



# #Neuroticgrammers: the mediating role of fear of missing out, escapism and self-expression motives between neuroticism and problematic Instagram use

Virginia Pupi<sup>1</sup> · Stefano Polizzi<sup>2,3</sup> · Elvis Mazzoni<sup>4</sup> · Roberta Biolcati<sup>1</sup>

Accepted: 15 March 2024  
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## Abstract

Although Instagram is widely used among young people, it has only recently caught researchers' attention. Following the perspective of the I-PACE model, the present study examined the relationship between neuroticism and problematic Instagram use (PIU) in Italian university students who had an Instagram account. We assumed that the relationship between neuroticism and PIU could be explained by direct and indirect paths, passing through Fear of Missing Out (FoMO) and motives for Instagram use. 362 Instagram users (72.1% female;  $M_{age} = 25.35$ ,  $SD = 4.25$ ) filled out a questionnaire assessing demographics, Instagram use features, Neuroticism, Problematic Instagram use, FoMO, and Motivations for Using Instagram. Results showed that neuroticism affected PIU only indirectly through FoMO, escapism and self-expression motives. Additionally, FoMO promoted higher levels of escapism and self-expression motives, increasing participants' risk of PIU. This is the first study testing the mediating role of motives for using Instagram between personality predisposing factors and PIU. The findings provide new insights into the relationship between the factors that may promote PIU and have important clinical implications. These include the possibility for practitioners to prevent PIU more easily by acting on users' motivations and cognitions, such as escapism, self-expression and FoMO, rather than working on predisposing personality factors, that are usually more stable over time.

**Keywords** Problematic Instagram use · Neuroticism · FoMO · Escapism motive · Self-expression motive

## Introduction

In recent times, Instagram has surpassed one billion active users, with more than 95 million photos and videos posted daily on the site (McCormick, 2022). Because of its attractiveness, Instagram has been considered by scholars one of the social networking sites (SNSs) with the greatest

addictive potential among young people (Alhabash & Ma, 2017; Kircaburun et al., 2020). Indeed, a minority of users are at risk of developing a problematic social networking sites use (PSNSU) (Kuss & Griffiths, 2017), which has been defined as “being overly concerned about social networking sites [...], to be driven by a strong motivation to log on or to use social networking sites and to devote so much time and effort [...] that it impairs other social activities, studies or job, interpersonal relationships and/or psychological health and well-being” (Andreassen & Pallesen, 2014). Despite the lack of an official diagnosis regarding PSNSU within the international diagnostic manuals, or widely accepted diagnostic criteria for social networking sites disorders (Spada, 2014), in recent years, Brand and colleagues (2016) have proposed an Interaction of Person-Affect-Cognition-Execution (I-PACE) model in an attempt to explain how different variables may concur and interact in the process of developing and maintaining the problematic use of specific Internet applications, such as the PSNSU (Brand et al., 2016).

✉ Virginia Pupi  
virginia.pupi3@unibo.it

<sup>1</sup> Department of Education Studies, University of Bologna, Bologna 6, Via Filippo Re, 40126, Italy

<sup>2</sup> Department of Physics and Astronomy, University of Bologna, Bologna, Italy

<sup>3</sup> Department of Experimental, Diagnostic and Specialty Medicine, University of Bologna, Bologna, Italy

<sup>4</sup> Department of Psychology, University of Bologna, Bologna, Italy

According to the researchers' view, individuals' problematic use of specific SNSs can be explained through the interaction mechanisms between different predisposing features, as individuals' core characteristics (e.g., personality traits and specific use motivations), and cognitive and affective factors influencing addictive behaviors in using those platforms (Elhai et al., 2016; Wegmann & Brand, 2019). Indeed, the development of the problematic behavior occurs in the interaction between the individual's predisposing variables and certain triggers provided by specific virtual environments. The interplay of these features gives rise to experiences of gratification and compensation that are part of the process of the problematic use development and maintenance. The I-PACE model offers a theoretical perspective for psychological research since it permits formation and testing of clear hypotheses regarding the interaction effects of specific variables in explaining development and variance in symptoms severity of behavioral addictions.

### Neuroticism, Fear of Missing Out and PSNSU

In the I-PACE model, Brand and colleagues (Brand et al., 2019) referred to certain potential predisposing variables of problematic Internet use with some general terms (e.g., psychopathology, temperamental characteristics, including, for example, impulsivity). Moreover, they suggested that even though some personality traits have consistently been found to relate with problematic use and addiction (e.g., high neuroticism, impulsivity and shyness, low conscientiousness, and self-esteem; Griffiths, 2017), different personality profiles may be specified further with respect to diverse problematic platforms use. Specifically, Wegmann and Brand (2019) suggested that individual psychosocial characteristics and social cognitions, as well as their interactions, appear to be relevant risk factors for PSNSU. The scholars proposed the *fear-driven/compensation-seeking hypothesis* (Wegmann & Brand, 2019), according to which individuals with basic social deficits at personality level, such as social anxiety and low social competence, might use SNSs problematically to satisfy their unmet need for connection and belonging. For instance, people with a high level of neuroticism may be attracted to using SNSs, such as Facebook, because they hope to receive feedback and reassurance from others and because it is easier for them to communicate through a screen than to speak face-to-face (Kandell, 1998). Indeed, neuroticism is a Big Five personality trait (Costa & McCrae, 1992) characterized by interpersonal problems, the frequent experience of negative emotions, and inadequate coping strategies (Suls & Martin, 2005). Socially, people with high trait neuroticism generally report more negative interactions with others (e.g., Lincoln

