MAGIC MIRROR ON THE WALL: SELFIE-RELATED BEHAVIOR AS MEDIATOR OF THE RELATIONSHIP BETWEEN NARCISSISM AND PROBLEMATIC SMARTPHONE USE

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Abstract

Objective: Recent research has suggested that problematic smartphone use is associated with several psychological factors and that mobile apps and smartphone-related behavior (i.e. selfie behavior) may encourage the development of problematic smartphone use. However, little is known about how the interplay between dysfunctional personality characteristics and selfie-related behavior can influence problematic smartphone use. The aim of this study was to examine the relationship between narcissism and problematic smartphone use, as well as the mediating role of selfie-related behavior in this relationship among young men and women.

Method: In the current study, a total of 627 undergraduate students (283 males and 344 females) completed a cross-sectional survey. A structural equation model was tested separately for males and females in order to evaluate the associations between narcissism, selfie-related behavior and problematic smartphone use.

Results: The results showed that greater narcissism was related to increased selfie-related behavior, which in turn were positively associated with problematic smartphone use both for males and females. However, selfie-related behavior mediated the relationship between narcissism and problematic smartphone use only for females.

Conclusions: The study provides fresh insight into our understanding of the psychological mechanisms underlying problematic smartphone use, which may inform prevention and treatment interventions.

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Introduction

Over the last decade, smartphones have come to represent a widespread technology, providing people with instant access to electronic information and communication. Recent research has displayed the benefits of smartphone use as a tool in the promotion of health, education, productivity enhancement, information seeking and social use (George & De Cristofaro, 2016; Jung, 2014; Kang & Jung, 2014). However, there is also accumulating evidence showing that an excessive and problematic use of the smartphone can be associated with negative outcomes such as individual stress, low self-esteem (Wang, Wang, Gaskin, & Wang, 2015) and symptoms of psychopathology (Demirci, Akgonul, & Akpinar, 2015; Elhai, Dvorak, Levine, & Hall, 2017a).

Problematic smartphone use (PSU) can be defined as a heterogeneous and multifaceted condition which involves an excessive use of the smartphone leading to significant life functional impairments (Billieux, Maurage, Lopez-Fernandez, Kuss, & Griffiths, 2015). However, it remains unclear whether addictive-like PSU symptoms lead to psychological and social life impairments (Kardefelt-Winther et al., 2017).

The issue regarding the use of an "addiction" framework for analyzing the individuals with problems controlling their Internet use (i.e. Internet addiction, gaming addiction, etc.) or more specific applications (i.e. social media addiction, online shopping addiction, etc.) remains a matter for debate (Casale & Fioravanti, 2017; Musetti et al., 2016) with several criticisms raised against the conceptualization of these phenomena within the framework of a biomedical model of addiction (Starcevic, Billieux, & Schimmenti, 2018; van Rooij, Ferguson, van de Mheen, & Schoenmakers, 2017). Interestingly, some alternative etiological hypotheses, considering specific psychological processes underlying addiction-like symptoms, have emerged (Billieux et al., 2015; Kardefelt-Winther et al., 2017). In this vein,

accordingly to van Rooij et al. (2017), in the current study we employ the term problematic smartphone use. Over the last decade, attention has been directed towards research into the theoretical frameworks explaining the etiology and manifestations of problematic smartphone use, whilst several distinct pathways that may lead to PSU have been highlighted (Elhai, Levine, & Hall, 2019). The integrative pathway model (IPM) proposed by Billieux and colleagues (2015) identified three different pathways which may lead to PSU: an '*excessive reassurance*' pathway, in which socially insecure and anxious individuals display addictive pattern use in order to gratify their excessive social reassurance needs; an '*impulsive pathway'*, which is determined by poor impulse control resulting in uncontrolled urges and deregulated smartphone use; an '*extraversion pathway*' which originates from a strong need to be connected with others and to establish new relationships. Each of these pathways is influenced by individual factors (e.g., psychological traits) and privileged applications (e.g., SMS, instant messaging, social networks) that can lead to different patterns of use and misuse (e.g., frequency and type of use, risky use, addiction-like symptoms).

