

## **Problematic internet use and study motivation in higher education**

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Short title: PIU and study motivation.

## **Abstract**

The current study explored the relationship between problematic internet use (PIU) and motivation to learn, and examined psychological and social factors mediating this relationship. Two hundred and eighty-five students in an Italian University were recruited for the current study. There was a negative relationship between PIU and motivation to study: a negative impact on learning strategies, meaning that the students found it harder to organise their learning productively; and PIU also positively associated with test anxiety. The current results also demonstrated that there was partial mediation of this effect of PIU on learning strategies in terms of loneliness. This suggests that those with high levels of PIU may be particularly at risk from lower motivations to study, and, hence, lower actual generalised academic performance due to a number of consequences of PIU.

**Keywords:** problematic internet use; motivation to learn, learning strategies; test anxiety; loneliness.

The relationship between the use of internet technology and digital devices and academic performance, and academic-behaviours, such as motivation to learn, has been a subject of concern for the past 20 years (see Junco, 2012; Kubey, Lavin, & Barrows, 2001). For example, the OECD (2015) suggested that countries that invested heavily in information technology demonstrated poorer growth in academic performance than those who did not. However, relatively little is known about the how the use of digital technology negatively impacts academic performance – directly on grades or through reducing some general abilities relating to study – or what factors may contribute to any such negative impacts – such as additional psychological issues the individual may display.

Concerns about the impact of digital technology on academic performance have been especially great when the use of such technology also provokes problematic behavioural patterns, such as internet addiction or Problematic Internet Use (PIU; Hawi & Samaha, 2016; Iyitoğlu & Çeliköz, 2017). PIU is said to occur where individuals report problems concerning their usage of digital technology that involve major disruption to their work and social relationships (Block, 2008; Caplan, 2007), and negative affect when separated from the internet (Romano, Osborne, Truzoli, & Reed, 2013). Estimates of the prevalence of PIU in the general population vary between 2% and 8%, and range up to 20% in younger samples, although these figures are difficult to interpret precisely due to the differing definitions of ‘problematic internet usage’ or ‘internet addiction’ that are employed (Kuss, Griffiths, & Binder, 2013).

Despite these concerns about the impact of digital technology on academic performance, the results of a range of studies that have examined the direct relationship between PIU and actual academic performance, as are measured by Grade Point Average (GPA), have been somewhat mixed (see Akhter, 2013, for a review). Several studies have found a negative relationship between levels of PIU and GPA (Hawi & Samaha, 2016;

Iyitoğlu & Çeliköz, 2017; Lepp, Barkley, & Karpinski, 2014; Türel & Toraman, 2015). In contrast, another group of studies have found no relationship between these variables (Ellore, Niranjana, & Brown, 2014; Usman, Alavi, & Shafeq, 2014). There may be many reasons for this mixed set of results, and this set of mixed outcomes might reflect either a problem with this variable as an index of achievement (Didier, Kreiter, Buri, & Solow, 2006; Johnson, 2003), or something about which samples produce this relationship. However, this situation makes further research into the impact of PIU on academic behaviour and performance important to conduct in order to clarify the situation.

Whatever the reasons for the mixed pattern of results from previous studies relating PIU and academic performance, it should be noted that GPA may not be the key index of the impact of PIU on learning. It may be that PIU impacts individuals' motivation to learn (Reed & Reay, 2015; Zhang, Qin, & Ren, 2018), and this reduced motivation may, in turn, negatively impact academic performance, whether or not captured by GPA (Pedaste, Must, Silm, Täht, Kori, Leijen, & Mägi, 2015; Steinmayr & Spinath, 2009). Motivation to learn is a construct that covers a broad range of skills needed for study, including: self-efficacy, intrinsic value, learning strategy, test anxiety, and self-regulation (Pintrich & DeGroot, 1990). Indeed, the relationship between PIU and motivation to learn may be more troublesome for academic behaviours than any specific impact of PIU on academic achievement in terms of GPA, as motivation to learn may generalise across many situations, creating ongoing less than optimal learning (Alt & Boniel-Nissim, 2018; Pizzolato, Olson, & Monje-Paulson, 2017). However, there is only limited evidence currently available to assess whether there is such a negative effect of PIU on learning motivation in higher education (Reed & Reay, 2015). Given this, the primary goal of this study was to assess this relationship further, especially in terms of the precise aspects of learning and study motivation strategies that PIU might impact.

