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Addictive Behaviors

Testing the role of extended thinking in predicting craving and problematic social network sites use

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ABSTRACT

Background and aims

Problematic Social Network Sites Use (PSNSU) mirrors substance use disorders with regard to symptoms (e.g., diminished control). Recent theoretical advances in the addiction research field recognize a central role of affective and cognitive processes in the development of addictive behaviors. For example, the metacognitive model of addictive behaviors sustains that cognitive processes like extended thinking, disruption in metacognitive monitoring, and thought suppression are associated with addictive behaviors leading to increased craving. The current study aims to test the mediating role of extended thinking (i.e., worry, rumination, and desire thinking) in the relationship between psychological distress and PSNSU.

Methods

A community sample of 548 individuals (F = 68.5%, $M_{age=}$ 29.29 ± 12.04 years) completed an online survey. Structural Equation Modeling (SEM) was utilized to analyze the relationships among the variables under study.

Results

The assessed structural model adequately fits the data, accounting for 89% of PSNSU variance. Psychological distress predicted PSNSU through the mediation of desire thinking and rumination and the serial mediation of (i) worry and craving (ii) desire thinking and craving The model is gender invariant.

Conclusions

The current findings provide preliminary evidence for the role of extended thinking in PSNSU. Worry, rumination and desire thinking may be central cognitive processes in eliciting craving and PSNSU for individuals who experience psychological distress.

1. Introduction

Social Networking Sites (SNSs) are web-based platforms that allow users to construct public or semi-public profiles, create and share content or view and interact with the ones posted by others, and participate in virtual communities (e.g., Boyd & Ellison, 2007; Verduyn et al., 2017). As such, SNSs enable forms of computer-mediated communication (CMC) characterized by multimodality, immediacy, interactivity, and active participation (e.g., Pempek et al., 2009). Given their accessibility and usability for the satisfaction of specific individual needs (e. g., Nadkarni & Hofmann, 2012) – from managing one's self-presentation (e.g., Fioravanti et al., 2023) to keeping up to date about news (Statista, 2023) – SNSs quickly became the primary media source used by

adolescents and young adults (Ofcom, 2023). SNSs penetration rate has been continuously increasing across all regions over the past years, and current estimates indicate nearly 5 billion users worldwide, with most adolescent and young adult users checking their accounts daily (Statista, 2022).

Despite the several benefits and opportunities that SNSs can offer, their rapid and extensive growth sparked a debate among clinicians about whether the use of such platforms held the potential to be problematically used as some forms of excessive use seem to mirror substance use disorders (e.g., Andreassen, 2015). In 2015, the World Health Organization (WHO) stated that the excessive use of social media represents a source of concern for public health (WHO, 2015), and a recent review on the global prevalence of digital addictions found a pooled

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prevalence estimate of 17.42 % for problematic patterns of SNSs use (Meng et al., 2022).

Problematic Social Networking Sites use (PSNSU) consists of diminished control over the use of social networks, increasing priority given to using social networks, and continuation of using social networks despite experiencing negative consequences in everyday life (Andreassen, 2015). Users who develop PSNSU become overly concerned about SNSs, driven by a strong motivation to use SNSs and devote a great amount of time and effort to SNSs to the degree that it impairs other social activities, education and/or occupation, interpersonal relationships and/or psychological health and wellbeing (Andreassen, 2015).

Some authors suggested that PSNSU may pertain to the ICD-11 (WHO, 2022) category "other specified disorder due to addictive behaviors" (Brand et al., 2020) based on empirical evidence highlighting i) clinically significant distress and functional impairment in day life due to the behavior, ii) the pertinence of the addiction framework to explain PSNSU, and iii) the key mechanisms involved are similar with those involved in other addictive behaviors (e.g., Müller, 2016). Yet, PSNSU has not been recognized as a mental disorder by international diagnostic systems to date and some authors argue that it may be a temporary compensatory strategy to cope with transient negative states (Casale, 2020). Consequently, we will use the expression "Problematic Social Networking Sites use" as the use of the term disorder seems to be premature in the present field.