Research has increasingly examined the role of mobile apps and associated smartphone behavior in boosting the PSU (Elhai, Hall, Levine, & Dvorak, 2017b; Roberts, Yaya, & Manolis, 2014; Zhitomirsky-Geffet & Blau, 2016). For example, social and communication apps seem to be the two most addictive mobile applications in college students (Ding, Xu, Chen, & Xu, 2016). Lee and colleagues (2014) found that mobile instant-messaging may be considered a cause of PSU, and Oulasvirta and colleagues (2012) described "the checking habit" as a repetitive checking of dynamic content and information accessible on the device, acting as reinforcement that can encourage PSU. The taking of selfies is another popular digital activity associated with smartphone use, involving both shooting and sharing selfies online. Posting selfies is a prevalent form of social media behavior that is almost exclusively smartphone-based. Although the theoretical framework defining selfie-related behavior is still vague, there is an ongoing debate regarding the psychopathological characteristics of this smartphone-based behavior (Boursier & Manna, 2018), with a growing risk of hyper-pathological conceptualization of common media use (Billieux et al., 2015; Kardefelt-Winther et al., 2017; Starcevic et al., 2018). The current study aims to shed some light on the link between selfie-taking and problematic smartphone use by testing a specific model (see below). In our model, the Internet is considered a (social) environment rather than a tool (Musetti et al., 2016) and this issue is particularly important when research analyzes problematic smartphone behavior. Thus, we focus on what preexisting traits or behavior might lead to an individual's difficulty in adapting to an environment (Caplan, 2002; Clowes, 2019; Musetti & Corsano, 2018).

Moreover, following the IPM framework (Billieux et al., 2015), (i.e. from the *reassurance pathway*), the current study will test a model in which dysfunctional personality traits, such as narcissism, and specific smartphone-related behavior (e.g., selfie taking and sharing) can influence the amount of PSU.

Narcissism and PSU

Scholars have evidenced that PSU can be associated with psychological distress, i.e. anxiety and depression (Elhai et al., 2017a; Elhai et al., 2019; Hussain, Griffiths, & Sheffield, 2017), social anxiety (Enez Darcin, Kose, Noyan, Nurmedov, Yılmaz, & Dilbaz, 2016; Sapacz, Rockman, & Clark, 2016), stress (Thomée, Härenstam, & Hagberg, 2011; Wang et al, 2015), as well as with psychological traits such as self-efficacy, neuroticism and impulsivity (Billieux, Van der Linden, & Rochat, 2008; Carvalho, Sette, & Ferrari, 2018; Gökçearslan, Mumcu, Haşlaman, & Çevik, 2016; Pivetta, Harkin, Billieux, Kanjo, & Kuss, 2019; Roberts, Pullig, & Manolis, 2015). To date, empirical research into the association between personality traits and PSU has not extensively examined the role of individual narcissism. Narcissism can be viewed as a multidimensional personality trait characterized by grandiose views of oneself, lack of empathy and a constant need for attention and adulation from others (Campbell & Campbell, 2009; Morf & Rhodewalt, 2001). Pincus et al. (2009) defined narcissism as "one's capacity to maintain a relatively positive self-image through a variety of self-, affect-, and field-regulatory processes, underlying the individual's need for validation and affirmation as well as the motivation to overtly and covertly seek out self-enhancement experiences from the social environment" (p. 365). Although research has shown that narcissistic traits can play a substantial role in smartphone and social media usage (Andreassen, Pallesen, & Griffiths, 2017; Hawk, van den Eijnden, van Lissa, & ter Bogt, 2019; Malik & Khan, 2015; Ryan & Xenos, 2011; Reid, & Thomas, 2017), only a few studies have focused on the association between narcissism and PSU and seem to support this link. For example, Pearson and Hussain (2015) found that higher narcissistic scores were linked to PSU, whereas the study by Hussain and colleagues (2017) did not confirm this pattern of association. Hawk et al. (2019) showed that adolescents with higher narcissism levels reported longitudinally problematic social media use and smartphone stress. A recent study by Ksinan, Mališ, and Vazsonyi (2019), confirmed a positive association between grandiose and vulnerable narcissism andcompulsive smartphone use. Similarly, Balta and colleagues (2019) found that narcissism, conjointly with sadism and spitefulness, were directly and positively associated with PSU. However, no previous research has, so far, examined potential mediators of the relationship between narcissism and PSU. The current study aims to test the mediational role of selfie-related behavior in the association between individual narcissism and PSU.

