Problematic gaming and internet use: towards a standardised measure and the relationship

with life satisfaction

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ABSTRACT

Video games and the internet are wildly popular sources of entertainment. Both are highly prolific, and thousands of hours are logged in both daily. This increase in popularity, however, came with a number of documented behaviours and incidents that revealed an addiction to gaming and the internet may develop in some. Research on problematic online gaming (POG) and problematic internet use (PIU) has burgeoned, however no official diagnostic framework nor standard measure exists due to a lack of consensus. This study aimed to test the reliability of the Problematic Online Gaming Questionnaire and the Problematic Internet Use Questionnaire across digital and paper formats as well as examine POG, PIU and their relationship to life satisfaction and psychological well-being in a sample of gamers (n = 977). The POGQ and PIUQ were found to be reliable across formats. POG and PIU correlated and were predictive of psychological well-being and life satisfaction. This meant that the POGQ and PIUQ were able to identify problematic gaming and internet behaviours, which in future can help to determine their worth as a tool for identifying those at risk of lower psychological well-being and life satisfaction resulting from POG and PIU and provide them with help.

CONTENTS

INTRODUCTION

Video games are one of the most widely used forms of entertainment in the modern world. It is estimated that 1.5 billion people have played a video game in their life, and the industry generated $99.6 billion in 2016 (Newzoo, 2016). Video games are a very common form of entertainment, especially among adolescents – it is estimated that 97 per cent of American teenagers play video games (Lenhart et al., 2008), and 58% of the gaming market's growth in 2016 came from the Asia-Pacific region (Newzoo, 2016). The internet is similarly ubiquitous in everyday functioning, with just over 3 billion people estimated to have used the internet at least once in their life (ITU, 2016); Ofcom statistics (2016, p.22) report that the average time spent online per week is 22 hours. This increase in the prevalence and use of both video games and the internet has led to a number of observable effects, which researchers have intended to examine with varying levels of success.

Video game research has burgeoned over the past fifteen years, with meta-analyses such as that of Anderson and colleagues (2010) identifying 130 relevant research papers on the area of video games and their relationship to aggression alone, totalling 130,000 participants. While the effects of video games, particularly violent video games, on aggression and violent behaviour has been the primary focus of video games research for nearly two decades, not nearly as much attention has been donated to the area of studying gaming addiction.

The internet has received a considerably larger amount of attention, with numerous research studies being published on a wide range of effects, from how it is used (Eynon & Malmberg, 2011) to effects on creativity (Shoshani & Braun Hazi, 2007; Jackson et al., 2012) and even to how the anonymous nature of the internet affects behaviour, such as the online disinhibition effect (Suler, 2004). However, recent meta-analyses report that only

46 relevant clinical studies can be found (Kuss & Lopez-Fernandez, 2016) regarding internet addiction, and few of them reach consensus on what video game addiction is or how to measure it. These studies examined the characteristics of those who seek treatment, the effectiveness of pharmacotherapy, psychotherapy and combinations of the two. Comorbidity between problematic internet use and a variety of disorders, such as ADHD, social anxiety disorder, and personality and affective disorders was found. The treatments showed varied results, citing the commonality of comorbid symptoms as a prevalent confound and noticing that few of these studies used controls, resulting in difficulty ascertaining as to whether or not the treatments were effective or non-specific factors were responsible for the subsequent effects. Combined therapies with mid-term interventions were recommended as effective treatments for PIU.

Kuss and Lopez Fernandez (2016) also report that the literature has thus far failed to examine internet addiction in a general sense. This is troublesome, since both internet and gaming addiction are not yet officially recognised in psychiatric diagnostics and, as mentioned, much research reveals comorbidity with disorders such as hypomania, dysthymia, social anxiety disorder, OCD and ADHD to name only a few (Bernardi & Pallanti, 2009; Dufour, Nadeau & Gagnon, 2014; Floros et al., 2014; Müller, Beutel & Wölfling, 2014; Tonioni et al., 2014; Tonioni et al., 2012; Wölfling et al., 2013; Wölfling et al., 2015). Kuss and Lopez-Fernandez (2016, p.169) also emphasise the need to use valid and reliable measures of internet addiction, which they also note are lacking.

In response to the volume of research on and interest in internet and gaming addiction, the American Psychiatric Association has listed internet gaming addiction in Section III of the DSM V as a condition for further study (APA, 2013). This condition includes both internet gaming addiction and internet addiction. The current edition of the International Statistical Classification of Diseases and Related Health Problems (ICD-10), often a counterpart to

the DSM, currently does not have any reference to internet or gaming addiction (World Health Organisation, 2016). Some believe that it should not be added until a more stable basis of evidence is accrued (Grant et al., 2014).

It is important to note going ahead that there are many names and definitions for both of these in the literature: compulsive internet use, pathological internet use, internet addiction and so on so forth. For the purposes of this study, these two constructs will be referred to as Problematic Internet Use (PIU) and Problematic Online Gaming (POG). These can be defined as: "any use of the internet that is uncontrollable, markedly distressing, time-consuming or resulting in social, occupational or financial difficulties and not solely present during hypomanic or manic symptoms" (Shapira et al., 2000, p.267). Problematic gaming will also be defined as such for the purposes of this paper.

As previously discussed, the lack of attention on POG and PIU has led to disputation of their nature. The proposed set of criteria used in diagnosing POG and PIU is that of the American Psychiatric Association's DSM-V (APA, 2013), listed under Section III 'Conditions for Further Study'. These criteria were originally derived from clinical Chinese samples (Petry et al., 2014) using a number of previous substance and behavioural addiction criteria (Tao et al., 2010). The diagnostic framework covers both POG and PIU and consists of nine theoretical criteria, five of which must be exhibited within twelve months for a diagnosis:

1. Preoccupation: Time spent thinking about games when not actively playing them;

2. Withdrawal: Symptoms, such as restlessness, anxiety, irritability or aggression, which manifest when one is unable to game for a length of time;

3. Tolerance: The need for longer play sessions over time in order to satiate desire;

4. Reducing/stopping: An acknowledgement of needing to play less but failing in attempts to do so;

5. Dropping of other activities: A loss of interest in other things besides playing a video game. For instance, other hobbies, socialising, or work;

6. Continuing in spite of problems: Awareness of undesirable consequences fails to prevent one from playing, e.g. trouble at work for being late, lacking sleep, getting into arguments with peers and family in relation to one's gaming habits;

7. Deception: Attempts to mask one's gaming habits from family and friends;

8. Escapism: Use of gaming in order to escape personal issues or uncomfortability;

9. Risk/loss: Risk/loss of relationships as a result of this behaviour.

This list of criteria is far from perfect. It is difficult to say what role each criterion plays in representing addiction: Griffiths and colleagues (2016) criticised Petry and company's criteria extensively and in detail as inaccurate and without established consensus (however, in a retort, Petry and colleagues [2016] contested that Griffith's criticism similarly did not represent consensus).

For instance, "preoccupation" is arguably a shaky ground for signifying addiction, since gaming is a passion for many and it is an industry that is as deep and complex as that of the film industry. For many, video games provide an income and a purpose, be it via making them, criticising them or playing them: platforms such as YouTube and Twitch have given rise to an entertainment industry around watching others play video games. King & Delfabbro (2014) noted that this criterion may be made more accurate by assessing cognitive content in relation to gaming rather than the time spent thinking about or playing games. Specifically, King and Delfabbro claim that beliefs about games, rigid rules around gaming behaviour, over-reliance on gaming for self-esteem and using games as a vehicle

for social acceptance should be the primary identifiers of unhealthy preoccupation with video games.

Correspondingly, escapism's use as a diagnostic criterion can also be questioned, since many use video games as a way to relax and get away from the day to day stresses they may face. The relationship between stress and video games in the literature is unclear: there is some evidence to suggest that video games (especially casual video games: see *Appendix A*) do contribute to a decrease in physiological signs of stress (Russoniello, O'Brien, & Parks, 2009) and increased work-related fatigue is associated with higher levels of relaxation-motivated video game play (Reinicke, 2009). First person shooters may also be related to relaxation (Collins & Cox, 2014), however this conflicts with much of the research that indicates that video games result in increased arousal (Anderson et al., 2010; Anderson & Bushman, 2001). This lack of clarity could be due to most studies failing to directly compare the variation in motivations and experiences between game types and genres (van Rooij et al., 2010; Shen & Williams, 2011; Collins & Cox, 2014). Petry and colleagues argue that the distinction between genres matters little in representing the underlying construct (Petry et al., 2016), however recent research on a German sample seems to provide some evidence to the contrary (Rehbein et al, 2016).

Similarly, some criteria are infrequently observed in research data and can even be lacking in diagnostic value (Tao et al., 2010). With reference to the deception criterion, this may be due to the lack of a need to deceive others about one's gaming habits: if gamers live alone or are involved in gaming circles where extensive play is not questioned, they may not need to deceive others about how they use the game. Furthermore, Kardefelt-Winther (2014) notes that gaming does not bear the same negative connotations nor consequences that, for instance, gambling or drug addiction would, further reducing the need to deceive others about one's gaming habits.

Ferguson, Coulson & Barnett (2011) supplement this criticism by noting that these criteria may pathologise what can be argued to be relatively normal behaviour. One example used is that, if a drug addict is feeling stressed, they may turn to drugs to relieve that stress, which can later result in dependency, health complications or even death. However, if a person is feeling stressed and turns to games, their effect is not comparable to that of the drug addict since there is no harmful substance involved: it's merely playing a video game. In addition, a gambling addict may gamble their money or means of living away, facing imminent and considerable consequences upon loss, whereas there exists no such way to do this in a video games context; the only thing wagered, by and large, is one's time.

Griffiths, among the most prominent researchers in gaming and addiction research, proposed alternate criteria, known as the 'components' model, for addiction in general. He believes these better reflect gaming addiction, since these criteria can be observed across a number of addictions whether substance or behaviour-based (Griffiths, 2005):

1. Salience: Similar to preoccupation in the DSM criteria, playing video games becomes the most important part of one's life and govern much of their behaviour, thoughts and emotion.

2. Mood modification: Playing video games is used as a coping strategy in order to regulate mood.

3. Tolerance: Similar to the DSM version, this represents an increasing need to extend game time in order to achieve satisfaction.

4. Withdrawal: Again similar to the DSM criteria, unwanted or unpleasant states which result from being unable to play video games for some time.

5. Conflict: Echoing criterion six of the DSM V diagnostic framework, this represents any conflict between the person's video game play and those outside of it, such as

friends, family and work colleagues. There may also be internal conflicts in the person, representing feelings of lost control.

6. Relapse: The tendency for falling back into the behaviour exhibited during a period of addiction while attempting to curb that behaviour.

Griffiths (2014, pp. 126-127) argues that these criteria more parsimoniously explain problematic gaming and can be observed in other similar behaviours. These criteria can also be questioned, however: Charlton and Danforth (2007) posit that cognitive salience and tolerance cannot necessarily be considered part of an addiction since they are both observable for other behaviours and as such are exhibitory signs of "engagement" (i.e. enthusiasm). Rather, core criteria, such as behavioural salience, relapse and conflict are more reliable in examining addictive behaviours such as that of POG and PIU.

As such, the criteria for POG and PIU diagnoses can be called into question due to the nature of the behaviour. There is considerable nuance to the reasons as to how, why, where and in which contexts people play video games that reveals the need for more serious consideration of the criteria, more in-depth research and consideration to that end. As of yet, very few if any studies consider the effect of the type of game on behaviour, a problem that is not confined solely to video game addiction research but also to research on aggression and video games; similarly, contents of the person's internet usage are rarely investigated. Taking all of this into account, it can be argued that referring to each construct as "problematic behaviour" is most appropriate, since there is little consensus as to the constructs' status as an addiction and little research in support of any clinical addiction criteria; yet it is agreed that excessive gaming and internet usage are something that can have detrimental effects on one's life.

As is stands, there is much evidence to suggest that playing video games for an excessive amount of time can have deleterious effects. Several deaths have been directly related to video game playing behaviour: numerous people have died from cardiovascular complications and epileptic seizures as a result of extensive play sessions, some lasting beyond fifty hours (Spencer, 2007; BBC, 2005; The Australian, 2012; Hunt & Ng, 2015; Berghammer, 2002). Compared to other addictions such as that of drug abuse, deaths as a result (direct or indirect) of gaming are extremely limited. Nonetheless, they represent the extremes of what those who exhibit POG may be at risk of, and death is not the only effect POG can have.