In support of a theoretical link between PIU and motivation to learn, PIU has been found to impact a wide range of psychological variables that may be relevant to motivation to learn. These abilities include a range of cognitive capabilities associated with executive functioning, such as impulse control and planning (Reed, Osborne, Romano, & Truzoli, 2015; Zhou, Zhou, Zhu, 2016). Additionally, PIU also has been noted to reduce the ability to experience reward (Guillot, Bello, Tsai, Huh, Leventhal, & Sussman, 2016). Reduction in such cognitive skills and abilities may well impair motivation to study in academic contexts (Kuo, Chen, Chang, Lee, Liu, & Chen, 2018; Reed & Raey, 2015). However, PIU also has been found to be associated with depression (Lai et al., 2015; Morrison & Gore, 2010), anxiety (Romano, Roaro, Re, Osborne, Truzoli, & Reed, 2017; Stavropoulos, Gomez, Steen, Beard, Liew, & Griffiths, 2017), and loneliness (Ostovar, Allahyar, Aminpoor, Moafian, Nor, & Griffiths, 2016). Such psychological and social variables have been found, themselves, to impact on students' motivation to learn (Froiland, Oros, Smith, & Hirschert, 2012). Thus, it is a possibility that these psychological variables, rather than PIU itself, may be key in determining the effect of PIU on motivation to learn. Given that it is unclear whether PIU has a direct or a mediated effect on motivation to learn, a secondary goal of the study was to explore the relationship between PIU and learning motivation is mediated by psycho-social states.

Of particular interest in this regard, are the relationships between PIU, depression, loneliness, and learning motivation. As noted above, it has been shown that PIU impacts these psychological variables strongly (Ostovar et al., 2016). It has also been shown that negative emotions, such as depression and anxiety, mediate the use of digital communication devices (Jun & Choi, 2015; Lepp et al., 2014) – it is known that social motivation, especially connected with loneliness, is a strong motivator of internet use (Caplan, 2006). As depression and loneliness are correlated (Demir & Kutlu, 2016), it is unclear whether

negative emotions, like depression, or social factors, like loneliness, are prime moderators of the relationship between PIU and learning motivation. A recent study by Reed, Giles, Gavin, Carter, and Osborne (2016) has shown that loneliness, rather than depression, is a key factor in academic quality of life, and this may suggest that this social variable, rather than the psychological ones, may be important in this higher education context.

In summarising the above, the current study aimed to explore whether a relationship exists between levels of PIU and motivation to learn in higher-education students. In addition, the current study aimed examined whether psychological and social factors, such as depression, anxiety, and loneliness, known to be associated with PIU, mediated any relationship between PIU and learning motivation. As this is a novel area to explore, it was of interest to determine which, if any, of these psychological variables were important in this regard.

## **Method**

### **Participants**

Two hundred and eighty-five students in an Italian University were recruited for the current study. These students responded to advertisements regarding the study that were displayed around campus, through University social media, and during lectures. All students were volunteers, and none received any payment or credit for their participation. There were 39 males and 246 females, with a mean age of 22.81 ( $\pm 3.58$ ; range 19 – 50) years. There were 80 (28%) students studying Nursing (at bachelor degree level), 64 (23%) studying Psychiatric Rehabilitation Techniques (at bachelor degree level), and 141 (49%) studying Speech Therapy (at bachelor degree level). The grade point average of the students of 26.49 ( $\pm 1.75$ ).