et al., 2003), and thus also report feeling less satisfied with their social support network compared to those individuals who are emotionally stable (e.g., Dehle & Landers, 2005). Although neuroticism has been positive associated with different problematic Internet uses (Bowden-Green et al., 2021 for a systematic review), and significantly correlated with problematic smartphone use, Internet gaming disorder, problematic Facebook use (Marciano et al., 2020 for a meta-analysis), only few studies have investigated its relationship with PIU and with contradicting results (Balta et al., 2020; Ershad & Aghajani, 2017). Moreover, personality and temperament features are rather vague predictors for specific addictive behaviors, given that these variables are involved in many psychopathologies and often explain only a mild-to-moderate proportion of symptoms across different disorders (Zilberman et al., 2018). According to the I-PACE model other factors, like social cognitions, may interact with the personality predisposing variables in explaining the PSNSU (Wegmann & Brand, 2019). In particular, Fear of Missing Out (FoMO) is a social and maladaptive cognitive bias, which refers to the preoccupation with missing information, such as other users' activities and social events occurring in one's SNS (Przybylski et al., 2013). Several studies of school-aged adolescents, college students, and adults have evidenced moderate to large positive association between FoMO and PSNSU (e.g., Balta et al., 2020; Casale & Fioravanti, 2020; Tomczyk & Selmanagic-Lizde, 2018; Dempsey et al., 2019). In particular, young people who tend to have higher levels of FoMO are more likely to compulsively check their devices to stay constantly connected to what is happening online and to present PSNSU (Casale & Fioravanti, 2020). In the perspective of the I-PACE model, Wegmann and Brand (2019) suggested that FoMO might play a mediating role between predisposing variables and PSNSU, since this cognition could act as a reinforcing mechanism for the problematic use. Indeed, according to the Self-Determination theory (SDT, Deci & Ryan, 1985; Ryan & Deci, 2000), FoMO might be driven by people's unmet psychological needs, such as the need for autonomy, competence, or connectedness with others (Przybylski et al., 2013). Therefore, users with high levels of neuroticism, which have a generally anxious predisposition (Mehroof & Griffiths, 2010), are more likely to experience FoMO and tend to compulsively use SNSs to fulfil their psychological need for social connection (Alt & Boniel-Nissim, 2018).

## Neuroticism, motives for using Instagram and PIU

Recently, Potenza and colleagues (2017) have emphasized the importance of investigating potential mediating variables that may be crucial targets for the treatment of problematic Internet tendencies (e.g., expectancies, affective and cognitive responses to triggers). According to the I-PACE model, usage motives play a key factor in using SNSs and refer to the expectations about the concrete effects that the use of a specific site is likely to have in a certain condition (Brand et al., 2016). As for neurotic people, they are not motivated to expand their social connections, have an average number of friends/followers, and use the Internet for leisure and selected SNSs activities, such as passive SNSs use (Bowden-Green et al., 2021). Specifically, they may resort to Instagram with the aim of escape from their own problems, spending a long time watching other people's videos and live streams, looking at their photos and interacting with other users by liking or commenting on posts, in some cases developing PIU (Kırcaburun & Griffiths, 2019). Thereby, people high in neuroticism distract themselves, avoid unpleasant thoughts (Hartmann et al., 2010), and manage their negative affections (e.g., depression or anxiety symptoms) (Gao et al., 2017). Escapism, defined as "the use of the online environment to avoid thinking about real-life problem" (Yee, 2006, p. 774) resulted a relevant motive in favoring PIU (Kırcaburun & Griffiths, 2019). Moreover, escapism is an immersion-related motivation which has been found to be a strong predictor of problematic smartphone use (Wang et al., 2015) problematic and non-problematic online gaming and may have a negative impact on gamers' lives (e.g., Billieux et al., 2011). Indeed, escapism behavior shows reality-avoidance attitude by diverting into the simulated world (Olkina et al., 2015), and gamers who have high neuroticism tend to perceive the real world as something threatening, so they escape to computer games as safer and more controlled environments (Müller et al., 2014). Similarly, individuals with a high level of neuroticism tend to express themselves through SNSs, as the online world reduces the anxiety associated with offline social situations, and they are more likely to create and fuel an online ideal and positive self. In fact, these people worry about others' comments and reactions to their posts and photos (e.g., selfies) because of their sensitivity to rejection and their need for social acceptance (Bowden-Green et al., 2021). With regard to Instagram, the self-expression motive refers to the possibility for users to present their personality, lifestyle, and tastes in their posting activities (Lee et al., 2015). As a result, users high in neuroticism may express themselves online in order to achieve social recognition of their image (Marshall et al., 2015), and satisfy their need to belong (Butt

& Phillips, 2008). In previous research, the self-expression motive has been associated with heavy use of SNSs (Lin et al., 2014), and the self-presentation has been related with frequent engagement with Facebook and problematic Facebook use (Marino et al., 2018; Masur et al., 2014), whereas the expression of a positive self has been found to be a key motivation for PIU (Kırcaburun et al., 2020). Since people high in neuroticism also experience low levels of social support in their face-to face relationships (Hughes et al., 2012; Swickert et al., 2002) and are afraid of being misunderstood (Wilson et al., 2015), those subjects may turn to SNSs to present themselves and feel closer to other users (Andreassen et al., 2014). As a result, through their SNS posting activities, neurotics gain social validation of themselves (Marshall et al., 2015), satisfy their need to belong (Butt & Phillips, 2008), and reduce loneliness (Amichai-Hamburger & Ben-Artzi, 2003).