An established base of research literature exists to suggest a link between problematic gaming, depression and anxiety and a range of other psychiatric symptoms (Carras et al., 2016; Mentzoni et al., 2011; Vadlin et al., 2016; Brunborg, Mentzoni & Frøyland, 2014; Wei et al., 2012; Stetina et al., 2011; Liau et al., 2015), with some evidence to suggest a reciprocal effect (Gentile et al., 2011). There is no common understanding as to why this link exists nor as to its direction, however: no causative link has been found between video games and depression for obvious ethical reasons; longitudinal studies are lacking in this area; and cross-sectional studies, due to their nature, fail to delineate as to what aspect about playing a game may contribute to the link with depression, nor the direction of the relationship. For instance, Carras and colleagues (2016) found that those with more online social interactions reported fewer symptoms of problematic gaming than those who tend to play alone, raising further questions with regards to the mediating effects between gaming behaviour and psychological well-being. There is some research to suggest that problematic gaming is associated with depression in a US adolescent sample (Romer, Bagdasarov & More, 2013) which in turn predicts more problematic gaming. Research

with Singaporean children also suggests that problematic gaming is associated with greater anxiety, social phobia and poorer school performance (Gentile et al., 2011).

When examining gaming addiction research, it is important to note two things: that these studies do not use one unified set of measures (a common issue in the literature); and that there are vast cultural differences in perceptions and prevalence of POG, especially in countries such as South Korea where POG prevalence tends to be higher (King, Delfabbro & Griffiths, 2012). Being born in an Asian country may also present a five-fold risk of developing POG behaviours than any other Western region with the exception of Middle America (Wittek et al., 2016), although this is a recent finding and is yet to be replicated extensively in the literature. This is not without meaning, however: Asian countries, particularly South Korea, are known to have widespread problems with video game and internet addiction (Koh, 2015) to the point that legislation has been passed to control access to video games and internet access (Sun, 2011; Groom, 2014). Some professional players even develop physical deformities that require surgery to correct (Lee, D. 2015).

It is not merely enough to consider the lack of unity in measures and the difference in cultures when considering POG research, but also the individual's mind and its inner workings. Exactly how video games and the mind interact has been an elusive area of POG research. As it stands, there exists only a small amount of research on what mediates problematic gaming. Parenting may mediate game time (Shin & Huh, 2011; Nikken & Jansz, 2014) however there exists no valid and reliable measure of parental mediation of internet use and there is similarly research that indicates no effect of parenting on addiction (Lee C. & Kim, 2017).

Recent research conducted by Loton and colleagues (2016) suggests that using video games as a maladaptive coping mechanism for depression, anxiety and stress may play a

role in developing an addiction to video games, though the study recruited self-identified "problem gamers" and as such is limited in its generalisability. The most interesting aspect about this research is that it distinguished between engagement and problematic gaming, the former of which only had a direct effect on anxiety and not depression nor stress, once coping was accounted for. This seems to support Charlton & Danforth's (2007) earlier distinction between engagement and addiction, though Loton and colleagues' is the first study to provide evidence as to that distinction.

Research evidence on the neurological effects of playing games has also yielded interesting results in how video games interact with the mind and the brain. There are noticeable differences in grey matter volumes between professional gamers, problematic gamers and healthy controls – these differences are associated with greater impulsiveness and perseverative errors in the gaming participants although the sample was small (Han, Lyoo & Renshaw, 2012). Wang L. and colleagues (2016) also showed that problematic gaming was associated with functional network dysfunction in the brain, as well as impaired executive and emotional control, although coordination between sensorimotor, visual, visuospatial and auditory systems seemed to be enhanced.

A meta-analysis published by Kuss and Griffiths (2012) reviewed 18 studies on the effects of POG on the brain, noting particularly that dopaminergic activity in the brain (which is associated with reward systems) is decreased in those showing signs of POG. This is theorised to be a result of desensitisation, since: there is evidence to suggest that striatal dopamine is released during gameplay (Koepp et al., 1998), though this evidence may be limited by confounds such as sensitivity to cerebral blood flow and head movement (Egerton et al., 2009); and increased video game play has also been linked with increased volume in the left ventral striatum (Kühn et al., 2011). Both of these findings are linked to several other addictive behaviours which are also observed in those being treated for

Parkinson's disorder with dopamine medication, such as pathological gambling and binge eating (Dagher & Robbins, 2009; Steeves et al., 2009).

Activation of brain regions associated with craving and emotion is increased during gameplay, and subsequent treatments, such as psychopharmacological and cognitive-behavioural treatments, have been observed to decrease associated symptoms (Han, Hwang & Renshaw, 2010; Ge, L. et al., 2011).

While this research evidence may provide a rather bleak view of the effects of video games on the mind, that's not to say there aren't several positive effects of video games on the mind that are given much less credence in the literature than the negative. A number of research studies have found various positive effects of playing games on a number of processes in the brain as well as brain structure (Eichenbaum, Bavelier & Green, 2014), such as effects on: spatial navigation and working memory (Kühn et al., 2014); learning (Epstein et al., 2016); education (Griffiths, 2002); spatial cognition (Feng, Spence & Pratt, 2007); and perception and cognition (Boot, Blakely & Simons, 2011). They may even be able to play a role in training surgeons (Rosser et al., 2007). Granic, Lobel & Engels (2014), in the most comprehensive meta-analysis of the benefits of playing video games to date, note a number of positive educational, cognitive, social and emotional aspects to gaming which are rarely discussed in comparison to the negative effects. However, positive effects are not something that need to be helped, whereas negative effects are.

Much like problematic gaming, problematic internet use has been observed since the 90s, with Dr. Kimberly Young's pioneering research on internet addiction. Young (1999) argues that it is the content that is accessed that feeds into the addiction rather than the actual vehicle of conveying the content, i.e. the internet.

This can be analogous to drugs and alcohol: the vehicle of the addictive substance, perhaps a syringe or bottle, plays only the part of administration – the contents are what the addict is really after. Complimenting this analogy to drugs is a considerable base of research that has linked internet use to psychological distress (Grubbs et al., 2015), depression (Young & Rogers, 1998; Morrison & Gore, 2010) and internalisation of problems (De Leo, 2013). Internet use may also play a role in exacerbating suicidal thoughts and behaviours (Alao et al., 2006; Thompson, 1999). This is consistent with case studies which examine internet-related suicides, in which suicidal tendencies led to use of the internet in the context of information and encouragement towards committing suicide, rather than the other way around (Haut & Morrisson, 1998; Suresh & Lynch, 1998). There is a growing body of research that also implicates social media in increases in depression, anxiety and decreased sleep (Primack et al., 2017; Nesi, 2015; Bányai et al., 2017; O'Keefe & Clarke-Pearson, 2011; Tandoc, Ferrucci & Duffy, 2015), with various factors such as envy, popularity and gender playing a role in mediation of these effects.

How one uses the internet and what one uses it for may also play a role in its effects on one's mental state as well. With reference to suicidality, while there are many cases of cyberbullying that contributed to the suicide of the victim, the internet can also be used to reduce suicidality and develop a support network. Lester (2009), who published an in-depth review of the literature surrounding suicide and internet usage, reporting that there were as many suicide-preventive uses of the internet as suicide-facilitative, including internet users who alert authorities to a suicidal person, suicide and depression support groups and online counselling systems, such as SAHAR and the Befrienders organisation, with mixed advantages and disadvantages.

Much like what was observable with POG, PIU also has a number of observable effects on the brain. While there is research that claims that those who exhibit PIU also exhibit

deficiencies in levels of certain neurotransmitters such as dopamine (Ge, Y., & Liu, 2015), GABA and 5-HT (Song et al., 2010), this evidence uses an indirect measure known as the Symptoms Scale of Neurotransmitter Deficiency (Braverman, 2005), which measure neurotransmitter levels via symptoms, such as anxiety and depression. Deficiencies in these levels may be associated with lower levels of certain neurotransmitters (Song et al., 2010) as measured by this index, but are not known to be caused by them, and the measure has so little evidence supporting its reliability and validity as to be considered spurious at best.

The strongest evidence for effects in the brain instead lies in that of brain-imaging and chemical studies: voxel-based morphometry has been used to examine the brains of those exhibiting signs of PIU, and has revealed decreased grey matter volumes in a number of brain regions such as in the bilateral dorsolateral prefrontal cortex, which is associated with executive functioning, inhibition and abstract reasoning, and changes in fractural anisotropy of white matter in areas such as the right parahippocampal gyrus, which plays a role in environment recognition (Yuan et al., 2011). Zhou and colleagues also found comparable decreases in grey matter among adolescents exhibiting PIU (Zhou, Y. et al., 2011).

Positron emission tomography also reveals that striatal dopamine D2 receptors in those with internet addiction exhibited diminished functioning (Kim, S.H. et al., 2011). Park and Kim (2015) claim that those exhibiting signs of pathological use of the internet may also have brain structures comparable to those seen in substance abusers. High-performance liquid chromatography, which is a chemistry technique that separates components of a liquid, also reveals that those who exhibit PIU contained lower levels of dopamine metabolites (id est norepinephrine) in their blood (Zhang et al., 2013). These levels correlated with higher scores on self-report anxiety measures, as a result indicating the

possibility of neurotransmission dysfunction, although this finding requires more research with direct measures.

An important factor to consider is that the sample sizes in the above studies are generally small, predominantly male and many are limited to a Chinese or South Korean context, limiting generalisability to other areas in the world. Comorbidity may also be an issue: Ge and Liu (2015) conducted their work on 1,895 Chinese "urban left-behind" children, who lack a relationship with their parents and whose mental plight is becoming increasingly apparent (Duan & Zhou, 2005; Luo, Wang & Gao, 2009; Zhao, J. & Liu, 2010; Wang & Li, 2008). As established, the attitudes and behaviours surrounding video gaming in South Korea also show that research on South Korean samples prove troublesome in their ability to generalise to the rest of the world. Since this is a relatively new and under-examined area of research, the findings of these studies must be taken with some consideration as to their weaknesses. Overall, it is clear that excessive use of the internet has serious implications for one's mental health as well as their brain structure.

A final yet prominent issue to be discussed is the lack of measurement standards in the literature, which stems from the lack of consensus on the definition and aspects of internet and gaming addiction as proposed by the DSM. Almost every research study in both fields utilises different measures to every other study. This is an issue for two reasons: firstly, distributed focus on validating and testing separate questionnaires bogs down attempts to understand POG and PIU; secondly, each measure examines different aspects of POG and PIU, thus lacking a unified approach.

This issue was most comprehensively examined by King and colleagues (2013), who conducted a meta-analysis on all available measures of POG at the time. A total of eighteen instruments were reviewed, with a total of 58,415 participants across 63 studies.

King and colleagues found that all instruments were short, easy to score, internally consistent, exhibited good convergent validity and showed potential for standardising norm data for adolescents. However, these studies did not consistently cover core criteria for addiction examinations (none covered all criteria), lacked cut-off scores, did not factor in time (as per DSM criteria 12-month limit) and that certain important dimensions of data were lacking, such as predictive validity and dimensionality. While the review did not examine every aspect of every questionnaire, to date it provides the most in-depth view of the instruments available for use in the field as well as how they performed under examination.

Practically the same issue exists in the field of internet addiction research, as a meta-analysis by Laconi, Rodgers & Chabrol (2014) reveals, with few of the forty-five available measures exhibiting extensive evidence for their validity and a similar lack of unified measurement.

In conclusion, the literature on the topic of POG and PIU can be described as inconsistent and lacking in cohesion. While there are a number of well-designed and replicated findings, the vast array of confounds, such as cultural effects, the nuances between those who are addicted and those who are enthused, inadequate literature to support cut-off scores, mixed prevalence figures and a distinct lack of unified measures complicate the general picture of POG and PIU. It cannot be understated how tenuous the distinction between regular internet and gaming use and PIU and POG can be: many rely on both for work, many form bonds of friendship and even romantic relationships, some games even contain their own microcosms of society: EVE, for example, is a space-based MMORPG that has a mock economy in which hundreds of thousands of units of real-world currency are spent by large conglomerations of players in order to prevail in-game – they even publish extensive economy reports (CCP Games, 2016). The flow of interaction is

convoluted in online games and on the internet: it is imperative to consider the complexity of the interactions not only between users, but also between the psychological processes and behaviours involved in mediating both those interactions and the person's use of the platforms. The various positive effects of playing video games and using the internet are not to be disregarded either.

Nonetheless, it is clear that a certain amount of the gaming and internet population do exhibit signs of nocuous effects that must be addressed. It is clear that certain cognitions and behaviours underlie and inform POG and PIU (and vice versa) that have the potential to cause great harm to an individual, resulting in impaired functioning, diminished well-being and social isolation. The lack of consensus in the research and measurement presents the greatest obstacle to the development of successful interventions and services for those who are addicted to and display problematic use of video games and the internet. With this in mind, this study intends to examine two questionnaires proposed to indicate people who exhibit POG and PIU: The Problematic Online Gaming Questionnaire or 'POGQ' (Demetrovics et al., 2012) and the Problematic Internet Use Questionnaire or 'PIUQ' (Demetrovics, Szeredi & Rózsa, 2008).

