
COGNITIVE DISTORTIONS AND PROBLEMATIC INTERNET USE CONNECTION: EXAMINING THE MEDIATOR ROLES OF LONELINESS AND SOCIAL ANXIETY BY PARTIALLING OUT THE EFFECTS OF SOCIAL DESIRABILITY

Yaşar KUZUCU¹, Özge SARIOT ERTÜRK^{2*},
Ömer Faruk ŞİMŞEK³, İbrahim GÖKDAŞ⁴

¹ PhD - Aydın Adnan Menderes University, Faculty of Education, Department of Psychological Counseling and Guidance, Aydın, Turkey, yasarku@yahoo.com, Telephone: +90 256 218 20 00

² PhD - Aydın Adnan Menderes University, Faculty of Science and Arts, Psychology Department, Aydın, Turkey, ozge.sariot@adu.edu.tr, Telephone: +90 505 385 55 36

³ PhD - İstanbul Rumeli University, Faculty of Economics, Administrative and Social Sciences, Psychology Department, İstanbul, Turkey, simsekof@gmail.com, Telephone: +90 212 866 01 01

⁴ PhD - Aydın Adnan Menderes University, Faculty of Education, Department of Computer and Instructional Technologies Education, Aydın, Turkey, igokdas@gmail.com, Telephone: +90 256 218 20 00

Abstract

This research investigated direct and indirect relationships that occur between interpersonal cognitive distortions, loneliness, social anxiety and problematic Internet use (PIU) when the effect of social desirability was controlled. The study was based on a cognitive-behavioural model of generalized PIU. Data were collected from 260 university students ranging from 18 to 26-year-olds (M=21.29, SD=1.78). The participants answered the Interpersonal Cognitive Distortions Scale (ICDS), UCLA-R Loneliness Scale, The Liebowitz Social Anxiety Scale Self-Report Version (LSAS-SR), Compulsive Internet Use Scale (CIUS) and Marlowe-Crowne Social Desirability Scale (MCSDS). Structural equation modelling (SEM) was used to examine a model in which interpersonal cognitive distortions predicted PIU via loneliness and social anxiety. The results showed that of the two intervening variables, only loneliness had a mediator role between interpersonal cognitive distortions and PIU when social desirability was controlled. The findings were discussed in terms of the literature and the implications for practice were considered.

Keywords: cognitive distortion, loneliness, social anxiety, social desirability, problematic Internet use

* Correspondence concerning this article should be addressed to: Özge Sariot Ertürk, PhD - Aydın Adnan Menderes University, Faculty of Science and Arts, Psychology Department, Aydın, Turkey, E-mail: ozge.sariot@adu.edu.tr; Telephone: +90 505 385 55 36

1. Introduction

Over recent years, there has been a remarkable increase in the amount of Internet use. According to Internet World Stats (de Argaez, 2019), the number of Internet users between 1995 and 2019 increased from 16 million to 4.536 billion and approximately 58.8% of the world population are Internet users. The rapid increase in Internet use ultimately causes struggles such as problematic Internet use (PIU) (Kim & Davis, 2009; Mamun et al., 2019; Mazhari, 2012). Despite the benefits of Internet, several studies recognize that Internet use can also be linked to various psychological problems (Beard & Wolf, 2001; Kim & Davis, 2009; Young, 1998). In fact, Internet use has radically changed our lives in a positive way, yet we still know comparatively little about the causes of the associated personality dynamics behind its use. Previous research has identified that having mental health problems can lead to risks of addiction (Sinha, 2007; Witkiewitz & Villarroel, 2009) as well as PIU (Caplan, 2007; Gámez-Guadix, Villa-George & Calvete, 2012; LaRose, Lin & Eastin, 2003). Studies also show that there is an association between PIU and shyness (Chak & Leung, 2004), low self-esteem (Niemz, Griffiths & Banyard, 2005), impulsivity (Cao, Su, Liu & Gao, 2007), hyperactivity (El Asam, Samara & Terry, 2019), sensation seeking (Lin & Tsai, 2002), sleep problems (Alimoradi et al., 2019), depression (Gámez-Guadix et al., 2012; LaRose et al., 2003; Odacı & Kalkan, 2010), loneliness (Özdemir, Kuzucu & Ak, 2014) and social anxiety (Ko, Yen, Yen, Chen & Chen, 2012; Weinstein et al., 2015).

PIU is explained in the frame of several other theories such as Uses and Gratifications Theory (UGT) (Blumler & Katz, 1974), General Strain Theory (GST) (Agnew, 1992) and Compensatory Internet Use Theory (CIUT) (Kardefelt-Winther, 2014). In addition, Cognitive Behavioural Theory (CBT) (Davis, 2001) has strong assumptions concerning PIU. CBT argues that cognitive distortions are substitutional factors leading to the development and continuance of behavioural and emotional problems (Beck, 1976; Beck, 1988; DiTomasso, Martin & Kovnat, 2000; Halamandaris & Power, 1997; Walen, DiGiuseppe & Dryden, 1992). CBT suggests that problems are not determined by external reality itself, but instead by the maladaptive interpretation superimposed upon it (Beck, 1988). Cognitive model places “dysfunctional beliefs/maladaptive cognitions” at the centre of PIU including the theoretical base for a connection between cognitive distortions and PIU. The maladaptive cognition of individuals can be about the self or the world at-large. Moreover, maladaptive cognition about the world can be in relation to generalized or specific events. For example, the maladaptive thoughts of an individual about the Internet might include ideas such as “The Internet is the only place I am respected” or “The Internet is my only friend” (Davis, 2001). As a result, cognitive theory defines PIU as a cognitive-behavioural status which has crucial negative effects on a person’s life.

In terms of psychological problems, based on the cognitive-behavioural model by Davis (2001) regarding generalized PIU, Caplan (2003) contends that people who have psychological problems prefer online interaction over having one-on-one interpersonal connection because it is easier for them to compensate for what they believe to be defects in their social skills. Other studies have found that some people use the Internet to manage negative feelings such as sadness, anxiety and/or loneliness (Muñoz-Rivas, Fernández & Gámez-Guadix, 2010; Scherer, 1997) as well as to escape psychological problems (Morahan-Martin & Schumacher, 2000). In cases where Internet use seems to provide a level of comfort for problems such as stress, loneliness, depression and/or anxiety, it is more likely to become addictive (LaRose et al., 2003). More specifically, the relation of PIU with loneliness (Odacı, & Çelik 2013) and social anxiety (Odacı & Kalkan, 2010) is supported. Furthermore, as mentioned in CBT (Yurica & DiTomasso, 2005), social anxiety and loneliness are developed and maintained by cognitive distortions.

Several studies reveal the central role of cognitive distortions for the development of PIU. For instance, interpersonal cognitive distortions are significant predictors for PIU among university students (Berber-Çelik & Odacı, 2012; Çelik & Odacı, 2013; Kalkan, 2012) as well as cyber-victimization and bullying among adolescents (Owens, Skrzypiec & Wadham 2014). Moreover, interpersonal cognitive distortions can lead to interpersonal problems and may result in withdrawal from others (Whisman & Friedman, 1998). Approaching conversations with negative expectations is another attitude of people with cognitive distortions and having this attitude may lead to failure in developing close friendships, which can ultimately result in loneliness (Morahan-Martin, 1999). Importantly, in addition to loneliness, cognitive distortions are related to a fear of negative evaluation, namely social anxiety (Cook, Meyer & Knowles, 2019). Withdrawal from others, lack of close friendships and worries about negative evaluation can ultimately lead to less interpersonal time spent with others in offline interaction, and as a result, more time spent online. Therefore, loneliness and social anxiety seem to have an essential connection with interpersonal cognitive distortions and PIU.

1.1. Mediating role of Loneliness

Cognitive distortions that a lonely person possesses are perceived as the fundamental reason for their experience of loneliness (Burns, 1985). In line with this theory, a lonely person more often perceives both themselves and others around them more negatively than a non-lonely person does (Halamandaris & Power 1997). Another explanation for the relationship between PIU and loneliness is that the Internet use might isolate individuals from the real world, which can result in loneliness (Casale & Fioravanti, 2011). In addition, the relationship that occurs between loneliness and PIU appears to be bi-directional. Kim and Davis (2009) show that loneliness is an outcome of PIU. PIU and the feelings of loneliness were measured twice and tested using a cross-lagged panel model in Yao

and Zhong's (2014) study. Their results showed that excessive Internet use enhances feelings of loneliness which progress over time. On the other hand, as previously mentioned, other studies report that a high level of loneliness is a risk factor for PIU (Berber-Çelik & Odacı, 2012; Moody, 2001; Morahan-Martin & Schumacher, 2000). Ceyhan and Ceyhan (2008) report loneliness as the strongest predictor for PIU when compared to computer self-efficacy and depression.

