

#### *4.6 Application of Findings*

The study was conducted in the context of a specialist training provider for people with ID to support and develop its service users for higher level education and employment. This vulnerable population has access to services that can provide information and guidance around the safe use of modern ICTs, whilst also enabling students to access the benefits of them (Lussier-Desrochers et al., 2017). With the current study implicating a relationship between SAS-SV scores on daytime sleepiness, and implicating SA as a potential ecological factor affecting self-determination (Shogren et al., 2007), the current study can allow for greater organisational awareness of the potential risks implied by the current findings. In the future early interventions can be put in place by a multi-disciplinary team, to decrease the likelihood that service-users will engage in PSU, which may lead to SA or daytime sleepiness.

#### *4.7 Conclusion*

This study had two objectives; Firstly, to investigate whether general causalities mediated the relationship between SA risk and daytime sleepiness, in people with ID engaged in education; Secondly, the study aimed to understand the impact of age on these psychopathologies. Findings suggest that causality orientations do not mediate the

relationship between SA risk and daytime sleepiness, statistically significant causal relationships were found between SA risk scores on Impersonal and Controlled causality orientations. Conversely, findings suggest no statistically significant relationship between Autonomous causality orientations and SA risk, or daytime sleepiness. Consequently, interventions targeting SA may focus on the reduction of extrinsic motivators or a-motivation as a means of reducing SA risk. In relation to the second aim, it is suggested that age is not a significant factor in determining SA risk. This is contrary to much previous research with the general population, and findings have implications for the potential vulnerability to SA in people with ID of any age.

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## **Appendices**

**Appendix A – Short-URL Handout**

**Appendix B – Microsoft Forms Opening Page of Survey**

**Appendix C – Epworth Sleepiness Scale**

**Appendix D – General Causality Orientations Scale**

**Appendix E – Smartphone Addiction Scale – Short Version**

**Appendix F – Debrief Form**



## Appendix B

# Self-Determination as a Mediator of Smartphone Addiction and Daytime Sleepiness in Adults

My name is Adam Taylor and I am doing research with Dublin Business School looking at Smartphone Addiction, Daytime Sleepiness and Self-determination. If you want to know more about what these terms mean, please feel free to ask at any time. This research is part of my studies for a Higher Diploma in Psychology and will be marked at the end of my course.

You are invited to take part in this study. Getting involved means that you will be filling out an online survey on Microsoft Forms. Choosing to take part is voluntary. If you start and do not want to continue, then you can stop at any time. Any answer that you give will not be saved unless you press submit at the end of the survey. You can do the survey anywhere and at any time.

The survey will ask you about how using a Smartphone has changed your life. It will also ask how often you feel sleepy throughout the day and how you would react to some situations at work or with family and friends.

Some questions might cause some bad thoughts or feelings. If this happens then you will be able to speak to your Instructor and all the support staff in your centre. Contact information for supports out of the centre will also be provided to you.

Taking part is voluntary and you do not have to be involved in the study.

The surveys do not ask for your name and are confidential. This means no one will know the answers you give on the survey. Once you have pressed submit it is impossible to delete your answers because we would not know which data is your own. This also means you cannot withdraw your answers after you submit them.

Your information will be kept safe on a password protected computer. It is important to know that by submitting the survey that you are consenting to participate in the study. A question will ask you on the opening page of the survey whether you consent to participate. You will not be able to continue without consenting to take part in the survey.

If you would like more information about the research, you can contact me by email at [10402418@mydbs.ie](mailto:10402418@mydbs.ie). My research supervisor can be contacted at [ronda.barron@dbs.ie](mailto:ronda.barron@dbs.ie).

Thank you for taking the time to complete this survey.

\* Required

### Consent Page

Welcome to the survey for the study; Self-Determination as a Mediator of Smartphone Addiction and Daytime Sleepiness in Adults with Intellectual Disabilities

Please read the following question carefully

1. Do you consent to participate in this study? \*

Yes

No

Next

## **Self-Determination as a Mediator of Smartphone Addiction and Daytime Sleepiness in Adults**

My name is Adam Taylor and I am doing research with Dublin Business School looking at Smartphone Addiction, Daytime Sleepiness and Self-determination. If you want to know more about what these terms mean, please feel free to ask at any time. This research is part of my studies for a Higher Diploma in Psychology and will be marked at the end of my course.