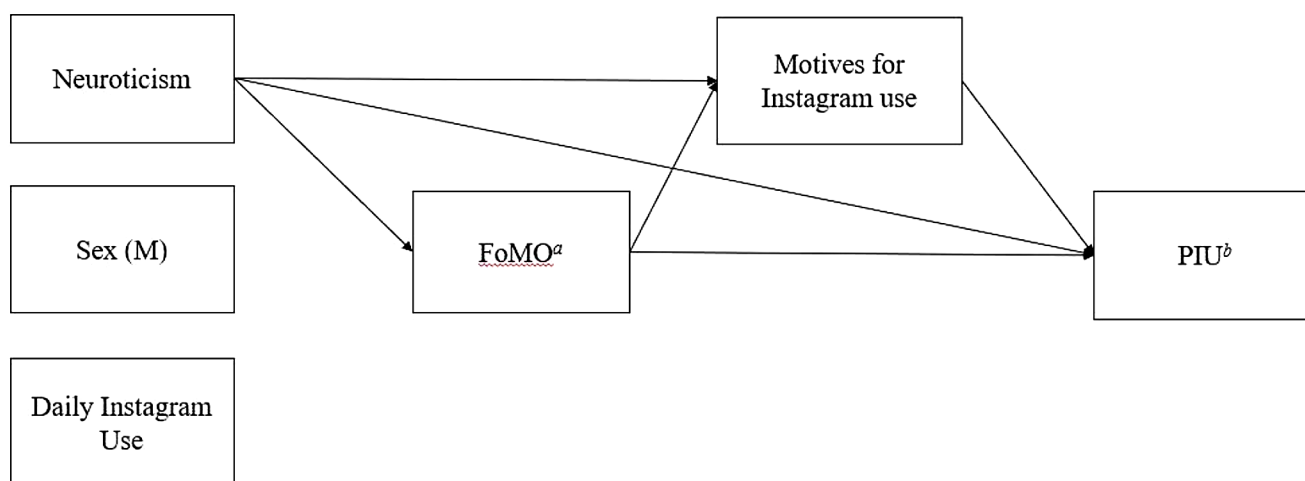
### The present study

This study examined the relationship between neuroticism, FoMO, escapism and self-expression motives for using Instagram and PIU in a sample of university students having an Instagram account. Indeed, the downside of focusing on isolated predictors is twofold: it may favor overestimating the impact of an isolated predictor, while failing to consider other aspects of an individual's characteristics that may explain the problematic behaviour. Based on the interaction mechanism of the I-PACE model between personality, social cognitions, and expectancies in favoring PSNSU, we hypothesized that (i) neuroticism would be positively related to PIU; (ii) escapism motive would positively mediate the association between neuroticism and PIU; (iii) self-expression motive would positively mediate the connection between neuroticism and PIU; (iv) FoMO would positively mediate the relationship between neuroticism and PIU; (v) FoMO would positively mediate the relationship between neuroticism and escapism motive in favouring PSNSU; (vi) FoMO would positively mediate the relationship between neuroticism and self-expression motive in fostering PSNSU. To test our hypotheses, we adopted a sequential mediating model, which seems to best reflect the dynamic interaction process between variables proposed by the I-PACE model for problematic Internet-related behaviors (Fig. 1).

## Methods

### Participants and procedure

Three hundred and sixty-two participants aged between 18 and 39 ( $M=25.35$ ,  $SD=4.25$ ) were recruited through an



**Fig. 1** Path diagram of the hypothesized model. Note <sup>a</sup>FoMO= Fear of Missing Out; <sup>b</sup>PIU= Problematic Instagram use

online survey using Feedback Server software. In 2020, the questionnaire was promoted among Italian university students during pandemic. The only inclusion criterion for participation was to have an Instagram account. The Ethics Commission of the university where the authors work approved the research project. The study was conducted in agreement with the ethical norms laid down by the Italian National Psychological Association, and in conformity with the ethical standards promoted by the Declaration of Helsinki (1964). All participants were informed about the aim of the research, and they all provided informed consent. No personal identifying information was collected, and no fee was offered.

## Measures

The questionnaire comprised (i) basic sociodemographic information (i.e., age, sex, and academic status) (ii) questions about the use of Instagram, and (iii) four psychometric scales.