## Participant's Internet Use

Participants were asked to respond to a series of questions regarding their use of the internet, which they were informed was to include their use of social networks. In response to the questions: *“How long do you spend on the internet (including social media) each day?”*, to which they could tick one of a number of answer boxes: 217 (76%) students indicated that they spent 1-3 hours per day on line; 65 (22%) indicated 4-7 hours; and 3 (1%) indicated > 7 hours. Participants were asked to describe their main use of internet through a question: *“What is your main use of internet (on average, the activity that occupies more than 50% of your time), indicate one choice.”*. The main online activities were: ‘information seeking’ = 32 (11%); ‘learning activity’ = 20 (7%); ‘social networking’ = 115 (40%); ‘gaming’ = 1 (.5%); ‘fun’ (i.e., music or video downloading) = 66 (23%); ‘shopping’ = 1 (.5%); 50 participants (17%) responded that they were not able to choose the main use of internet as they found many equally valuable aspects. The main social motives for internet use, in response to the question: *“What are your social motives for using the internet? Indicate one choice.”*, were: ‘maintaining long-distance relationships with friends and relatives’ = 97 (34%); and ‘supporting daily “face to face” relationships’ = 174 (61%). No answer to this item was given by 14 participants (5%), probably for the same reasons indicated, above, for the previous question.

## Materials

**Motivated Strategies for Learning Questionnaire** (MSLQ; Pintrich & DeGroot, 1990) measures learning strategies and motivation to study in students. There are 25 items, composed of 5 subscales: self-efficacy, intrinsic value, learning strategy, test anxiety, and self-regulation. Each question is scored on a 5-point scale, with a higher answer

corresponding to higher levels of motivation for learning. The score for each scale is calculated by summing the responses. The internal reliability (Cronbach  $\alpha$ ) of the scales ranges from .71 for self-regulation to .82 for intrinsic motivation. The scale has been widely used for college students (Pintrich, 2004). In the Italian version of MSLQ, the internal reliability of the scales ranges from .72 self-regulation to .87 for self-efficacy (total Cronbach's alpha = .83; Olivari, Bonanomi, Gatti, & Confalonieri, 2015; Bonanomi, Olivari, Mascheroni, Gatti, & Confalonieri; 2018).

**Internet Addiction Test (IAT; Young, 1998)** is a 20-item scale covering the degree to which use of internet disrupts everyday life (work, sleep, relationships, etc.). Each item is scored on a 1-4 scale, and the overall score ranges from 20 to 100. The factor structure of the IAT is currently debated (cf. Chang & Man Law, 2008; Widyanto & McMurrin, 2004), but Young (1998) has suggested that employing a cut-off score of 40 or more for the total score of the IAT represents some level of problematic internet usage (see also Hardie & Tee, 2005; Romano et al., 2013; Widyanto & McMurrin, 2004). The internal reliability (Cronbach  $\alpha$ ) of the scale has been found to be between .90 (Widyanto & McMurrin (2004) and .93 (Young, 1998). In an Italian college students sample (Faraci, Craparo, Messina, & Severino, 2013),  $\alpha$  values were satisfactory for both the one-factor solution (.91), and the two-factor solution (.88 and .79).

**Hospital Anxiety and Depression Scale (HADS; Snaith & Zigmond, 2000)** is a widely used measure of anxiety and depression. Originally designed for use by hospital general medical outpatients, it has been used for student samples (Andrews & Wilding, 2004). The main characteristic of the scale is that it excludes the somatic symptomatology from the assessment, concentrating the attention, for depression, on the reduction of the hedonic capacity, considered the most sensitive indicators of this disorder. It contains 14 items (7 for anxiety and 7 for depression) that relate to the last week. There are 7 questions



each for anxiety and depression, each question is scored from 0 to 3 depending on the severity of the symptom; the maximum score is 21 for each of the scales. Respondents can be classified into four categories: 0-7 normal; 8-10 mild; 11-14 moderate; and 15-21 severe. The test-retest reliability and validity are both very strong (Snaith & Zigmond, 2000), and the internal reliability is 0.82 for the anxiety scale, and 0.77 for the depression scale for a non-clinical population (Crawford, Henry, Crombie, & Taylor, 2001).

