

**The Role of Rejection Sensitivity in the Relationship Between Online Vigilance and
Problematic Internet Use**

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Abstract

Previous literature suggests that online vigilance may be associated with problematic internet use (PIU) based on its characteristic patterns of behaviour, and the commonalities that they shared. However, this relationship has not been thoroughly explored yet. Hence, this study focuses on investigating whether there is a positive relationship between these two variables. Moreover, it investigates the role of rejection sensitivity as a moderator on the relationship between online vigilance and PIU. For this purpose, an online questionnaire that measured participants' level of PIU, online vigilance and rejection sensitivity was created. The survey link was shared through social media platforms and the websites [surveycircle.com](https://www.surveycircle.com) and SONA system. The sample consisted of 224 respondents aged between 18 and 28 years old and with good English proficiency. The collected data was analysed by conducting a simple linear regression model and a moderated simple linear regression model. Findings showed that there was a significant correlation between online vigilance and PIU. Furthermore, the results indicated that rejection sensitivity significantly strengthened this relationship. This study adds valuable knowledge by providing empirical evidence of the link between PIU and online vigilance, and the strengthening effect of fear of rejection on this relationship. Nevertheless, future research is necessary to better understand the relationship between online vigilance and PIU, as well as the implications of rejection sensitivity within this relationship.

The Role of Rejection Sensitivity in the Relationship Between Online Vigilance and Problematic Internet Use

Due to the technological advances of the last decades, internet use has become ingrained in our daily lives and our society. As a result, Kemp (2022) estimated that in 2021 internet users spent an average of six hours and 58 minutes online per day, marking the highest numbers in history. One of the main contributors was the COVID-19 pandemic, during which internet usage increased by about 50-70% as a consequence of safety measures like social distancing that were taken (Beech, 2020). Accordingly, reports also registered a significant rise in problematic internet behaviours (Chiba et al., 2021; Islam et al., 2020; Luo et al., 2021; Verma, 2021). Given the increasing integration of the internet into individuals' daily lives, through various devices and for different purposes, it is crucial to conduct further research and gain a comprehensive understanding of problematic internet behaviours.

Problematic Internet Use

It is undeniable that the internet grants an infinitude of possibilities that humans can benefit from. Nonetheless, the sharp increase in time that people spend online has brought up a debate about the hazards of the internet for both individuals and society (Blank & Lutz, 2016). On the one hand, the internet broadens possibilities with functions such as permanent access to unlimited information on nearly any subject or the ability to connect in seconds with people across the globe. In line with this, experts emphasize that ongoing communication with their social circle facilitates the reinforcement and maintenance of individuals' social bonds (Brey, 2006; Vorderer et al., 2018). Additionally, findings suggest that online communication tends to be more self-disclosing, which positively contributes to the maturation of social bonds (Valkenburg & Peter, 2009). In sum, the internet provides humanity with crucial benefits like access to limitless information or the ubiquitous possibility of connecting with others in seconds.

On the other hand, the internet has addictive properties that can lead to excessive use, which can hinder individuals' well-being, as well as their social and self-development. Çikrikci's (2016) suggests referring to this behaviour as *problematic internet use (PIU)*, instead of internet addiction, compulsive or pathological internet use. Although there is no consensus on a single definition, PIU refers to "excessive or poorly controlled preoccupations, urges or behaviors regarding internet use that lead to impairment or distress" (Weinstein & Lejoyeux, 2010).

The consequences of PIU on individuals' well-being are severe. Evidence shows a strong correlation between PIU and poor mental health, social and behavioural problems such as eating disorders (Çelik et al., 2015), social anxiety (Lai et al., 2015), anxiety, stress, depression, and loneliness (Ostovar et al., 2016). Moreover, in Kerkhof's et al. (2011) study they found that problematic internet users in a romantic relationship reported less commitment, less feelings of intimacy and more conflicts. Additionally, PIU has also been associated with poor physical health and physical complaints such as headache, back and neck pain (Güzel et al., 2018); obesity (Bozkurt et al., 2017) and sleeping disturbances (Alimoradi et al., 2019). In sum, evidence shows that PIU has serious negative consequences on individuals' psychological and physical well-being.

On top of the individual consequences PIU can have, it can also significantly affect society at large. Firstly, PIU can widely impact the economy of nations due to the various healthcare costs resulting from the treatment of the physical and negative psychological consequences associated with PIU (Rumpf et al., 2022). Moreover, it increases the risk of provoking accidents due to unsafe behaviours like negligent driving, leading to economic and intangible costs (Kim et al., 2017; Turkle, 2011). These findings show that PIU does not only affect the individual itself but also profoundly impacts society. Therefore, it is important to better understand the determinants of PIU to develop interventions that tackle these underlying mechanisms. The focus of this thesis is to identify and investigate relevant concepts that may contribute to the severity of PIU.