The impact and the high prevalence of PSNSU encouraged an examination of the contributing factors to this problematic behavior in the last three decades. As evidenced by recent meta-analyses, personality factors related to PSNSU encompass neuroticism, conscientiousness (Akbari et al., 2023), low self-esteem (Saiphoo et al., 2020), and narcissism (Casale & Banchi, 2020). Other meta-analyses (Marino et al., 2018; Huang, 2020; Shannon et al., 2022) reported that negative emotions such as anxiety, stress, and depression significantly predict problematic social media use. Individuals could develop PSNSU as a consequence of using SNSs as a strategy to cope with high psychological distress (e.g., Marino et al., 2018).

1.1. Theoretical framework

Recent theoretical advances in the addiction research field recognize a central role to affective and cognitive processes in the development and maintenance of addictive behaviors. In particular, three theories are crucial for having detected specific thinking patterns and affective responses involved in addictive behaviors. The Interaction of Person-Affect-Cognition-Execution (I-PACE) model (Brand et al., 2019) posits that the development and the subsequent consolidative process of addictive behaviors is determined by an interaction of predisposing variables (e.g., personality traits), cognitive and affective responses to specific stimuli, and executive functions such as general inhibitory control. The I-PACE model has been extensively adopted in the research field of addictive behaviors, with studies applying it to PSNSU (e.g., (Hussain et al., 2021) as well as to other technology-related addictive behaviors concerning smartphone use, Internet use and gaming (e.g., Jhone et al., 2021; Mehmood et al., 2021). Additionally, the application of the Self-Regulation Executive Function (S-REF) model by Wells and Matthews (1996) to addictive behaviors (Spada et al., 2015) led to the formulation of a triphasic metacognitive model of addictive behaviors in which cognitive processes like extended thinking (i.e., worry, rumination and desire thinking), selective attentional biases, disruption in metacognitive monitoring and thought suppression concur to a dysfunctional self-regulatory mode – i.e., the Cognitive-Attentional Syndrome (CAS; Wells & Matthews, 1996) – that prompts the addictive behavior and lead to increased levels of craving and engagement. The activation of the CAS is driven by maladaptive metacognitions (such as positive metacognitions about the usefulness of engaging in aspects of the CAS – e.g., 'Worrying will help me cope') in an attempt to regulate

negative thoughts and emotions (Wells, 2000). However, the cognitive coping strategies of the CAS allocate attentional resources to the unpleasant internal experiences, thus not helping to downregulate them but rather favoring their prolongation and the experience of craving (Spada et al., 2015). Results in the field of digital addictions show promising evidence towards the applicability of the metacognition framework to PSNSU as well as to other technology-related addictive behaviors (for a review, see Casale et al., 2021). Lastly, the Elaborated Intrusion (EI) Theory of Desire (Kavanagh et al., 2005; May et al., 2004) underlines the role of cognitive processes – both automatically and voluntarily activated –in activating and maintaining craving. Studies following this framework provided evidence that Desire Thinking (DT) – a voluntary and conscious cognitive process oriented to prefigure images, information, and memories about the positive target-related experience – is crucial for a better understanding of processes underlying the escalation and persistence of the craving experience (Caselli & Spada, 2015). Recently, DT and metacognitions have been proposed to fit into the cognitive responses identified by the I-PACE model (Brandtner et al., 2021), manifesting a shared recognition of the contribution of extended thinking styles and cognitive processes when developing theories regarding addictive behaviors.

When it comes to PSNSU, some evidence emerged about the role of extended thinking. In particular, rumination – a self-focused, repetitive thinking style spiraling around the experience, the causes and the consequences of a context or a situation characterized by negative affectivity (Smith & Alloy, 2009) – appears to mediate the relationship between internalizing symptoms and levels of PSNSU (Chentsova et al., 2023; Dempsey et al., 2019). In detail, individuals who reported higher internalizing symptoms (i.e., depressive and social anxiety symptoms) also described greater PSNSU via higher engagement in ruminative thinking (Chentsova et al., 2023). Consistently, rumination was found to be associated with problematic Facebook use (PFU) severity and mediated its relationship with social anxiety (Dempsey et al., 2019). The already described DT was found to be positively associated with PSNSU after controlling for boredom, affect, and impulsivity (Mustoo Başer et al., 2022). Imaginal prefiguration (i.e., the DT component related to the individual imagining themselves doing the desired activity), in particular, was significantly related to problematic social media use (Awad et al., 2022; Solem et al., 2021). Moreover, evidence emerged about the role of DT as a potential underlying mechanism linking established variables associated with problematic social media use (negative affect, impulsivity, and thought suppression) to craving and problematic social media use (Sharifi Bastan et al., 2022). Finally, DT and positive metacognitions about DT were found to be central cognitive processes in eliciting craving and PSNSU among individuals who experience boredom proneness and fear of missing out (Bocci Benucci et al., 2023).

