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RESEARCH ARTICLE

What is the role of emotional regulation and psychological rigidity in the relationship between stress and pathological Internet use?

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ABSTRACT

Objective: This study aims to test various models to determine whether emotion regulation difficulties and psychological flexibility play a moderating or mediating role in the relationship between stress and pathological Internet use (PIU).

Method: The study involved 400 undergraduate students who completed several self-report instruments related to these concepts. Subsequently, Pearson's correlation, mediation, and moderated mediation analyses were carried out to test the models.

Results: The results supported the mediating role of difficulties in emotion regulation between stress and PIU and the moderating role of psychological flexibility between difficulties in emotion regulation and PIU.

Conclusion: Stressful life events may lead to difficulties in emotion regulation, in which case, the less flexible a person is psychologically, the more likely he or she is to engage in PIU. In short, this study highlights the roles of both emotion regulation problems and flexibility in the association of stress with PIU, and its findings may offer new perspectives for the conceptualization of this problematic condition.

Keywords: Emotion regulation difficulties, pathological Internet use, psychological flexibility, stress

INTRODUCTION

It was in the 1960s that the technological basis of Internet first emerged in the United States, and it has become an indispensable part of our lives since 1990, allowing us to reach information easily and engage in a variety of activities. Its growth in popularity has been significant; between 2000 and 2018, the number of Internet users has reached around 4.021 billion, which corresponds to 53% of the world population (1). This prevalence of Internet use is not limited to the West, as Turkey has recorded similar increase rates. For example, a study conducted in Turkey in April 2017 identified a rate of Internet use of 66.8 percent among people aged 16-74 compared to 61.2 percent for the entire population in 2016 (2).

The Internet offers many useful applications, including shopping, social media, sending messages, reading online news, newspapers, or magazines; searching for health-related information, and looking for information about goods and services (3). However, on the downside, Internet use has also been associated

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with psychological problems including addiction. To date, a number of preliminary criteria for describing this problem have been established for research and administrative purposes: difficulties in controlling one's use of the Internet, lying about use, use of the Internet for increasing amounts of time and for longer than planned, deterioration in functionality, preoccupation with the Internet, withdrawal symptoms when not using the Internet, and use of the Internet to escape problems and negative emotions (4). While Internet addiction is defined in this way, there are different explanations for the definition of PIU that will be treated in the current study. As Morahan-Martin and Schumacher (5) mentioned in their study, there are no specific criteria for PIU. They described PIU as "disturbed patterns of Internet use." In addition, PIU is defined as a use of the Internet that causes numerous symptoms, including using the Internet in order to change one's mood, failure to fulfill basic life obligations, feelings of guilt, and craving (5). In one of the studies related to PIU, it was stated that the symptoms of PIU were similar to those of Internet addiction (6).

The characteristics of Internet use are similar in many cultures. For example, Internet use is widespread among university students (7) who, given their easy access to the Internet, are strong candidates for PIU (5,8). It was stated that stress may be one of the reasons why Internet addiction is widespread among university students. Being a student is challenging as it is the time for the individual to create a sense of identity, which leads to stress (9). Students may either cope with stress on their own or turn to maladaptive behaviors such as PIU with the purpose of stress relief on the Internet (10). Given the emotional nature of stress, coping with this emotion may be important for the development of PIU (11). In other words, using the Internet might be considered as an unhealthy way of emotion regulation after stressful events. Studies also showed that addiction might be related to an inability of emotion regulation (12). Emotion regulation is described as a set of dynamic and complex processes involving the alteration of emotional reactions to meet the needs of the environment (13). It has been shown to be influential in several psychological problems (14,15) including Internet addiction (16,17). There have been no studies to date in the relevant literature examining specifically the relationships among difficulties in emotion regulation, PIU, and stress together.