**UCLA Loneliness Scale** (UCLA; Russell, 1996) consists of 20 statements designed to assess loneliness. Participants respond to each question using a 4-point scale (“I often feel this way”, “I sometimes feel this way”, “I rarely feel this way”, and “I never feel this way”), and each item is scored from 0 to 3, giving the total score a range from 0 to 60. A higher score indicates a higher severity of loneliness. A cut-off point for loneliness problems is usually given at one standard deviation above the mean for the sample. The scale has high reliability, with an internal consistency of .92, and a test-retest reliability of .73 (Jobe, Williams, & White, 2007).

## **Procedure**

After the participants had given their consent for their participation. The purpose of the research was explained to the participants in terms of their internet use (including social media use), learning style, and personality. The types of questionnaires that they had to answer were also explained to them. Participants were told of their right to withdraw from the study at any time, and were also informed about the steps being taken to ensure their privacy. After this, in a classroom of the University, participants were given the tests described above. The tests were presented one at a time, in a random order to the participants, except that IAT, and questions regarding their internet use, were always presented last. During this period, the participants could ask the experimenter any questions

they wished about the scales that they were completing if they did not understand anything. The participants could take as long as they wished to complete each questionnaire, but, on average, the entire process typically took about 20-30 min per participant. The data were all collected during the period of one month for the entire sample.

## Results

The mean level of internet addiction (IAT) for the sample was 37.19 ( $\pm$  9.69; range = 17 – 90), 34.4% of the sample fell above the cut-off for mild problems, with the mean for males being 37.92 ( $\pm$  9.10; range = 25 - 58) and that for females being 36.98 ( $\pm$  9.78; range = 17 - 90),  $t < 1$ ,  $d = .11$ .

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 Table 1 about here  
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Table 1 presents the means (standard deviations) and correlations for depression (HADS\_D), anxiety (HADS\_A), loneliness (UCLA), and impulsivity (BIS) for the sample, as well as their correlations with internet addition (IAT). These correlations show that internet addition correlated moderately positively with all of the variables.

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 Table 2 about here  
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Table 2 displays the means (standard deviations) for the motivation to study subtypes and their Pearson correlations with internet addiction (IAT), depression (Dep; HADS\_D), anxiety (anx; HADS\_A), loneliness (lone; UCLA), and impulsivity (impulse; BIS). Inspection of these data show that internet addiction had a significant negative effect on

learning strategies, and a positive effect on test anxiety. A pattern that was mirrored for depression, anxiety, and loneliness, but not for impulsivity.

Given the above, two separate mediation analysis were performed to see if there was a relationship between internet addiction and learning strategies or whether any relationship was mediated by depression, anxiety, and/or loneliness, and another analysis was conducted for test anxiety.

In Step 1 of the mediation model for task value, the regression of internet addiction (IAT) on learning strategies, ignoring the mediators, was significant,  $\beta = -.062$ ,  $t(283) = 2.63$ ,  $p = .009$ . Step 2 showed that the regression of internet addiction (IAT) on depression (HADS\_D), was also significant,  $\beta = .037$ ,  $t(283) = 2.97$ ,  $p = .003$ , as was the regression of internet addiction on anxiety (HADS\_A),  $\beta = .047$ ,  $t(283) = 2.10$ ,  $p = .037$ , and the regression of internet addiction on loneliness (UCLA),  $\beta = .202$ ,  $t(283) = 3.47$ ,  $p < .0001$ . Step 3 of the mediation process showed that the mediator (depression), controlling for the other variables, was not significant,  $\beta = -.197$ ,  $t(280) = 1.55$ ,  $p = .123$ , the mediator anxiety was significant,  $\beta = .197$ ,  $t(280) = 2.61$ ,  $p = .009$ , as was the mediator loneliness,  $\beta = -.092$ ,  $t(280) = 3.52$ ,  $p < .001$ . Step 4 of the analyses revealed that, controlling for the mediators, the relationship between internet addiction and learning strategies was only marginally significant,  $\beta = -.197$ ,  $t(280) = 1.91$ ,  $p = .057$ . A Sobel test was conducted significant mediation in the model by loneliness ( $z = 2.42$ ,  $p = .016$ ), but not for depression ( $z = 1.32$ ,  $p = .188$ ), or anxiety  $z = 1.57$ ,  $p = .117$ ). This indicated that loneliness at least partially mediated the relationship between internet addiction and learning strategies.