To our knowledge, no study directly examined the role of worry (the third form of extended thinking of the CAS) in PSNSU. Worry is "a chain of repetitive thoughts and images negatively affect-laden and relatively uncontrollable. The worry process represents an attempt to engage in mental problem-solving on an issue whose outcome is uncertain but contains the possibility of one or more negative outcomes. Consequently, worry relates closely to fear process" (Borkovec et al., 1983, p.10). Worry typically concerns negative future events and attempts to avoid negative outcomes or prepare for the worst (e.g., Borkovec et al., 1998). Although chronic worry is a clinical feature of Generalized Anxiety Disorder, it is also a common cognitive process in other psychological disorders (e.g., panic disorder, obsessive–compulsive disorder, anorexia nervosa) as well as in the non-clinical population (Papageorgiou, 2006). Similarly to rumination, worry has been linked to negative consequences, such as increments in negative intrusive thoughts and emotions, that interfere with adopting effective self-regulatory strategies (Papageorgiou, 2006). Both worry and rumination are self-focused negative repetitive thinking styles (e.g., McEvoy et al., 2013), the first describing concerns with a future time perspective

(Borkovec et al., 1983) and the latter being more distinctively characterized by a focus on feelings and past experiences (Nolen-Hoeksema, 1991). DT is a form of extended thinking that shares with rumination and worry a self-focused attentional orientation and a perseverative nature, but it differs in terms of the proportion of imagery-based elaboration and the degree of focus on decision-making and planning instrumental behavior (Caselli & Spada, 2015). Despite these conceptual differences, within the metacognitive model of addictive behaviors worry, rumination and DT are considered unhelpful coping strategies that perpetuate the accessibility of intrusions (in response to which they have been activated) and predict craving and engagement in the addictive behavior as a means of achieving self-regulation. The activation of extended thinking in response to internal triggers (such as psychological distress) leads to an escalation of negative affect and craving. Consequently, the individual becomes more likely to use SNSs to regulate these feelings and resolve the discrepancy between current and desired states. To date, no study has provided a comprehensive model accounting for the specific contribution of each form of extended thinking in eliciting craving and PSNSU.

1.2. The current study

The current study aims to expand the understanding of the role of cognitive processes in determining craving and, consequently, PSNSU. Specifically, we aimed to fill the identified gap in the literature by testing the role of extended thinking styles like worry, rumination and desire thinking in the relationship between psychological distress and PSNSU. The proposed model is displayed in Fig. 1. In particular, following the proposed conceptualization, we hypothesize that (1) individual levels of psychological distress lead to the activation of extended thinking – worry, rumination and DT – as an attempt to cope with the negative affect; (2) extended thinking styles subsequently increase craving, which in turn leads to PSNSU. Age would be considered as a control variable, as previous studies have shown that younger people report more psychological distress (e.g., Twenge et al., 2019) and higher levels of PSNSU (Montag et al., 2024). Since previous studies suggested gender differences in PSNSU symptoms and in the relationship between psychological distress (i.e., depression and anxiety

symptoms) and PSNSU (Wang et al., 2022), the gender invariance of the hypothesized model will be tested.

2. Methods

2.1. Participants

An a priori analysis was conducted using G*Power (Faul et al., 2009) to determine the sample size adequacy. The results indicated that 204 participants would be necessary to achieve a power of 0.95 by assuming a medium effect size (f2 = 0.15) and an alpha level of 0.05.

A sample of 548 SNSs users (M_{age} = 29.29 ± 12.04 years; %Females = 68.5 %) participated in the study. Concerning educational qualifications, 35% of the sample reported having a high school diploma, 29.90% a bachelor's degree, 18.10% a master's degree, 9.5% a middle school diploma, and the remaining 7.8% a higher qualification (e.g., Ph.D). The most reported occupation was being a student (38.10%), followed by worker (35.20%), working student (20.40%), 4.6% unemployed, and the remaining 1.60% declared to be retired. Considering participants' relationship status, 40.70 % declared being single, 33.40 % had a non-cohabiting partner, and 25.90 % had a cohabiting partner.