Among the various theories of PIU and its underlying mechanisms, one of the most popular ones is the conceptualization of PIU as a maladaptive coping strategy (e.g., Armstrong et al., 2000; Bessiere et al., 2008; Kim et al., 2009; Kuss et al., 2012). More precisely, it suggests that PIU may be the result of using the internet as a tool to fulfil unmet social and emotional needs such as loneliness, fear of negative evaluation or social anxiety (Chak & Leung, 2004; Kim et al., 2009; Weidman et al., 2012). One crucial reason for that is users' perception of the internet as a safe space where they can carefully plan their social interactions (Chak & Leung, 2004). Consequently, being more appealing to individuals with unsatisfied needs as a means to meet their core necessities. Nevertheless, Kardefelt-Winther (2014) suggests that these unsatisfied need should rather be considered as motivations that, when taken in the context of other social or environmental factors, drive individuals to engage in problematic internet behaviour. In line with this, Tokunaga and Rains' (2010) meta-analysis supports that social anxiety, loneliness and depression play a key role in the

development of PIU. Moreover, Weinstein et al. (2016) found that internet gaming disorder, a specific form of PIU, was linked to higher levels of social rejection sensitivity. These findings show that mental struggles and unfulfilled social needs are main contributors to PIU.

Considering these contributing factors and the aforementioned consequences, further research is necessary to better understand PIU. Among other identified concepts, a crucial one may be online vigilance.

Online Vigilance

Online vigilance is defined as a “non-pathological form of constant psychological connectedness to online content and communication” (Johannes et al., 2021). This psychological phenomenon emerged with the invention of wireless technologies, such as smartphones and 4G, which allow users to be permanently online and permanently connected (Burchell, 2014; Ling, 2012). Individuals with high levels of online vigilance display three characteristic patterns of behaviour. Firstly, they think more often and intensively about their online environment, which involves a persistent cognitive preoccupation about past, present and future online interactions. Secondly, they are more prompt to react to online cues, at a higher speed and regardless of the situation. Lastly, they constantly monitor their online environment even while engaging in offline activities (Reinecke et al., 2018).

Because online vigilance is a relatively new concept, it has not been thoroughly investigated yet and the scientific debate about its effect on people includes controversy. While PIU is inherently maladaptive, online vigilance can both benefit and impair individuals. Some findings suggest that online vigilance does not necessarily compromise individuals’ well-being (Johannes et al., 2021). In fact, they argue that high levels of online vigilance can promote individuals’ well-being by enhancing positive effects of online communication like mood regulation and relatedness need satisfaction (Reinecke et al., 2018). Still, other researchers agree that online vigilance can lead to unhealthy habits like the passive use of technology, which subsequently can hamper the accomplishment of personal and professional duties (Vorderer et al., 2016). In line with this, findings associate online vigilance with negative effects on users’ well-being like procrastination (Meier et al., 2016), digital stress (Reinecke et al., 2016), and reduced mental capacity (Stothart et al., 2015). Moreover, Cheever et al. (2014) observed that participants’ expectations of being permanently available online, a characteristic of online vigilance, exhibited excessive use of mobile devices and psychological dependency on them.

Regarding the possible link between online vigilance and PIU, the compensatory role of the internet needs to be considered. As aforementioned, research shows that some individuals engage in online activities to cope with challenging daily life experiences or as a mood buffer (Zillmann, 2016). Because online vigilant individuals are more willing to proactively interact with their online environment, they are also more likely to develop strong habits of turning to the online world when facing distressing situations (Vorderer et al., 2016). These habits are reinforced by immediate gratification, such as in Rosen's et al. (2013) study that showed that texting evoked immediate strong feelings of gratification in the participants. Although this behaviour is not problematic itself, this habit may transform into a chronic cycle of internet-related expectancies and dysfunctional coping that subsequently can develop in PIU (Brand et al., 2014). Researchers have suggested a positive correlation between these two phenomena (Vorderer et al., 2018). However, it has not been extensively investigated yet.

To better understand a possible link between OV and PIU, it is necessary to investigate concepts which might play a role in this relationship. Hereby, rejection sensitivity may play a crucial role.

Rejection Sensitivity

Rejection sensitivity is defined as the "affective worry of rejection that can impair well-being and interpersonal function" (Weinstein et al., 2016). Studies indicate that people who fear disapproval in face-to-face social environments are more likely to use social media to avoid social rejection (Kanat-Maymon et al., 2018; Lee & Stapinski, 2012; Wang et al., 2016). This is because online interactions entail fewer risks of negative evaluation and emotional vulnerability than real-life interactions (Lee & Stapinski, 2012). Following this, Ali et al. (2021) found that the stronger participants feared rejection, the more they would engage in compulsive media usage. Furthermore, findings suggest that individuals with high rejection sensitivity display stronger PIU behaviours (Sun & Wu, 2011; Tan & Guo, 2008). This evidence shows a relation between PIU and rejection sensitivity. Nonetheless, drawing upon Kardefelt-Winther (2014), rejection sensitivity may act as a motivator in the relationship between online vigilance and PIU.