You are invited to take part in this study. Getting involved means that you will be filling out an online survey on Microsoft Forms. Choosing to take part is voluntary. If you start and do not want to continue, then you can stop at any time. Any answer that you give will not be saved unless you press submit at the end of the survey. You can do the survey anywhere and at any time.

The survey will ask you about how using a Smartphone has changed your life. It will also ask how often you feel sleepy throughout the day and how you would react to some situations at work or with family and friends.

Some questions might cause some bad thoughts or feelings. If this happens then you will be able to speak to your Instructor and all the support staff in your centre. Contact information for supports out of the centre will also be provided to you.

Taking part is voluntary and you do not have to be involved in the study.

The surveys do not ask for your name and are confidential. This means no one will know the answers you give on the survey. Once you have pressed submit it is impossible to delete your answers because we would not know which data is your own. This also means you cannot withdraw your answers after you submit them.

Your information will be kept safe on a password protected computer. It is important to know that by submitting the survey that you are consenting to participate in the study. A question will ask you on the opening page of the survey whether you consent to participate. You will not be able to continue without consenting to take part in the survey.

If you would like more information about the research, you can contact me by email at

██████████@mydbs.ie. My research supervisor can be contacted at ██████████@dbs.ie.

Thank you for taking the time to complete this survey.

### **Consent Page**

Welcome to the survey for the study; Self-Determination as a Mediator of Smartphone Addiction and Daytime Sleepiness in Adults with Intellectual Disabilities

Please read the following question carefully

**Do you consent to participate in this study?\* Yes/No**

**Are you aged 18 or over?\* Yes/No**

## Appendix C

## Epworth Sleepiness Scale

How likely are you to doze off or fall asleep in the following situations, in contrast to feeling just tired? This refers to your usual way of life in recent times. Even if you have not done some of these things recently try to work out how they would have affected you. Use the following scale to choose the *most appropriate number* for each situation:

- 0 = would *never* doze
- 1 = *slight* chance of dozing
- 2 = *moderate* change of dozing
- 3 = *high* chance of dozing

Situation	Chance of dozing
Sitting and reading	_____
Watching TV	_____
Sitting, inactive in a public place (e.g. a theater or a meeting)	_____
As a passenger in a car for an hour without a break	_____
Lying down to rest in the afternoon when circumstances permit	_____
Sitting and talking to someone	_____
Sitting quietly after a lunch without alcohol	_____
In a car, while stopped for a few minutes in the traffic	_____

**Thank you for your cooperation**

---

## Appendix D

### General Causality Orientations Scale (Deci and Ryan, 1985)

These items pertain to a series of hypothetical sketches. Each sketch describes an incident and lists three ways of responding to it. Please read each sketch, imagine yourself in that situation, and then consider each of the possible responses. Think of each response option in terms of how likely it is that you would respond that way. (We all respond in a variety of ways to situations, and probably most or all responses are at least slightly likely for you.) If it is very unlikely that you would respond the way described in a given response, you should circle answer 1 or 2. If it is moderately likely, you would select a number in the mid range, and if it is very likely that you would respond as described, you would circle answer 6 or 7.

- 1. You have been offered a new position in a company where you have worked for some time. The first question that is likely to come to mind is:**
  - a) What if I can't live up to the new responsibility?
  - b) Will I make more at this position?
  - c) I wonder if the new work will be interesting.
  
- 2. You have a school-age daughter. On parents' night the teacher tells you that your daughter is doing poorly and doesn't seem involved in the work. You are likely to:**
  - a) Talk it over with your daughter to understand further what the problem is.
  - b) Scold her and hope she does better.
  - c) Make sure she does the assignments, because she should be working harder.
  