In Step 1 of the mediation model for learning belief, the regression of internet addiction (IAT) on test anxiety, ignoring the mediators, was significant,  $\beta = .074$ ,  $t(283) = 4.23$ ,  $p < .001$ . Step 2 showed that the regression of internet addiction (IAT) on depression (HADS\_D), was significant,  $\beta = .037$ ,  $t(283) = 2.97$ ,  $p = .003$ , as was the regression of

internet addiction on anxiety (HADS\_A),  $\beta = .047$ ,  $t(283) = 2.10$ ,  $p = .037$ , and the regression of internet addiction on loneliness (UCLA),  $\beta = .202$ ,  $t(283) = 3.47$ ,  $p < .0001$ . Step 3 of the mediation process showed that the mediator (depression), controlling for the other variables, was not significant,  $\beta = -.009$ ,  $t < 1$ ,  $p = .904$ , the mediator anxiety was significant,  $\beta = .261$ ,  $t(280) = 5.39$ ,  $p < .001$ , but loneliness was not significant,  $\beta = .027$ ,  $t(280) = 1.62$ ,  $p = .107$ . Step 4 of the analyses revealed that, controlling for the mediators, the relationship between internet addiction and test anxiety was significant,  $\beta = .057$ ,  $t(280) = 3.77$ ,  $p < .001$ . A Sobel test was conducted significant mediation in the model by anxiety was only marginally significant ( $z = 1.92$ ,  $p = .054$ ), but not for depression ( $z = .12$ ,  $p = .909$ ), or loneliness ( $z = 1.42$ ,  $p = .156$ ). This indicated that the relationship between internet addiction and test anxiety was not mediated.

## Discussion

The current study noted that there was a negative relationship between levels of PIU, in a sample of university students, and motivation to study. In particular, there was a negative impact on learning strategies, meaning that the students found it harder to organise their learning productively. Levels of PIU also were positively associated with test anxiety. This finding adds to the growing literature that suggests PIU has a negative impact on ability to study (Reed & Reay, 2015; Zhang et al., 2018).

This negative relationship is important, as it suggests that PIU may impact on the cognitive skills needed to be able to study, such as are encompassed by motivation to learn, rather than on performance in one particular area (Alt & Boniel-Nissim, 2018; Pizzolato et al., 2017). PIU has been shown to impair ability across a range of executive functioning tasks, such as impulse control, planning (Reed et al., 2015; Zhou et al., 2016), as well as affecting reward sensitivity (Guillot et al., 2016). Such cognitive abilities and skills may

impact academic behaviours, such as motivation to learn, by impairing individual's ability to plan (Kuo et al., 2018; Reed & Raey, 2015), or to experience reinforcement from task completion (Guillot et al., 2016), as well as being associated with higher levels of depression (Lai et al., 2015) and anxiety (Romano et al., 2017; Stavropoulos et al., 2017). Any or all of these PIU-related impairments to cognition and mental state may link with reduced motivation to study, and academic performance, in general.

The current study did not examine the impact of PIU on the GPAs of the sample, as the current sample typically displayed high GPAs, with relatively little variance, which reduces artificially the chances of seeing a relationship. However, previous work has also noted a negative relationship between PIU and GPA of samples who are not so highly-selected on the bases of their GPAs as the current participants (Hawi & Samaha, 2016; Iyitoğlu & Çeliköz, 2017; Lepp et al., 2014).