It is thought that psychological flexibility could be a variable that may be protective for PIU in individuals with stress and difficulty in emotion regulation. Psychological flexibility refers to the ability to interact fully with one's present thoughts and emotions without the need for unnecessary defense and the ability to maintain goals and value-oriented behaviors. This construct would appear to be closely related to psychological well-being (18); whereas at the opposite end of this continuum we find psychological rigidity, which has been shown to play a role in the etiology and maintenance of psychopathology (19) including Internet addiction (20). However, no study has examined the relationship between psychological flexibility and PIU. Accordingly, this study takes another novel approach of testing the role of psychological flexibility in the relationship between stress and PIU.

In summary, both psychological flexibility and difficulties in emotion regulation have been identified in the context of several psychological problems, but to date, the role of these two variables in PIU has yet to be analyzed. Some authors touched upon the similarities and differences between psychological flexibility and difficulties in emotion regulation, emphasizing that difficulty in emotion regulation is a form of cognition while psychological flexibility is considered to be a kind of willingness and effort towards such a regulation trend (21). This raises the question of how difficulties in emotion regulation and psychological flexibility interact in the relationship between stress and PIU. In light of the findings in the literature, the present study aims to investigate two models. The first model hypothesizes that experiences of stress lead to difficulties in emotion regulation, which, in turn, results in PIU; thus, we tested the mediating role of difficulties in emotion regulation between stress and PIU (Figure 1). The second model focuses primarily on the mediating role of difficulties in emotion regulation between stress and PIU but also examines the moderating role of psychological flexibility between difficulties in emotion regulation and PIU (Figure 2). In other words, we hypothesize that stress leads to problems in emotion regulation and that, depending

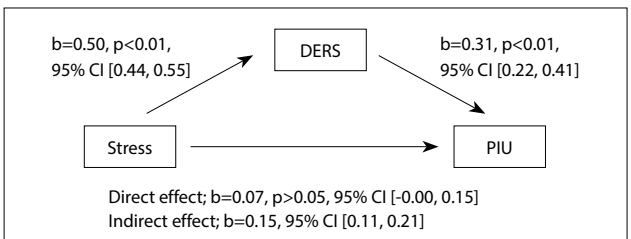

Figure 1. Proposed model of mediation by DERS.
DERS: Difficulties in Emotion Regulation Scale, b: Beta value, CI: Confidence interval, PIU: Pathological Internet Use.

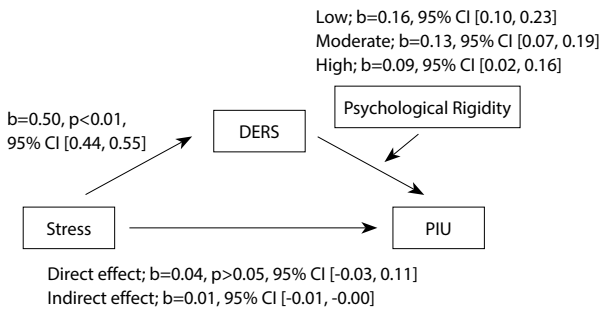

Figure 2. Proposed model of moderated mediation.
DERS: Difficulties in Emotion Regulation Scale, b: Beta value, CI: Confidence interval, PIU: Pathological Internet Use.

on the level of psychological flexibility, people may experience PIU (i.e., moderated mediation).

METHOD

Participants

The study sample comprised 400 undergraduate students (218 female, 182 male) recruited by convenience sampling following announcements. Participants were enrolled in various departments (26.3% in psychology, 20.2% in electrical and electronic engineering, 12.9% in business administration, 10.1% in sociology, 9.3% in linguistics, 7.6% in textile engineering, 5.6% in the faculty of law, 3.5% in statistics, and 4.5% in other departments) of two universities (Dokuz Eylul University and Gediz University) located in Izmir/Turkey. Participants' mean age was 21.24 years (standard deviation: 1.73, range 18-25). Most of the respondents said that they lived with their family or with a roommate (45.3% and 25.3%, respectively).