- 3. You had a job interview several weeks ago. In the mail you received a form letter which states that the position has been filled. It is likely that you might think:**
  - a) It's not what you know, but who you know.
  - b) I'm probably not good enough for the job.
  - c) Somehow they didn't see my qualifications as matching their needs.



- 4. You are a plant supervisor and have been charged with the task of allotting coffee breaks to three workers who cannot all break at once. You would likely handle this by:**
- a) Telling the three workers the situation and having them work with you on the schedule.
  - b) Simply assigning times that each can break to avoid any problems.
  - c) Find out from someone in authority what to do or do what was done in the past.
- 5. A close (same-sex) friend of yours has been moody lately, and a couple of times has become very angry with you over "nothing." You might:**
- a) Share your observations with him/her and try to find out what is going on for him/her.
  - b) Ignore it because there's not much you can do about it anyway.
  - c) Tell him/her that you're willing to spend time together if and only if he/she makes more effort to control him/herself.
- 6. You have just received the results of a test you took, and you discovered that you did very poorly. Your initial reaction is likely to be:**
- a) "I can't do anything right," and feel sad.
  - b) "I wonder how it is I did so poorly," and feel disappointed.
  - c) "That stupid test doesn't show anything," and feel angry.
- 7. You have been invited to a large party where you know very few people. As you look forward to the evening, you would likely expect that:**
- a) You'll try to fit in with whatever is happening in order to have a good time and not look bad.
  - b) You'll find some people with whom you can relate.
  - c) You'll probably feel somewhat isolated and unnoticed.
- 8. You are asked to plan a picnic for yourself and your fellow employees. Your style for approaching this project could most likely be characterized as:**
- a) Take charge: that is, you would make most of the major decisions yourself.
  - b) Follow precedent: you're not really up to the task so you'd do it the way it's been done before.

- c) Seek participation: get inputs from others who want to make them before you make the final plans.

**9. Recently a position opened up at your place of work that could have meant a promotion for you. However, a person you work with was offered the job rather than you. In evaluating the situation, you're likely to think:**

- a) You didn't really expect the job; you frequently get passed over.
- b) The other person probably "did the right things" politically to get the job.
- c) You would probably take a look at factors in your own performance that led you to be passed over.

**10. You are embarking on a new career. The most important consideration is likely to be:**

- a) Whether you can do the work without getting in over your head.
- b) How interested you are in that kind of work.
- c) Whether there are good possibilities for advancement

**11. A woman who works for you has generally done an adequate job. However, for the past two weeks her work has not been up to par and she appears to be less actively interested in her work. Your reaction is likely to be:**

- a) Tell her that her work is below what is expected and that she should start working harder.
- b) Ask her about the problem and let her know you are available to help work it out.
- c) It's hard to know what to do to get her straightened out.

**12. Your company has promoted you to a position in a city far from your present location. As you think about the move you would probably:**

- a) Feel interested in the new challenge and a little nervous at the same time
- b) Feel excited about the higher status and salary that is involved.
- c) Feel stressed and anxious about the upcoming changes.

## Appendix E

### Kwon et al. (2013) Smartphone Addiction Scale – Short Version

How much does each statement relate to you (1 Strongly Disagree, 6 Strongly Agree)

“Strongly Disagree”

“Strongly Agree”

1

2

3

4

5

6

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

## **Appendix F**

### **Debrief Sheet**

Your answers have been submitted.

Thank you for taking part in this study.

If you feel like the study has caused some bad feelings or thoughts please speak to your Instructor, who will arrange a meeting with your Rehabilitative Officer, or Psychologist.

You can also access a number of free support services outside of the centre, that are available 24 hours a day;

#### Samaritans

The Samaritans telephone service is available 24 hours a day.

Freephone 116 123

Text 087 2 60 90 90 - standard message rates apply

Email [jo@samaritans.ie](mailto:jo@samaritans.ie)

#### Aware

The Aware Support Mail service is available to anyone, aged 18 years and over

[supportmail@aware.ie](mailto:supportmail@aware.ie)

#### Pieta House

Pieta House can be contacted at (01) 6010000, after which they will organise a meeting with you in order to assess your needs.