**Instagram Addiction Scale (IAS).** The IAS was developed by Kircaburun and Griffiths (2018), as a modified version of the Internet Addiction Test (Young, 1998) and validated in Italian by Soraci and colleagues (Soraci et al., 2022). In the present study the IAS was adopted to detect PIU. The IAS has 15 items and two factors: the social effect, which reflects the negative effects of PIU on the user's social relationships (eight items, e.g., "How often do you prefer the excitement of Instagram instead of being with your close friends?"); the compulsion, that refers to the increasing need for Instagram use (seven items, e.g., "How often do you try to cut down the amount of time you spend on Instagram and fail?"). The scale comprises a 6-point Likert scale from "ever" to "always" and scores can range between 15 and 90. The

cut-off points of the scale are: non-addiction (15–37), mild (38–58), moderate (59–73), and severe addiction (over 73). Cronbach alpha coefficient was  $\alpha=0.89$  for the total scale,  $\alpha=0.76$  for the social effect subfactor, and  $\alpha=0.85$  for the compulsion subfactor.

**Fear of Missing Out Scale, (FoMOs).** The scale was developed by Przybylski, Murayama, DeHann, & Gladwell (2013), and adapted in Italian by Casale and Fioravanti (2020). The instrument includes 10 items (e.g., "When I go on vacation, I watch what my friends are doing; when I do something fun, it is important that I share details online"). To answer, a five-step Likert scale response set was used (1 = "Not true for me"; 5 = "Extremely true for me"). The scale produced an average score of 10 to 50, with higher scores indicating higher levels of FoMO. The Cronbach alpha of the scale was  $\alpha=0.83$ .

**Motivations for Using Instagram.** The scale was developed by Lee and colleagues (2015) and comprises 28 items and five dimensions of motives for using Instagram. In the present study only two motivations were considered: self-expression (e.g., "To be noticed by others") and escapism (e.g., "To forget about troubles"). The Cronbach alpha coefficient for the motives subfactors were  $\alpha=0.82$  for self-expression and  $\alpha=0.76$  for escapism motive. The Cronbach alpha coefficient for the motives subfactors were  $\alpha=0.82$  for self-expression motive, and  $\alpha=0.76$  for escapism motive.

**Big Five Inventory (short version) (BFI-10).** The BFI-10 assesses personality traits according to the five-factor approach. The scale was developed by Rammstedt and John (2007) and adapted in Italian by Guido and colleagues (2015). Responses are on a five-point scale ranging from 1 "completely disagree" to 5 "strongly agree", and scores are between 2 and 10. For the current study, we administered only the neuroticism subscale, which had Cronbach's alpha  $\alpha=.70$ . The personality factor of neuroticism (or if reverse,

emotional stability) has two bidirectional items. Response sets are on a five-point scale ranging from 1 “*completely disagree*” to 5 “*strongly agree*”, and scores range are between 2 and 10.

### Statistical analysis

To analyze the data, frequency, descriptive statistics, and Pearson correlation tests were conducted through SPSS 23.0 software application. Confirmatory factor analyses and path analyses were applied using R 4.2.0 software (lavaan package v0.6-11). Following Chen and Kim’s guidelines (2013)) the normality of each variable was verified, fulfilling the statistical assumptions of the model. Then, we used path analysis, or more specifically a sequential mediation model, to examine the mediating role of FoMO and Instagram use motives on the effect of neuroticism on PIU. To employ path analysis or structural equation modeling, the sample size should be greater than 200 (Haenlein & Kaplan, 2004; Nasser & Wisenbaker, 2003), which is considered large by Kline’s guidelines (Kline, 2005). The model parameters were estimated by maximum of likelihood and given, for all continuous variables, in the standardized form, while for categorical variables standardization was accomplished only with respect to the dependent variable. The standard errors, 95% confidence intervals and  $p$ -values of the total effects (direct and indirect) of independent and mediator variables on the outcome variable were calculated using 5000 bootstrap samples, in order to consider the effect of non-normality of the coefficient products (Montoya, 2022). Moreover, for the path analysis, the criterion of parsimony was used, i.e. the smallest number of parameters necessary to answer our main research questions was introduced into the model (Weston et al., 2008). To assess the role of neuroticism on PIU removing the effect of known potential confounders, we controlled all the paths with sex, whereas paths having FoMO and PIU as dependent variables were adjusted for daily Instagram use, as a categorical variable. Finally, in the CFA and path analyses, goodness of fit criteria determined by Hu and Bentler (1999) were used to designate model fit and the most appropriate estimation algorithm was used, following (Li et al., 2016), i.e. robust unweighted least square for CFA and maximum of likelihood with unbiased covariance matrix. Considered thresholds for good fit are:  $\chi^2/df < 5$ , GFI > 0.9, CFI > 0.95, RMSEA < 0.10, SRMS < 0.10. We estimated the impact of common method bias by means of the Harman’s single factor test, performed via an exploratory factor analysis including all the factors of the study. As the AVE was 0.3 (< 0.5), we concluded that our results were not contaminated by common method bias (Kock & Lynn, 2012).

### Results

The main characteristics of the sample were shown in Table 1, whereas score ranges, mean scores, standard deviations, skewness, excess kurtosis, and bivariate correlation coefficients of the study variables were reported in Table 2.