Research describes that being online vigilant simulates the feeling of taking part in two different social realities at the same time (Burchell, 2014). Based on the compensatory role of the internet, individuals high in rejection sensitivity are expected to be more prone to being highly online vigilant to fulfil their social needs (Vorderer et al., 2018). However,

experts alarm that this can be a double-edged sword because highly online vigilant users tend to perceive disconnecting as disregarding their social responsibilities (Cheever et al., 2014). Additionally, online vigilance creates the perception that other internet users are frequently active and communicating with each other, without necessarily including everyone else (Burchell, 2014). This perception is intensified by the anxious expectations characteristic of individuals with high levels of rejection sensitivity (Zimmer-Gembeck & Nesdale, 2012). Consequently, this can result in permanent pressure to stay online as Thomée's et al. (2010) study shows, where people with high levels of online vigilance reported perceiving their phones as a demanding task that required them to always be available. This perception intensified by their rejection sensitivity may perpetuate individuals' motivation to be permanently online and permanently connected (Vorderer et al., 2018).

In summary, the permanent cognitive preoccupation about the online world is a central characteristic of being online vigilant. Therefore, it may be linked to PIU by motivating users to engage in online activities more often. Additionally, high levels of rejection sensitivity may trigger anxious expectations about being excluded from online social interactions. Consequently, rejection sensitivity may lead highly online vigilant individuals to remain connected. In other words, rejection sensitivity may exercise a strengthening effect on the relationship between online vigilance and PIU (Vorderer et al., 2018).

Present Study

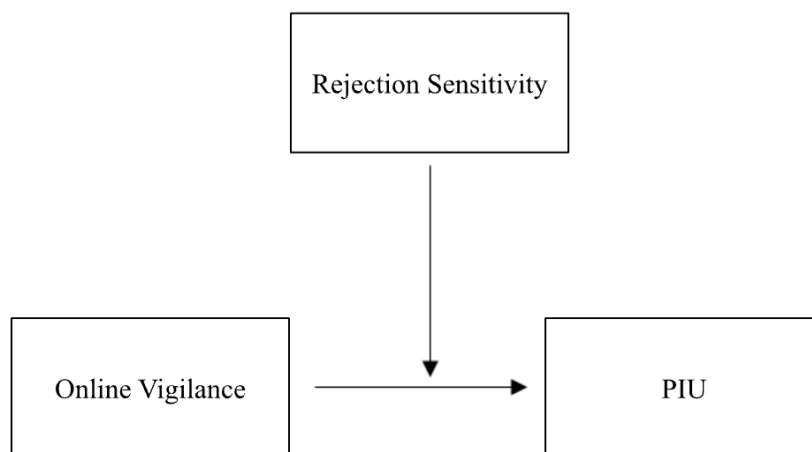
The previously discussed literature demonstrates that PIU has detrimental individual and societal consequences, which highlights the importance of understanding the underlying mechanisms of this phenomenon to prevent its expansion. Moreover, based on research findings, a relationship between online vigilance and PIU can be expected. However, this possibility has not been extensively researched yet. Additionally, regarding influential factors, evidence has shown that rejection sensitivity may potentially positively influence it. Investigating the possible influence of rejection sensitivity on the relationship between online vigilance and PIU will facilitate the development of new safety measures that protect both individuals and society against the detrimental effects of such behaviours. Thus, the central questions of this study are: *To what extent is individuals' level of online vigilance associated with their level of PIU? And to what extent does rejection sensitivity moderate the relationship between PIU and online vigilance?* Based on this, this study will test the following hypotheses (see Figure 1):

H1: Higher levels of online vigilance are associated with higher levels of PIU.

H2: Higher levels of online vigilance and rejection sensitivity are associated with higher levels of PIU.

Figure 1

Model of the hypothesized associations



Method

Design

To examine the hypotheses, a correlational design using an online survey was conducted. The variables investigated were the dependent variable PIU, the independent variable online vigilance, and the independent variable rejection sensitivity as a moderator.

Participants

A power analysis determined that at least 196 participants were needed for this research to have good statistical power. Therefore, participants were recruited using convenience and snowball sampling methods. The link to the survey was shared on the social media platforms Instagram and WhatsApp. Moreover, some of those individuals shared the link with their social network. Besides that, the survey was published on the website suverycircle.com and on the SONA system from the University of Twente, where students received partial study credits in reward for their participation. To take part in the study individuals had to meet certain inclusion criteria, participants had to be between 18 and 28 years old and have a good English proficiency level.

In total, 263 participants were recruited. However, 35 respondents were removed from the data for not completing at least half of the survey and three respondents were excluded for

not belonging to the intended age group. Consequently, 38 (14.45%) respondents were excluded in total, and the final sample size was 224. The sample consisted of 144 women (64.3%) and 80 men (35.7%), the mean age of the participants was 22.47 ($SD = 1.99$). Respondents were from 34 different nationalities, with Dutch being the most common one (47.3%). See Table 1 for other characteristics of the sample population.

Table 1

Sociodemographic Characteristics of Participants

Baseline characteristic	Frequencies	
	f	%
Nationality		
Dutch	106	47.3
Spanish	31	13.8
German	28	12.5
Other	59	26.4
Occupation		
Student	160	71.4
Employed	29	12.9
Both	32	14.3
Other	3	1.34

Note. N = 224

Materials

The platform Qualtrics.com was used to create the online survey. The questionnaire consisted of a block with demographic questions, and three blocks for each of the variables: PIU, online vigilance, and rejection sensitivity.