The effect mechanism of loneliness on PIU is explained in a variety of ways. For lonely people, virtual platforms can be an ideal medium to socialize (Caplan, 2003; Morahan-Martin, 1999), and extend the boundaries of their social networks. The Internet can provide these virtual platforms for social interaction where lonely people, who are not content with offline social relationships, can interact with others. As a result, the feeling of loneliness experienced by lonely people may be resolved through their interactions on new online platform (Huan, Ang, Chong & Chye, 2014). Morahan-Martin and Schumacher (2000) describe the Internet through the perception of a lonely person as 'socially liberating, the Prozac of social communication' (p. 26). Lonely people can in a sense be liberated through interaction on the Internet because the users can maintain a high level of anonymity as well as have no need to provide immediate response to others (Huan et al., 2014). To sum up, loneliness might result in PIU due to the positive aspects of Internet use. The Internet can be a less risky and more comfortable alternative social medium for lonely people because it provides a space where a low level of behaviour regulation is necessary.

1.2. Mediating role of the Social Anxiety

As previously mentioned, social anxiety also appears to be related with PIU because it develops and is maintained through cognitive distortions. In social anxiety, distorted cognition involves the overvaluation of the possibility and/or costs of different negative social settings (McManus, Clark & Hackmann, 2000). In addition, socially anxious people tend to be less successful at employing cognitive reappraisal (Goldin, Manber-Ball, Werner, Heimberg & Gross, 2009). In fact, systematic bias in cognition plays an important role in the emergence and perpetuation of social anxiety (Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg & Van Ijzendoorn, 2007; Muris & Field, 2008); while, Weeks, Ooi and Coplan (2015) indicate that shyness, judgment bias and social anxiety were positively correlated, and judgment bias significantly predicted social anxiety. Moreover, a reduction in the maladaptive beliefs that cause social anxiety is associated with clinical improvement (Boden et al., 2012).

In addition to loneliness, when dealing with PIU, social anxiety is an important problem that deserves greater attention (Ko et al., 2012). Discomfort in social environments is a form of social anxiety. While it decreases face-to-face communication, it increases interpersonal problems (Gosling, Augustine, Vazire, Holtzan & Gaddis, 2011). People who suffer from social anxiety frequently avoid

painful feelings they anticipate from social interactions through preventative behaviour as well as social isolation (Di Blasi et al., 2015). Furthermore, individuals with problems related to social anxiety such as social isolation, avoidance and interpersonal problems may turn to the Internet as a way of avoiding or challenging their fears of one-on-one interaction (Beidel, Turner, Stanley & Dancu, 1989; Maes et al., 2019). As a result of social comfort in online relations, socially anxious people tend to use the Internet more (Enez-Darcin et al., 2016; Weinstein et al., 2015). Online relations induce less stress and anxiety than 'real world' relations. Additionally, anxiety regarding real identity, personality traits and appearance leads young adults to socially interact online (Hall, 2001). For example, 15% of adult cases of PIU are classified as having social anxiety disorder (Bernardi & Pallanti, 2009).

Besides their relation to PIU, loneliness and social anxiety are correlated with each other. This relationship between loneliness and social anxiety can be explained in several ways. Firstly, individuals with social anxiety prefer to communicate less with others, which in effect makes them lonely. Secondly, due to their weak social skills, individuals with social anxiety can face unfavourable judgement and rejection from others. Lastly, anxiety, nervousness and irritation in the behaviour of socially anxious individuals may lead to difficulties in their interpersonal communication, and as a result, lead to feelings of loneliness (Sübaşı, 2007). Because of this nested relationship, loneliness and social anxiety are frequently included together in PIU studies. Yıldız-Durak and Seferoğlu (2019) found that loneliness and social anxiety were significantly related to the problematic usage of social media.

Problematic internet use has received increased attention among counsellors and psychologists (Lu & Yeo, 2015; Moss-Morris & Petrie, 1997; Nasir, Zamani, Yusoooff & Khairudin, 2010), and Internet use is highest among younger adults, especially university students (Moss-Morris & Petrie, 1997; Nasir et al., 2010). However, there has been a limited amount of investigation into the role that distortions play in PIU. According to Özdemir et al. (2014) among the relationships of depression, loneliness and PIU, only loneliness is associated with PIU through low self-control. Thus, to better understand the relationship between loneliness, social anxiety and PIU, it is important to look beyond this relationship. To date, there is no studies regarding the function of social desirability has explained PIU in connection with cognitive distortions, loneliness and social anxiety. Social desirability is an instinctive need of human beings that derives from their need for social approval (Mo, 2019). Studies mentioned the relation of social desirability with reported cognitive distortions (Nas, Brugman & Koops, 2005), loneliness (Mo, 2019), anxiety level (Dadds, Perrin & Yule, 1998) and PIU (Turel, Mouttapa & Donato, 2015). More specifically, researchers reveal that social anxiety, which is characterized as the sensitivity of being socially approved or disapproved, is one of the predictors of social approval (Karaşar & Baytemir, 2018). In addition to relation with these variables, social desirability is one of the

most frequently reported impediments in social science research (Krishnamurthy & Chetlapalli, 2015; Roth & Altmann, 2019; Sudman & Bradburn, 1974) where research participants have a need to provide socially desirable answers to the social science queries they receive. Therefore, the reliability of these studies is assumed to be reduced because of such a bias. In several studies of PIU, the uncontrolled social desirability of participants is highlighted as a limitation of the research (Krishnamurthy & Chetlapalli, 2015; Ostovar et al., 2016).

1.3. The Present Study and Hypotheses

In previous studies, theoretical and empirical grounds regarding the relationship between problems such as loneliness and social anxiety are addressed in addition to the essentialness of controlling for social desirability. The present study proposed that problematic use of Internet could be the result of cognitive distortions via their effects of social anxiety and loneliness. Therefore, the aim of this study was to investigate the dynamics behind the relationship between interpersonal cognitive distortions and PIU. That is, the mediator functions in this relationship by loneliness and social anxiety were expected to be illuminated while partialling out the effects of social desirability. Another purpose of this study was to explore the direct and indirect relationships of cognitive distortions, loneliness, social anxiety and PIU. The present study examined, for the first time, the association of loneliness, social anxiety and PIU when social desirability was controlled (see Fig. 1).

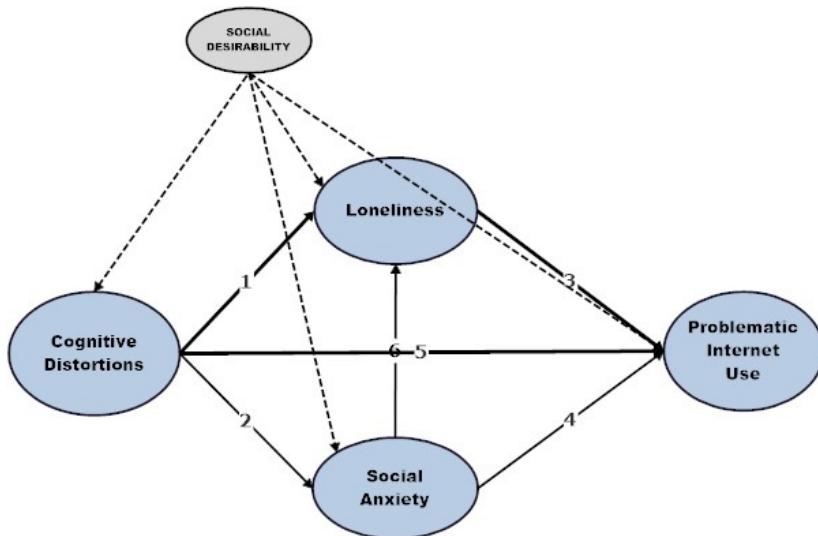


Figure 1. The hypothesized model concerning the mediator role of loneliness and social anxiety in the relationship between interpersonal cognitive distortions with problematic internet use while the effects of social desirability are controlled for.

2. Methods

2.1. Participants and Procedure

The sample of this study consists of 260 university students from Turkey; 109 (41.8%) male and 152 (58.2%) females. Age of participants ranged between 18 and 26 ($M=21.29$, $SD=1.78$). Convenience sampling method was used in the present study.

Self-report measures were applied to participants at their own classroom practice within approximately 45 minutes. After instructions about how to complete the survey and assurances of anonymity, participants were asked to sign written informed consent forms. There was no identifying personal information among questions and all participants volunteered to participate the research. The survey involved Interpersonal Cognitive Distortions, Loneliness, Social Anxiety, Compulsive Internet Use and Social Desirability Scales.

Interpersonal Cognitive Distortions Scale (ICDS; Hamamcı & Büyüköztürk, 2004): ICDS was used in order to measure dysfunctional beliefs in regard to interpersonal relationships. The scale contains three subscales and 19 items. The first subscale Interpersonal Rejection (8 items), involves items that are related to negative attribution of individuals about peoples' behaviors and characteristics, and beliefs such as “being very close to others in their relationships that cause negative consequences”. Items of second subscale, Unrealistic Relationship Expectation (8 items), refers to high expectations of people in their relationships that concerns both their own behaviors and behaviors of others. The last subscale Interpersonal Misperception (3 items) based on the individuals' beliefs indicating prediction of thoughts and emotions of others beyond communication. Higher score points to greater dysfunctional relationship beliefs. Cronbach alpha internal consistency coefficient was found .67 for total scale, .73 for the first subscale, .66 for the second subscale, and .43 for the third subscale. Test-retest coefficient in 15 days was found .74.