Selfie-related behaviors and narcissism

The new generation of smartphones equipped with high-resolution cameras, as well as the rapid growth of photo-sharing Social Networking Sites (SNSs) have contributed to the diffusion of a 'selfie-cool'. Taking, posting and sharing selfies have become quotidian routines for millions of people and has rapidly permeated the global culture of connectivity (Van Dijck, 2013). Selfies have rapidly become one of the most important avenues for the satisfaction of basic social needs through social networks (SNSs), namely the need for self-presentation (Diefenbach & Christoforakos, 2017; Nadkarni & Hofmann, 2012). Photo sharing, as well as other self-promoting behavior (status updates, number of followers and 'like', tags, messages, photographs) present in SNSs, provide the opportunity to display a positive self-promotional self-image to a broad social community from whom to attract attention and admiration. For these reasons, SNSs have been seen as an avenue through which narcissistic needs

might be expressed. For narcissistic individuals, SNS platforms represent the perfect place to reinforce their inflated self-views and to seek attention and approval from others (McCain & Campbell, 2018). A growing body of research has documented the fact that selfie-related behavior (SRB) is closely related to narcissism (Biolcati & Passini, 2018; Charoensukmongkol, 2016; Halpern, Valenzuela, & Katz, 2016; McCain et al., 2016; Sorokowski et al., 2015;Wang, 2017) and that narcissistic individuals are more likely to wish to post selfies on SNSs (Kim, Lee, Sung, & Choi, 2016) and with a higher frequency of posting and actual number of selfies (Fox & Rooney, 2015; Kim & Chock 2017; Sung, Lee, Kim, & Choi, 2016; Weiser, 2015). Some theoretical models, such as the self-enhancement model and the dynamic self-regulatory processing model of narcissism (McCain, 2016; 2018; Morf & Rhodewalt, 2001) provided useful data to better understand the link between narcissism and social media, by explaining how narcissistic individuals are to manipulating the online social environment to boost their grandiose self through a range of strategic intrapersonal and interpersonal self-regulatory behavior and processes. Social interactions on SNNs reflect one of the main contexts in which these behavior and processes are played out. For narcissists, these relationships allow one to maintain a grandiose self-image and to cover the need for excessive reassurance from others. At the same time, they allow individuals to avoid the anxiety arising from a close relationship with others. In accordance with the dynamic self-regulatory processing model of narcissism (Morf & Rhodewalt, 2001), Wang and colleagues (2018) suggested that selecting and posting attractive selfies on SNSs may have a self-regulatory function through which narcissists achieve the self-regulatory objective of maintaining and enhancing their inflated self-view. In the current study, we examined a model positing that narcissistic traits are associated with higher selfie-related behavior, which in turn can trigger excessive and problematic smartphone use.

Finally, it is worth noting that much of the research on narcissism and selfie-related behavior has highlighted the importance of gender differences. For example, some studies showed that girls usually share and post more selfies on social networks than boys (Arpaci, Yalçın, Baloğlu, & Kesici, 2018; Baiocco et al., 2016; Dhir, Pallesen, Torsheim, & Andreassen, 2016; Sorokowska et al., 2016). However, Fox and Rooney (2015) reported an association between narcissism and selfie-posting and -editing behavior among men. Similarly, the studies by Arpaci et al.(2018) and Sorokowski et al. (2015) found that selfie behavior was closely related to narcissism for men but not for women. Other studies failed to detect a differential role of gender when examining the relationship between narcissism and online photo sharing. The study by Kapidzic (2013) found that narcissism envisioned the propensity to select attractive profile pictures for both men and women, and the study by Kim and Clock (2017) reported that gender was not a significant predictor of selfie behavior nor does it play a moderating role in the link between narcissism and selfie posting.