The Nine-Item Problematic Internet Use Questionnaire (PIUQ-9)

The first block included the PIUQ-9 which was used to screen respondents' level of PIU. Developed by Koronczai et al. (2011), the PIUQ-9 is a shorter version of the original 18-item PIUQ. It contains three subscales: (a) obsession, (b) neglect and (c) control, with three items respectively. Every item is responded to with a 5-point Likert scale ranging from *never* to *always/almost always*. Exemplary, an item of the questionnaire is "Do you neglect household chores to spend more time online?". The scores get added up, with 45 being the highest possible score and 9 the lowest, the higher the score the greater level of PIU. The

PIUQ-9 showed good reliability in adults ($\alpha = .84$) and adolescents ($\alpha = .87$) (Koronczai et al., 2011). This was confirmed by the reliability test conducted in this study ($\alpha = .81$). Moreover, it showed good psychometric properties in ten different countries and languages (Burkauskas et al., 2020; Laconi et al., 2019; Demetrovics et al., 2008; Spritzer et al., 2021).

Online Vigilance Scale (OVS)

The second block corresponded to the OVS (Reinecke et al., 2018). This scale contains three sub-scales: (a) salience, (b) monitoring and (c) reactivity, with four items each. Each item corresponds to a 5-point Likert scale that ranges from 1 (*does not apply at all*) to 5 (*fully applies*). An example of an item is “My thoughts often drift to online content”. To compute the final score the response of all items is summed up, 60 is the highest possible score and 12 the lowest. The higher the respondent scored, the higher their level of online vigilance. Reinecke et al. (2018) found that the OVS had good reliability ($\alpha = .92$) and good test-retest reliability, with a correlation coefficient of .87. In line with this, the reliability test conducted in this study showed that the OVS had good reliability ($\alpha = .88$). Moreover, the scale showed a stable factor structure across various contexts and user populations (Reinecke et al., 2018).

The Eight-Item Rejection Sensitivity Questionnaire (RSQ/RS)

The third block included the 8-item RSQ, aimed to measure individuals' level of rejection sensitivity. The RSQ operationalizes rejection sensitivity as generalized expectations and anxiety about whether significant others would respond in an accepting or rejecting manner (Downey & Feldman, 1996). Each item describes a hypothetical situation that includes one question (a) and one statement (b) that participants had to respond to on 6-point Likert scales.

The first question is regarding the individuals' level of concern about the outcome of the situation, the response ranges from *very unconcerned* (1) to *very concerned* (6). On the second question, respondents indicate, from *very unlikely* (1) to *very likely* (6), the probability that the other person(s) would respond in a supportive manner. An example of an item is “You ask your parents for help in deciding what programs to apply to: (a) How concerned or anxious would you be over whether or not your parents would want to help you?, (b) I would expect that they would want to help me”.

To compute the RSQ score firstly a score for each situation was obtained by multiplying the score of rejection concern (response to question a) by the reversed score of the level of acceptance expectancy (response to question b). In other words, *rejection sensitivity* = (response a) * (7- response b). The RSQ score was the mean of the resulting

eight scores, the total score could range between 1 and 48. Higher scores reflected higher rejection sensitivity.

The 8-item RSQ is a shorter version of the 18-item RSQ created by Downey and Feldman in 1996. This questionnaire can be used in any population, and it showed good psychometric properties, high internal consistency ($\alpha = .81$) and good test-retest reliability, with a correlation coefficient of .83 (Columbia University in the city of New York, s. f.). In this study, the scale showed moderate reliability ($\alpha = .66$).

Procedure

To conduct this study, ethical approval from the BMS ethical commission of the University of Twente (230547) was obtained. Subsequently, the respondents were recruited through different online platforms. The link that was shared led to the platform Qualtrics.com, where participants were provided with some general information regarding the study, exclusion criteria, potential risks, confidentiality, anonymity, possibility of withdrawal, and the researcher's contact details. By proceeding to the next step participants signed the informed consent and continued with the survey (Appendix A). Thus, they were directed to the next page where they had to respond to various demographic questions such as age, gender, and nationality. Following, participants had to respond to the three questionnaires previously describe. Participants needed to respond to all questions before continuing with the next questionnaire, once they clicked to the next block they could not go back. When they finished the last questionnaire, the respondents were thanked for their time and were allowed to close the window. Approximately, completing the survey took 10-12 minutes. The data collected during the study were anonymized and stored securely in the researcher's computer.

Data Analysis

The program Rstudio 2023.03.0+386 was used to analyse the gathered data. Firstly, the data was screened, and the missing and invalid data were removed from the data set. Secondly, the demographics of the sample were analysed to identify its characteristics. Following, the scores of every participant on each scale were computed, creating the variables PIU, online vigilance, and rejection sensitivity. Three outliers on the variables PIU and rejection sensitivity were identified with a boxplot and removed from the data. Moreover, the normality of the results of the three variables was checked with the Shapiro-Wilk test.

A Pearson correlation analysis was performed to examine the correlations between the three variables. To test the first hypothesis a simple linear regression model was used, with online vigilance as the independent variable and PIU as the dependent variable. The

assumptions of normality, linearity and homoscedasticity were tested. To test the second hypothesis a moderated simple linear regression model with PIU as the dependent variable, online vigilance as the independent variable and rejection sensitivity as the independent moderator variable was performed. All assumptions were tested.