To test the hypothesized model (Fig. 1), path analysis was applied. In the model, all variables were observed variables. Our model was overidentified, with 8 remaining degrees of freedom and therefore it was of great value to question if the model was a good fit of the data. Goodness of fit indices of the model (Fig. 2) pointed out good or acceptable fit to the data, indicating that the model was acceptable ( $\chi^2/df = 3.2$ , root mean square residuals (RMSEA) = 0.092 (90% CI [0.06, 0.13]), standardized root means square residuals (SRMR) = 0.019, Comparative Fit Index (CFI) = 0.97, Goodness of Fit Index (GFI) = 0.96. As our sample size was smaller than 500, we used a cut-off for acceptable fit for the RMSEA of 0.10, as suggested by (Weston et al., 2008), while all the other parameters showed good fit to the data, no matter the effect of the size.

Neuroticism had a significant association with FoMO ( $\beta = 0.28$ ,  $p < .001$ ; CI [0.37, 0.18]) and with the escapism motive ( $\beta = 0.12$ ,  $p = .01$ ; CI [0.21, 0.02]), but not with the self-expression motive, nor directly with PIU. Comparing direct with indirect effects (Table 3), we found that escapism and FoMO fully mediated the effect of neuroticism on PIU, accounting for 58% of its total effect on the outcome variable. Moreover, the sequential mediation from neuroticism through FoMO and the two motives resulted significant and accommodated for 23% of the total effect. The effect of FoMO on both motives was moderate ( $\beta = 0.46$ ,  $p < .001$ ; CI [0.37, 0.55] for escapism and  $\beta = 0.45$ ,  $p < .001$ ; CI [0.35, 0.54] for self-expression), and the direct effect of FoMO on PIU was slightly smaller on average, but significant ( $\beta = 0.28$ ,  $p < .001$ ; CI [0.19, 0.37]). Escapism and self-expression were significantly associated with PIU and the effect of escapism was on average around 50% more than the one of self-expression (respectively  $\beta = 0.25$ ,  $p < .001$ ; CI [0.14, 0.36] and  $\beta = 0.16$ ,  $p < .01$ ; CI [0.06, 0.25]). Both motives were weak partial mediators of the effects of FoMO on PIU, accounting globally for 41% of the total effect, with escapism having larger mediation role (25% vs. 16%). Escapism and self-expression motives showed a positive correlation  $r = .38$ ,  $p < .001$ . Concerning the control variables, sex (Males vs. Females) was only associated with the escapism motive ( $\beta = -0.36$ ,  $p < .001$ ; CI [-0.57, -0.16]), implying that, on average, males had a score of escapism motive of 2.15 points less than females. Daily Instagram use was included in the analysis merging its two last categories, resulting in one category of “*more than 3 hours*”. This was done because only 4 people belonged to the “*More than 5*



**Table 1** Characteristics of the participants included in the study sample ( $N=362$ )

		n	(%)
Sex	Males	101	27.9
	Females	261	72.1
Academic status	High school diploma	126	34.8
	Bachelor's degree	150	41.4
	Master's degree	66	18.2
	Postgraduate or doctorate degree	20	5.5
Instagram access	Less than once a week	20	5.5
	At least once a week	22	6.1
	At least once a day	60	16.6
	More times a day	260	71.8
Daily Instagram use	Not everyday	34	9.4
	Less than 30 min per day	68	18.8
	Between 30 min and 1 h per day	112	30.9
	Between 1 and 3 h per day	119	32.9
	Between 3 and 5 h per day	25	6.9
	More than 5 h per day	4	1.1
PIU <sup>a</sup>	Severely addicted	0	0
	Moderately addicted	3	0.8
	Mildly addicted	63	17.4
	Non addicted	296	81.8
Instagram users	Total sample	362	100

Note<sup>a</sup>PIU= Problematic Instagram use; <sup>a</sup>cut-off points of the *Instagram Addiction Scale*: non-addicted (15–37), mild addicted (38–58), moderate addicted (59–73), and severe addicted (> 73)

**Table 2** Score ranges, mean scores, standard deviations, skewness, excess kurtosis, and Pearson correlation coefficients of the study variable