The present study aims to address the gaps in PSU literature, as described above, by examining the mediating role of SRB in the relationship between narcissism and problematic smartphone use in males and females. Although previous research has established a link between narcissism and SRB (e.g., Biolcati & Passini, 2018; Singh, Farley, & Donahue, 2018) and evidenced the proliferation of SRB (both taking and sharing) along with the development of

excessive smartphone use (Sung et al., 2016), to date there is still a dearth of research examining a conceptual framework for the relationship between narcissism, SRB and smartphone overuse. In the present study, it is hypothesized that the relationship between narcissism and problematic smartphone use could be explained through the mediating role of SRB in females, given their higher over-involvement in SRB such as selfie-posting behavior (Dihr et al., 2016; Sorokowska et al., 2016; Weiser, 2015) and selfie-editing frequency (Wang, 2019), when compared to males, for which the mediation of SRB is not hypothesized.

Materials and Methods

Participants

A cross-sectional design was used to test the study hypotheses. A convenience sample of 640 college students was consecutively recruited from the University of Palermo from March 2015 to June 2016. Participants who did not complete the measures correctly or entirely (n = 13) were excluded. The final data-set include 627 college students. Participants' ages ranged from 18 to 36 years (M = 22.77, SD = 3.28) for males (n = 283, 45.1%), and from 19 to 29 years (M = 21.61, SD = 2.38) for females (n = 344, 54.90%).

Measures

A socio-demographic questionnaire was used to gather general data such as gender and age.

Narcissism. Narcissism was assessed using the Italian version of the 40-item Narcissistic Personality Inventory (NPI-40; Fossati, Borroni, & Maffei, 2008; Raskin & Terry, 1988). Respondents were asked to choose one of two statements for each item (e.g., "I try not to be a show off" *vs.* "I am apt to show off if I get the chance"). The NPI-40 includes a total score and seven subscales (Authority, Entitlement, Exhibitionism, Exploitativeness, Self-sufficiency, Superiority, Vanity) that assess specific sub-dimensions of the general construct. Only the total score was considered in this study. High scores on the NPI-40 indicate greater levels of narcissism. In the current study Cronbach's alpha reliability coefficients were .89 and .82 for males and females, respectively.

Smartphone Problematic Use. The Smartphone Addiction Inventory-Italian version (SPAI; Lin et al., 2014; Pavia, Cavani, Di Blasi, & Giordano, 2016) was used to measure problematic smartphone use. The SPAI is a 24-item instrument and is scored using a four-point Likert scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). The total SPAI score ranges from 24 to 96, with higher scores indicating greater problematic smartphone use (PSU). In the present study, Cronbach's alpha reliability coefficients were .92 and .90 for males and females, respectively.

Selfie related Behavior. Two single-questions were formulated to measure different facets of SRB. The first asked "How many selfies do you take in one day?" and the second asked "How many selfies do you post in one day?". For both questions responses were given on a 10-point scale, writing down the number of selfies taken/posted in one day from "*0*" to "*10*".

Procedures

Participation was voluntary, and informed consent

was obtained before data collection. Instruments were administered collectively in classrooms under the supervision of the principal investigator. All participants were informed that the data collection was anonymous, they could omit any information they did not wish to give and could withdraw from the study at any time. A confidential identification code was created for each participant and was used for all the identifying information. Department directors approval for the research was obtained before students' participation in the study. The study was conducted in accordance with the Declaration of Helsinki and with the ethical guidelines for psychological research laid down by the Italian Psychological Association (AIP). All subjects were informed about the study and all provided informed consent.

Plan of Data Analysis

To assess internal consistency, Cronbach α was computed for all scales. Descriptive statistics (mean and SDs) and bivariate Pearson correlations between narcissism, SRB, and PSU were computed. Assumptions for parametric data were evaluated (Tabachnick & Fidell, 2007). Positive skewed distributions were found for SPAI and SRB in both males and females, as well as for NPI in females, and square root transformations were conducted to improve the normality of these variables. Independent sample t-tests were conducted to examine differences between males and females. Analyses were conducted using PASW (version 17.0).