Results

Assumptions Testing

The Shapiro-Wilk test revealed that the variables PIU and online vigilance were normally distributed but the variable rejection sensitivity was not ($W(221) = .98, p = .019$). Nonetheless, when displayed in a histogram the variable did not significantly deviate from a normal distribution (see Appendix B). Based on this and the large sample size the results of the Shapiro-Wilk test were not considered determinant.

Moreover, all assumptions were tested and met by both models. According to the Shapiro-Wilk test, neither the data from the simple linear regression model ($W(221) = .99, p = .953$) nor the moderated simple linear regression model ($W(221) = .99, p = .908$) significantly deviated from a normal distribution. The p-value resulting from Ramsey's RESET test also indicated that the model of the first hypothesis ($p = .359$) and the model of the second hypothesis ($p = .847$) met the linearity assumption. Additionally, the Breusch-Pagan test showed that neither the simple linear model ($p = .71$) nor the moderated simple linear model ($p = .64$) violated the assumption of homoscedasticity. Lastly, the VIF test showed that the multicollinearity assumption of the moderated simple linear regression model was not violated ($VIF = 1.10$).

Descriptive Statistics

Descriptive statistics were computed to summarize and describe the variables of interest in this study: PIU, online vigilance, and rejection sensitivity (see Table 2). The PIUQ-9 showed a total mean score of 24.79 ($SD = 5.84$), which is above the questionnaire's cut-off score of 22. Based on this threshold, 64.73% ($n = 145$) of the respondents showed PIU, 67.5% of men and 63.19% of women. Furthermore, the total mean score on the OVS was 32.59 ($SD = 8.25$), which can be interpreted as a moderate level of online vigilance. Regarding the RSQ, the total mean score showed that the sample did not display high levels of rejection sensitivity ($M = 8.75, SD = 3.45$). Moreover, as Table 2 shows, men scored slightly higher in all three variables. However, the t-tests showed that the difference between genders was not significant for the variables PIU ($t(165.14) = 0.91, p = .367$), online vigilance ($t(161.48) = 1.12, p = .264$), nor rejection sensitivity ($t(163.05) = 1.62, p = .107$).

The Pearson correlation analysis revealed a significant moderate positive correlation between PIU and online vigilance, ($r(221) = .65, p < .01$). Moreover, it found a significant weak positive correlation between PIU and rejection sensitivity ($r(221) = .23, p < .01$) and between online vigilance and rejection sensitivity ($r(221) = .30, p < .01$).

Table 2

Descriptive of variables

	Full sample		Men		Women	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
PIU	24.79	5.84	25.26	5.79	24.53	5.87
Online vigilance	32.59	8.25	33.43	8.31	32.13	8.20
Rejection sensitivity	8.75	3.45	8.73	3.45	7.95	3.43

Note. M = Mean; SD = Standard Deviation

Hypotheses Testing

To determine if the first hypothesis could be accepted a simple linear regression model was performed to study the relationship between online vigilance and PIU. In line with the expectations, the results of the regression model showed a significant positive relationship between the variables online vigilance and PIU ($b = 0.45, SE = 0.04, t(219) = 12.58, p < .001$). Moreover, online vigilance accounted for 41.9% of the variance of PIU score ($SE = 4.39, R^2 = .42, F(1,219) = 158.2, p < .001$). Thus, the hypothesis “Higher levels of online vigilance are associated with higher levels of PIU” was accepted.

For the second hypothesis a moderated simple linear regression model was conducted to study the possible influence of rejection sensitivity on the relationship between online vigilance and PIU. Upon analysing the data, it was determined that the moderator variable had a statistically significant effect on the model ($t(217) = 2.34, p = .02$) (see Table 3). The estimated coefficient for the interaction between online vigilance and rejection sensitivity indicated that PIU is expected to increase by 0.024 every one-unit increase in the product of the independent variables. The model explained 43.47% of the variance in PIU ($R_{adj}^2 = 0.43$) and the overall model fit was significant ($SE = 4.35, F(3, 217) = 55.62, p < .001$). Therefore, based on these findings the hypothesis “Higher levels of online vigilance and rejection sensitivity are associated with higher levels of PIU” was accepted. Figure 2 shows a visual representation of the model.

Table 3

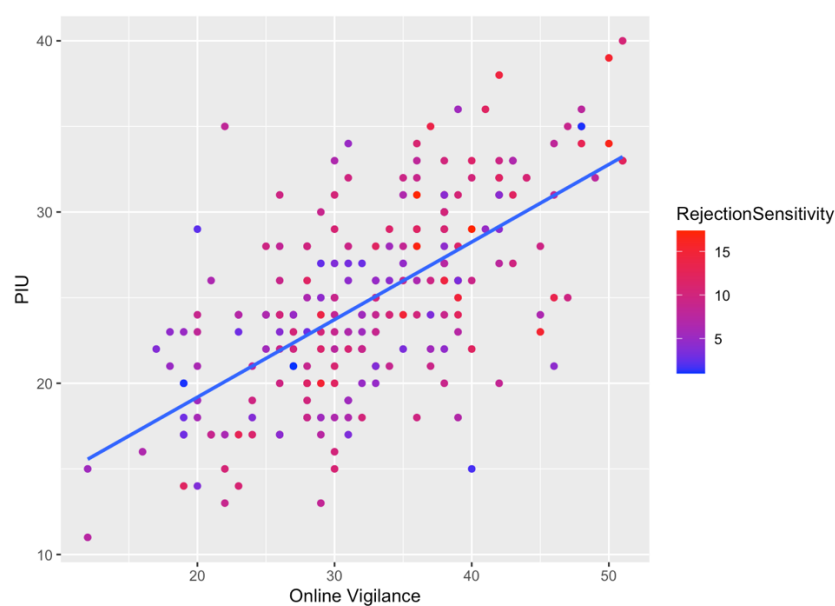
Moderation analysis for the interaction effect of rejection sensitivity on the relationship between online vigilance and PIU