Measures

Students-Life Stress Inventory (SSI): The original version of this inventory was developed by Gadzella (22). To evaluate the level of life stress among students, 53 items with a 7-point response option are included in the SSI; a higher score indicates a higher level of stress. While it is possible to focus on the total score, the instrument was originally made up of two subscales. The "stressors" section included items related to frustrations, conflicts, pressures, changes, and self-imposed stressors, and the section "reactions to stressors" comprised items related to physiological, emotional, and behavioral reactions and cognitive appraisal. The original reliability scores were 0.52 and 0.81 in the respective subscales (22). The findings show that SSI has sufficient psychometric properties. Later, Baloglu and Bardakci (23) examined the Turkish version of this inventory, finding satisfactory internal consistency (total reliability coefficient: 0.88), and the findings of the inventory were associated with the original subscales frustration, conflicts, pressures, changes, and self-imposition; and physiological, emotional, behavioral, and cognitive appraisal. As no specific hypothesis is put forward in this study related to the subscales of the SSI, only the total score of the scale was selected with an internal consistency of 0.92.

Difficulties in Emotion Regulation Scale (DERS): The DERS was designed by Gratz and Roemer (24) to evaluate difficulties in the emotion regulation process and comprises 41 items with 5-point ratings in six subscales of awareness, clarity, nonacceptance, impulse, goals, and strategies. The higher the score for the total and the subscales is, the greater are the problems related to emotion regulation. Depending on the aim of the research, either the total or the subscale scores can be used (25,26). The total score was used in the current study, as the aim was to understand the total score mediating effect. Cronbach's alpha was 0.93 in the original study of this scale with satisfactory results for its validity. The DERS was adapted into Turkish by Ruganci and Gencoz (27). Cronbach's alpha for the reliability of the Turkish version was 0.94 and the test-retest consistency reliability was 0.78, confirming that the instrument is also suitable to examine problems in emotion regulation in Turkish culture. For the current study, Cronbach's alpha reliability was found to be 0.92.

Acceptance and Action Questionnaire-II (AAQ-II): The questionnaire developed by Bond et al. (28) contains seven items with 7-point ratings. Its aim was to evaluate psychological flexibility. The scale has no subscales and reflects a single factor of psychological rigidity, which is at the opposite end of psychological flexibility on the continuum, and a higher score indicates a greater level of psychological rigidity. Therefore, in the results section the term psychological rigidity was chosen instead of psychological flexibility. The mean Cronbach's alpha score was 0.84 for six samples in the original study using this questionnaire (ranging between 0.78 and 0.88), while test-retest consistency reliability was 0.78 (28). The AAQ-II was adapted to Turkish by Meunier et al. (29), who found satisfactory reliability and validity. For the present sample, the internal consistency reliability coefficients were found to be 0.92.

Internet Addiction Test (IAT): The IAT designed by Young (30) comprises 20 items with five Likert-type response options, the aim being to identify pathological

use of the Internet, with higher scores indicating higher PIU. There have been several studies suggesting the use of cutoff scores to describe pathological use. To illustrate, a score in the range 0-49 means no pathological use while scores between 50 and 79 indicate a moderate level of pathological Internet use. Those with scores exceeding 80 can be considered PIUs (31,32). High reliability scores were found in several studies (33,34). The test was adapted to Turkish culture by Boysan et al. (35). Cronbach's alpha reliability of the IAT was 0.93, with additional evidence supporting its validity showing that the IAT has sufficient psychometric properties. Cronbach's alpha reliability for the present study was found to be 0.90.

Procedure

After obtaining ethics approval from the Dokuz Eylul University Faculty of Letters Ethics Committee, an announcement of the study was first made to attract potential participants from the universities. Later, an explanation of the research purpose emphasizing voluntary participation was presented to the participants. After informed consent was obtained from all individual participants included in the study, they were asked to complete a questionnaire set. The distributed questionnaires were returned after about 1 month. Some participants dropped out by not handing in the questionnaires. To control for serial order effect, the order of tests was randomized. Completion of the questionnaires took approximately 30 minutes.