Rationale, aims and hypotheses

The rationale that governs this research is to help in bridging the gap of understanding that exists in the current literature by examining the reliability of two questionnaires used in the area. As established, a clear lack of consensus has presented a myriad challenges and resulted in a number of different measures being created, each of them measuring different parts of addiction criteria and each with different models. It is also disputed as to whether or not PIU and POG should be considered as part of the one classification as per the DSM-V.

In conducting this research, it is possible to examine the merits of the questionnaires used as well as examining their shortfalls in order to further refine available measuring tools and processes. This research may also help to determine whether or not there is a basis in evidence for grouping PIU and POG under the same classification or if they are significantly separate.

The aim of this study is to assess the reliability of the POGQ and PIUQ across digital and physical applications, id est inter-format reliability, and to examine the relationship between POG and PIU as well as how they interact with gender, psychological well-being and life satisfaction. It is important to emphasise that this research is not clinical in nature: merely, its results may contribute to the field of knowledge that can be used to guide further research and possibly interventions and programmes for those who are exhibiting signs of PIU and POG.

This study also intends to use a purposive sample, namely gamers. Unfortunately, the scientific literature on what can be defined as a gamer is very limited. There are a few papers which discuss what describes a gamer most accurately (for instance, Kirkpatrick, 2012) and, while there are even some proposed taxonomies for gamers (Williams, Yee & Caplan, 2008), there is little to no consensus on what a gamer can be classified as (for further discussion, see *Appendix A*). In this paper, the sampling method will attempt to control for this lack of consensus methodologically.

This research proposes, and intends to answer, three questions: are POG and PIU related? Is there a sex difference between levels of POG and PIU? Finally, what relation do POG and PIU have with psychological well-being and life satisfaction? Taking these questions into consideration, there are three hypotheses that will be tested in this study:

First: POG and PIU will be moderately to strongly related. Recent research by Király and colleagues (2014) on a nationally representative adolescent Hungarian sample revealed that problematic internet use and problematic online gaming may be distinct, but they also observed overlap between POG and PIU in six per cent of their near two-thousand participant sample. Gunuc (2015) also found that gaming addiction and internet addiction were significantly correlated ($r = .66$). With this research evidence in mind combined with the highly online nature of video games and discussion forums, it is expected that higher levels of POG will be associated with higher levels of PIU.

Second: There will be an observable gender difference in the levels of PIU and POG between males and females; specifically, males are expected to exhibit higher levels of PIU and POG than females. The literature reveals that males seem to spend more time playing games and on the internet than females (Choo et al., 2010; Wittek et al. 2016; Vadlin et al. 2016; Wei et al. 2012) and suggests that males exhibit both more problematic (Carli et al., 2013) and pathological video gaming symptoms than females (Choo et al., 2010; Desai et al., 2010). Research evidence also suggests that gamers are primarily male (Griffiths et al., 2003; Nagygyörgy et al., 2012; ESA, 2016; Williams, Yee & Caplan, 2008) and being young and male predicts problematic gaming (Wittek et al., 2016). Most studies have a gender bias towards males, which may be due to self-selecting or convenience sampling methods as well as the genres targeted. Many also target adolescent populations, which poses questions as to generalisability to an older population. However, it should be noted that research (such as the industry-standard ESA, 2016) which indicates a more 50/50 gender split use sampling methods that include anybody who plays a game in the same category as those who are most enthusiastic about games, which can be problematic (see *Appendix A*). However, even when there is an even split, significant gender differences can be found (Király et al., 2014). This is supplemented by Pew

Research Center statistics, which indicate that males tend to identify more with the label of "gamer" than females (Duggan, 2015). Taking all this research into account, it is expected that males will exhibit greater levels of POG and PIU than females.

Third: higher levels of POG and PIU will predict lower levels of life satisfaction and general psychological wellbeing. Since the questionnaires utilised measure behaviours that are deemed problematic, id est exhibiting these behaviours leads to a number of complications in one's life, it is expected that higher levels of POG and/or PIU will predict lower levels of psychological well-being and life satisfaction. Previous research has indicated the presence of a relationship between mood disorders, such as depression, and internet addiction (Young & Rogers, 1998; Kim, K. et al., 2006; Ha et al, 2007; Whang, Lee & Chang, 2004; Park, S. et al., 2012) as well as for gaming addiction (Kuss & Griffiths, 2012). Internet addiction has also been shown to predict depression, anxiety and stress (Bahrainian et al., 2014; Caplan, 2003; Akin & Iskender, 2011; Younes et al., 2016). Limited research exists (such as Romer, Bagdasarov & More, 2013) that measures whether or not problematic gaming can predict negative effects such as those listed, however due to the nature of the construct, it is logical to assume that problematic gaming behaviours may predict negative outcomes.

METHODOLOGY

Design: This study utilised a cross-sectional design.

Participants: 1219 online participants and 54 pen-and-paper participants were recruited for this study. Since this study intended to study the population of gamers, purposive sampling methods were used. As discussed, the definition of "gamer" is contestable at best in the literature. This study attempts to control for this by drawing a sample from a pool of communities in which gaming is the central focus: these forums are sought out by people with an interest in gaming and require one to establish an account to access. It is reasonable to believe, therefore, that these people exhibit an enthusiasm for gaming and video games and thus can accurately be termed "gamers". The same logic applies to college gaming societies.

Thus, members of online gaming discussion forums and Irish college gaming societies were recruited to be in this sample. The specific online forums recruited were based mainly on reddit: /r/kotakuinaction, /r/gamerghazi, /r/steam, /r/xbox and /r/pcmasterrace. Other gaming forums, such as neoGAF, were contacted, but either did not respond or declined to participate. Due to the small sizes of the college gaming societies, the specific colleges cannot be named in order to prevent data becoming identifiable, however the colleges were all located in the south-east of Ireland.

Materials: The Problematic Online Gaming Questionnaire (Demetrovics et al., 2012); the Problematic Internet Use Questionnaire (Demetrovics, Szeredi & Rózsa, 2008); the Satisfaction with Life Scale (Diener et al., 1985); and the World Health Organisation 5 (WHO-5) Well-being Index (WHO, 1998).

The POGQ was developed by Demetrovics and colleagues (2012) on an online sample recruited from Hungarian online gaming forums. This is an 18-item self-report

questionnaire that measures problematic gaming using a five-point Likert scale. The minimum possible score is 18 and the maximum possible score is 90. The questionnaire measures six factors, which both exploratory and confirmatory factor analyses revealed to best fit the data: preoccupation; immersion; withdrawal; overuse; interpersonal conflicts; and social isolation. The data revealed that the questionnaire exhibited good validity and reliability, and sensitivity and specificity analysis revealed a cut-off score of 65 was revealed to be optimal. The study's generalisability was limited by a 90% male sample, however the same questionnaire was later shown to be as valid and reliable in a 50% male sample (Király et al., 2014). The short form of the questionnaire also performed successfully in reliability and validity tests (Pápay et al., 2013). This questionnaire still lacks extensive validity and reliability testing, however, and is yet to be reliability tested across different formats (such as pen-and-paper).

The PIUQ, developed by Demetrovics, Szeredi & Rózsa (2008), measures problematic internet use. It is an 18-item self-report questionnaire that measures problematic gaming using a five-point Likert scale. The minimum possible score is 18 and the maximum possible score is 90. EFA and CFA suggest a three-factor model of PIU: obsession, neglect and control disorder. The three-factor model seemed to fit the data best, however this is unconfirmed: the three factor model was described as "barely adequate" by Kelley & Gruber (2010, p.1), however other evidence seems to indicate that the three-factor model fits adequately (Demetrovics et al., 2016; Koronczai et al., 2011). No cut-off score has yet been provided.

The Satisfaction with Life Scale (Diener et al., 1985) is a widely-used self-report measure of life satisfaction and subjective well-being. It consists of five items relating to one's overall satisfaction with their life measured on a seven-point Likert scale. The minimum score is five, and the maximum score is thirty five. Categories are listed as: extremely

dissatisfied (5-9); dissatisfied (10-14); below average (15-19); average (20-24); above average (25-29); and highly satisfied (30-35). The measure has performed well in an extensive array of reliability and validity tests since its inception (Pavot & Diener, 2008; Vásquez, Duque & Hervás, 2013; de Sousa et al., 2015; Pavot et al., 1991; Neto, 1993; Abdallah, 1998; Pavot & Diener, 1993; Gouveia et al., 2009).

The World Health Organisation (WHO) 5 Well-Being Index was developed by the WHO in 1998 (WHO, 1998). It is a 5-item self-report questionnaire that assesses subjective psychological well-being. Meta-analyses (Topp et al., 2015) reveal extensive support for its reliability and clinimetric validity, and it has been used both as a screening tool for depression and as a measure of outcomes post-treatment, although it is limited to a two-week retrospective for consideration of its items. Possible scores range between 0 and 25, the former indicating poor psychological well-being and the latter indicating optimal. A score of below 13 or a 0 or 1 score to any one item indicates poor well-being and is recommended for further examination under ICD 10 Major Depression Inventory. Resources for those who felt at risk were provided in the debrief (*see Appendix B*). Its wide applicability across multiple fields and its versatility across both clinical and non-clinical fields made it an adequate candidate for this study.

All of the above materials were typed verbatim into a Google Forms survey for online dissemination. All statistical analyses were performed using SPSS Version 23 (IBM, 2015).

Procedure: The researcher first began with accruing the online sample since it required less setup than the real-world sample. This was performed by first identifying a set of online gaming forums that might be receptive to the survey being posted on their site. All

moderators were contacted and asked for permission prior to posting the survey link. The survey was then posted to the forums that granted the researcher permission to do so.

Due to the interactive and often critical nature of many of these forums, the researcher was on hand to reply to any input the participants had so as to keep the participants informed of the purpose of the study and assuage any concerns they may have had. The online survey began accepting responses on the 2nd of November, 2016, and ceased accepting responses on the 6th of March 2017, although most of the sample had accrued shortly after responses began being accepted.

The researcher then began contacting multiple college gaming societies to assess which ones were open to participating in the survey. Those that agreed organised appointments and times to do so in their own colleges.

When this appointment began, the participants were informed of the nature of the study and given consent forms to sign. Those that consented were given a survey to complete. When the participants had all finished, they were given the option to remain for a short debriefing to answer any questions they may have had.

All forms of data collection ceased on the 6th of March, 2017. All of the data was compiled and entered into SPSS for analysis. Statistical analyses was then performed on the data. Each hypothesis involved the examination of certain variables. Hypothesis one required the examination of the POG and PIU scale totals. Hypothesis two involved examining these totals as well as comparing the two gender variables on their levels of POG and PIU totals. The examination of hypothesis three comprised the examination of the following variables: age, gender, satisfaction with life, psychological well-being, all six POG subscales and all three PIU subscales.

RESULTS

The total number of participants collected across both formats was 1,270. 54 of these were from the pen and paper group and 1,219 were from the online group. Before analysis was conducted, some participants' data had to be deleted based on the following criteria:

- Only participants above 18 years of age

- No mock responses

- Males/females only

The final online sample used totalled 931 participants, 58 of which were female and 873 of which were male. Some pen-and-paper questionnaires had to be discarded due to the age limit, incomplete data or lack of a signature on the consent form. The final pen-and-paper sample totalled 46 participants, 6 of which were female and 40 of which were male.

Full descriptives for the online sample are included in table 1, and for the paper sample in table 2. Normality tests indicated that the online sample was not normally distributed with respect to any variable. The pen-and-paper sample was normally distributed in all variables except for age, gender and satisfaction with life. Histograms depicting these distributions can be seen in the Appendix.

Table 1: Online Sample

	Mean (95% CI)	SE	Median	SD	Range
Age	25.81 (25.39 – 26.22)	.21	24	6.48	18-69
POG	39.38 (38.73 – 40.03)	.33	38	10.19	18-75
PIU	35.74 (34.97 – 36.52)	.40	34	12.17	18-82
PWB	13.33 (13.03 – 13.63)	.15	14	4.74	0-25
SWL	18.95 (18.46 – 19.43)	.25	19	7.60	5-35

Table 2: Pen-and-Paper sample

	Mean (95% CI)	SE	Median	SD	Range
Age	20.70 (19.83 – 21.57)	.43	20	2.93	18-37
POG	43.76 (40.75 – 46.78)	1.50	45	10.16	24-69
PIU	39.11 (35.57 – 42.64)	1.80	39	11.90	21-67
PWB	14.93 (13.83 – 16.04)	.55	15	3.71	7-23
SWL	23.11 (21.26 – 24.95)	.92	25	6.22	6-33

The suggested cut-off score for POG is 65 (Demetrovics et al., 2012). Fifteen participants scored at or above this level, indicating a prevalence of 1.6% (n = 15) in the online sample and 4.3% (n = 2) in the paper sample. There is no suggested cut-off score for PIU, however since the questionnaires are nearly identical, applying the same cut-off score reveals a PIU prevalence rate of 2.3% (n = 21) in the online sample and 4.3% (n = 2) in the paper sample.