UCLA-R Loneliness Scale (Russell, Peplau & Cutrona, 1980): The scale was used to measure global loneliness degree of participants. The scale adapted to Turkish by Demir (1989) and includes 20 items. Each item reflects an emotion or cognition concerning social relationships, like “There are people I feel close to and I feel isolated from other”. Items are rated from 1 (never) to 4 (always). The total score for the scale could range between 20-80 and higher scores indicate greater levels of loneliness. For the internal consistency of the scale Cronbach Alpha was reported as .94.

Liebowitz Social Anxiety Scale: Self-Report Version (LSAS-SR; Liebowitz, 1987): The scale was used to measure social anxiety level of the participants. The scale consists of 24 items. Items of the scale both ask participants how much anxious and fearful they feel in a particular situation and how often they avoid the situation over the past week. In other words, the scale gives scores for both fear

and avoidance level of participants in social and performance situations. Items were rated with a 4-point Likert scale, that ranges from no or very little fear (1) to severe (4) for fear questions and from no avoidance or rarely avoidance (1) to always avoidance (4) for avoidance questions. Cronbach alpha, for the scale was 0.93.

Compulsive Internet Use Scale (CIUS; Meerkerk, Van Den Eijnden, Vermulst & Garretsen, 2009): The scale was used to measure problematic internet use of participants. CIUS has 14 items which identify main features of internet use. These features are (a) preoccupation or salience (e.g., How often do you look forward to your next Internet session?), (b) loss of control (e.g., How often do you find it difficult to stop using the Internet when you are online?), and (c) continued use of Internet despite the intention to stop (e.g., How often have you unsuccessfully tried to spend less time on the Internet?). Items were rated with a 5-point Likert scale (never to very often) and scores from the scale could change between 0 and 56. The higher scores obtained from the scale indicated the higher level of problematic internet use. For CIUS Cronbach's alpha calculated as .89, that refers to a high internal consistency. It has a good validity which was indicated by high correlations with convergent and divergent variables. CIUS was adapted to Turkish by Kuzucu, Özdemir and Ak (2015). Similar to the original form, exploratory and confirmatory factor analyses revealed one-factor structure. Additionally, the internal consistency coefficient score of the scale was .91. The correlation coefficient between the first and second implementations of the CIUS was .89.

Marlowe-Crowne Social Desirability Scale (MCSDS; Crowne & Marlowe, 1960): The short version of the scale was used to control social desirability bias. The short version of the scale adapted from the original form scale and reported as internally consistent (Fraboni & Cooper 1989; Ii & Sipps, 1985). The short version of the scale translated and adapted to the Turkish by Ural and Özbirecikli (2006). The short form constructed from 7 items. Participants report their agreement or disagreement about socially desirable behaviors via responses ranging from strongly disagree (1) to strongly agree (6) six-point Likert scale. A total score was calculated by summation of the item scores. Higher scores refer to a greater tendency toward social desirability. This version also reported as reliable and acceptably valid in Turkish. The Cronbach Alpha value for the Turkish short version of MCSDS was reported as .78 (Ural & Özbirecikli, 2006).

3. Results

3.1. Strategy of Analysis

In the current study, before testing the proposed models; descriptive statistics, correlation analyses, assumption test and measurement model were reported. After the preliminary analysis, measurement and structural equation models (proposed models) were tested using Lisrel 8.8 (Arbuckle & Woethke, 1999). The Maximum

Likelihood estimation method was preferred, because its fit values are less likely to be influenced by sample size and distribution than other methods (Hu & Bentler, 1998). In addition to the analysis of the proposed model, alternative models must also be tested (Green, 2015) in order to rule out the possibility of statistical coincidence. Alternative models were tested in order to prove that the model fitted the data because of its theoretical basis, but not due to a statistical coincidence. In the main model, the mediation hypotheses were analyzed using bootstrapping procedure. The bootstrapping is one of the most preferred and trusted way of analyzing the role of intervening variables (MacKinnon, Lockwood, Hoffman, West & Sheets, 2002) and used to determine whether the indirect pathways were significantly different from zero (Shrout & Bolger, 2002).

3.2. Preliminary Analyses

Means, standard deviations, and correlations for the 17 observed variables are represented in Table 1. SEM and multilevel regression have the same assumptions as their single-level counterparts. So, the multilevel regression analysis assumes linearity of relationships, normal residual errors, homoscedasticity, autocorrelation and independence conditional on the grouping variables in the model (Hox, 2013; Cohen, Cohen, West & Aiken, 2013). Before empirically evaluating the model, the data was analyzed for the assumption of normality and multicollinearity.

Normality of the variables were tested using skewness and kurtosis values. Obtained values were less than 1.5, ranging from -1.09 to -1.29 for skewness and from -0.99 to 1.51 for kurtosis, demonstrating that variables are normally distributed in the sample. Kolmogorov-Smirnov test was also performed and findings ($p > .05$) confirmed the normality. Mardia's coefficient was used to test multivariate normality and results (5.4) showed multivariate normality.

In the literature, various methods have been recommended to test the multicollinearity problem such as Variance inflation factor (VIF) and condition Index (CI) (Alin, 2010; O'Brien, 2007). In the current study, VIF and CI values were lower than the critical values, 10 and 30, respectively. Findings demonstrated that there were no multicollinearity issues.

Table 1. Means, standard deviations, and correlations of observed variables.

Observed Variables	M	SD	1	2	3	4	5	6	8	9	10	11	12	13	14	15	16	17	18
Interpersonal																			
Cognitive Distortions																			
IR	14.44	2.71	1																
URE	13.55	2.77	.67**	1															
IM	13.39	2.67	.49**	.53**	1														
Loneliness																			
L Parcel1	7.60	2.56	.09	.10	.21**	1													
L Parcel2	7.98	2.74	.05	.14*	.27**	.72**	1												
L Parcel3	8.33	2.76	.12*	.15*	.27**	.77**	.74**	1											
Social Anxiety																			
SA Parcel1	10.30	2.99	.19**	.20**	.11	.13*	.16**	.18**	1										
SA Parcel2	8.12	2.99	.22**	.26**	.24**	.19**	.24**	.27**	.71**	1									
SA Parcel3	8.71	2.98	.16**	.21**	.22**	.19**	.27**	.21**	.70**	.73**	1								
SA Parcel4	9.67	2.91	.12*	.20**	.16**	.21**	.23**	.22**	.68**	.74**	.69**	1							
SA Parcel 5	9.53	3.30	.18**	.21**	.17**	.20**	.22**	.22**	.81**	.72**	.71**	.68**	1						
Problematic Internet Use																			
PIU Parcel1	7.83	2.99	.12*	.11	.23**	.23**	.16**	.16**	.19**	.19**	.16*	.13*	.19**	1					
PIU Parcel2	8.29	2.94	.19**	.18**	.29**	.24**	.18**	.16**	.18**	.20**	.17**	.18**	.24**	.83**	1				
PIU Parcel3	8.07	3.23	.16**	.10	.28**	.22**	.14*	.15*	.20**	.23**	.19**	.16**	.26**	.81**	.77**	1			
Social Desirability																			
SD Parcel1	5.02	1.78	.13*	.06	.14*	.10	.10	.07	.23**	.26**	.17**	.21**	.24**	.14*	.18**	.16**	1		
SD Parcel2	4.43	1.77	.14*	.10	.21**	.21**	.19**	.17**	.16**	.23**	.16**	.18**	.17**	.20**	.22**	.26**	.53**	1	
SD Parcel3	5.36	1.80	.18**	.19**	.24**	.15*	.13*	.14*	.23**	.21**	.16**	.19**	.19**	.16**	.21**	.18**	.46**	.43**	1

Notes: N=260, * p<.05**p<.01, IR= Interpersonal Rejection, IM= Interpersonal Misperception, URE=Unrealistic Relationship Expectation.

3.3. Test of measurement model

Considering Anderson and Gerbing's method (1988), the measurement model was analyzed before the structural equation model. To test the measurement model, we treated interpersonal cognitive distortions, social anxiety, loneliness and PIU as latent variables. Parceling method was used to normalize the distribution of observed variables and to increase the reliability of these indicators (Little, Cunningham, Shahar & Widaman, 2002). Parcels were created for the social anxiety, loneliness and Internet addiction. The cognitive distortion was represented in the model by its subscales as observed variables (Interpersonal Rejection, Unrealistic Relationship Expectation and Interpersonal Misperception).

Findings indicated that measurement model has good fit to the data, χ^2 (71, N= 260) = 154.75, χ^2/df = 2.17; CFI =.97; GFI=.92; NFI= .95; RMR= .060; RMSEA = 0.069 (90 percent confidence interval for RMSEA = 0.054 - 0.084). All loadings of the measured variables on the latent variables were statistically significant (standardized values ranged from 0.25 to 0.89 $p<.001$) showing that the latent variables were adequately operationalized by their respective indicators. The correlation between latent variables were statistically significant ($p<.001$). Table 2 indicated that most of the correlations among the variables were moderate.