Before starting the analysis, the data were prepared for processing. For dealing with missing values, an Expectation-Maximization algorithm was used. After checking the normality assumptions, the data could be analyzed. First, Pearson's Correlation Coefficients were calculated to examine the interrelations among the different aspects of the current study. Further analyses were conducted to understand the contribution of the predicted results. Since the current study investigated the role of emotion regulation difficulties and psychological flexibility in the relationship between stress and PIU, first the mediation and then moderated mediation analyses were used to understand the context of relationship between related variables. For the mediation and moderated mediation analyses, PROCESS analyses were conducted (36). According to Preacher and Hayes (37), three criteria should be met for a mediation model to be satisfied. Firstly, the mediator and independent variables should be significantly correlated (i.e., direct effect); secondly, the correlation between the mediator and dependent variables should be significant after controlling for the effect of the independent variable on the dependent variable (i.e., direct effect); and thirdly, there should be a significant indirect effect of the independent variable on the dependent variable (i.e., indirect effect). In the second model, we tested moderated mediation where four criteria should be met. First, it was assumed that there must be relations between independent, mediator, and dependent variables. The second criterion was that mediator and moderator variables should be related to each other. Third, the moderator variable should be a predictor of the dependent variable. The last criterion was that an indirect relationship should exist between independent variable and dependent variable by way of the mediator variable across low and high levels of the moderator variable (36). In the present case, the dependent variable was PIU and the independent variable was primarily stress. Emotion regulation was a mediator variable, while psychological flexibility was the moderator variable of this research. In other words, before conducting the analysis, four conditions were tested: 1) whether there was a significant effect of stress levels on difficulties in emotion regulation, 2) whether difficulties in emotion regulation had a significant effect on psychological flexibility level, 3) whether a significant interaction existed between difficulties in emotion regulation and psychological flexibility levels in predicting PIU levels, and 4) whether an indirect relationship existed between stress and PIU by way of emotion regulation problems across low and high levels of psychological flexibility. Prior to the analyses, all related predictors were well centered (38).

RESULTS

According to Pearson's correlation analysis, it was found that a tendency of PIU was positively related to the level of stress in the life of the student ($r=0.40$, $p<0.01$), psychological rigidity ($r=0.41$, $p<0.01$), and level of difficulty in emotion regulation ($r=0.47$, $p<0.01$). Furthermore, the stress level was also found to be positively related to psychological rigidity ($r=0.65$, $p<0.01$) and difficulties in emotion regulation ($r=0.66$, $p<0.01$). Generally speaking, a moderate degree of association was identified between PIU and other variables. In other words, it would appear that, as Internet use increases, stress levels, psychological rigidity, and emotion regulation difficulties also rise (Table 1).

Regression analysis was used to test the hypothesis that emotion regulation alone mediated the relationship between stress and PIU. The results indicated that stress

Table 1: Correlation coefficient, mean and standard deviation in the study measures

	Correlations					
Measure	**1**	**2**	**3**	**4**	**Mean**	**SD**
1. IAT	1				33.03	16.72
2. SSI	0.40*	1			133.04	27.49
3. DERS	0.47*	0.66*	1		87.73	20.66
4. AAQ-II	0.41*	0.64*	0.70*	1	20.54	9.42

SD: Standard deviation, IAT: Internet Addiction Test, SSI: The Students-Life Stress Inventory, DERS: Difficulties in Emotion Regulation Scale, AAQ-II: Acceptance and Action Questionnaire – II, *p<0.001.

was a significant predictor of emotion regulation (b=0.50, p<0.01) and that emotion regulation was a significant predictor of PIU (b=0.31, p<0.01). These results support the mediation hypothesis. After controlling for the mediator, the level of stress was no longer a significant predictor of PIU or difficulties in emotion regulation (b=0.07, p>0.05), which is consistent with full mediation, where one or more mediator variables transmit the total effect of the independent variable to the dependent variable. Thus, the direct effect is the total effect of the independent variable on the dependent variable, whereas an indirect effect shows that the independent variable has no direct effect on the dependent variable. Approximately 23% of the variance in satisfaction was accounted for by the predictors (R^2=0.23, F[2, 385]=53.64, p<0.01). The indirect effect was tested using a bootstrap estimation approach containing 1,000 samples (39), and the results indicated that the indirect coefficient was significant (b=0.15, 95% confidence interval [95% CI] [0.11, 0.21]) (Figure 1).