	Estimate	SE	t	p
Intercept	16.15	2.95	5.48	<.001
Online vigilance	.26	.09	2.88	.004
Rejection sensitivity	-.76	.36	-2.12	.035
Interaction	.02	.01	2.34	.020

Note. SE = Standard Error. Dependent variable = PIU.

Figure 2

Scatterplot Depicting the Correlation Between Online Vigilance and PIU, Moderated by Rejection Sensitivity.



Discussion

Due to the severe consequences that PIU has on individuals and society, and its alarming prevalence increase in the last years, it is crucial to better understand the influencing factors of PIU. Based on this study's findings, effective interventions that aim to prevent its development and its consequences can be designed. The purpose of this research was to investigate if there is a relationship between individuals' level of online vigilance and PIU. In line with the expectations, findings revealed that these two variables were strongly correlated.

Moreover, the other central finding was the strengthening moderating effect that individuals' level of rejection sensitivity had on this relationship.

In response to the first research question, the study findings suggest that individuals with higher levels of online vigilance tend to be more susceptible to PIU. Although limited research exists on this relationship, this evidence aligns with the observations made by Cheever et al. (2014), who noted a connection between online vigilance and problematic internet behaviours. Moreover, this supports the argument that individuals who are highly online vigilant tend to engage more frequently in online activities, which is associated with higher levels of PIU too (Vorderer et al., 2018).

For the second research question, respondents' degree of rejection sensitivity was also taken into consideration. The moderation analysis determined that rejection sensitivity enhanced the relationship between online vigilance and PIU. Therefore, individuals that were more rejection sensitive showed a stronger correlation between their level of online vigilance and PIU. This evidence goes in line with the conceptualisation that PIU is a compensatory coping mechanism that aims to fulfil unmet social needs, such as rejection sensitivity (Weidman et al., 2012). Accordingly, these findings give further proof of researchers' belief that rejection sensitivity, among other psychological needs, motivate individuals to be more online vigilant and exacerbate individuals' problematic internet behaviours as a result of their fear of being excluded and their attempt to fulfil their social needs (Brand et al., 2014; Vorderer et al., 2018).

Strengths and Limitations

This study added some unique insights to the research field of PIU and its influential factors. Even though previous researchers suggested a correlation between online vigilance and PIU (Vorderer et al., 2018), few studies specifically addressed this relationship. Therefore, the empirical evidence provided by this research is highly valuable. Moreover, previous literature showed a strong correlation between rejection sensitivity and PIU (Sun & Wu, 2011; Tan & Guo, 2008). Nevertheless, no previous research investigated its possible role as a moderator on the relationship between online vigilance and PIU. Moreover, these findings emphasize the importance of considering individual differences when studying PIU.

Another strength of this study is the method used for recruiting participant. The online quantitative cross-sectional design of the study enabled obtaining a big sample size in a minimum time and without costs. Due to the large sample size obtained, the study presents good statistical power which assures the precision and validity of its findings (The importance of large sample sizes in research, 2022).

Nonetheless, it is important to note some of the limitations this study encountered. Firstly, recruiting the participants using convenience sampling may have compromised the generalizability and representativeness of the findings. Using convenience sampling implies the risk that the sample used in the study may not be representative of the general population (Nikolopoulou, 2023). Therefore, inferences and generalizations based on this evidence must be made with caution. Moreover, convenience sampling may have undermined the internal validity of the findings. There was a risk of self-selection bias among respondents, thus participants that voluntarily decided to participate in the study may significantly differ from those that decided not to (Nikolopoulou, 2023). Hence, it is possible that certain individuals of the populations were under or over-represented, for example the student population since most participants were students. Moreover, because almost half of the respondents were Dutch the sample may be culturally biased. In conclusion, based on the aforementioned limiting factors, generalizations regarding the study findings must be done carefully while taking them into account.

Another limitation of the study is the use of Likert scales, which have been shown to be sensitive to response bias (Kreitchmann et al., 2019). Response bias is the difference between the self-reported and truthful values of the same measure, motivated by factors like social-desirability or acquiescent responding. This measurement error, which is ubiquitous in surveys where sensitive topics are addressed, is a threat to the validity of the assessment (Bauhoff, 2014). Because the survey included sensitive topics like rejection sensitivity and PIU, it is possible that participants felt tempted to give more socially acceptable answers and attenuated their responses. If this is the case, the validity of the collected data would be compromised, and the results of the study may underestimate the relationship between online vigilance and PIU and the role of rejection sensitivity. Nevertheless, the advantage of this methodology is that, since the questionnaires used are available to the public, other studies can replicate this research.