2.2. Measures

2.2.1. Psychological distress

Psychological distress was measured using the 21-item Italian version (Bottesi et al., 2015) of the Depression Anxiety Stress Scales-21 (DASS-21; Lovibond & Lovibond, 1995). In the DASS-21, distress is conceptualized along three dimensions: depression, anxiety, and stress. Respondents are asked to indicate on a 4-point Likert scale ranging from 0 *(Did not apply to me at all)* to 3 *(Applied to me very much or most of the time)* how much the item represents their state over the previous past week and higher scores mean higher levels of psychological distress. A sample item is "I felt downhearted and blue". In the current sample, Cronbach's alpha for the total scale was 0.94, and McDonald's Omega was 0.94.
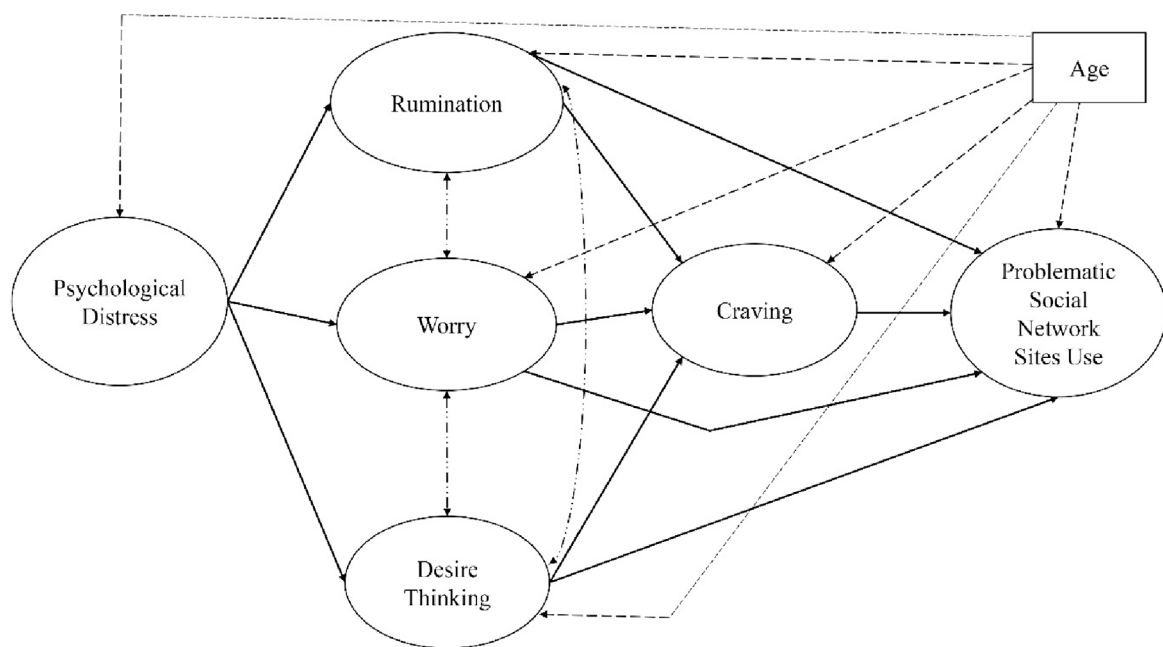

Fig. 1. Hypothesized model.

2.2.2. Rumination

Rumination was measured using the Italian version (Palmieri et al., 2007) of the 22-item Ruminative Response Scale (Treynor et al., 2003). Participants are asked to respond on a 4-point Likert scale ranging from 1 (*Almost never)* to 4 (*Almost always*), considering what they think or do when they feel down, sad, or depressed, not what they think they should do. Higher scores indicate a higher tendency to ruminate. A sample item is "I think 'What am I doing to deserve this?'". In the current sample, Cronbach's alpha was 0.91, and McDonald's Omega was 0.91.