The mean and median levels of psychological well-being was low among the sample, with 367 (39%) online participants and 11 (24%) paper participants scoring below the risk score of 13. The scores for satisfaction with life were slightly below average and average in the online and paper sample respectively, with 119 (13%) online participants and 1 (2%) paper participant scoring at or below the "extremely dissatisfied" level.

Reliability analysis was conducted on all four questionnaires and across both formats. The online sample revealed: the POGQ (18 items), PIUQ (18 items), WHO-5 (5 items) and SWLS (5 items) had Cronbach's alphas of .86, .91, .82 and .89 respectively. This indicates all questionnaires show good reliability.

The paper sample revealed: the POGQ (18 items), PIUQ (18 items), WHO-5 (5 items) and SWLS (5 items) had Cronbach's alphas of .86, .91, .70 and .83 respectively. This indicates that all questionnaires except the WHO-5 show good reliability, whereas the WHO-5 only met the minimum acceptable value in the pen-and-paper sample (Tavakol & Dennick, 2011). The POGQ and PIUQ remain reliable across digital and physical formats.

Inferential Statistics

Hypothesis one was that POG and PIU would be moderately to strongly and positively related. All assumptions with the exception of normality (in the case of the online sample) were satisfied. A two-tailed Pearson product moment partial correlation analysis was conducted controlling for age, psychological well-being and satisfaction with life. The analysis revealed that online POGQ and PIUQ scores were moderately positively correlated when controlling for these three variables ($r = .62$, $n = 931$, $p < .001$). Analysis of zero-order correlation ($r = .66$) suggested that controlling for these variables has little effect on the relationship between POG and PIU. Paper sample analysis revealed that POGQ and PIUQ scores were also moderately positively related ($r = .61$, $n = 46$, $p < .001$), and zero-order correlations ($r = .63$) showed controlling for the mentioned variables had little effect on the relationship between POG and PIU. This indicates that higher levels of POG are moderately associated with higher levels of PIU.

Hypothesis two stated that there was an expected gender difference in the levels of POG and PIU. Since the online sample was non-normally distributed, a non-parametric Mann-Whitney U test was used to compare the medians of the male and female samples. The test indicated that there were no significant differences in the median levels of POG ($U = 22134$, $p = .108$, two-tailed) between males (Mdn = 38) and females (Mdn = 41) nor PIU ($U = 22333$, $p = .132$, two-tailed) between males (Mdn = 33) and females (Mdn = 35).

POG and PIU scores were normally distributed in the pen-and-paper sample, however, and so an independent samples t-test was conducted to examine this hypothesis. There was no statistically significant difference between males (n = 40) and females (n = 6) in: POG, t (12.09) = 1.22, p = .09, two-tailed; and PIU, t (6.26) = .06, p = .25, two-tailed.

On the POGQ, males (M = 44.20, SD = 10.67) scored higher than females (M = 40.83, SD = 5.38); on the PIUQ, males (M = 39.15, SD = 11.87) again scored higher than females (M = 38.83, SD = 13.29), although by a marginal amount. The magnitude of the differences in the: POG means (mean difference = 3.37, 95% CI = -2.66 to 9.40) was small (Cohen's d = .40); and PIU means (mean difference = .32, 95% CI = -13.60 to 14.22) was very small (Cohen's d = .03). This indicates that there was no gender difference in levels of POG and PIU in either sample.

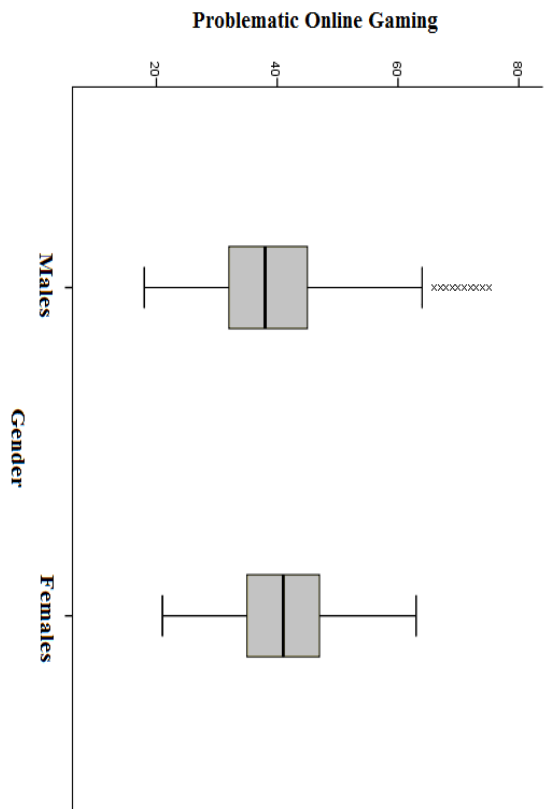These differences can be seen in figures one through four.

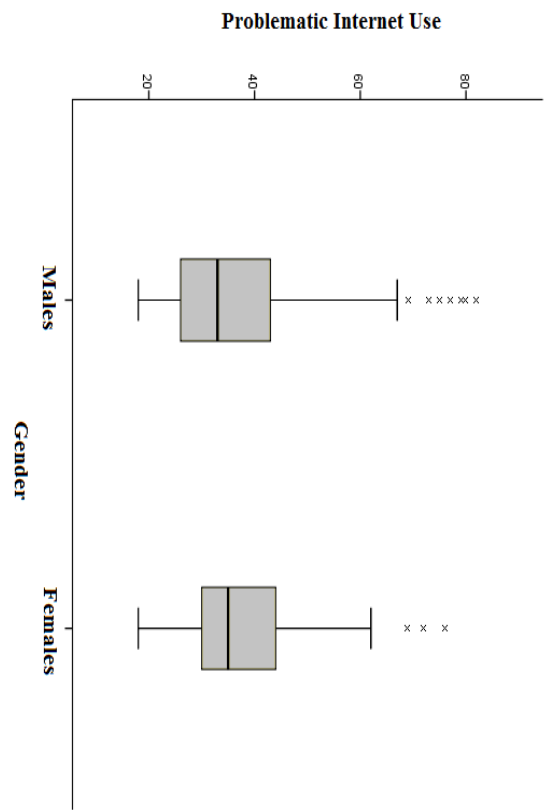Figure 1: Levels of POG in males and females (online sample)

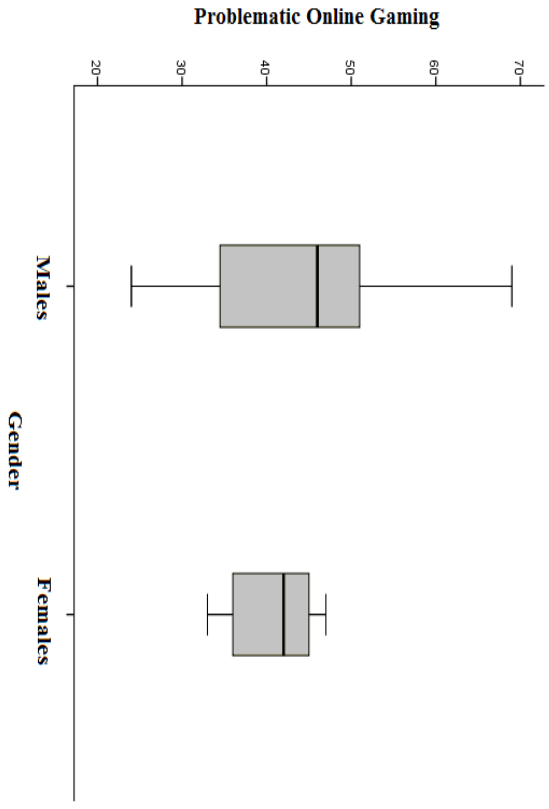Figure 2: Levels of PIU in males and females (online samples)

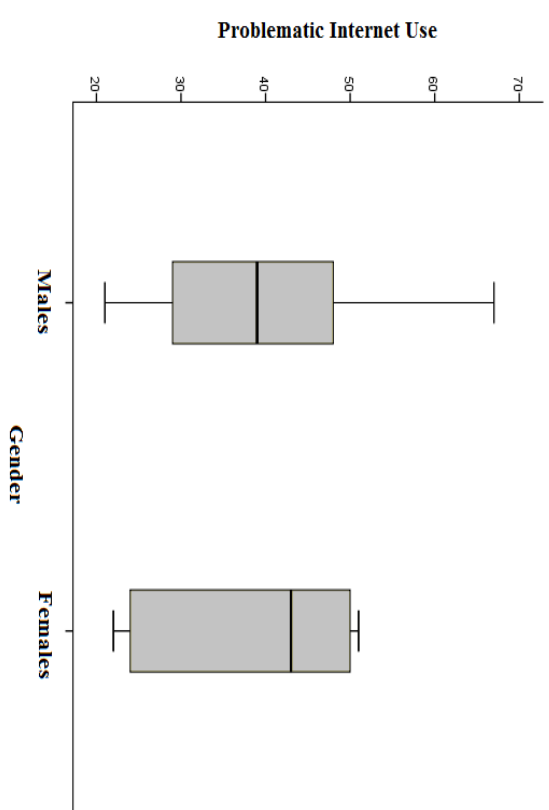Figure 3: Levels of POG in males and females (paper sample)

Figure 4: Levels of PIU in males and females (paper sample)

Hypothesis three stated that POG and PIU would predict psychological well-being and life satisfaction scores. Hierarchical regression analysis was used to examine this hypothesis. The paper sample was excluded from this analysis due to its small size; the online sample was used instead. Preliminary analyses revealed that, while assumption of normality was violated, the assumptions of linearity and homogeneity remained intact. Correlation analysis was run between all predictor variables, presented in Table 3. The correlations were mostly weak to moderate, though some were strong (range = .12 to .71, two-tailed), indicating multicollinearity was a possible concern for some variables. With the exception of POG Preoccupation, all PVs were correlated with SWLS and WHO-5 scores, indicating multiple regression analysis was a suitable test for the data.

Table 3

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Age	-												
2. Gender	.03	-											
3. POG Preoccupation	.03	-.12**	-										
4. POG Immersion	.09**	-.14**	.33**	-									
5. POG Withdrawal	.01	-.12**	.45**	.41**	-								
6. POG Overuse	.02	-.24**	.21**	.39**	.35**	-							
7. POG Interpersonal	-.02	-.21**	.23**	.32**	.39**	.42**	-						
8. POG Social Isolation	.02	-.07*	.29**	.43**	.46**	.39**	.33**	-					
9. PIU Obsession	.03	-.16**	.32**	.36**	.56**	.32**	.31**	.34**	-				
10. PIU Neglect	.03	-.19**	.23**	.49**	.43**	.47**	.45**	.54**	.65**	-			
11. PIU Control Disorder	.04	-.20**	.17**	.39**	.32**	.61**	.34**	.32**	.55**	.71**	-		
12. WHO-5	-.07*	.00	-.04	-.12**	-.21**	-.13**	-.09**	-.15**	-.22**	-.27**	-.23**	-	
13. SWLS	-.04	-.03	-.01	-.11**	-.14**	-.17**	-.10**	-.14**	-.20**	-.21**	-.21**	.59**	-

$* = p < .05$, $** = p < .01$

Hierarchical multiple regression analysis was performed to examine the predictive capabilities of POG and PIU scores on psychological well-being and life satisfaction. Age and gender were entered as predictor variables into the first block, since the research discussed in the literature reveals a relationship between POG, PIU, gender and age (id est being young and male correlate highly with exhibiting signs of POG and PIU). The POG/PIU were added alternately for each criterion variable. Since no *a priori* reason existed to dictate which order to enter POG and PIU in, a direct method approach was used for both variables separately. Four regressions, therefore, were carried out. Results for psychological well-being are presented in Table 4 and satisfaction with life are presented in Table 5.

Beginning with WHO-5 scores: the gender and age model was statistically insignificant, $F (2, 928) = 1.96$, $p = .14$ and predicted .2% of the variance in WHO-5 scores. When the POGQ subscales were entered as predictors, the model became significant, $F (8, 922) = 7.09$, $p < .001$. and explained 5% of the variance in scores. The addition of POG explained an additional 5.4% of the variance after controlling for gender and age (R^2 change $= .054$; $F [6, 922] = 8.77$, $p < .001$). POG Withdrawal was the strongest predictor ($\beta = -.20$, $p < .001$), followed by POG Preoccupation ($\beta = .08$, $p = .04$). No other predictors were significant. No multicollinearity was observed.