Model testing was performed using Mplus software (version 6.12). The overall goodness of model-fit was assessed using the χ^2 test statistics (χ^2/df ratios < 3 indicate reasonable fitting models), the comparative fit index (CFI), and the root-mean-square error of approximation (RMSEA) (Hoyle & Panter, 1995). For CFI, values higher than .95 are considered as indicators of good fit (Schermelleh-Engel et al., 2003) and values between .90 and .95 are usually interpreted as indicators for an acceptable fit (Hu & Bentler, 1998, 1999; Kline,

2005; Schermelleh-Engel et al., 2003); for the RMSEA, values lower than .05 indicate good fit (Hu & Bentler, 1999). In all models, age was included as a control variable. SRB was operationalized by two indicators: selfies taken in one day and selfies posted in one day, as measured by the two single-item questions. Finally, 95% confidence intervals (CIs) were computed using 5000 bootstrap resamples for indirect effects (Preacher & Hayes, 2008). CIs that do not contain a zero value indicate a significant indirect effect.

Results

Preliminary analyses

Descriptive statistics and differences between males and females are shown in Table 1. Females show higher problematic smartphone use (p <.05), whereas males show higher NPI scores (p < .001). No significant differences were found between males and females' levels of selfies-related behavior (taken, as well as posted, selfies in a single day).

Bivariate correlations between variables are shown in Table 2. Both for males and females, higher NPI scores are related to higher numbers of selfies taken in one day. Moreover, both for males and females, higher problematic smartphone use was related to higher SRB (both taken and posted selfies). Finally, only for males, higher NPI scores are related to higher problematic smartphone use.

Test of Hypothesis

Figures 1 a and b display the structural equation models for females and males, respectively. For females, all fit indices suggested that the model fits the data well (χ^2 = 2.96; df = 2, χ^2 /df = 1.48; CFI = .995; RMSEA = .037; RMSEA 90% C.I. = .000 - .120). The standardized parameter estimates presented in Figure 1a indicate that NPI was positively associated to SRB, which in turn was positively associated with problematic smartphone

Table 1. *Descriptive statistics and differences between males and females*

	Males (n = 283)		Females (n = 344)		t	p
	M	SD	M	SD		
NPI	13.45	8.00	9.10	5.69	7.692	<.001
SPAI	36.12	11.03	38.23	10.09	-2.489	<.05
Selfies taken in one day	.77	1.62	.82	1.35	-.471	.638
Selfies posted in one day	.32	.99	.41	.72	-1.293	.197

Note: NPI = Narcissistic Personality Inventory; SPAI = Smartphone Addiction Inventory.

Table 2. *Correlations between variables*

		NPI	SPAI	Selfies taken in one day
males	NPI	-		
	SPAI	.189**	-	
	Selfies taken in one day	.153**	.309**	-
	Selfie posted in one day	.061	.292**	.624**
females	NPI	-		
	SPAI	.093	-	
	Selfie taken in one day	.184**	.288**	-
	Selfie posted in one day	.082	.280**	.573**

Note: NPI = Narcissistic Personality Inventory; SPAI = Smartphone Addiction Inventory; ** p < .01.

use. The direct path between NPI and SPAI, however, was not significant. The mediation test indicated that NPI showed a significant indirect effect on SPAI due to SRB (standardized indirect effect value = .064, p < .01, 95% CI .025 - .102). Older students showed lower SRB. NPI and SRB accounted for 11% of the variance in problematic smartphone use (R^2 = .114). Subsequently, a fully mediated model with only indirect effects of NPI on SPAI via SRB was estimated. The fit of this second model was compared to the first model by applying the difference between the two model chi-squares (Holmbeck, 1997). The fully mediated model had an acceptable fit (χ^2 = 3.221; χ^2/df = 1.07; CFI = .999; RMSEA = .015; RMSEA 90% C.I. = .000 - .093). The path from NPI to SBRs was significant (ß = .204, p < .01) as was the path from SBRs to SPAI (ß = .324, p < .001). Moreover, the chi-square difference ($\Delta\chi^2$ = .261) favored the model in which the relationship between NPI and SPAI is fully mediated by SRB.

For males, all fit indices suggested that the model fits the data well (χ^2 = .329; df = 2, χ^2 /df = .164; CFI = 1.000; RMSEA = .000; RMSEA 90% C.I. = .000 - .065). Fig. 1b shows that, also for males, NPI was positively associated to SRB, which in turn was positively associated with problematic smartphone use. Nevertheless, the mediation test indicated that the indirect effect of NPI on SPAI through SRB was not significant (standardized indirect effect value = .053, p = .074, 95% CI .004 - .102). Additionally, age was

not related to selfies use and the direct relationship between NPI and SPAI was not significant. NPI and SRB accounted for 12% of the variance in problematic smartphone use (R^2 = .122).