In order to test moderated mediation criteria used in SPSS PROCESS (36), the relationship between stress and PIU was first checked. According to this analysis, stress level was a significant predictor of PIU (R^2=0.15, F[1, 389]=71.68, p<0.01, b=0.23, 95% CI=[0.18-0.29]). The results also revealed that stress was a significant predictor of emotion regulation problems and that stress explained 44% of the explained variance (R^2=0.44, F[1, 384]=312.80, p<0.01, b=0.50, %95 CI=[0.44-0.55]). Accordingly, it can be said that the first condition is supported for the moderated mediation model. For the second condition, it was understood that difficulties in emotion regulation were positively related to psychological rigidity (r=0.70, p<0.01). The third condition for the model was also confirmed in that the results of the analyses also showed that the moderation model for difficulties in emotion regulation with psychological rigidity was a significant predictor of PIU (R^2=0.25, F[4, 381]=32.46, p<0.01).

The interaction term for moderation was also significant. The findings showed that difficulties in emotion regulation mediated the association between stress levels and PIU. Furthermore, it was shown that psychological rigidity had a moderating effect on the relationship between difficulties in emotion regulation and PIU. When psychological rigidity was low, the level of PIU was also low (b=0.09, 95% CI=[0.02-0.16]). Likewise, the level of PIU was high when psychological rigidity was high (b=0.16, 95% CI=[0.10-0.23]). In summary, the highly psychologically rigid group showed more Internet-addiction characteristics than the less psychologically rigid group.

The direct effect of stress on PIU was removed through moderated mediation (direct effect: 0.04, SE=0.03, p>0.05, 95% CI=[−0.03-0.11]). In this way, an indirect relationship was found between stress and PIU via difficulties in emotion regulation across low and high levels of psychological rigidity (b=−0.00, 95% CI=[−0.01-−0.00]), and, as a result, the hypothesis of the moderated mediation model was supported (Figure 2).

DISCUSSION

The present study aimed to examine the relationship between psychological flexibility, emotion regulation, stress, and PIU that have potential implications in both scientific and clinical areas. It has been known for a while that stress is associated with PIU; however, the role of psychological flexibility and emotion regulation in this relationship is a matter of interest. Therefore, the present study investigated the mediating role of difficulties in emotion regulation between stress and PIU, with the moderating role of psychological flexibility between difficulties in emotion regulation and PIU.

Correlation analyses revealed that people with higher levels of stress tend to be less psychologically flexible, experience more difficulties in emotion regulation, and report more PIU. These findings replicate and extend previous work demonstrating a relationship between stress and PIU (5,8). As stress increases, individuals might gravitate towards the Internet. Another association found in the current study was between emotion regulation and PIU. This finding is concordant with the predisposing nature of emotion regulation. Emotion regulation was posited to be a predisposing factor for emotional disorders (40). Therefore, it might also be important for the development of PIU. Moreover, a negative association was found between psychological flexibility and PIU, mirroring previous finding with Internet addiction (20).

University students might use the Internet to cope with stress and avoid unwanted experiences. Based on the extant literature, stress, emotion regulation, and psychological flexibility might represent a feature of psychopathology in general rather than being specific to PIU (19,40,41,42).

As mentioned above, stress was positively associated with PIU in accordance with previous studies (5,8). Beyond confirming previous findings, the present study also showed that the relationship might be explained through emotion regulation. In other words, it was found that stress was directly related to PIU and indirectly related to PIU through emotion regulation. Accordingly, an incremental rise in stress brings about an increase in emotion regulation problems, and this results in an increase in PIU. Based on the association found in this study, it was concluded that individuals with high stress had more difficulties in emotion regulation. This might be because individuals with good emotion regulation skills might be better able to cope with stressful situations, and these situations then become less stressful. Therefore, according to studies asserting that the Internet is used for stress relief purposes (10), they do not need to use the Internet to relieve themselves from stress. Individuals with a lower ability to regulate emotion might experience difficulties because they cannot regulate a stressful situation. For this reason, they might use the Internet pathologically. This finding is also consistent with the definition of difficulties in emotion regulation as a lack of behavioral control in times of distress (43). In other words, individuals might use the Internet pathologically because they are unable to control their behavior under stress.