The PIU model was tested separately. The gender and age model was insignificant, with the exact same results as that above. When the PIU subscales were added, the model became significant, $F (5, 925) = 17.06$, $p < .001$ and explained 8% of the variance in scores. The addition of PIU explained an additional 8% of the variance in scores after controlling for gender and age (R^2 change $= .08$; $F [3, 925] = 27.01$, $p < .001$). The only significant subscale was PIU Neglect ($\beta = -.19$, $p < .001$). No multicollinearity was observed.

Table 4 – Multiple Regression Model of Psychological Wellbeing for POG and PIU

	R	R^2	$adjR^2$	B	SE	β	t
Age & Gender	.07	.00	.00				
Age				.00	.03	.00	.13
Gender				-1.27	.64	-.07*	-1.98
POG Model	.24	.06	.05				
Age				-.02	.03	-.03	-.88
Gender				-1.17	.63	-.06	-1.86
Preoccupation				.21	.10	.08*	2.10
Immersion				-.03	.06	-.02	-.59
Withdrawal				-.29	.06	-.20***	-4.76
Overuse				-.11	.07	-.06	-1.57
Interpersonal Conflict				.03	.10	.01	.29
Social Isolation				-.11	.09	-.05	-1.31
PIU Model	.29	.08	.08				
Age				-.04	.02	-.06	-1.73
Gender				-1.01	.62	-.05	-1.64
Obsession				-.08	.04	-.08	-1.84
Neglect				-.21	.06	-.19**	-3.75
Control Disorder				-.06	.04	-.06	-1.32

Note: * = p < .05, ** = p < .01, *** = p < .001

For SWLS scores: the gender and age model was statistically insignificant, $F_{(2, 928)}$ = 1.26, p = .28 and predicted .01% of the variance in scores. When POG subscales were

added, the model became significant, $F(8, 922) = 6.31$, $p < .001$ and explained 4.4% of the variance in scores. Adding POG explained an additional 5% of the variance after controlling for gender and age (R^2 change = .05; $F[6, 922] = 7.97$, $p < .001$). POG Overuse was the strongest predictor ($\beta = -.13$, $p = .001$), followed by POG Withdrawal ($\beta = -.11$, $p = .01$), POG Preoccupation ($\beta = .09$, $p = .02$) and age ($\beta = -.07$, $p = .03$). No other predictors were significant. No multicollinearity was observed.

The PIU model was again tested separately. The gender and age model was again insignificant, with the same results as above. When PIU subscales were added, the model became significant, $F(5, 925) = 12.49$, $p < .001$ and explained 5.8% of the variance in scores. Adding PIU explained an additional 6.1% of the variance in scores when controlling for gender and age (R^2 change = .06; $F[3, 925] = 19.92$, $p < .001$). PIU Control Disorder was the strongest predictor ($\beta = -.10$, $p = .03$), followed by PIU Obsession ($\beta = -.09$, $p = .03$) and age ($\beta = -.08$, $p = .01$). No other predictors were significant. No multicollinearity was observed.

These regression analyses reveal that POG and PIU significantly predict psychological well-being and life satisfaction, although the total explained variances are small and not all subscales predicted lower levels of psychological well-being and life satisfaction.

Table 5 – Multiple Regression Model of Life Satisfaction for POG and PIU

	R	R^2	$adjR^2$	B	SE	β	t
Age & Gender	.05	.00	.00				
Age				.03	.04	-.03	-.86
Gender				-1.34	1.02	-.04	-1.31
POG Model	.23	.05	.04				
Age				-.09	.04	-.07*	-2.19
Gender				-1.19	1.01	-.04	-1.18
Preoccupation				.38	.16	.09*	2.32
Immersion				-.05	.09	-.02	-.51
Withdrawal				-.25	.10	-.11*	-2.58
Overuse				-.39	.11	-.13**	-3.47
Interpersonal Conflict				-.09	.14	-.02	-.55
Social Isolation				-.17	.14	-.05	-1.23
PIU Model	.25	.06	.06				
Age				-.96	1.00	-.03	-.97
Gender				-.10	.04	-.08*	-2.51
Obsession				-.14	.07	-.09*	-2.14
Neglect				-.17	.09	-.10	-1.94
Control Disorder				-.16	.07	-.10*	-2.21

Note: * = p < .05, ** = p < .01, *** = p < .001

DISCUSSION

The results of this study revealed a number of interesting things to discuss. The questionnaires were consistently reliable across formats, indicating that they can be used in digital and physical form, adding to the basis of evidence for the POGQ and PIUQ's use as a measure of problematic gaming and internet behaviours.

It is first and foremost worth noting that the mean psychological well-being in the sample was low, around 13, with a standard deviation of around three. The WHO-5 recommends that those scoring thirteen or less or answering 0 or 1 to any question on the questionnaire could be at risk of depression. This low mean can be considered concerning, however it was likely affected by outliers as revealed by the positive skew of the distribution plots (*see Appendix D*). Satisfaction with life was considerably more average as described by scoring guidelines, and had a large standard deviation but was minimally skewed.

Hypothesis one stated that POG and PIU were related, and this hypothesis was supported by the data. The two were moderately and positively related, which bears many implications for this research piece and beyond. This indicates that, when measuring either construct, one must consider the relation to the other and how the two constructs may interact and consider the possibility of one confounding the other. Considering the two are not only correlated but so easily experienced in tandem in reality (for instance: Twitch streams), it is possible that a person who exhibits POG may also exhibit PIU. This may also suggest the possibility of an underlying issue that manifests in an over-reliance on gaming and the internet: as established in the literature review, POG and PIU are often comorbid with clinical depression and anxiety. One must also consider the context in which one plays video games and browses the internet: future research may benefit from taking into account the context in which people play, since playing alone in one's home

and playing in a social setting may lead to different results. It is important, in this regard, to keep the nuances of gaming and the internet in mind: the ability to converse and talk with friends and strangers online at any time as well as the context of such interactions may play an important part in one's use of the internet and, subsequently, whether or not that use becomes problematic. For instance, one with social anxiety may become reliant on the internet for social interaction while in a comfortable environment, and it is not a given that they would perform better or benefit more in a real-world social situation.

The data secondly revealed that this research failed to observe a statistically significant difference in the levels of POG and PIU between males and females, thus rejecting the second hypothesis. This finding is incongruous with much previous research (Choo et al., 2010; Wittek et al. 2016; Vadlin et al. 2016; Wei et al. 2012; Carli et al., 2013; Desai et al., 2010), which has found males to exhibit more pathological and problematic symptoms than females even in samples with more equal gender distribution. This does not rule out gender bias: since only 58 of the sample were female, it is likely that the sample simply lacked the statistical power to detect any possible effect. It is also possible that the POGQ, since it was developed on a 90% male sample (total n = 3,415), does not measure female POG in the same way that it measures male POG. However, the POGQ and the PIUQ are virtually the same questionnaire, with minimal change in wording as is pursuant to their respective constructs (both of which are also related). Unlike the POGQ, the PIUQ was developed on a 54% male sample (total n = 5005) and also found no gender difference. When conducting future research, one may want to focus on obtaining as gender-equal a sample as is possible in order to most reliably observe any differences in POG and PIU that may exist.

The final hypothesis stated that POGQ and PIUQ would be able to predict lower levels of psychological well-being and life satisfaction as measured by the WHO-5 and the SWLS.

This hypothesis was supported. While most significant correlations were negative, POG Preoccupation predicted a positive, if very weak, increase in levels of psychological well-being and life satisfaction. The explained variances were small, however the PIUQ was a stronger predictor of both well-being measures. This could mean that PIU is a stronger contributor to one's psychological well-being and life satisfaction in comparison to POG.

A possible explanation for this could be the inherent differences in the activities: people play games to relax and have fun as a pastime. Many gamers find gratification in mastering a game's gameplay, experiencing a game's story or immersing oneself in the game. In a lot of senses, it is easier to control one's interactions in video games due to the game's established ruleset and one's motives for playing. When it comes to the internet, the possible interactions increase and one's control over them decreases, resulting in an increased chance of being exposed to bad news and undesirable or offensive content. Research has revealed this to be possible in the case of Facebook – students' perceptions of other users' lives are linked to their Facebook use (Chou & Edge, 2012), which may worsen depressive symptoms in those predisposed to depression (Pantic, 2014).

This would explain why, when predicting both psychological well-being and satisfaction with life, PIU subscales always exhibited negative coefficients, whereas some POG subscales exhibited positive coefficients. Specifically, POG Preoccupation significantly predicted increased psychological well-being and life satisfaction, albeit weakly. It makes sense that, if someone enjoys video games, that thinking about these games would make them feel better, especially in situations where one may feel they would like to play a game to escape but do not have access to a video game. This result seems to undermine the DSM-V's Preoccupation criteria with reference to gaming addiction.

PIU Obsession, which is comparable to POG Preoccupation, significantly predicted lower levels of life satisfaction, but also was negatively correlated albeit insignificantly with psychological well-being. An example of why this may be the case is self-image: social media allows one to portray themselves in a controlled manner, and one may constantly be concerned with how they look online. As discussed in the literature review, previous research has revealed social media use and internet addiction to have been associated with increased anxiety and depression. This could explain the differential ability of the POGQ and PIUQ to predict psychological well-being and life satisfaction. Interestingly, gender was a significant predictor in the PIU model of life satisfaction – more so than two of the PIUQ's subscales themselves, which echoes recent findings around the role of gender in social media-related depression (Nesi, 2015; Primack et al., 2017).

The small amount of variance explained by these measures as well as the insignificance of many subscales' predictive power also indicate that problematic internet and gaming addiction do not seem to be major contributors to lower levels of life satisfaction and psychological well-being. It is likely that greater stresses, such as ill health of a loved one or oneself, financial pressure and a multitude of other factors that were not measured or specified in this research are more likely to have a greater impact on psychological well-being and satisfaction. It could be argued that this undermines the conception of excessive gaming and internet use as an addiction, since it would likely have exhibited a greater ability to predict lower levels of life satisfaction and psychological well-being. However, the measures may be suited to identifying non-clinical instances of problematic behaviour so as to address it in its most early stages and mitigate later psychological distress.

When conducting future examinations of the predictive ability of the POGQ and PIUQ, this study may contribute to establishing an *a priori* in the configuration of POG and PIU in a hierarchical regression model. Since PIU is moderately related to POG and is a greater

predictor of psychological well-being and life satisfaction scores, it may be pertinent to run a hierarchical regression analysis to control for PIU before entering the POG subscales in order to examine how much extra predictive ability POG subscales contribute when PIU is controlled for. It is clear that the relationship between the two requires further exploration while taking into account the limitations exhibited by this research. It may also be interesting to examine if there is a bidirectional relationship between POG, PIU and life satisfaction and psychological well-being, or if the latter are a better predictor of the former rather the other way around.

There are a number of limitations with this research, the most glaring of all being the predominantly male sample. While it is arguable that this represents the population of gamers accurately, it hampers one's ability to examine gender differences accurately. As discussed, this can be remedied with a focus on accruing as gender-equal sample as possible. On the topic of generalisability, the bulk of the sample was made up of participants from the US and the UK, which calls into question this study's ability to generalise beyond. While there were participants from countries all over the world, their numbers remained in the mid to low tens for the most part, if at all. The use of a non-random sampling method also places limits on generalisability, although using such a method was arguably necessary for the most accurate examination of the chosen variables.

The use of the WHO-5 and SWLS may also present a limitation to this research endeavour. While they have been extensively used in previous psychological research, more specific and accurate measures may yield more useful information in the future. One specific issue is that the WHO-5 measures one's feelings in the two weeks prior to testing, which may be a poor indicator of psychological well-being overall due to a number of possible reasons, for instance a relative's death, exam pressure, and so on, so forth. Similarly, the SWLS is a non-specific measure of life satisfaction – there may be a

multitude of reasons why someone's life satisfaction is low that are unrelated to gaming and internet use. Both of these self-report scales may better be replaced by clinically-focused and validated questionnaires going forward, although this bears upon sample size and questionnaire fatigue risk. All measures used were self-report measures, which also presents a possible limitation to the results.

One may argue that sourcing a sample from the internet may bias the results when examining the relationship between POG and PIU, since the gaming forums sourced are located online. While this is a legitimate criticism, the pen-and-paper sample, though being far smaller, revealed not only identical reliability, but a highly significant correlation between POG and PIU with similar strength to the online sample. While this is not a complete refutation of this criticism, it does suggest that both POG and PIU do share a relationship that is not significantly affected by the possible bias introduced by conducting the test online.