In addition to showing a direct relationship between PIU and two aspects of study motivation, learning strategies and test anxiety, the current results also demonstrated that there was partial mediation of this effect on learning strategies in terms of loneliness. This is a novel finding in the PIU literature, which has previously noted a possible mediating relationship between PIU and academic performance involving negative psychological states like depression and anxiety (Jun & Choi, 2015; Lepp et al., 2014). However, previous research has noted that these psychological states are linked to loneliness (Jun & Choi, 2015; Lepp et al., 2014), and that it is loneliness that plays a large role in positive feelings about academic life in higher education (Reed et al., 2015). Given this, it may be that the poorer social interactions that are known to be associated with those with high levels of PIU, will impact on loneliness, which will, in turn, impact on motivation to engage in a highly social educational environment such as a University.

There are, of course, a number of limitations that need to be acknowledged. The current findings were derived from a higher educational establishment, with highly-selected students. It is unknown if the current pattern of results would generalise to other students. However, given the pattern of data established from a range of studies noted above, there is little reason to doubt this. The current data were collected from a single point in time, and represent a cross-sectional sample of the data from the participants. Longitudinal studies could be conducted to examine the temporal relationships between these effects. Although this would not establish causality, it may establish some degree of temporal precedence between the variables. It is unknown whether the use of a different selection of measurement tools would have produced the same effects, and studies to examine this aspect of the generality would also be helpful. Finally, it should also be noted that future studies could capitalise on the objective measures of social media and internet use now available for most people, rather than relying on self-report.

Notwithstanding these limitations, the current study suggestion that finding ways to limit, or get students to self-limit, the use of internet and social media would have beneficial effects on study motivation, and potentially on academic performance. Clearly, much of this usage is beyond the scope of an academic institution to control, but encouraging mindful use of social media, and replacing usage with other enjoyed activities, is one potentially useful suggestion that could be made to students (Hunt, Marx, Lipson, & Young, 2018). Beyond this, higher education institutions may wish to rethink their increasing employment of digital technology as a putative aid to communication between students and staff, as it may have counterproductive impacts on the prime objective of such institutions, which are the academic performance of their students, and their psycho-social development.

In summary, the current study demonstrated an association between PIU and learning strategies and test anxiety, and also noted that this associations was mediated to some extent

by loneliness. This suggest at those with high levels of PIU may be particularly at risk from lower motivations to study, and, hence, lower actual generalised academic performance due to a number of consequences of PIU.

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### **Data Availability Statement**

The data that support the findings of this study are available from the corresponding author upon reasonable request.

**Table1: Means (standard deviations) for depression, anxiety, loneliness, and impulsivity for the sample, along with their Pearson correlations with each other and with internet addition (IA).**

		Anxiety	Loneliness	Impulsivity	IA
Depression (HADS_D)	5.38 (2.08)	.534***	.386***	.035	.174**
Anxiety (HADS_A)	7.21 (3.64)		.436***	.158**	.124*
Loneliness (UCLA)	15.23 (9.70)			.052	.202***
Impulsivity (BIS)	61.85 (6.56)				.134*

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\*  $p < .05$ ; \*\* $p < .01$ ; \*\*\*  $p < .001$

**Table 2: Means (standard deviations) for the motivation to study subtypes and their Pearson correlations with internet addiction (IAT), depression (Dep; HADS\_D), anxiety (anx; HADS\_A), loneliness (lone; UCLA), and impulsivity (impulse; BIS).**

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		IAT	Dep	Anxiety	Lone	Impulse
Self-efficacy	28.78 (3.95)	-.040	-.195***	-.173**	-.208***	.173**
Intrinsic mot.	21.69 (3.20)	-.079	-.018	-.022	-.128*	.045
Learning	24.49 (3.88)	-.155**	-.118*	-.013	-.214***	.041
Test anxiety	8.86 (2.70)	.265***	.253***	.415***	.289***	.003

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Self-reg.	8.92 (1.62)	-.044	-.038	.018	-.043	.040
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\*  $p < .05$ ; \*\* $p < .01$ ; \*\*\*  $p < .001$