Discussion

The study has focused on the mediating role of SRB in the relationship between narcissism and problematic smartphone use and explored gender differences in these relationship patterns. The results of the study show that both in females and males high levels of narcissism are related to more frequent selfie-related behavior. Previous studies have found that narcissism can predict higher levels of self-promoting contents in various SNSs activities (Buffardi & Campbell, 2008; Carpenter, 2012; Charoensukmongkol, 2016). Specifically, the results of the current study are in line with research that has provided evidence for a strong relationship between narcissism and SRB (Biolcati & Passini, 2018; Fox & Rooney, 2015; Lee & Sung, 2016; Sorokowski et al., 2015; Wang et al., 2018; Weiser, 2015) and has shown that the motivation of SRB in narcissistic individuals may reflect a form of strategic self-enhancement aimed to reinforce the constant pursuit of adulation by others (Campbell, Reeder, Sedikides, & Elliot, 2000; McCain et al., 2016). According to the dynamic, self-regulatory processing model of narcissism (Morf & Rhodewalt,

Figures 1 a/b. *Selfie behavior as mediator in the relationship between Narcissism and Smartphone Overuse*
1a. Females
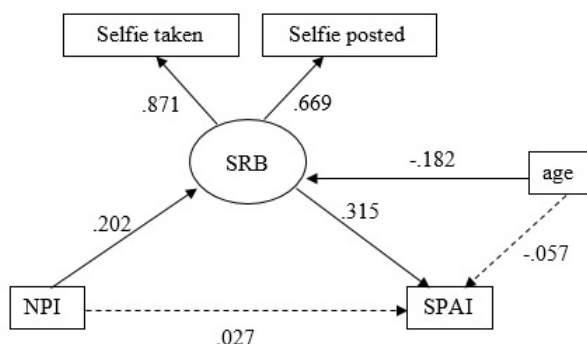
1b. Males
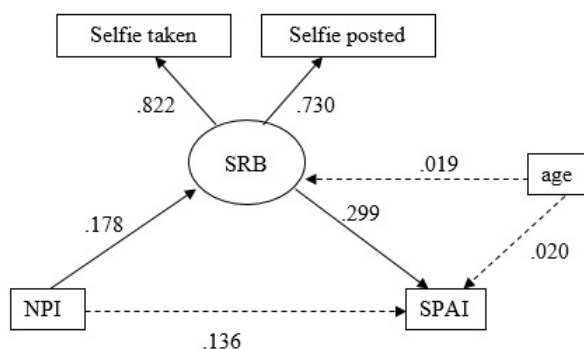
Note: NPI = Narcissistic Personality Inventory. SPAI = Smartphone Addiction Inventory;. SRB = Selfie-related Behavior. Standardized coefficients are presented in the diagram. Significant parameters are represented by solid lines (corresponding p-value at least < .05). Non-significant parameters are represented by dashed lines. Errors were omitted from the diagram.

2001), this finding also suggests that individuals who have higher narcissist traits tend to engage in more selfie-related behavior, in order to meet their self-regulatory objectives of enhancing their grandiose self-views (Wang, 2018; Weiser, 2015).

This study also showed that SRB, namely selfies taken and posted in one day, are associated with PSU. In accordance with previous research (Ding et al., 2014; Mehdizadeh, 2010; Oulasvirta, Rattenbury, Ma, & Raita, 2012), this result suggests that repetitive habitual SRB, like other smartphone habits and practices (e.g. frequently checking dynamic content from Online Social Network), can trigger PSU. Specifically, as Salehan and Negahban (2013) warned, the use of mobile social networking applications positively affects PSU, thus demanding more attention from research on the consequences of intensive use of smartphone applications.