During the course of data gathering, the highly interactive nature of the internet was readily apparent: forum members were vocal with their criticisms of the study at hand, many of which were accurate. Most prominent among the criticisms (even being observed among the paper sample) was the wording of the POGQ and PIUQ. Two questions in particular proved troublesome: POG item 16, "How often do you choose gaming over going out with someone?"; and PIU item 8, "How often do you choose the internet rather than being with your partner?". One's interpretation of this question may inaccurately contextualise one's answer: answering "never" does not distinguish between those who never choose to game over meeting with a friend and those who interact socially using games and the internet, or game in the presence of friends; similarly, answering "never" does not distinguish between those who do not choose the internet over their partner and those who either are in a relationship through the internet or are in no relationship at all.

While Demetrovics and colleagues found no relationship between marital status and POGQ and PIUQ in their original conceptions of the scales, it can still be argued that the wording lacks discriminative ability and could be reworked.

Similar criticisms apply to those who rely on the internet and gaming for employment and whether or not these scales account for this, however there is a distinction between that type of use made in the addiction criteria that is supported empirically by Demetrovics and colleagues also having failed to observe occupation having an effect on levels of POG and PIU.

These criticisms could have been further tested in this study, however due to researcher error, marital status and occupation were not measured. Future research may benefit from including these measures in order to replicate Demetrovics and colleagues' findings. A final recommendation of future research is to conduct further confirmatory factor analyses in order to examine the factor structure of these questionnaires to ensure the accuracy of their measurements.

In conclusion, the POGQ and PIUQ were reliable measures. POG and PIU were moderately and positively related and were able to serve as reliable predictors of psychological well-being and life satisfaction. While they only explained less than 10% of the variance in scores, this research can be used as evidence as to the utility of both the POGQ and PIUQ in examining internet and gaming addiction. Slowly, researchers will continue to whittle down every measure to its finest components; it is intended that this research will aid in the creation of a cohesive measure to be used in examining gaming and internet addiction, as well as the development of measures able to identify those in need of subsequent interventions that can aid in the reduction of internet and gaming addiction, resulting in a better quality of life.

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APPENDIX A

On 'casual games', page 10: The definition of a casual video game is a widely debated topic in gaming circles. Russoniello, O'Brien & Parks (2009) refers to the Casual Games Association Market Report of 2007, which defines a casual game as: fun, quick to access, easy to learn and lacking a requirement of skill, expertise or time commitment to play. While one's definition of fun will differ depending on the person asked and "ease of access" is constantly in flux due to the increasingly digital availability of games, there is a considerable difference in the level of difficulty between games used in the Russoniello's study, such as Peggle, and those not considered to be casual games, such as Street Fighter V or Dark Souls, both of which have a level of mechanical depth that requires a dedication and investment of time to master and, from that mastery, enjoy.

What constitutes a "gamer" is also often contested in popular discussion: some believe that the act of playing a video game, any video game, makes one a gamer, which is represented in the methodology of many gaming demographic studies, including that of the industry-standard Entertainment Software Association's research. Others contend that this is not enough: for instance, some contend that a large population of people drive, yet only some would claim to be car enthusiasts or "gearheads". As such, it would be inaccurate to describe a gamers merely as "someone who plays games". In choosing to use forums and societies dedicated to gaming that also have prerequisites (i.e. the need for an account or registration) to joining, it is hoped that this study controlled for this lack of consensus with its design.

APPENDIX B

Enclosed in this section the consent form and information/debrief sheet used in this research, in that order.

Problematic gaming and internet use: towards a standardised measure and the

relationship with life satisfaction

Invitation to participate

You are invited to participate in this study, which intends to measure the relationship between your internet and gaming use and your general psychological well-being and life satisfaction to see if there is a relationship between them.

In this study, you will be presented with four questionnaires: the Problematic Online Gaming Questionnaire; the Problematic Internet Use Questionnaire; the World Health Organisation Well-Being Index 5 and; the Satisfaction with Life Scale.

The first two, each eighteen items long, will measure your patterns of internet and gaming use, while the last two, each five items long, will measure your general psychological well-being and your subjective sense of satisfaction with your life.

Overall, there are forty-six questions. The survey should take you between five and fifteen minutes to complete, depending on how long you wish to consider the items. All data collected will be confidential and private.

If you would like to participate in this research, please sign here:

Age: _____

Gender: _____

Country of birth:_____

Your name (print): _____

Your signature: _____

If at any stage in the study you wish to cease participation, you may simply put up your hand and submit your sheet to Daeln, the researcher. You can opt to withdraw your data without repercussion if you wish, and you will be debriefed after the study has ended.

Debriefing for this study on internet and gaming use and the relationship with life satisfaction

Thank you for taking the time to participate in this study, which examines the relationship between one's use of video games and the internet and how that relates to one's subjective sense of psychological wellbeing. Many use the internet and video games as a way to destress, unwind and relax. However, some may use the internet and video games excessively, and it may impact upon not only their physical health, but their mental health and social life as well.

In this study, we measured each participant's level of use of the internet and video games as well as each participant's subjective assessment of satisfaction with their life. Using the four questionnaires you completed, we measured the following variables: your level of internet use and how it may impact your life; your level of gaming use and how it may impact your life and; your sense of overall life satisfaction and general psychological well-being.

It is expected that those with a higher level of internet and gaming use will have a problematic dependence on the internet and video games, which is expected to correlate with lower levels of life satisfaction and general psychological well-being. If this is true, then the questionnaires used may be able to identify those who use the internet and video games in ways that may be detrimental.

If the data reveals such a relationship between these variables, then this research can be used to show that the questionnaires are able to identify those who may be unsatisfied with their life. This allows researchers to provide the support that such a person may need to improve their situation and increase their life satisfaction, leading to a more positive living experience.

If you feel uncomfortable with submitting your data, you may withdraw it at any stage without repercussion. Simply inform the researcher using the email address provided below.

If at any stage you feel that you may be upset, dissatisfied or concerned with either this study or your own use of the internet or video games, or your general psychological well-being or life satisfaction, please contact Daeln at the following e-mail address:

daeln.murphy@student.ncirl.ie

Additionally, if you would like to request a copy of the final write-up, or a summary of the results, you may do so as well by emailing Daeln at the provided address.

If you are feeling upset, depressed, anxious or distressed at all and feel that you may need some help, you may contact the following organisations for assistance:

Ireland:

The Rutland Centre 24-hour helpline: +353 1 494 6358

Rutland Centre email address: info@rutlandcentre.ie

Samaritans 24-hour helpline: 116 123

Aware support line: 1800 80 48 48

Aware email address: info@aware.ie

International:

Befrienders Worldwide email address: info@befrienders.org

World Federation of Mental Health email address: info@wfmh.com

International Foundation for Research and Education on Depression website: ifred.org

APPENDIX C

Enclosed in this section are the questionnaires used in the research piece.

Problematic Online Gaming Questionnaire (POGQ)

Please read the statements below regarding *online gaming*. The questionnaire REFERS TO ONLINE GAMES exclusively, but we use the expression 'game' in each statement for simplicity's sake.

Please indicate on the scale from 1 to 5 to what extent, and how often, these statements apply to you!

	Never	**Seldom**	**Occasionally**	**Often**	**Always**
1. When you are not gaming, how often do you think about playing a game or think about how would it feel to play at that moment?	1	2	3	4	5
2. How often do you play longer than originally planned?	1	2	3	4	5
3. How often do you feel depressed or irritable when not gaming only for these feelings to disappear when you start playing?	1	2	3	4	5
4. How often do you feel that you should reduce the amount of time you spend gaming?	1	2	3	4	5
5. How often do the people around you complain that you are gaming too much?	1	2	3	4	5
6. How often do you fail to meet up with a friend because you were gaming?	1	2	3	4	5
7. How often do you daydream about gaming?	1	2	3	4	5
8. How often do you lose track of time when gaming?	1	2	3	4	5
9. How often do you get irritable, restless or anxious when you cannot play games as much as you want?	1	2	3	4	5
10. How often do you unsuccessfully try to reduce the time you spend on gaming?	1	2	3	4	5

11. How often do you argue with your parents and/or your partner because of gaming?	1	2	3	4	5
12. How often do you neglect other activities because you would rather game?	1	2	3	4	5
13. How often do you feel time stops while gaming?	1	2	3	4	5
14. How often do you get restless or irritable if you are unable to play games for a few days?	1	2	3	4	5
15. How often do you feel that gaming causes problems for you in your life?	1	2	3	4	5
16. How often do you choose gaming over going out with someone?	1	2	3	4	5
17. How often are you so immersed in gaming that you forget to eat?	1	2	3	4	5
18. How often do you get irritable or upset when you cannot play?	1	2	3	4	5

World Health Organisation – 5 Well-Being Index

Please indicate for each of the five statements which is closest to how you have been feeling over the last two weeks. Notice that higher numbers mean better well-being.

Example: If you have felt cheerful and in good spirits more than half of the time during the last two weeks, put a tick in the box with the number 3 in the upper right corner.

	Over the last two weeks	All of the time	Most of the time	More than half of the time	Less than half of the time	Some of the time	At no time
1	I have felt cheerful and in good spirits	5	4	3	2	1	0
2	I have felt calm and relaxed	5	4	3	2	1	0
3	I have felt active and vigorous	5	4	3	2	1	0
4	I woke up feeling fresh and rested	5	4	3	2	1	0
5	My daily life has been filled with things that interest me	5	4	3	2	1	0

Problematic Internet Use Questionnaire (PIUQ)

In the following you will read statements about your Internet use. Please indicate on a scale from 1 to 5 how much these statements characterize you.

	Never	Seldom	Occasionally	Often	Always
1. How often do you fantasize about the Internet, or think about what it would be like to be online when you are not on the Internet?	1	2	3	4	5
2. How often do you neglect household chores to spend more time online?	1	2	3	4	5
3. How often do you feel that you should decrease the amount of time spent online?	1	2	3	4	5
4. How often do you daydream about the Internet?	1	2	3	4	5
5. How often do you spend time online when you'd rather sleep?	1	2	3	4	5
6. How often does it happen to you that you wish to decrease the amount of time spent online but you do not succeed?	1	2	3	4	5
7. How often do you feel tense, irritated, or stressed if you cannot use the Internet for as long as you want to?	1	2	3	4	5
8. How often do you choose the Internet rather than being with your partner?	1	2	3	4	5
9. How often do you try to conceal the amount of time spent online?	1	2	3	4	5
10. How often do you feel tense, irritated, or stressed if you cannot use the Internet for several days?	1	2	3	4	5
11. How often does the use of Internet impair your work or your efficacy?	1	2	3	4	5
12. How often do you feel that your Internet usage causes problems for	1	2	3	4	5

you?

13. How often does it happen to you that you feel depressed, moody, or nervous when you are not on the Internet and these feelings stop once you are back online?	**1**	**2**	**3**	**4**	**5**
14. How often do people in your life complain about spending too much time online?	**1**	**2**	**3**	**4**	**5**
15. How often do you realize saying when you are online, "just a couple of more minutes and I will stop"?	**1**	**2**	**3**	**4**	**5**
16. How often do you dream about the Internet?	**1**	**2**	**3**	**4**	**5**
17. How often do you choose the Internet rather than going out with somebody to have some fun?	**1**	**2**	**3**	**4**	**5**
18. How often do you think that you should ask for help in relation to your Internet use?	**1**	**2**	**3**	**4**	**5**

Satisfaction With Life Scale

Below are five statements that you may agree or disagree with. Using the 1 - 7 scale below, indicate your agreement with each item by placing the appropriate number on the line preceding that item. Please be open and honest in your responding.