Another limitation of the study can be the scale used to measure respondents' level of rejection sensitivity, the RSQ, which showed moderate reliability in the study sample. Thus, respondents' scored level of rejection sensitivity must be interpreted with caution since its precision may be limited. Consequently, the moderate reliability of the questionnaire may have affected or attenuated the findings regarding the moderating effect of rejection sensitivity on the relationship between online vigilance and PIU. By replicating the study, these findings could be compared in order to diminish the impact of this limitation.

Nevertheless, it is encouraged that future research uses the 18-items RSQ, which has been demonstrated to have good test-retest reliability (Downey & Feldman, 1996).

Future Directions

Based upon the findings and limitations previously mentioned, there are several directions that future research could focus on. Although this research is an important step in better understanding the relationship between online vigilance and PIU, many aspects of this relationship that have not been explored yet. In the future, longitudinal studies and experimental designs could provide valuable insights into this relationship and the possible role of online vigilance as a causal factor in the development of PIU. Likewise, further research is needed to gain a deeper understanding of the underlying mechanisms through which rejection sensitivity moderates the relationship between online vigilance and PIU. Lastly, as aforementioned there are countless possible influential factors in the relationship between online vigilance and PIU that have not been considered yet. Therefore, future research should continue to investigate other possible impactful variables.

Conclusion

PIU represents a severe threat to individuals' well-being and to society. This phenomenon has been associated with serious problems such as social anxiety, depression, loneliness, and eating disorders that can critically undermine people's mental and physical health (Çelik et al., 2015; Lai et al., 2015; Ostovar et al., 2016; Tokunaga & Rains, 2010). Therefore, it is crucial to continue investigating PIU in order to better understand what factors influence it and how it can be deterred and treated.

This study shows that online vigilance positively correlates with PIU, a relationship that was suggested by previous literature but that only a few studies have focused on exploring. Moreover, results showed that individuals' level of rejection sensitivity significantly strengthened this relationship. This evidence supports the belief that individuals with unfulfilled emotional needs, in this case, rejection sensitivity, are more prone to display high online vigilance and PIU. The findings discussed in this paper have helped to define some important implications of PIU that were suspected, but never studied before. Moreover, they can have important implications in future tailored mental health interventions, as they suggest that targeting individuals' level of online vigilance and rejection sensitivity can alleviate individuals' level of PIU. Nevertheless, much work remains to be done to entirely understand this relationship.

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Appendix A

Qualtrics Study (Informed Consent, PIUQ-9, OVS and RSQ)

Welcome!

This study is being conducted by Belén del Águila Rodríguez, a Psychology student at the University of Twente. She is being supervised by Selin Ayas and Tessa Dekkers, professors at the University of Twente. The purpose of this study is to investigate problematic internet use, and possible relevant variables in this context. Your participation can help the development of new methods and/or strategies to prevent and treat the development of problematic internet use.

Am I eligible to take part?

The requirements of the study are that you have to be between 18 and 28 years old as well as a sufficient English proficiency level.

Potential risks and inconveniences

The study has been approved by the BMS Ethics Committee. However, the questionnaire may contain personally sensible questions. If these cause a significant discomfort, you can quit at any given point during the questionnaire. We ask these questions solely in the interest of the study.

Participation

Your participation is *voluntary* and you can withdraw at any time during the questionnaire. By closing your browser all the data you will have entered will be deleted and you will not be included as a participant. However, once you have fully completed the questionnaire, we will not be able to withdraw your data since it is *completely anonymous* and *confidential*.

Confidentiality

We make every effort to protect your privacy to the best of our ability. No confidential information or personal data from or about you will be disclosed in any way that will allow anyone to recognize you. Data is collected anonymously and stored in a secure environment at the University of Twente. No one other than the researcher and supervisors will be able to view individual responses. Internal reporting will only be based on group averages.

Questions or complaints

Do you have questions and/or complaints? Please contact the researcher Belén del Águila Rodríguez.

Email: b.delaguiarodriguez@student.utwente.nl

By clicking the button below, you indicate that you have been adequately informed and you will be directed to the questionnaire.

What is your age (indicate in years)

How do you identify yourself?

- Female
- Male
- Other
- Prefer not to say

What is your nationality of origin?

- Dutch
- German
- Spanish
- Other (please indicate)

What is your current occupation

- University student
- Employee/Working
- Both
- Other (please indicate)

Are you in a relationship?

- Yes
- No

Now you will read questions about your Internet use. Please indicate on a scale from 1 to 5 the extent to which you agree with each statement.

	Never	Rarely	Sometimes	Often	Always/Almost always
Do you feel that you should decrease the amount of time spent online?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you neglect household chores to spend more time online?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you feel tense, irritated, or stressed if you cannot use the Internet for as long as you want to?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Does it happen to you that you wish to decrease the amount of time spent online but you do not succeed?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you spend time online when you'd rather sleep?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you feel tense, irritated, or stressed if you cannot use the Internet for several days?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you try to conceal the amount of time spent online?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do people in your life complain about you spending too much time online?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Does it happen to you that you feel depressed, moody, or nervous when you are not on the Internet and these feelings stop once you are back online?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Now we would like to know more about the role Internet and online content has in your daily life. Please indicate on a scale from 1 to 5 how much these statements apply to you.