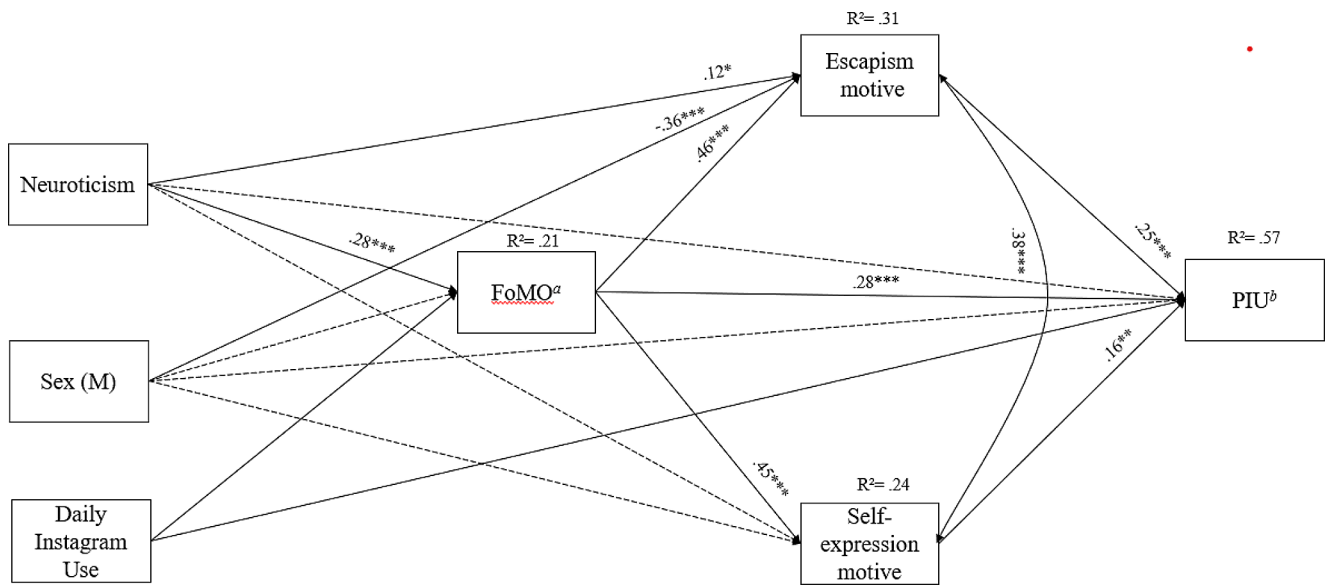
	1.	2.	3.	4.	5.
1.PIU <sup>a</sup>	1				
2. FoMO <sup>b</sup>	0.60**	1			
3. Self-Expression motive	0.47**	0.44**	1		
4. Escapism motive	0.63**	0.51**	0.51**	1	
5. Neuroticism	0.31**	0.32**	0.19**	0.31**	1
Score ranges	15–90	10–50	5–35	5–35	2–10
Mean	28.12	23.82	14.29	14.99	6.42
Standard deviations	10.42	8.05	7.46	6.68	1.73
Skewness	0.86	0.05	0.68	0.06	0.15
Excess Kurtosis	0.40	–0.77	–0.30	–0.37	–0.77

Note \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ ; <sup>a</sup>PIU=Problematic Instagram use; <sup>b</sup>FoMO= Fear of Missing Out

hours” category, otherwise the power would have been too low and the bootstrap unreliable. The reference category of the variable was the category “*I don't use it every day*”. The global significance of the association with the dependent variable was assessed by the likelihood ratio test (Vuong, 1989), giving a significant association ( $p < .001$ ) with both FoMO and PIU. Looking separately at each category, on average, compared with the reference, participants using Instagram between 30 min and 1 h daily had a PIU score 7.61 points larger ( $p = .003$ ); respondents who use it between 1 and 3 h had 12.63 points more ( $p < .001$ ); those who spent more than 3 h daily had 34.4 points more ( $p < .001$ ). Individuals using Instagram less than 30 min daily did not have a significantly different score with respect to the reference.

Regarding the association between daily time spent on Instagram with FoMO, on average, compared with the reference category, participants using Instagram less than 30 min had FoMO score 9.19 points larger ( $p = .01$ ); who used it between 30 min and 1 h had 14.30 points more ( $p < .001$ ); who used it between 1 and 3 h had 17.03 points more ( $p < .001$ ); who used it more than 3 h had 20.39 points more ( $p < .001$ ).

Among all the paths of the analysis from the personality trait to PIU, the largest effect, although weak in absolute terms, was the one of neuroticism on PIU via FoMO ( $\beta = 0.08$ ,  $SE = 0.02$ ). The largest partial effect on PIU was the path from FoMO through escapism ( $\beta = 0.12$ ,  $SE = 0.03$ ). The fitted model explained 21% of the variance of FoMO,



**Fig. 2** Final model of the path coefficients between variables. Note \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ ; <sup>a</sup>FoMO= Fear of Missing Out; <sup>b</sup>PIU= Problematic Instagram Use

**Table 3** Standardized estimates of total, direct and indirect effects from Neuroticism to PIU and mediator variables (N=362)

	Hypothesis	Effect <sup>c</sup>	SE.	% Explained total effect
<i>Effects from FoMO<sup>a</sup> to PIU<sup>b</sup></i>				
Total effect	Supported	0.47***	0.04	-
Direct effect	Supported	0.28***	0.06	60%
Total indirect effect	Supported	0.19***	0.03	40%
via Escapism	Supported	0.12***	0.03	25%
via Self-expression	Supported	0.07**	0.02	15%
<i>Effects from Neuroticism to PIU</i>				
Total effect	Supported	0.23***	0.04	-
Direct effect	Not supported	0.07	0.04	29%
Total indirect effect	Supported	0.16***	0.03	71%
via FoMO	Supported	0.08***	0.02	34%
via Escapism	Supported	0.029*	0.015	13%
via Self-expression	Not supported	0.01	0.01	5%
via FoMO and Escapism	Supported	0.032**	0.009	14%
Via FoMO and Self-expression	Supported	0.020**	0.007	9%

Note \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ . <sup>a</sup>PIU = Problematic Instagram use; <sup>b</sup>FoMO= Fear of Missing Out. <sup>c</sup>Effect sizes are provided as standardized betas

31% of escapism, 24% of self-expression and 57% of PIU (Table 3).

### Discussion

In line with the I-PACE model, this study aimed to explore the relationship and the process of interaction between neuroticism, FoMO, escapism and self-expression motives for using Instagram and PIU. To the best of our knowledge, the present research is the first to examine the sequential mediating role of FoMO and motives for using Instagram in promoting PIU among users high in neuroticism.