Table 2. Correlation of the latent variable with (Above Diagonal) and without (Below Diagonal) control variable.

Variable	1	2	3	4
1 ICD	-	.25**	.10**	.20*
2 Loneliness	.31**	-	.07**	.34**
3 Social Anxiety	.26**	.30**	-	.16**
4 PIU	.26**	.41**	.27**	-

Notes: N=260, * $p<.05$ ** $p<.01$ ICD = Interpersonal Cognitive Distortions, Problematic Internet Use.

3.4. Test of structural model

The nested models strategy was preferred to examine the mediation hypotheses in the model defined as the best fitting to the data. Mediation models were tested by comparing differences between the fully and partially mediated models.

In the first stage, full mediation model was tested without direct effects of interpersonal cognitive distortions on PIU. The full mediation model indicated following fit indices: χ^2 (72, N= 250) =155.52; χ^2/df = 2.16; CFI= .97; GFI= .92; AGFI=.88; NFI= .95; RMR=.065; RMSEA=.068 (90 percent confidence interval for RMSEA= 0.054-0.083).

In the second stage partial mediation was tested with direct and indirect effects included. For the partial model results demonstrated nearly the same fit indices: χ^2 (71, N = 250) = 154.75, χ^2/df = 1.95; CFI=.97; GFI=.92; AGFI=.88; NFI=.95; RMR=.060; RMSEA=.069 (90 percent confidence interval for RMSEA= 0.054- 0.084). Given that there is no statistically significant difference between the models (less than 3.84 chi-square difference with one degrees of freedom), the proposed model was evaluated to be superior since it is more parsimonious.

3.5. Testing with control variable

Method bias is a critical threat to construct validity and it occurs when the measurement technique introduces systematic variances into measures. A single interview of assessment will encourage participants to give socially desirable and cognitively consistent answers (Doty & Glick, 1998). Social desirability is a problem caused by individuals who desire to look better than their actual appearance, regardless of their real thoughts and feelings (Podsakoff, MacKenzie, Lee & Podsakoff, 2003).

In SEM approach, social desirability could be controlled to avoid its biasing effect. Calculated bias of the control variables variance is helpful to clarify interrelationship between variables (Johnson, Rosen & Djurdjevic, 2011). To see the effect of this factor in the measured variables, the procedure recommended by Podsakoff et al. (2003) was operated. Social desirability was defined as a latent variable, from which a path was assigned to all observed variables used in the model. The variance of the variable was set to 1.0, while to solve identification problems, its covariance with the other latent variables was set to 0.0.

Values and estimates of the measurement model with control variable were shown in Table 3. Results indicated that measurement model in which social desirability was controlled still has good fit values: χ^2 (105, N=260) =230.24, χ^2/df =2.19; CFI=.98; GFI=.90; AGFI=.86; NFI= .96; RMR= .086; RMSEA=0.069; (90 percent confidence interval for RMSEA=0.057-0.081). All loadings of the measured variables on the latent variables were large and statistically significant (standardized values ranged from 0.25 to 0.89, p <.001, see Table 3). After controlling social desirability, variables were still indicated to have been sufficiently operationalized by their observed variables. Results of the measurement model provided an acceptable fit to the data in order to test the structural model.

Table 3. Factor Loadings, standard errors, t-values and R² for the Measurement Model.

Measure and variable	Unstandardized factor loading	SE	<i>t</i>	Standardized factor loading	R ²
Interpersonal Cognitive Distortions					
IR	1.53	0.17	4.83	0.56	0.41
URE	2.00	0.24	2.71	0.75	0.59
IM	2.40	0.30	8.03	0.86	0.76
Loneliness					
L Par1	2.01	0.16	4.46	0.79	0.79
L Par2	2.22	0.18	12.1	0.75	0.75
L Par3	0.79	0.17	12.6	0.79	0.79
Social anxiety					
SA Parcel 1	1.83	0.17	7.82	0.59	1.01
SA Parcel 2	0.71	0.17	5.49	0.34	0.78
SA Parcel 3	0.89	0.21	4.28	0.37	0.74
SA Parcel 4	0.45	0.12	1.25	0.25	0.80
SA Parcel 5	0.45	0.12	3.56	0.26	0.83
Problematic Internet Use					
PIU Parcel 1	2.25	0.18	4.62	0.74	0.81
PIU Parcel 2	2.37	0.16	13.87	0.79	0.84
PIU Parcel 3	1.84	0.17	15.14	0.66	0.74
Social Desirability					
SD Parcel1	2.42	0.14	17.87	0.89	0.79
SD Parcel2	2.24	0.12	17.92	0.89	0.80
SD Parcel3	1.36	0.33	4.19	0.27	0.81

Notes: *N* = 260, *IR*=Interpersonal Rejection, *URE*=Unrealistic Relationship Expectation, *IM*=Interpersonal Misperception; L1-L3 = three parcels from UCLA-R; SAI-SA5 = five parcels from LSAS-SR, P1-P3= three parcels from CIUS, SD1-SD3 = three parcels from MCSDS.

Taking social desirability into account, test of mediation analyses were re-examined to compare differences between the full and partial models. The full mediation model indicated following fit indices: $\chi^2(100, N=260)=182.13$; $\chi^2/df=1.82$; CFI=.99; GFI=.93; AGFI=.88; NFI=.97; RMR=.056; RMSEA=.057 (90 percent confidence interval for RMSEA= 0.044 - 0.071). For the partial model, results again showed that there is no statistically significant difference between the models as can be seen from the fit indices: $\chi^2(99, N=260) = 180.25$, $\chi^2/df= 1.81$; CFI=.99 GFI=.92; AGFI=.88; NFI=.97; RMR=.053; RMSEA=.07 (90 percent confidence interval for RMSEA= 0.044- 0.071). The AIC and CAIC statistics were found to be 288.25 and

527.77, respectively. Consistent with the model comparison without social desirability presented above, the full model with control variable was considered to be superior since it has higher degrees of freedom, i.e., having more parsimony.

Some alternative models were examined to eliminate the possibility that the fit of the main model was only due to a statistical coincidence and thus to determine the statistical advantage of the main model against the alternatives. The first alternative model tested whether the relations of loneliness and social anxiety with PIU were mediated by interpersonal cognitive distortions. The findings of the following structural equation model indicated that this model deteriorated the model fit as indicated by the goodness of fit statistics: (102, N= 413) = 203.52; $\chi^2/df=1.99$; CFI= .98; GFI= .91; AGFI= .87; NFI= .96; RMR=.71; RMSEA= 0.063 (90 percent confidence interval for RMSEA= 0.050 - 0.076). The second alternative model proposed that PIU contribute to interpersonal cognitive distortions by the mediator role of loneliness and social anxiety. Test of the model again resulted in a worse fit; χ^2 (101, N =413) = 197; $\chi^2/df=1.99$; CFI = .98; GFI= .91; AGFI= .87; NFI= .97; RMR=.72; RMSEA= .062 (90 percent confidence interval for RMSEA = 0.049 - 0.075).

In order to examine the mediation hypotheses of the proposed model, bootstrapping method (Shrout & Bolger 2002) was used. Bootstrapping procedure creates a large number of samples from the dataset, from which estimates of the standard errors are obtained. The interval confidence of these standard errors is considered when testing the significance of indirect effects. Significant mediation is shown when the 99% confidence interval do not include zero. Bootstrap confidence intervals are reported in Table 4.

Table 4. Parameters and Bootstrap Confidence Intervals (CIs) for the Final Model.

Independent Variable		Mediators		Dependent Variable	95% CI (Lower –Upper)
ICD	⇔	Loneliness	⇔	PIU	.001 – .296
ICD	⇔	Social Anxiety	⇔	PIU	-.056 – .253

Notes: N=260, ICD=Interpersonal Cognitive Distortions, PIU=Problematic Internet Use.

Results indicated the contribution of the ICD has both a direct and an indirect relation to PIU. In the final model, the mediator role of Loneliness (ICD and CIU=.001–.296) has acceptable values within the 95% confidence interval. Confidence intervals for the indirect effects provided support for the mediation hypotheses in the present study. However, confidence interval includes zero for the mediator role of Social Anxiety (ICD and CIU=-.056–.253) which indicates social anxiety did not have a mediator role.

The results supported the final model, which presumed that ICD contributes to the PIU through loneliness. After social desirability was controlled, the relationship between independent variable and dependent variable was mediated only by loneliness.

Figure 2 shows the path diagram with the estimated standardized path coefficients. In this model only the paths from interpersonal cognitive distortions to loneliness (.26, $p < .01$) and from loneliness to PIU (.34, $p < .01$) were statistically significant while all other paths were found to be non-significant.