2.2.3. Worry

Worry was assessed using the Italian version (Morani et al., 1999) of the 16-item Penn State Worry Questionnaire (Meyer et al., 1989). Items are presented on a 5-point Likert scale ranging from 1 (*Completely disagree*) to 5 (*Completely agree*). Higher scores indicate a higher tendency to worry. A sample item is "I worry about projects until they are all done". In the current sample, Cronbach's alpha for the total scale was 0.93, and McDonald's Omega was 0.93.

2.2.4. Desire thinking

DT about SNSs use was assessed using the Italian 10-item Desire Thinking Questionnaire (DTQ; Caselli & Spada, 2011). The scale comprises two subscales that measure the imaginal prefiguration and the verbal perseveration components of desire thinking. Participants are asked to respond on a 4-point Likert scale ranging from 1 (*Almost never)* to 4 (*Almost always*). Higher scores indicate higher levels of desire thinking. A sample item is "I repeat mentally to myself that I need to use Social Networks". In the current sample, Cronbach's alpha for the total scale was 0.85, and McDonald's Omega was 0.85.

2.2.5. Craving

Craving related to Social Network use was assessed using the modified version of the 5-item Penn Alcohol Craving Scale (PACS-SNSs; Hormes et al., 2014) as was previously done in an Italian study (Marino et al., 2018). Participants are asked to respond on a 7-point Likert Scale investigating the frequency, intensity, and strength of craving for Social Network use. Higher scores indicate higher craving. Each item addresses experiences within the past week, and a sample item is "During the past week, how often have you thought about Social Networks or how good it makes you feel to check Social Networks?". In the current sample, Cronbach's alpha was 0.86, and McDonald's Omega was 0.87.

2.2.6. Problematic Social Networking Sites Use

PSNSU was measured using the Italian version (Monacis et al., 2017) of the 6-item Bergen Social Media Addiction Scale (BSMAS; Andreassen et al., 2016). Participants give their answers on a 5-point Likert scale ranging from 1 (*Very rarely*) to 5 (*Very often*). Higher scores indicate higher PSNSU. Each item addresses experiences within 12 months; a sample item is "How often during the last year have you used social networks so much that it has had a negative impact on your job/studies?". In the current sample, Cronbach's alpha was 0.83, and McDonald's Omega was 0.83.

2.3. Procedure

Participants were recruited using advertisements on Social Network groups, and they were informed that participation was voluntary and anonymous and that confidentiality was guaranteed. A web link directed the participants to the study survey. If they consented to participate, it was asked to answer some demographic questions, questions regarding their SNSs use, and a batch of self-report questionnaires. Since submitting the form without filling in all the required fields was not allowed, the results did not present missing data. Data were collected between April 2023 and November 2023, and no remunerative rewards were given.

2.4. Statistical analysis

Descriptive statistics and Pearson's correlations between the study variables were computed. In order to verify the theoretical hypothesized model (Fig. 1), Structural Equation Modeling (SEM) was performed using the lavaan package for the R statistical software (version 4.2.1) with the Maximum Likelihood (ML) estimation method. To limit the number of parameters to be estimated, parcelling was calculated using an empirically equivalent method (Landis et al., 2000), by assigning items in such a way that the parcels will have equal means, variances, and reliabilities. To evaluate the model's goodness of fit, we considered the χ^2 (and its degrees of freedom and p-value), the Standardized Root Mean Square Residual (SRMR) "close to" 0.09 or lower, the Comparative Fit Index (CFI) "close to" 0.95 or higher, and the Root Mean Square Error of Approximation (RMSEA) less than 0.08 (Hu & Bentler, 1999). The indirect effects were tested using the bootstrapping method with 5000 bootstrap samples (MacKinnon et al., 2002).

2.5. Ethics

The study procedures were carried out in accordance with the Declaration of Helsinki. The Institutional Review Board of the University of Florence approved the study. All subjects were informed about the study, and all provided informed consent.

3. Results

3.1. Descriptive statistics and correlational analyses

Regarding participants' use of Social Networks, the sample reported spending 14.75 ± 11.58 h a week using Social Networks. The Social Networks they declared to use the most were Instagram (57.1 %), Facebook (13.9 %), and TikTok (13.3 %).

Descriptive statistics and Pearson's correlation among the study variables are presented in Table 1. Significant and positive correlations were found between all the study variables.