Moreover, findings from this study show that higher narcissistic scores were not directly related to problematic smartphone use, neither for females nor for males. This result clashes with some previous research (e.g., Balta et al., 2019; Pearson & Hussain, 2015), but is in line with others previous findings (e.g., Hussain et al., 2017). Furthermore, and consistent with the hypothesis, in this study, SRB mediated the relationship between narcissism and higher propensity to PSU. However, this mediating effect was not found for males. The present study is the first to investigate the mediating role of SRB on the relationship between narcissism and PSU. Consistent with the *excessive reassurance pathway* by Billieux and colleagues (2015), it might be hypothesized that, for the most narcissistic women SRB, serve as self-regulatory behavior for obtaining 'excessive narcissistic reassurance' linked to their huge need to be admired by others, thus potentially increasing over-involvement in smartphone use.

The gender differences in the mediating role of SRB could be related to potentially relevant culture-specific variables that might explain this variation. In fact, although the dynamic processing model (Morf & Rhodewalt, 2001) suggests possible gender differences in the display of typical narcissistic characteristic-highlighting, with men more likely to exhibit narcissistic behavior, the authors also point out that females are more prone to displaying their narcissistic goals through means that conform to gender-stereotypic expectations of their sex role. In this vein, self-objectification has recently been the focus of relevant research into selfie behavior. The construct of self-objectification refers to the internalization of an observer's perspective as a primary vision of one's body or physical-self, leading one to view and evaluate oneself on the basis of appearance (Fredrickson & Roberts, 1997). Some recent studies have pointed out that for young women self-posting is positively associated with self-objectification (Zheng, Ni, & Luo, 2019) and also related to greater involvement in all selfie behavior (Veldhuis, Alleva, Bij de Vaate, Keijer, & Konijn, 2018).

In other words, findings from this study may suggest that narcissistic women (who are likely to internalize the societal beauty ideals, i.e. slim and toned body appearance), are more prone to showing greater involvement in SRB, in order to fulfill their needs for self-promotion and to enhance their inflated self-view, thus favoring an over-involvement in smartphone use. Nevertheless, further studies examining the potential role of self-objectification in the relationship between narcissism, selfie-related behavior and PSU are needed in order to confirm this hypothesis.

Limitations and strengths

The study has several limitations. Firstly, findings are cross-sectional and the current study does not allow one to draw inferences about the direction of the relationships between the variables examined. In addition, our study only examines the general construct of narcissism. Recent studies have examined the ways in which the different dimensions of narcissism are associated with social media behavior. For example, Singh and colleagues (2018) found that Grandiose Exhibitionism may be the narcissistic trait most strongly linked to self-promoting SNS behavior (e.g., posting frequent "attractive" selfies, and building and interacting with a large, public Facebook community), whereas the Leadership/Authority dimension demonstrated the weakest correlations with selfie posting/sending frequency and other social media behavior. Moreover, other important variables such as the role of the expectations that might shape the production of selfies (Boursier & Manna, 2018), were not assessed and should be examined in future studies. Finally, smartphone behavior has only been captured from self-report measures, which have been described as 'sub-optimal' when compared to phone operator data (Boase & Ling, 2013) or observational approaches.

Despite these limitations, several notable strengths should be considered. Firstly, although empirical studies suggest different patterns of gender differences in PSU, different online activities and narcissism personality traits, this online study provides further understanding of the relationships between narcissism, SBRs and PSU, specifically testing an explicative model of these relationships separately for males and females. The study also presents a conceptual framework for the relationship between personality characteristics (e.g., narcissism) and problematic smartphone use, suggesting a potential mediator (i.e. SRB) in this relationship. This approach may provide a useful investigation model for further examination of the role of other dysfunctional personality traits and smartphone behavior/applications in the development and maintenance of PSU.

Conclusions

In this study, we have investigated how grandiose narcissistic traits and selfie-related behavior can be associated with problematic smartphone use. The results provide further understanding of sex differences in the relationship between personality traits and PSU showing that SRB are significant predictors of smartphone overuse among narcissistic young women. Efforts at prevention and treatment, focusing on gender-linked psychological processes underlying problematic smartphone usage, are thus likely to be effective in reducing individual maladaptive psychological adjustment.

The results also confirm the recent findings on the role of specific personality traits and the adverse effects associated with the use of smartphone applications as significant factors potentially leading to problematic smartphone use. Overall, the findings may have some relevant implications for scholars investigating the mechanisms underlying PSU, suggesting the need for promoting healthy smartphone use among highly narcissistic women.

Authors' contribution

All authors contributed equally to this work. All

authors had full access to all data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

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