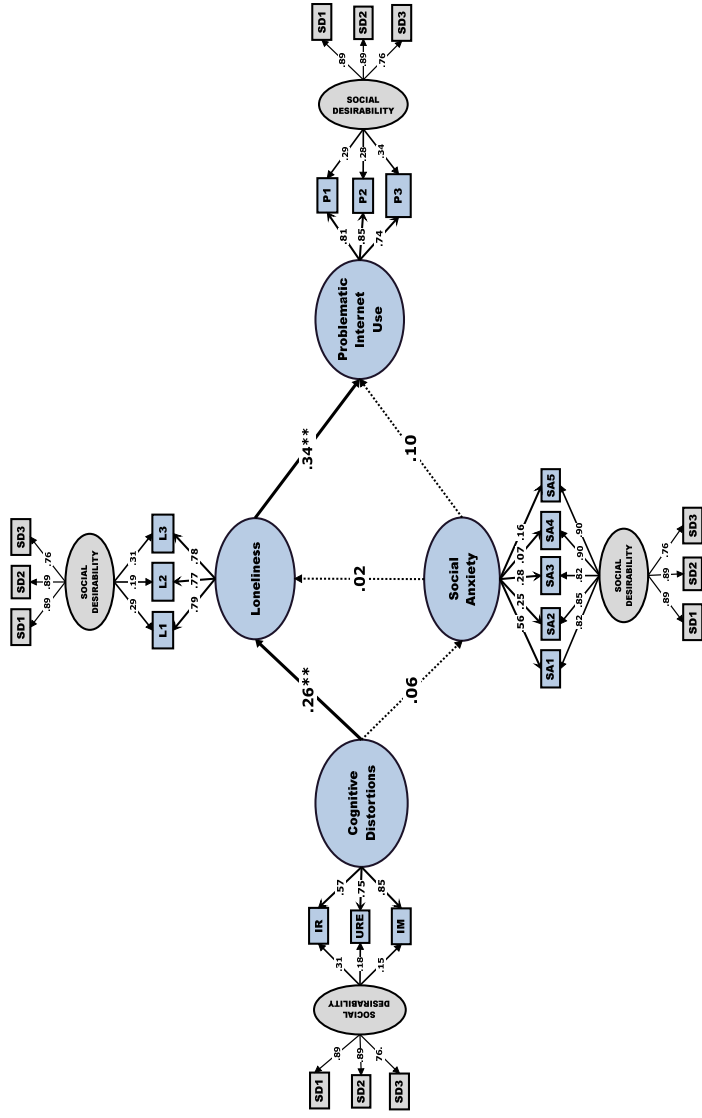


Figure 2. Standardized parameter estimates for the hypothesized model.

Notes: $N = 260$, IR =Interpersonal Rejection, URE =Unrealistic Relationship Expectation, IM =Interpersonal Misperception; L1-L3 = three parcels from UCLA-R; SA1-SA5 = five parcels from LSAS-SR, P1-P3 = three parcels from CIUS, SD1-SD3 = three parcels from MCSDS.

4. Discussion

This study focused on clarifying the relationship between interpersonal cognitive distortions and PIU. The results showed that in the relation between cognitive distortions and PIU, the mediator role of loneliness was significant, whereas social anxiety was not. In the proposed model tested in the present study, cognitive distortions were positively related with loneliness positively associated with PIU. Another pathway of the proposed model indicated by the paths from cognitive distortions to social anxiety and from social anxiety to PIU were found to be non-significant. Thus, this current research provided the first detailed explanation of the pathways in which cognitive distortions about interpersonal relations are associated with PIU.

Lonely individuals were more likely to feel that they could better express themselves when interacting with others on the Internet than when they were having in-person interaction offline (McKenna, Greene & Gleason, 2002). In addition, for lonely individuals, online communication tends to be less risky and easier than face-to-face communication (Morahan-Martin & Schumacher, 2000). Caplan (2003) argues that lonely individuals are attracted to the interpersonal advantages presented by online social interaction, which in turn predicts problematic outcomes. Lonely people prefer using the Internet for social interaction and tend to use the Internet in a way that replaces time that should be spent in offline social activities. This suggests that lonely people need support in controlling their social Internet use so that they can employ it in ways that support existing friendships and/or forge new ones (Nowland, Necka & Cacioppo, 2018).

People with psychological problems, such as loneliness, have problems not only in effective interpersonal relationships but also in controlling their Internet use (Kim, LaRose & Peng, 2009). Moreover, through their online relationships, it is easier for young people to control personal characteristics that they may be sensitive to, or have negative feelings and that would ultimately be exhibited in offline interaction. In other words, people can reveal their ‘ideal self’ while keeping their so-called personal deficiencies a secret through online relationships (Genuis & Genuis, 2005).

The present study took into account social desirability as a control variable, which is mentioned as a confounding variable for PIU in previous studies (Krishnamurthy & Chetlapalli, 2015). When social desirability was controlled, the relationship between cognitive distortion and PIU was mediated only by loneliness. This result means that loneliness maintains its power when explaining for PIU regarding social desirability as well as the tendency for people to show themselves as being creditable and/or having desirable characteristics.

Moreover, Yıldız–Durak and Seferoğlu (2019) have found no difference for the level of social desirability in the relation between loneliness and problematic social media use. People suffering from loneliness fail to consider

social desirability; in other words, they ignore social desirability, which in effect may cause loneliness for these people. Similarly, Mo (2019) has found a negative relationship between loneliness and social desirability, which means that loneliness is inversely affected by social desirability.

In this current study, control for social desirability affected the mediator role of social anxiety. In other words, the mediator role of social anxiety was not verified when social desirability was controlled. This means that social anxiety is not as powerful as loneliness against social desirability. The association between being socially anxious and showing social withdrawal prevents the need to behave in a socially desirable way, especially when social desirability is defined as “the tendency of individuals to project favourable images of themselves during social interaction” (Johnson & Fendrich, 2002). Thus, in an unsupportive and/or inadequately valued environment, socially desirable people may ultimately become socially anxious themselves (Leary & Jongman-Sereno, 2014).

In addition, in the current study, loneliness was an important predictor of PIU. Previous research has pointed out that loneliness is one of the most powerful predictors of PIU (Amichai-Hamburger & Ben-Artzi, 2003; Morahan-Martin & Schumacher, 2000). Özdemir et al. (2014) reveal that loneliness, rather than depression, was associated with PIU through self-control among university students. The present study findings were also consistent with the results of Caplan (2002), which indicates that among the psychosocial variables of loneliness, depression, shyness and self-esteem, only loneliness is associated with PIU.

4.1. Counseling Implications

The present study contributes to the current literature regarding PIU. The research led to the documentation of a model which clarified direct relationships between cognitive distortions and PIU. When social desirability was controlled, indirect relationships between distortions and PIU through the critical role of loneliness were also indicated. Thanks to these findings, school counsellors, psychologists and teachers can better develop prevention and intervention programs regarding difficulties with PIU. Programs focused on strategies for coping with loneliness can be effective in the prevention of and recovery from PIU. Additionally, based on the indications of the present study, in order to change PIU behaviour as a way of coping with loneliness, mental health specialists may consider using group counselling based on CBT. This may be an extremely useful strategy since by being in a group and having an opportunity to interact with others, lonely and socially anxious people can learn to cope with their negative emotions more effectively (Chrismore, Betzelberger, Bier & Camacho, 2011). Furthermore, for future prevention and intervention programs, informing students

on irrational beliefs and working to improve their social skills can be an important aim.

4.2. Implications for Future Research

The present research illuminated the link between cognitive distortions, loneliness, social anxiety and PIU. Addition to the cognitive distortions, irrational thoughts induced psychological disorders have crucial effects on PIU. Beside, some CBT variables are not studied in detail. Further studies could explore the connections of core beliefs, automatic thoughts and maladaptive schemas with PIU. Moreover, the third wave approaches in the field of CBT has a growing empirical data. The concepts of the acceptance and commitment therapy (ACT), mindfulness-based cognitive therapy (MBCT) and dialectical behaviour therapy can be related with problematic internet use. We also consider that intolerance of boredom and uncertainty are other possible causes which are worth examining in future research.

4.3. Limitations

Although this study contributes to the current literature by addressing the relationship of negative psychological features (e.g., interpersonal cognitive distortions) and PIU focusing on social anxiety and loneliness, there are some limitations. A limitation of this study is that the results were based on self-reported data from students. Future studies can include multi-informant data from teachers and/or parents which might provide more objective and credible measures than self-reported data from the student participants. Another limitation is the cross-sectional nature of this current study. Based on these results, it is not possible to form causal relationships because loneliness might be the consequence of addiction instead of its cause (Marlatt, Baer, Donovan & Kivlahan, 1988). In addition, another limitation of the study is low internal consistency level of the Interpersonal Cognitive Distortions Scale. Lastly, because of the present study was conducted by undergraduate students, the generalizability of the results has some limitations.