	Doesn't apply at all	Doesn't apply	Neutral	Applies	Fully applies
My thoughts often drift to online content	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have a hard time disengaging mentally from online content	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Even when I am in a conversation with other people, I often think about what is happening online right now in the back of my mind	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Often online content occupies my thoughts, even as I am dealing with other things	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I receive an online message, my thoughts drift there immediately	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I receive an online message, it triggers an impulse in me to check it right away	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I receive an online message, I immediately attend to it, even if I am engaged in other things at that moment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I receive an online message, I immediately give it my full attention	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I constantly monitor what is happening online	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I often feel the urge to make sure I know what is happening online	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I often start certain online applications so I don't miss out on any news	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I always keep an eye on what is happening online at the moment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Lastly, please imagine that you are in each situation of the following situations and answer the questions.

You ask your parents for help in deciding what programs to apply to

	How concerned or anxious would you be over whether or not your parents would want to help you? 1 Very unconcerned 2 3 4 5 6 Very concerned	I would expect that they would want to help me 1 Very unlikely 2 3 4 5 6 Very likely
Indicate your answer	<input type="radio"/> <input checked="" type="radio"/> <input checked="" type="radio"/> <input checked="" type="radio"/> <input checked="" type="radio"/> <input type="radio"/>	<input type="radio"/> <input checked="" type="radio"/> <input checked="" type="radio"/> <input checked="" type="radio"/> <input checked="" type="radio"/> <input type="radio"/>

You approach a close friend to talk after doing or saying something that seriously upset him/her

	How concerned or anxious would you be over whether or not your friend would want to talk with you? 1 Very unconcerned 2 3 4 5 6 Very concerned	I would expect that he/she would want to talk with me to try to work things out 1 Very unlikely 2 3 4 5 6 Very likely
Indicate your answer	<input type="radio"/> <input checked="" type="radio"/> <input checked="" type="radio"/> <input checked="" type="radio"/> <input checked="" type="radio"/> <input type="radio"/>	<input type="radio"/> <input checked="" type="radio"/> <input checked="" type="radio"/> <input checked="" type="radio"/> <input checked="" type="radio"/> <input type="radio"/>

After graduation, you can't find a job and ask your parents if you can live at home for a while

	How concerned or anxious would you be over whether or not your parents would want you to come home? 1 Very unconcerned 2 3 4 5 6 Very concerned	I would expect I would be welcome at home. 1 Very unlikely 2 3 4 5 6 Very likely
Indicate your answer	<input type="radio"/> <input checked="" type="radio"/> <input checked="" type="radio"/> <input checked="" type="radio"/> <input checked="" type="radio"/> <input type="radio"/>	<input type="radio"/> <input checked="" type="radio"/> <input checked="" type="radio"/> <input checked="" type="radio"/> <input checked="" type="radio"/> <input type="radio"/>

You call your boyfriend/girlfriend after a bitter argument and tell him/her you want to see him/her

	How concerned or anxious would you be over whether or not your boyfriend/girlfriend would want to see you? 1 Very unconcerned 2 3 4 5 6 Very concerned	I would expect that he/she would want to see me 1 Very unlikely 2 3 4 5 6 Very likely
Indicate your answer	<input type="radio"/> <input checked="" type="radio"/> <input checked="" type="radio"/> <input checked="" type="radio"/> <input checked="" type="radio"/> <input type="radio"/>	<input type="radio"/> <input checked="" type="radio"/> <input checked="" type="radio"/> <input checked="" type="radio"/> <input checked="" type="radio"/> <input type="radio"/>

You ask your parents to come to an occasion important to you

	How concerned or anxious would you be over whether or not your parents would want to come? 1 Very unconcerned 2 3 4 5 6 Very concerned	I would expect that my parents would want to come 1 Very unlikely 2 3 4 5 6 Very likely
Indicate your answer	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>

You ask a friend to do you a big favor

	How concerned or anxious would you be over whether or not your friend would do this favor? 1 Very unconcerned 2 3 4 5 6 Very concerned	I would expect that he/she would willingly do this favor for me 1 Very unlikely 2 3 4 5 6 Very likely
Indicate your answer	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>

You ask your boyfriend/girlfriend if he/she really loves you

	How concerned or anxious would you be over whether or not your boyfriend/girlfriend would say yes? 1 Very unconcerned 2 3 4 5 6 Very concerned	I would expect that he/she would answer yes sincerely 1 Very unlikely 2 3 4 5 6 Very likely
Indicate your answer	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>

You go to a party and notice someone on the other side of the room and then you ask them to dance

	How concerned or anxious would you be over whether or not the person would want to dance with you? 1 Very unconcerned 2 3 4 5 6 Very concerned	I would expect that he/she would want to dance with me 1 Very unlikely 2 3 4 5 6 Very likely
Indicate your answer	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>

Appendix B

Histogram of the Variable Rejection Sensitivity

Histogram of data\$RejectionSensitivity