3.2. Structural equation modeling

The assessed structural model accounted for 89 % of the variance of Problematic Social Networking Sites Use and showed good fit indices: χ^2 = 492.515, df = 191, p < .001; χ^2/df = 2.57; RMSEA [*90 %CI*] = 0.05 [0.05–0.06]; CFI = 0.96; SRMR = 0.04. The standardized estimates are depicted in Fig. 2. Psychological distress predicted PSNSU via the serial mediation of (i) worry and craving and (ii) desire thinking and craving. Rumination and desire thinking also significantly mediate the association between psychological distress and PSNSU. Indirect effects are presented in Table 2. Age was negatively associated with psychological distress, rumination, craving and desire thinking.

A multigroup SEM analysis was also conducted to evaluate the model invariance across men and women. The fit indices of the model split by gender (configural invariance) seemed acceptable: χ^2 = 506.160, df = 392, p < .001; χ^2/df = 1.29; RMSEA [*90 %CI*] = 0.03[0.02–0.04]; CFI = 0.97; SRMR = 0.04. Testing the metric invariance did not seem to deter the model fit significantly: $\Delta \chi^2$ = 24.182(15) p = .06; Δ CFI = -0.001; Δ RMSEA = 0.003; Δ SRMR = 0.004. Finally, testing the scalar invariance did not seem to worsen the model fit significantly: $\Delta \chi^2$ = 11.794(8) p = .16; Δ CFI = 0.00; Δ RMSEA = 0.000; Δ SRMR = 0.000. Therefore, the model is independent of gender.

4. Discussion

By combining the theoretical assumptions of the I-PACE model (Brandtner et al., 2021), the S-REF model applied to addictive behaviors (Spada et al., 2015) and the EI theory of desire (Kavanagh et al., 2005; May et al., 2004), the present study aimed to test the role of extended

Table 1
Descriptive statistics and correlations.

	$M \pm SD$	1.	2.	3.	4.	5.	6.	7.	8.
1. Psychological Distress	21.03 ± 13.70	–							
2. Rumination	53.91 ± 13.40	.65**	–						
3. Worry	51.93 ± 14.22	.58**	.59**	–					
4. Desire Thinking − Verbal Perseveration	6.49 ± 2.25	.29**	.31**	.18**	–				
5. Desire Thinking − Imaginal Prefiguration	6.59 ± 2.43	.29**	.28**	.21**	.60**	–			
6. Desire Thinking − Total	13.09 ± 4.19	.32**	.33**	.22**	.89**	.90**	–		
7. Craving	10.34 ± 6.63	.38**	.39**	.34**	.41**	.59**	.57**	–	
8. Problematic Social Networking Sites Use	12.81 ± 5.38	.45**	.49**	.41**	.51**	.63**	.64**	.73**	–
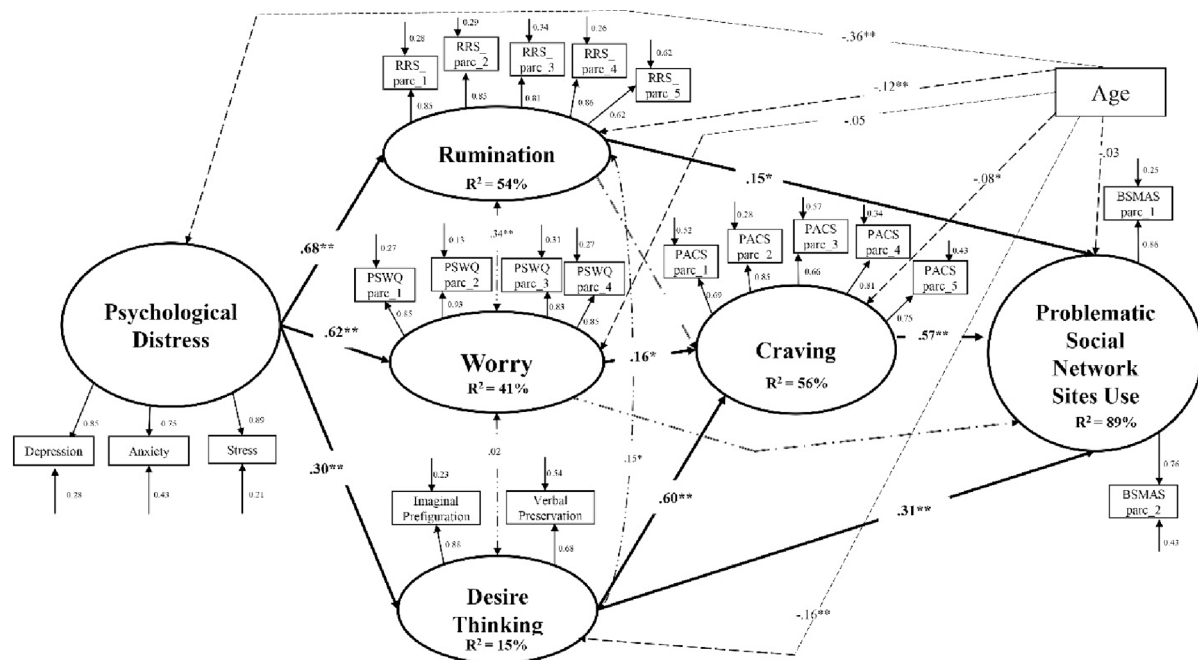
Fig. 2. Results of the SEM.