In conclusion, the results of testing the model have consistently pointed out that difficulties in emotion regulation mediated the association between stress and PIU. Although there are several studies in which difficulty in emotion regulation plays a mediating role in psychological problems (44,45), this is thought to be the first study confirming the mediating role of this construct in PIU.

It is thought that the effect of stress on PIU through emotion regulation might be lessened by psychological flexibility. Therefore, the moderating role of psychological flexibility in relation to difficulties in emotion regulation and PIU in addition to a mediating role of emotion regulation difficulties between stress and PIU was investigated, and the level of significance was found to be satisfactory. In other words, it would seem that increases in stress bring about emotion regulation problems, and in that condition, if flexibility is low, there is a higher probability of PIU. This finding can be explained by the definition of psychological flexibility as maintaining goals and value-oriented behavior (18). Although stressful individuals cannot manage their stress, goal-oriented behaviors can prevent them from using the Internet pathologically. In case of low psychological flexibility, the individual might become stuck in a stressful condition and may use the Internet pathologically to relieve stress. On the other hand, it is difficult for an individual to be both psychologically flexible and have difficulties in regulating their emotions. If an individual has a problem with emotion regulation, he/she might attend to their emotion in a rigid way and might see emotions as threats, and he/she is not considered psychologically flexible. In addition, if an individual does not interact fully with present thoughts and emotions, they might not need to regulate their emotion. This is where the similarities of emotion regulation and psychological flexibility come into play. While psychological flexibility is defined as the ability to maintain goals and value-oriented behaviors (18), one component of emotion regulation is difficulty in engaging goal-directed behavior (24). Therefore, an individual with emotion regulation difficulties is not expected to be psychologically flexible. These factors together might increase the effect of stress on PIU. While this is one point of view, there are differences between these two concepts. Psychological flexibility implies interaction with emotions, but emotional regulation is based on managing emotions. For this reason, they were addressed in the current study. This finding is a novel aspect of the current study in that this is the first time that flexibility has been addressed in a model with regard to PIU, although the issue had been investigated under various conditions in the form of mediation or moderation (46,47).

Considering the critical roles of both emotion regulation and psychological flexibility in PIU, both constructs should be included in psychological assessment, prevention, and intervention programs for PIU. To decrease the risk of PIU, it is important for university students to develop psychological flexibility. Given that psychological flexibility is a key concept in Acceptance and Commitment Therapy (ACT), this approach might be used. ACT third-wave psychotherapy is interested in acceptance, mindfulness, and distancing techniques (18) and was found to be beneficial for treating problematic Internet pornography use (48). In addition, adaptive emotion

regulation techniques should be considered for preventing and treating PIU.

There are some limitations of the current study regarding its findings, one of which relates to the composition of our sample, which included only undergraduate students. Future studies including participants who present to psychiatry clinics with pathological Internet and/or other technological instrument use would offer more detailed information. Moreover, other kinds of measures apart from those using self-report would provide a different perspective. Despite these limitations, the present study is the first one to investigate the association between stress, emotion regulation, psychological flexibility, and PIU.

Contribution Categories		Author Initials
Category 1	Concept/Design	E.Y., U.C., O.Y.
	Data acquisition	E.Y., U.C.
	Data analysis/Interpretation	E.Y., U.C., O.Y.
Category 2	Drafting manuscript	E.Y., U.C.
	Critical revision of manuscript	E.Y., U.C., O.Y.
Category 3	Final approval and accountability	O.Y.
Other	Technical or material support	O.Y.
	Supervision	O.Y.

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