References

- Agnew, R. (1992). Foundation for a general strain theory of crime and delinquency. *Criminology*, 30(1), 47-88. <https://doi.org/10.1111/j.1745-9125.1992.tb01093.x>
- Alin, A. (2010). Multicollinearity. *Wiley Interdisciplinary Reviews: Computational Statistics*, 2(3), 370-374. [https://doi.org/10.1016/S0747-5632\(02\)00014-6](https://doi.org/10.1016/S0747-5632(02)00014-6)
- Amichai-Hamburger, Y., & Ben-Artzi, E. (2003). Loneliness and Internet use. *Computers in Human Behavior*, 19(1), 71-80. [https://doi.org/10.1016/S0747-5632\(02\)00014-6](https://doi.org/10.1016/S0747-5632(02)00014-6)
- Anderson, J. C., & D. W. Gerbing. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin*, 103(3), 411-23.

- Arbuckle, J., & Wothke, W. (1999). *AMOS 4 user's reference guide*. Chicago: Smallwaters Corp.
- Alimoradi, Z., Lin, C. Y., Broström, A., Bülow, P. H., Bajalan, Z., Griffiths, M. D., Pakpour, A. H. (2019). Internet addiction and sleep problems: A systematic review and meta-analysis. *Sleep Medicine Reviews, 47*, 51-61. <https://doi.org/10.1016/j.smrv.2019.06.004>
- Bar-Haim, Y., Lamy, D., Pergamin, L., Bakermans-Kranenburg, M. J., & Van Ijzendoorn, M. H. (2007). Threat-related attentional bias in anxious and nonanxious individuals: a meta-analytic study. *Psychological Bulletin, 133*(1), 1-24. <https://doi.org/10.1037/0033-2909.133.1.1>
- Beard, K.W., & Wolf, E.M. (2001) Modification in the proposed diagnostic criteria for Internet addiction. *Cyberpsychology & Behavior, 4*(3), 377-383. <https://doi.org/10.1089/109493101300210286>
- Beck, A. T. (1976). *Cognitive therapy and emotional disorder*. New York, NY: The New American Library.
- Beck, A. T. (1988). *Love is never enough*. New York, NY: Harper & Row.
- Beidel, D. C., Turner, S. M., Stanley, M. A., & Dancu, C. V. (1989). The Social Phobia and Anxiety Inventory: concurrent and external validity. *Behavior Therapy, 20*(3), 417-427. [https://doi.org/10.1016/S0005-7894\(89\)80060-7](https://doi.org/10.1016/S0005-7894(89)80060-7)
- Berber-Çelik., & Odacı, H. (2012). The effect of experience of childhood abuse among university students on self-perception and submissive behavior. *Children and Youth Services Review, 34* (1), 200-204. <https://doi.org/10.1016/j.childyouth.2011.09.017>
- Bernardi, S., & Pallanti, S. (2009). Internet addiction: a descriptive clinical study focusing on commodities and dissociative symptoms. *Comprehensive Psychiatry, 50*(6), 510-516. <https://doi.org/10.1016/j.comppsy.2008.11.011>
- Blumler, J., & Katz, E. (Eds.). (1974). *The uses of mass communications*. Beverly Hills, CA: Sage.
- Boden, M. T., John, O. P., Goldin, P. R., Werner, K., Heimberg, R. G., & Gross, J. J. (2012). The role of maladaptive beliefs in cognitive-behavioral therapy: Evidence from social anxiety disorder. *Behavior Research and Therapy, 50*, 287-291. <https://doi.org/10.1016/j.brat.2012.02.007>
- Burns, D. D. (1985). *Intimate connections*. New York, NY: William Morrow.
- Cao, F., Su, L., Liu, T., & Gao, X. (2007). The relationship between impulsivity and Internet addiction in a sample of Chinese adolescents. *European Psychiatry, 22*(7), 466-471. <https://doi.org/10.1016/j.eurpsy.2007.05.004>
- Caplan, S. E. (2002). Problematic internet use and psychosocial well-being: Development of a theory based cognitive behavioral measurement instrument. *Computers in Human Behavior, 18*, 553-575. [https://doi.org/10.1016/S0747-5632\(02\)00004-3](https://doi.org/10.1016/S0747-5632(02)00004-3)
- Caplan, S. E. (2003). Preference for online social interaction: A theory of problematic Internet use and psychosocial well-being. *Communication Research, 30*(6), 625-648. <https://doi.org/10.1177/0093650203257842>
- Caplan, S. E. (2007). Relations among loneliness, social anxiety, and problematic Internet use. *Cyberpsychology & Behavior, 10*(2), 234-242. <https://doi.org/10.1089/cpb.2006.9963>

- Casale, S., & Fioravanti, G. (2011). Psychosocial correlates of internet use among Italian students. *International Journal of Psychology, 46*, 288-298. <https://doi.org/10.1080/00207594.2010.541256>
- Ceyhan, A. A., & Ceyhan, E. (2008). Loneliness, depression, and computer self-efficacy as predictors of problematic internet use. *Cyberpsychology & Behavior, 11*(6), 699-701. <https://doi.org/10.1089/cpb.2007.0255>
- Chak, K., & Leung, L. (2004). Shyness and locus of control as predictors of internet addiction and internet use. *Cyberpsychology & Behavior, 7*(5), 559-570. <https://doi.org/10.1089/cpb.2004.7.559>
- Chrimore, S., Betzelberger, E., Bier, L., & Camacho, T. (2011). Twelve-step recovery in inpatient treatment for Internet addiction. In K. S. Young & C. N. de Abreu (Eds.), *Internet addiction: A handbook and guide to evaluation and treatment* (pp. 205–222). Hoboken, NJ: Wiley and Sons.
- Cook, S. I., Meyer, D., & Knowles, S. R. (2019). Relationships between psychoevolutionary fear of evaluation, cognitive distortions, and social anxiety symptoms: A preliminary structural equation model. *Australian Journal of Psychology, 71*(2), 92-99. <https://doi.org/10.1111/ajpy.12215>
- Cohen, J., Cohen, P., West, S. G. & Aiken, L. S. (2013). *Applied multiple regression/correlation analysis for the behavioral sciences*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Crowne, D. P., & Marlowe, D. (1960). A new scale of social desirability independent of psychopathology. *Journal of Consulting Psychology, 24*(4), 349-354. <https://doi.org/10.1037/h0047358>
- Çelik, Ç. B., & Odacı, H. (2013). The relationship between problematic internet use and interpersonal cognitive distortions and life satisfaction in university students. *Children and Youth Services Review, 35*(3), 505-508. <https://doi.org/10.1016/j.childyouth.2013.01.001>
- Dadds, M. R., Perrin, S., & Yule, W. (1998). Social desirability and self-reported anxiety in children: An analysis of the RCMAS Lie Scale. *Journal of Abnormal Child Psychology, 26*(4), 311-317.
- Davis, R. A. (2001). A cognitive-behavioral model of pathological internet use. *Computers in Human Behavior, 17*, 187-195. [https://doi.org/10.1016/S0747-5632\(00\)00041-8](https://doi.org/10.1016/S0747-5632(00)00041-8)
- de Argaez, E. (September, 2019). World Internet users' statistics and 2019 world population stats. Retrieved September, 2019 from <https://www.internetworldstats.com/stats.htm>.
- Demir, A. (1989). The reliability and validity of UCLA Loneliness Scale. *Journal of Psychology, 7*(23), 14-18.
- Di Blasi, M., Cavani, P., Pavia, L., Lo Baido, R., La Grutta, S., & Schimmenti, A. (2015). The relationship between selfimage and social anxiety in adolescence. *Child and Adolescent Mental Health, 20*(2), 74-80. <https://doi.org/10.1111/camh.12071>
- DiTomasso, R. A., Martin, D. M., & Kovnat, K. D. (2000). Medical patients in crisis. In F. M. Dattilio & A. Freeman (Eds.), *Cognitive-behavioral strategies in crisis intervention* (pp. 1–23), New York, NY: Guilford Press.
- Doty, D. H., & Glick, W. H. (1998). Common methods bias: does common methods variance really bias results? *Organizational Research Methods, 1*(4), 374-406. <https://doi.org/10.1177/109442819814002>