- 7 - Strongly agree
- 6 - Agree
- 5 - Slightly agree
- 4 - Neither agree nor disagree
- 3 - Slightly disagree
- 2 - Disagree
- 1 - Strongly disagree

_____ In most ways my life is close to my ideal.

_____ The conditions of my life are excellent.

_____ I am satisfied with my life.

_____ So far I have gotten the important things I want in life.

_____ If I could live my life over, I would change almost nothing.

APPENDIX D

On the following pages, figures five to fourteen depict evidence for the distributions of the online and paper samples on variables of age, POG, PIU, psychological well-being and satisfaction with life.
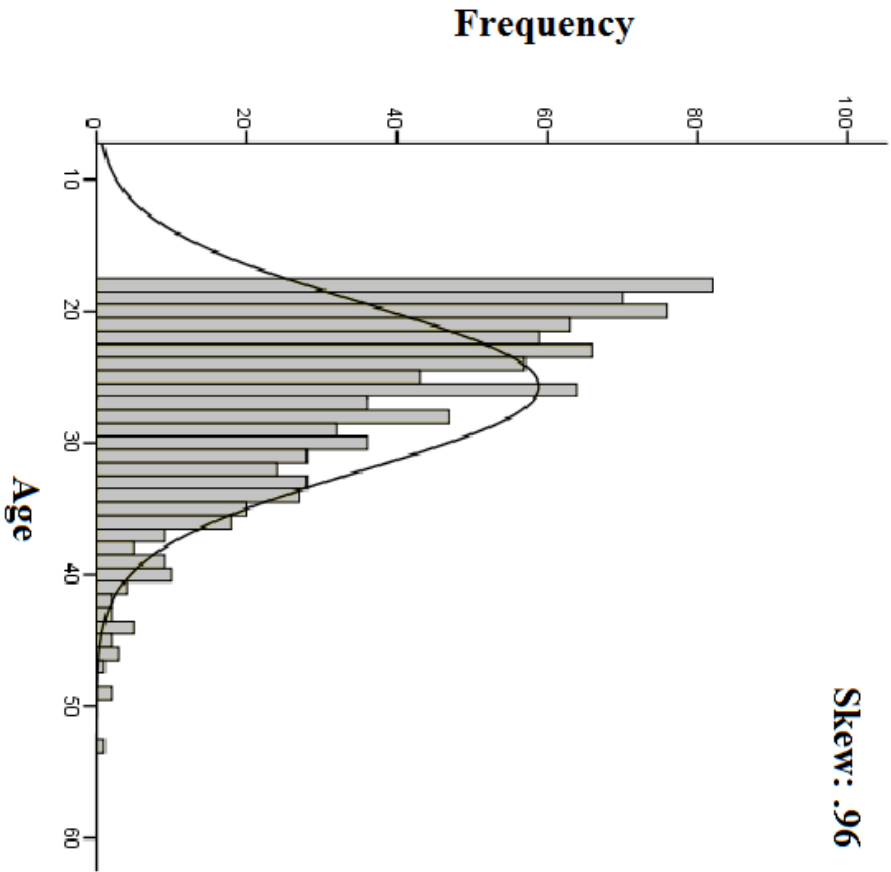
Figure 5: Age (Online sample) Skew: .96
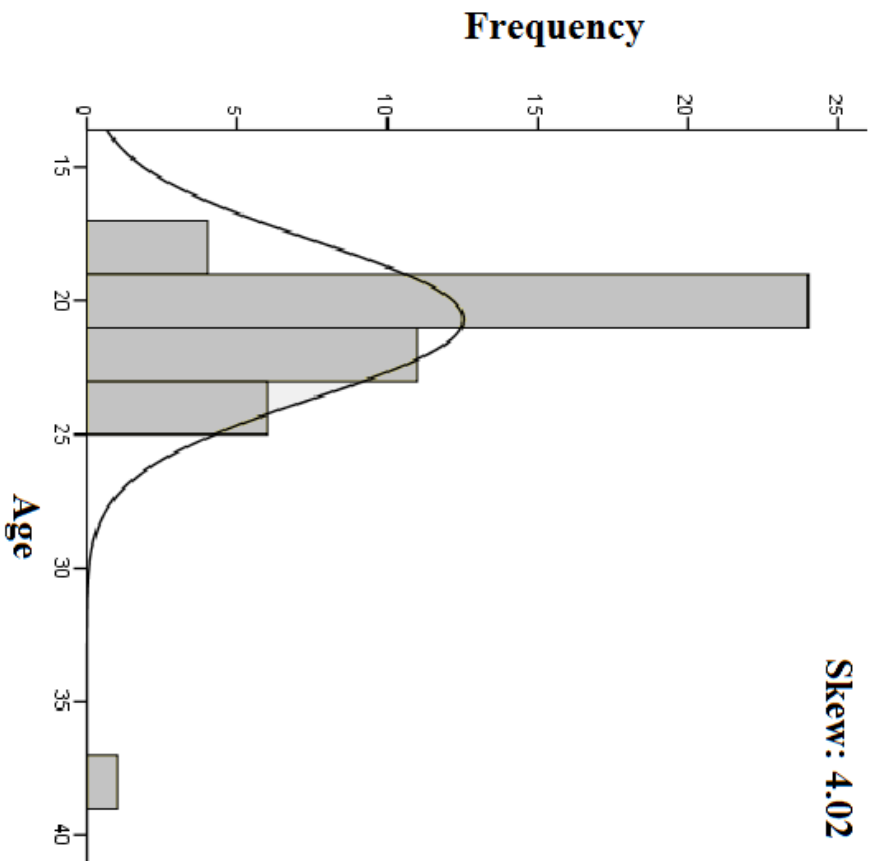
Figure 6: Age (Paper sample) Skew: 4.02
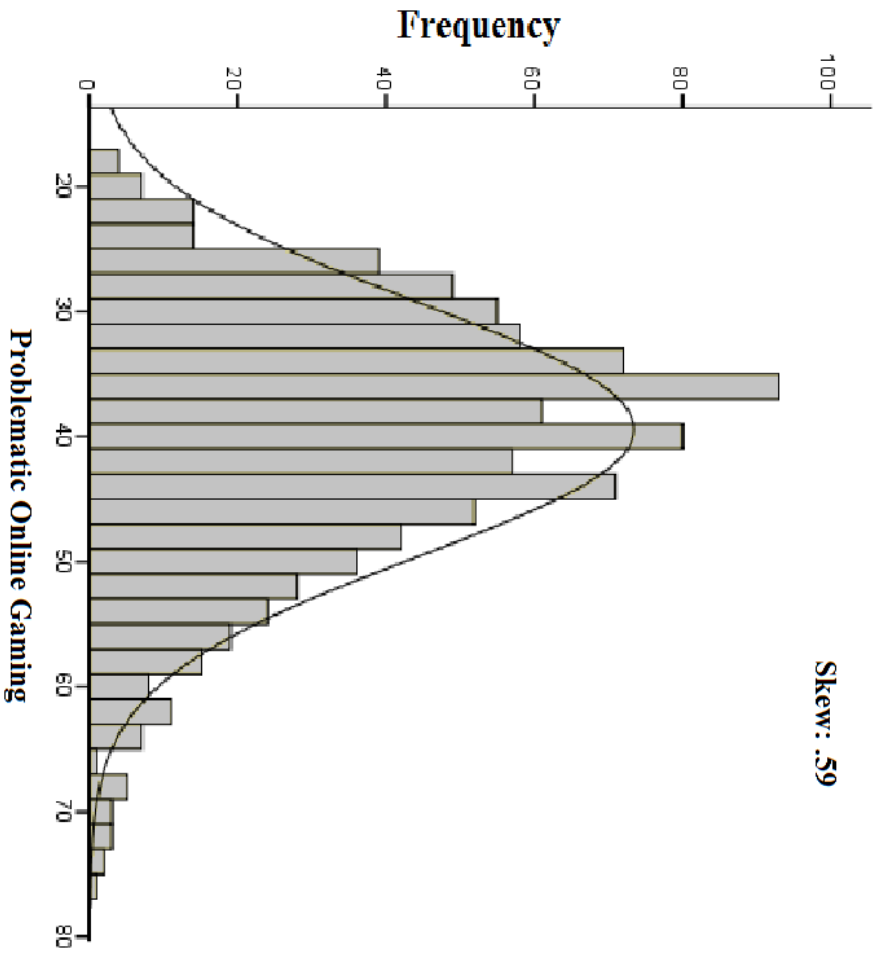
Figure 7: Problematic Online Gaming (Online sample) Skew: .59
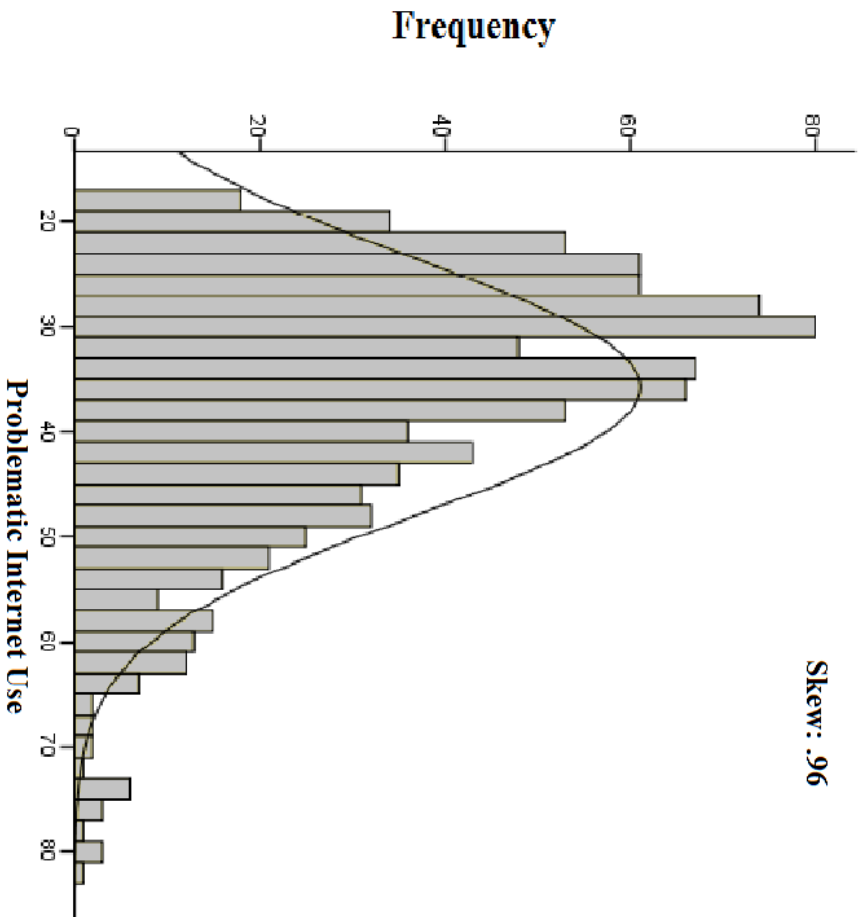
Figure 8 : Problematic Internet Use (Online sample) Skew: .96
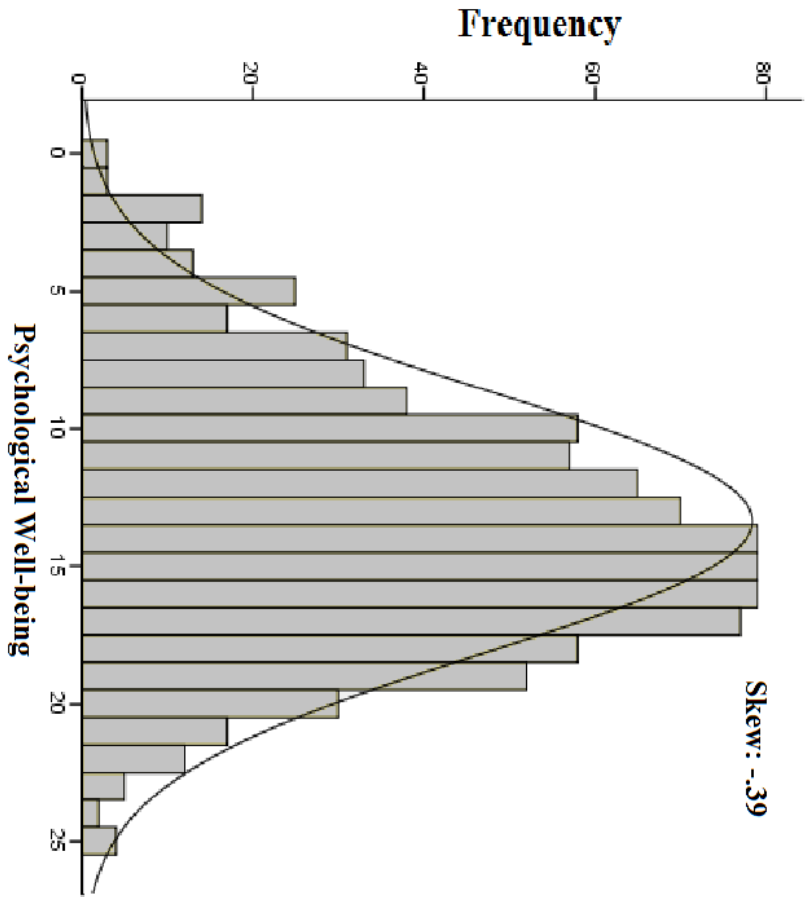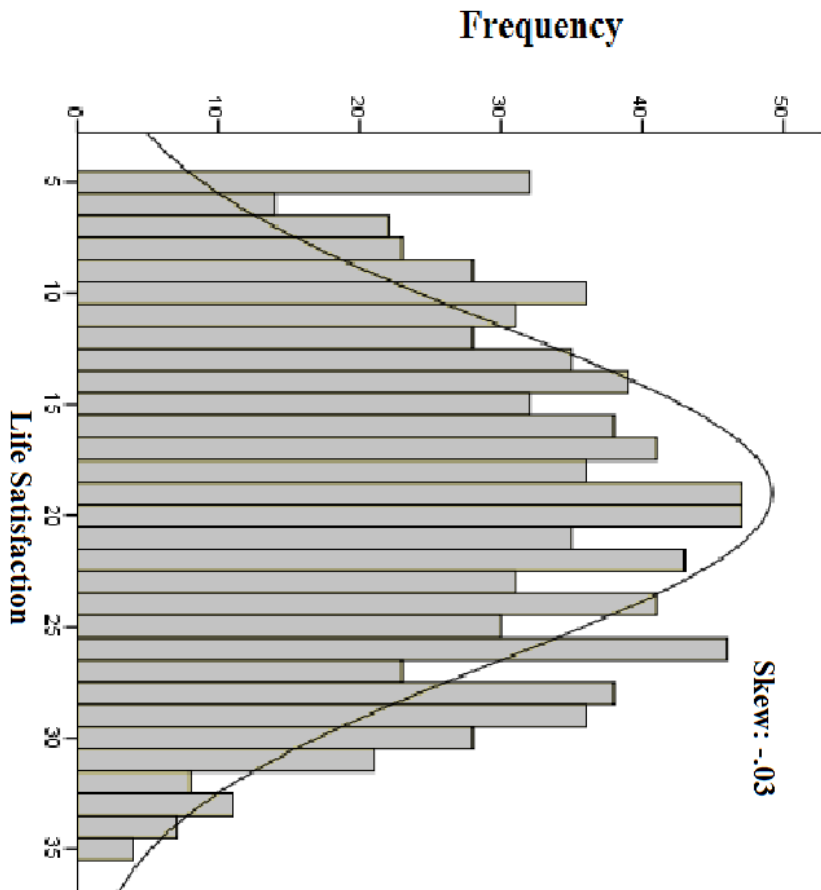
Figure 9: Psychological Well-being (Online sample)