Firstly, despite the moderate positive correlation between neuroticism and PIU, when considering the sequential mediation model, neuroticism had no direct effect on PIU, but it had an indirect negative effect on PIU passing through escapism. The lack of a significant direct path between the two variables was also found by Kircaburun and Griffiths (2018), who first assessed PIU through the *Instagram Addiction Scale* in a sample of university students. Despite people high in neuroticism may present characteristics which predispose them to develop PSNSU, personality factors may favor problematic tendencies even indirectly (Brand et al., 2016). Indeed, the lack of a direct effect between neuroticism and PIU suggests that not all users with high traits of neuroticism are vulnerable to PIU, but consistently with the I-PACE framework, other factors, come into play (Brand et al., 2016). In fact, people high in neuroticism can differ in their core characteristics, thereby presenting different motivations for engaging with Instagram. Our evidence suggests that users high in neuroticism, who were more inclined to

engage on Instagram mainly to escape from their problems, were more likely to develop PIU. These individuals resort to using Instagram as a compensation strategy (see the *Fear driven/compensation-seeking hypothesis*, Wegmann & Brand, 2019) to distract themselves from negative thoughts (e.g., neurotic ruminations) (Hartmann et al., 2010), or for mood management (Gao et al., 2017).

Secondly, our evidence showed that neuroticism was positively related to higher levels of FoMO, that in turn promoted higher scores of PIU. This result appears in line with the conceptualization of the I-PACE framework, which considers FoMO a mediating cognitive bias that could reinforce the predisposing variables for PSNSU. Furthermore, FoMO led both to higher levels of escapism and self-expression motivations for Instagram use, which in turn fostered higher scores of PIU. Indeed, people high in neuroticism may have anxiety about personal relationships, and are likely to be more vulnerable to experience FoMO and social exclusion (Alt & Boniel-Nissim, 2018). Therefore, their sensitivity to Instagram notifications and updates might stress their tendency to check the SNS compulsively and maladaptively. In our view, FoMO plays an important role in fostering motivations with respect to PIU. On the one hand, it amplifies the tendency to monitor others' activities on Instagram for those using the site to escape reality and manage their negative affects. On the other hand, contrary to our hypotheses, results showed that people high in neuroticism were not motivated to express themselves on Instagram, as evidenced by a non-significant effect between neuroticism and self-expression motive. A possible explanation is that people with a high level of neuroticism may fear social rejection and therefore prefer to use Instagram passively and not expose themselves online. However, when these individuals experience higher levels of FoMO, they also perceive pressure to update their content in order not to feel socially excluded and receive the attention from others. Indeed, since neurotic users are anxious and might have some difficulties in social relationships even online, it's possible that they resort to self-expression (e.g., posting activities) only to counter the fear of being excluded from the gaze of their followers, confirming evidence from a previous study suggesting the influence of FoMO on users' self-presentation tendencies (Salim et al., 2017). According to this view, in people with high levels of neuroticism, the motivation for self-expression on Instagram could be extrinsic and driven by sensitivity to the behavior of other users. In other words, self-expression motive might be a way of controlling and contrasting FoMO in people high in neuroticism.

Those findings are worthy of mention and consistent with the I-PACE model conceptualization of FoMO as a specific social cognition (Wegmann & Brand, 2019), which can favor or modulate users' motivations in using Instagram,

with the risk of addictive consequences. In line with the *Fear-driven/compensation-seeking hypothesis* (Wegmann & Brand, 2019), the maintenance of PIU might be promoted by negative expectancies, such as mood management for individuals who engage in Instagram for escapism, and the reduction of the fear of being socially excluded for those who use the site for self-expression. However, the motive of self-expression as a strategy to counter the fear of social exclusion promoted by FoMO seems partially at odds with Wegmann and Brand's (2019) conceptualization. In fact, the scholars have previously considered self-expression a predisposing motive for PSNSU specifically for users high in social competences, who recur to SNSs to gratify their need to belong and need for popularity (see the *Reward-driven hypothesis*, Wegmann & Brand, 2019). The novelty of our evidence highlights that self-expression might be a key predisposing motive for PIU also in people with unmet psychosocial needs, such as those high in neuroticism, but only when they also experience high levels of FoMO.

As regards confounding variables, in line with previous research (e.g., Chae et al., 2018) females recurred to escapism motive on Instagram more than males. Nevertheless, sex differences did not influence the PIU and the self-expression motive. It is worth noting that 72.1% of the sample were females, in line with previous studies about problematic Instagram use (e.g., Kircaburun & Griffiths, 2018). Furthermore, in terms of daily time spent on Instagram, the more hours users spent on Instagram, the higher levels of FoMO they experienced. These findings, consistent with the I-PACE model, suggest that the more time individuals spend on Instagram to gratify (or compensate for) their social needs, the more likely they are to reinforce their maladaptive cognition (i.e., FoMO) with respect to using the social networking site (Brand et al., 2016).