- El Asam, A., Samara, M., & Terry, P. (2019). Problematic internet use and mental health among British children and adolescents. *Addictive Behaviors, 90*, 428-436. <https://doi.org/10.1016/j.addbeh.2018.09.007>
- Enez-Darcin, A., Kose, S., Noyan, C. O., Nurmedov, S., Yılmaz, O., & Dilbaz, N. (2016). Smartphone addiction and its relationship with social anxiety and loneliness. *Behaviour & Information Technology, 35*(7), 520-525. <https://doi.org/10.1080/0144929X.2016.1158319>
- Fraboni, M., & Cooper, D. (1989). Further validation of three short forms of the Marlowe-Crowne Scale of Social Desirability. *Psychological Reports, 65*(2), 595-600. <https://doi.org/10.2466/pr0.1989.65.2.595>
- Gámez-Guadix, M., Villa-George, F. I., & Calvete, E. (2012). Measurement and analysis of the cognitive-behavioral model of generalized problematic Internet use among Mexican adolescents. *Journal of Adolescence, 35*, 1581-1591. <https://doi.org/10.1016/j.adolescence.2012.06.005>
- Genuis, S. J., & Genuis, S. K. (2005). Internet interactions: Adolescent health and cyberspace. *Canadian Family Physician, 51*(3), 329-331.
- Goldin, P. R., Manber-Ball, T., Werner, K., Heimberg, R., & Gross, J. J. (2009). Neural mechanisms of cognitive reappraisal of negative self-beliefs in social anxiety disorder. *Biological Psychiatry, 66*(12), 1091-1099. <https://doi.org/10.1016/j.biopsych.2009.07.014>
- Gosling, S. D., Augustine, A. A., Vazire, S., Holtzman, N., & Gaddis, S. (2011). Manifestations of personality in online social networks: Self-reported Facebook-related behaviors and observable profile information. *Cyberpsychology, Behavior, and Social Networking, 14*(9), 483-488. <https://doi.org/10.1089/cyber.2010.0087>
- Green, T. (2015). A methodological review of structural equation modelling in higher education research. *Studies in Higher Education, 1*-31. <https://doi.org/10.1080/03075079.2015.1021670>
- Halamandaris, K. F., & Power, K. G. (1997). Individual differences, dysfunctional attitudes, and social support: A study of the psychosocial adjustment to university life of home students. *Personality and Individual Differences, 22* (1), 93-104. [https://doi.org/10.1016/S0191-8869\(96\)00175-4](https://doi.org/10.1016/S0191-8869(96)00175-4)
- Hall, A. S., & Parsons, J. (2001). Internet addiction: College student case study using best practices in cognitive behavior therapy. *Journal of Mental Health Counseling, 23*(4), 312-327.
- Hamamcı, Z. & Büyüköztürk, S. (2004). The Interpersonal Cognitive Distortions Scale: Development of the scale and investigation of its psychometric characteristics. *Psychological Reports, 95*, 291-303. <https://doi.org/10.2466/pr0.95.1.291-303>
- Hox, J. J. (2013). Multilevel regression and multilevel structural equation modeling. In T. D. Little (Ed.), *Oxford library of psychology. The Oxford handbook of quantitative methods: Statistical analysis* (pp. 281–294). New York, NY: Oxford University Press.
- Hu, L. T., & Bentler, P. M. (1998). Fit indices in covariance structure modeling: Sensitivity to underparameterized model misspecification. *Psychological Methods, 3*(4), 424-453. <https://doi.org/10.1037/1082-989X.3.4.424>
- Huan, V. S., Ang, R. P., Chong, W. H., & Chye, S. (2014). The impact of shyness on problematic internet use: the role of loneliness. *The Journal of Psychology, 148*(6), 699-715. <https://doi.org/10.1080/00223980.2013.825229>

- Ii, A. Z., & Sipps, G. J. (1985). Cross validation of a short form of the Marlowe Crowne Social Desirability Scale. *Journal of Clinical Psychology, 41*(2), 236-238. [https://doi.org/10.1002/1097-4679\(198503\)41:2<236::AID-JCLP2270410217>3.0.CO;2-H](https://doi.org/10.1002/1097-4679(198503)41:2<236::AID-JCLP2270410217>3.0.CO;2-H)
- Lu X. & Yeo K. J. (2015). Pathological Internet use among Malaysia university students: risk factors and the role of cognitive distortion. *Computers in Human Behavior, 45*, 235–242.
- Johnson, R. E., Rosen, C. C., & Djurdjevic, E. (2011). Assessing the impact of common method variance on higher order multidimensional constructs. *The Journal of Applied Psychology, 96*(4), 744-761. <https://doi.org/10.1037/a0021504>
- Johnson, T. P., & Fendrich, M. (May, 2002). *A validation of the Crowne-Marlowe social desirability scale*. Paper presented at the Annual Meeting of the American Association for Public Opinion Research, StPetersburg. <http://www.srl.uic.edu/publist/Conference/crownemarlowe.pdf>
- Kalkan, M. (2012). Predictiveness of interpersonal cognitive distortions on university students' problematic Internet use. *Children and Youth Services Review, 34*(7), 1305-1308. <https://doi.org/10.1016/j.childyouth.2012.03.003>
- Karasar, B., & Baytemir, K. (2018). Need for Social Approval and Happiness in College Students: The Mediation Role of Social Anxiety. *Universal Journal of Educational Research, 6*(5), 919-927.
- Kardefelt-Winther, D. (2014). A conceptual and methodological critique of internet addiction research: towards a model of compensatory internet use. *Computers in Human Behavior, 31*, 351-354. <https://doi.org/10.1016/j.chb.2013.10.059>.
- Kim, H. K., & Davis, K. E. (2009). Toward a comprehensive theory of problematic Internet use: Evaluating the role of self-esteem, anxiety, flow, and the self-rated importance of Internet activities. *Computers in Human Behavior, 25*, 450-500.
- Kim, J., LaRose, R., & Peng, W. (2009). Loneliness as the cause and the effect of problematic Internet use: The relationship between Internet use and psychological well-being. *Cyberpsychology & Behavior, 12*(4), 451-455. <https://doi.org/10.1089/cpb.2008.0327>
- Ko, C.-H., Yen, J.-Y., Yen, C.-F., Chen, C.-S., & Chen, C.-C. (2012). The association between Internet addiction and psychiatric disorder: A review of the literature. *European Psychiatry, 27*(1), 1-8. <https://doi.org/10.1016/j.eurpsy.2010.04.011>
- Krishnamurthy, S., & Chetlapalli, S. K. (2015). Internet addiction: Prevalence and risk factors: A cross-sectional study among college students in Bengaluru, the Silicon Valley of India. *Indian Journal of Public Health, 59*(2), 115-121. <https://doi.org/10.4103/0019-557X.157531>
- Kuzucu, Y., Ozdemir, Y., & Ak, S. (2015). Psychometric properties of a Turkish version of the compulsive internet use scale. *European Scientific Journal, 11*(1), 37-47.
- LaRose, R., Lin, C. A., & Eastin, M. S. (2003). Unregulated Internet usage: Addiction, habit, or deficient self-regulation? *Media Psychology, 5*, 225-253.
- Leary, M. R., & Jongman-Sereno, K. P. (2014). Social anxiety as an early warning system: A refinement and extension of the Theory of Social Anxiety. In S. G. Hofmann & P. M. Di Bartolo (Eds.), *Social anxiety* (3rd ed., pp. 579-597). Amsterdam: Elsevier.

- Liebowitz, M. R. (1987). Social phobia. *Modern Problems of Pharmacopsychiatry* 22, 141-173. <http://dx.doi.org/10.1159/000414022>
- Lin, S. S., & Tsai, C. C. (2002). Sensation seeking and internet dependence of Taiwanese high school adolescents. *Computers in Human Behavior*, 18(4), 411-426. [https://doi.org/10.1016/S0747-5632\(01\)00056-5](https://doi.org/10.1016/S0747-5632(01)00056-5)
- Little, T. D., Cunningham, W. A., Shahar, G., & Widaman, K. F. (2002). To parcel or not to parcel: Exploring the question, weighing the merits. *Structural Equation Modeling*, 9,151-173. https://doi.org/10.1207/S15328007SEM0902_1
- Lu, X., & Yeo, K. J. (2015). Pathological internet use among Malaysia university students: risk factors and the role of cognitive distortion. *Computers in Human Behavior*, 45, 235-242. <https://doi.org/10.1016/j.chb.2014.12.021>
- Maes, M., Nelemans, S. A., Danneel, S., Fernández-Castilla, B., Van den Noortgate, W., Goossens, L., & Vanhalst, J. (2019). Loneliness and social anxiety across childhood and adolescence: Multilevel meta-analyses of cross-sectional and longitudinal associations. *Developmental Psychology*, 55(7), 1548–1565. <https://doi.org/10.1037/dev0000719>
- Mamun, M. A., Rafi, M. A., Al Mamun, A. S., Hasan, M. Z., Akter, K., Hsan, K., & Griffiths, M. D. (2019). Prevalence and psychiatric risk factors of excessive Internet use among Northern Bangladeshi job-seeking graduate students: A pilot study. *International Journal of Mental Health and Addiction*, 1-11. <http://doi.org/10.1007/s11469-019-00066-5>
- Marlatt, G. A., Baer, J. S., Donovan, D. M., & Kivlahan, D. R. (1988). Addictive behaviors: etiology and treatment. *Annual Review of Psychology*, 39(1), 223-252.
- Mazhari, S. (2012). The prevalence of problematic internet use and the related factors in medical students, Kerman, Iran. *Addiction & Health*, 4(3-4), 87-94.
- McKenna, K. Y. A., Greene, A. S., & Gleason, M. E. J. (2002). Relationship formation on the Internet: What's the big attraction? *Journal of Social Issues* 58: 9-31. <https://doi.org/10.1111/1540-4560.00246>
- McKinnon, D.P., Lockwood, C.M., Hoffman, J.M., West, S.G., & Sheets, V. (2002). A comparison of methods to test mediation and other intervening variable effects. *Psychological Methods*, 7, 83-104. <https://doi.org/10.1037/1082-989x.7.1.83>
- McManus, F., Clark, D. M., & Hackmann, A. (2000). Specificity of cognitive biases in social phobia and their role in recovery. *Behavioural and Cognitive Psychotherapy*, 28, 201-209. <https://doi.org/10.1017/S1352465800003015>
- Meerkerk, G. J., Van Den Eijnden, R. J., Vermulst, A. A., & Garretsen, H. F. (2009). The compulsive internet use scale (CIUS): some psychometric properties. *Cyberpsychology & Behavior*, 12(1), 1-6. <https://doi.org/10.1089/cpb.2008.0181>
- Mo, T. S. (2019). The interrelationship of loneliness, social desirability and academic achievement in Myanmar adolescents: viewing social desirability from adjustment approach. *European Journal of Education Studies*, 5, 11.
- Moody, E. J. (2001). Internet use and its relationship to loneliness. *CyberPsychology & Behavior*, 4,393- 401. <https://doi.org/10.1089/109493101300210303>
- Morahan-Martin, J. (1999). The relationship between loneliness and Internet use and abuse. *CyberPsychology & Behavior*, 2(5), 431-439. <https://doi.org/10.1089/cpb.1999.2.431>