Figure 10 : Life Satisfaction (Online sample)

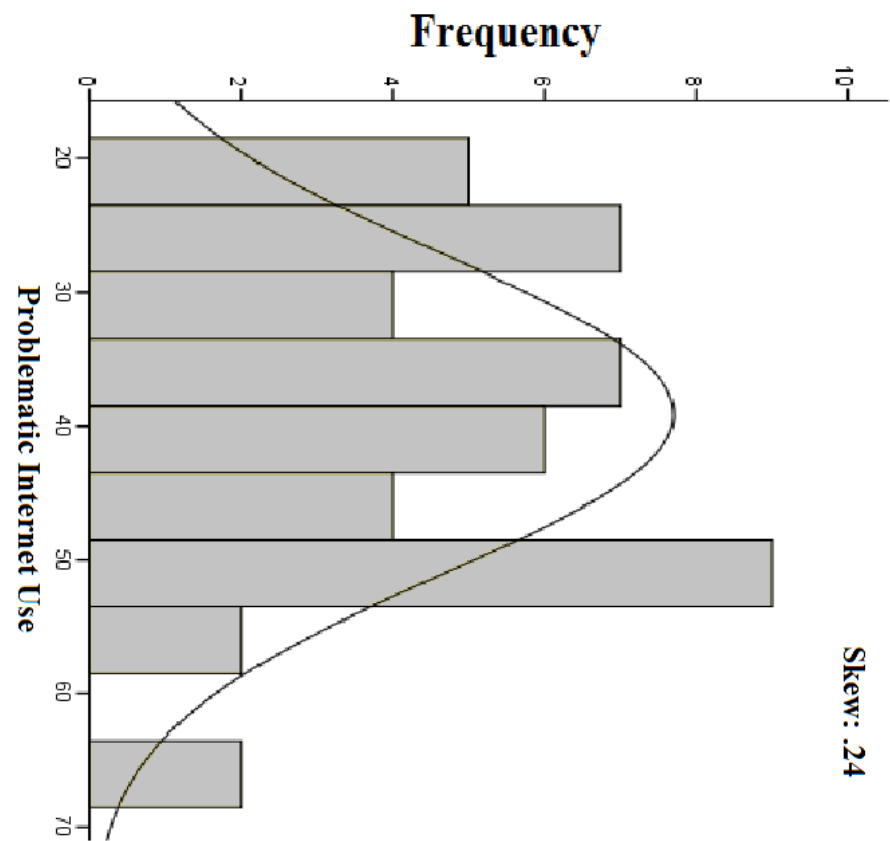Figure 11 : Problematic Online Gaming (Paper sample)

Skew: .31
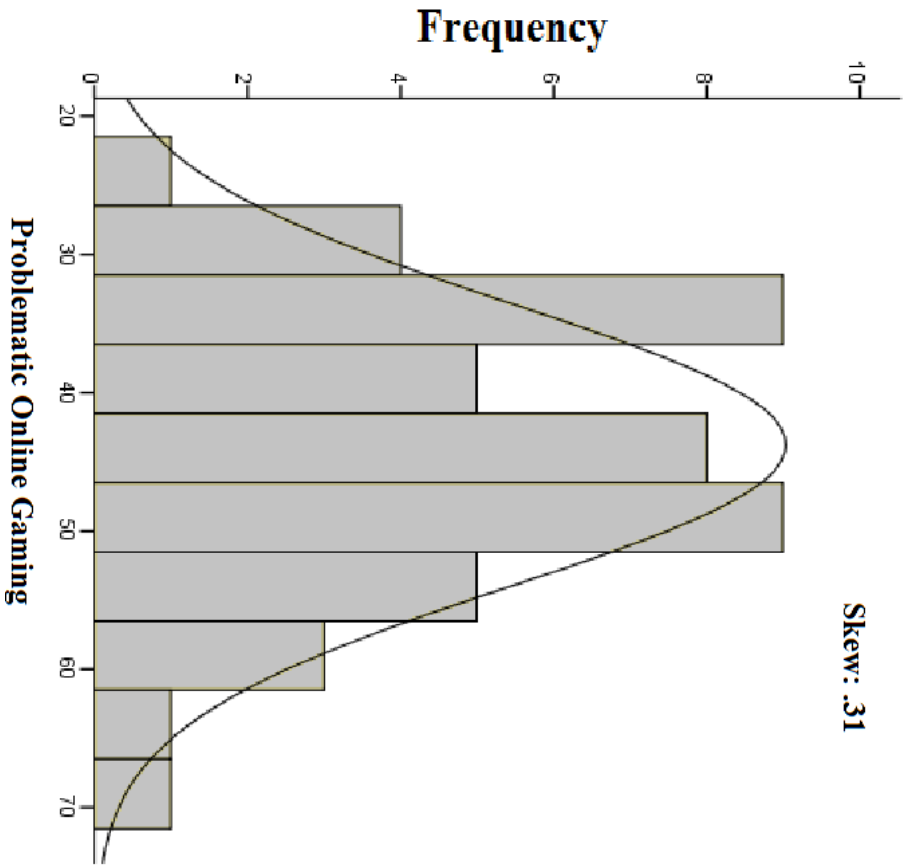
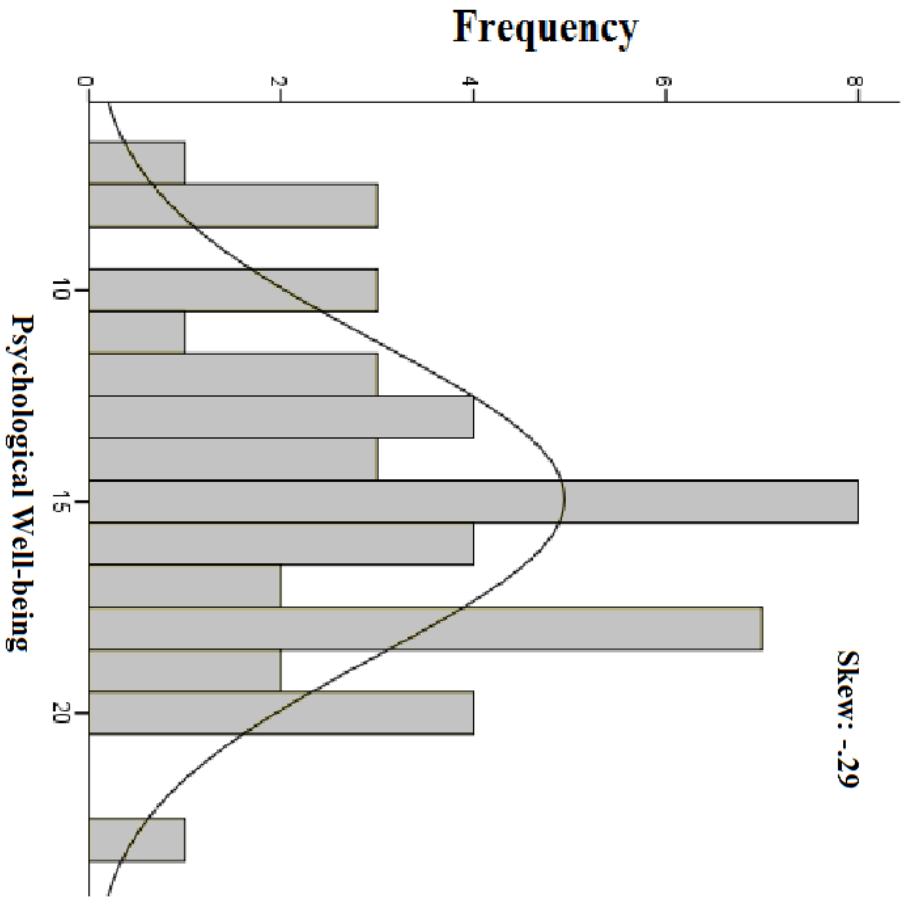Figure 12 : Problematic Internet Use (Paper sample)
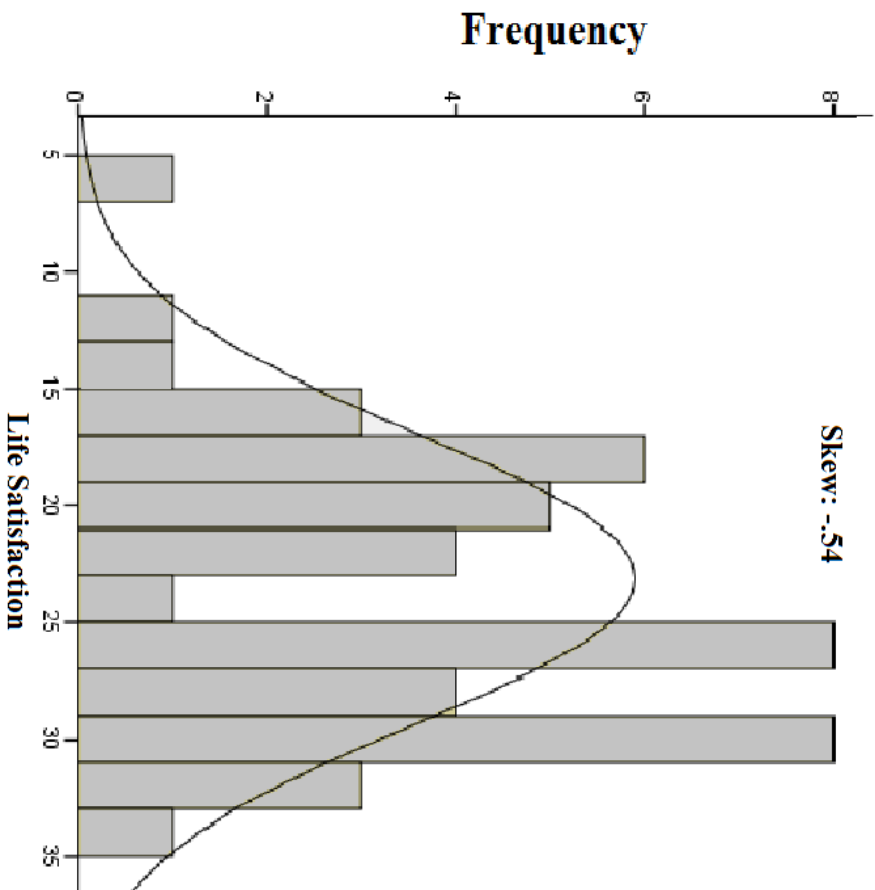
Skew: .24

Figure 13 : Psychological Well-being (Paper sample)

Figure 14: Life Satisfaction (Paper sample)