However, the study also presents some limitations. The sample was cross-sectional, and consequently, the results may not indicate causal relationships between variables. For this purpose, longitudinal studies are needed to demonstrate causal relationships between all the variables included in the study. Moreover, data were collected using self-report questionnaires; therefore, several biases may be affecting the results such as social desirability. Future research should use qualitative or mixed methods to collect more triangulated data for more reliable in-depth results. Additionally, the forthcoming studies might consider the interaction between motives for using Instagram and the use of different Instagram features (i.e., watching and posting live streams and videos, liking, and commenting others' posts) in promoting PIU. Finally, future studies should also consider the role of other factors that might predispose individuals to PIU according to the I-PACE model, such as psychopathological characteristics (e.g., anxiety and depressive symptoms).



Despite its limitations, the present research has several merits. As mentioned above, this study is the first to investigate, in line with the I-PACE model, how the interaction of FoMO, escapism and self-expression motives for using Instagram affect individuals' PIU in people high in neuroticism. The research has important theoretical implications for the I-PACE model in the study of personality factors favoring PIU and PSNSU in general. Firstly, compared with past studies, which have explored the association between neuroticism and PIU with mixed results (Balta et al., 2020; Kircaburun & Griffiths, 2018; Ershad & Aghajani, 2017), the current research is the first to investigate the main components of the I-PACE model together (neuroticism, FoMO as a cognitive bias and the expectancies related to Instagram), testing their interaction mechanisms in favouring PIU. Our findings suggested that neuroticism per se is not exhaustive in explaining the development of PIU, but other psychological factors may concur sequentially in fostering the addictive behavior. Secondly, our research confirmed the mediating role of FoMO as a reinforcing mechanism, that can modulate and raise the expectancies (escapism and self-expression motives) of young neurotic individuals in using and abusing of Instagram. Indeed, our study highlighted that FoMO as a social cognition may also prompt extrinsic motivation of self-expression in people who are not prone to use Instagram actively, but who may develop a problematic use of the site to present themselves and feel connected with other users. Thirdly, in line with the *fear driven/compensation seeking hypothesis* (Wegmann & Brand, 2019), our evidence pointed out that users with a high level of neuroticism resort to Instagram similarly to other online platforms (Facebook, online games, smartphones) to escape from reality and thus they may develop PIU. Moreover, this tendency is reinforced by higher levels of fear of missing out on others' activities on the site. Importantly, our study expanded the *fear driven/compensation seeking hypothesis* (Wegmann & Brand, 2019), suggesting that self-expression motive can also promote PIU in people with unmet social needs like those high in neuroticism. Specifically, for those users the self-expression activity on Instagram might be extrinsically promoted by the desire to reduce the fear of "being left out" from other members (FoMO).

Finally, our findings have major clinical implications in prevention and treating of neurotic people at risk for PIU. As outlined by Brand and colleagues (2019), broadening the knowledge of the I-PACE model in relation to different problematic Internet uses have important clinical benefits, as investigating potential mediating variables offer relevant targets for psychological interventions. Our study suggests to PIU treating clinicians the importance of targeting their prevention efforts towards those motivations that support negative expectations (such as the reduction of negative

affect) in neurotic individuals. These include the motivation of escapism on Instagram from pre-existing offline problems to alleviate worry and distress, and the motivation of self-expression through online posting activities in order not to feel excluded from the attention of followers.

In terms of possible interventions, this is good news, as acting on the users' motivations and cognitions might be easier than working on their personality predisposing factors.

## Conclusion

The evidence helps to explain the mechanisms of the I-PACE model related to PIU. Because of some core social deficits at personality level, users high in neuroticism are more likely to present the maladaptive social cognition of FoMO (Przybylski et al., 2013), that in turn affects escapism and self-expression motives to use Instagram, in some cases leading to a risk of PIU. In fact, according to our results, people who were more neurotic were not necessarily more susceptible to PIU, except when they escaped their problems. However, when these individuals were also more prone to experience FoMO because their unmet need to belong, they may use Instagram more as a mean to distract themselves from negative thoughts (escapism motive), as well as seeking to connect with other members and be socially validated by them (self-expression motive), ultimately exposing themselves to a higher risk of developing PIU.

**Author contributions** All authors contributed to the drafting of the work. Conceptualization: Pupi Virginia; Methodology: Pupi Virginia, Polizzi Stefano; Investigation: Pupi Virginia; Data Curation: Pupi Virginia, Polizzi Stefano; Writing Original-Draft Preparation: Pupi Virginia, Polizzi Stefano; Formal analysis: Pupi Virginia, Polizzi Stefano; Visualization: Pupi Virginia, Polizzi Stefano; Software: Polizzi Stefano; Writing- Reviewing and Editing: Pupi Virginia, Polizzi Stefano, Mazzoni Elvis, Biolcati Roberta; Supervision: Biolcati Roberta.

**Funding** Open access funding provided by Alma Mater Studiorum - Università di Bologna within the CRUI-CARE Agreement. No funding was received for conducting this study. All authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript. Approval for the study was obtained from the ethics committee of University of Bologna (No: 0245603). All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000.

Open access funding provided by Alma Mater Studiorum - Università di Bologna within the CRUI-CARE Agreement.

**Data availability** Informed consent was obtained from all participants included in the study. Students were informed and consented to the publication of the results. No personal identifying information was collected, and no fee was offered. Data are available on request.

## Declarations

**Conflict of interest** On behalf of all authors, the corresponding author states that there is no conflict of interest.

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