- Morahan-Martin., & Schumacher, P. (2000). Incidence and correlates of pathological Internet use among college students. *Computers in Human Behavior*, 16, 13-29. [https://doi.org/10.1016/S0747-5632\(99\)00049-7](https://doi.org/10.1016/S0747-5632(99)00049-7)
- Moss-Morris, R., & Petrie, K. J. (1997). Cognitive distortions of somatic experiences: revision and validation of a measure. *Journal of Psychosomatic Research*, 43(3), 293-306. [https://doi.org/10.1016/S0022-3999\(97\)00020-2](https://doi.org/10.1016/S0022-3999(97)00020-2)
- Muñoz-Rivas, M.J., Fernández, L., & Gámez-Guadix, M. (2010). Analysis of the indicators of pathological Internet use in Spanish university students. *The Spanish Journal of Psychology*, 13(2), 697-707. <https://doi.org/10.1017/S1138741600002365>
- Muris, P., & Field, A. P. (2008). Distorted cognition and pathological anxiety in children and adolescents. *Cognition and Emotion*, 22(3), 395-421. <https://doi.org/10.1080/02699930701843450>
- Nas, C. N., Brugman, D., & Kooops, W. (2005). Effects of the EQUIP programme on the moral judgement, cognitive distortions, and social skills of juvenile delinquents. *Psychology, Crime & Law*, 11(4), 421-434. <https://doi.org/10.1080/10683160500255703>
- Nasir, R., Zamani, Z. A., Yusoooff, F., & Khairudin, R. (2010). Cognitive distortion and depression among juvenile delinquents in Malaysia. *Procedia-Social and Behavioral Sciences*, 5, 272-276. <https://doi.org/10.1016/j.sbspro.2010.07.087>
- Niemz, K., Griffiths, M., & Banyard, P. (2005). Prevalence of pathological Internet use among university students and correlations with self-esteem, the General Health Questionnaire (GHQ), and disinhibition. *Cyberpsychology & Behavior*, 8(6), 562-570. <https://doi.org/10.1089/cpb.2005.8.562>
- Nowland, R., Necka, E. A., & Cacioppo, J. T. (2018). Loneliness and social internet use: pathways to reconnection in a digital world? *Perspectives on Psychological Science*, 13(1), 70-87. <https://doi.org/10.1177/1745691617713052>
- O'Brien, R. M. (2007). A Caution Regarding Rules of Thumb for Variance Inflation Factors. *Quality & Quantity*, 41(5), 673-690.
- Odacı, H., & Çelik, Ç. B. (2013). Who are problematic internet users? An investigation of the correlations between problematic internet use and shyness, loneliness, narcissism, aggression and self-perception. *Computers in Human Behavior*, 29(6), 2382-2387. <https://doi.org/10.1016/j.chb.2013.05.026>
- Odacı, H., & Kalkan, M. (2010). Problematic Internet use, loneliness and dating anxiety among young adult university students. *Computers in Education*, 55, 1091-1097. <https://doi.org/10.1016/j.compedu.2010.05.006>
- Ostovar, S., Allahyar, N., Aminpoor, H., Moafian, F., Nor, M. B. M., & Griffiths, M. D. (2016). Internet addiction and its psychosocial risks (depression, anxiety, stress and loneliness) among Iranian adolescents and young adults: A structural equation model in a cross-sectional study. *International Journal of Mental Health and Addiction*, 14(3), 257-267. <https://doi.org/10.1007/s11469-015-9628-0>
- Owens, L., Skrzypiec, G., & Wadham, B. (2014). Thinking patterns, victimisation and bullying among adolescents in a South Australian metropolitan secondary school. *International Journal of Adolescence and Youth*, 19(2), 190-202. <https://doi.org/10.1080/02673843.2012.719828>

- Özdemir, Y., Kuzucu, Y., & Ak, Ş. (2014). Depression, loneliness and Internet addiction: How important is low self-control? *Computers in Human Behavior*, 34, 284-290. <https://doi.org/10.1016/j.chb.2014.02.009>
- Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5), 879-903. <https://doi.org/10.1037/0021-9010.88.5.879>
- Roth, M., & Altmann, T. (2019). A multi-informant study of the influence of targets' and perceivers' social desirability on self-other agreement in ratings of the HEXACO personality dimensions. *Journal of Research in Personality*, 78, 138-147. <https://doi.org/10.1016/j.jrp.2018.11.008>
- Russell, D., Peplau, L. A., & Cutrona, C. E. (1980). The revised UCLA Loneliness Scale: concurrent and discriminant validity evidence. *Journal of Personality and Social Psychology*, 39(3), 472-480. <https://doi.org/10.1037/0022-3514.39.3.472>
- Scherer, K. (1997). College life on-line: Healthy and unhealthy internet use. *Journal of College Student Development*, 38, 655-665.
- Shrout, P. E., & Bolger, N. (2002). Mediation in experimental and nonexperimental studies: New procedures and recommendations. *Psychological Methods*, 7, 422-445. <https://doi.org/10.1037/1082-989X.7.4.422>
- Sinha, R. (2007). The role of stress in addiction relapse. *Current Psychiatry Reports*, 9, 388-395. <https://doi.org/10.1007/s11920-007-0050-6>
- Sudman, S., & Bradburn, N. M., (1974). *Response effects in surveys: A Review and synthesis*. Chicago: Aldine Publishing Company.
- Sübaşı, G. (2007). Some variables for social anxiety prediction in college students. *Education and Science*, 32 (144): 3-15.
- Turel, O., Mouttapa, M., & Donato, E. (2015). Preventing problematic Internet use through video-based interventions: A theoretical model and empirical test. *Behaviour & Information Technology*, 34(4), 349-362. <https://doi.org/10.1080/0144929X.2014.936041>
- Ural, T., & Özbirecikli, M. (2006). Is ethical judgement influenced by social desirability in responding? An analyse on Turkish accountants. *Journal of Çukurova University Social Sciences Institute*, 15(1), 393-409.
- Walen, S. R., DiGiuseppe, R., & Dryden, W. (1992). *A practitioner's guide to rational-emotive therapy*. New York, NY: Oxford University Press.
- Weeks, M., Ooi, L. L., & Coplan, R. J. (2016). Cognitive biases and the link between shyness and social anxiety in early adolescence. *The Journal of Early Adolescence*, 36(8), 1095-1117. <https://doi.org/10.1177/0272431615593175>
- Weinstein, A., Dorani, D., Elhadif, R., Bukovza, Y., Yarmulnik, A., & Dannon, P. (2015). Internet addiction is associated with social anxiety in young adults. *Annals of Clinical Psychiatry*, 27(1), 4-9.
- Whisman, M. A., & Friedman, M. A. (1998). Interpersonal problem behaviors associated with dysfunctional attitudes. *Cognitive Therapy and Research*, 22(2), 149-160.

- Witkiewitz, K., & Villarroel, N. A. (2009). Dynamic association between negative affect and alcohol lapses following alcohol treatment. *Journal of Consulting and Clinical Psychology, 77*, 633-644. <https://doi.org/10.1037/a0015647>
- Yao, M. Z., & Zhong, Z. J. (2014). Loneliness, social contacts and Internet addiction: A cross-lagged panel study. *Computers in Human Behavior, 30*, 164-170. <https://doi.org/10.1016/j.chb.2013.08.007>
- Yildiz-Durak, H., & Seferođlu, S. S. (2019). Modeling of variables related to problematic social media usage: Social desirability tendency example. *Scandinavian Journal of Psychology, 60*(3), 277-288. <https://doi.org/10.1111/sjop.12530>
- Young, K. S. (1998). Internet addiction: The emergence of a new clinical disorder. *Cyberpsychology & Behavior, 1*, 237-244. <https://doi.org/10.1089/cpb.1998.1.237>
- Yurica, C. L., & DiTomasso, R. A. (2005). *Cognitive distortions. In Encyclopedia of cognitive behavior therapy*. Boston, MA: Springer.