thinking styles (i.e., worry, rumination and desire thinking) in the relationship between psychological distress and PSNSU. The hypothesized model was supported, as it has shown the impact of extended thinking in this relationship. Indeed, in line with the metacognitive model of addictive behaviors (Spada et al., 2015), all three forms of extended thinking, activated in response to psychological distress, predict craving and PSNSU.

The role of rumination as a relevant cognitive process that explains the relationship between internalizing symptoms and PSNSU has already been previously reported (Chentsova et al., 2023; Dempsey et al., 2019). The current findings confirm that engagement in ruminative thinking could lead to PSNSU for individuals who report stress, anxiety and depression symptoms. Moreover, consistent with what has been reported for other technology-related addictive behaviors, such as problematic smartphone use, people who use rumination to cope with psychological distress may be more likely to use SNSs excessively or problematically in an attempt to regulate their negative emotions (e.g., Elhai et al., 2018). Results showed that rumination in response to psychological distress was associated with PSNSU only directly (i.e., not through the mediation of craving). This result could be explained by the fact that using SNSs is easily achievable (via the smartphone), and consequently, craving for SNSs use could be a transient experience.

In line with previous studies, the role of DT in craving and PSNSU was confirmed (e.g., Bocci Benucci et al., 2023; Sharifi Bastan et al., 2022). DT may be activated as a cognitive strategy to regulate negative

internal states (psychological distress) that fails as, in the medium to longer term, it may lead to an escalation of negative emotions and craving since the desired activity (in this case SNSs use) is perseveringly thought but not achieved (Caselli & Spada, 2015). Thus, SNSs use may be perceived as the only route to reduce psychological distress and craving, consequently increasing the probability of engaging in PSNSU as a self-regulation strategy.

The current findings provide, for the first time, preliminary evidence for the role of worry in PSNSU. As for the other two forms of extended thinking (i.e., rumination and DT), worry was found to mediate the relationship between psychological distress with craving and PSNSU. Previous studies have supported the association between high levels of worry and the tendency to use alcohol in problematic drinkers (e.g., Goldsmith et al., 2009). In particular, results indicate that tension- and worry-reduction alcohol expectancies and drinking to cope motives help to explain the relationship between generalized anxiety and negative-affect heavy drinking (Goldsmith et al., 2009). Similarly, it is possible to hypothesized that craving for SNSs and PSNSU could serve as a coping strategy to reduce the negative intrusive thoughts and emotions prompted by worry.

Regarding gender invariance, when we explored potential differences in the structural model across men and women, the model was found to be independent of gender. This result provides preliminary evidence that the same path leading from psychological distress to craving and PSNSU through the mediation of extended thinking styles (i.

Table 2
Indirect effects.

	Estimate	Standard Error	p	CI lower	CI Upper
Psychological Distress → Worry → Craving → Problematic Social Network Sites Use	0.166	0.061	0.006	0.047	0.285
Psychological Distress → Worry → Problematic Social Network Sites Use	0.105	0.088	0.234	−0.068	0.277
Psychological Distress → Rumination → Craving → Problematic Social Network Sites Use	0.106	0.069	0.127	−0.030	0.241
Psychological Distress → Rumination → Problematic Social Network Sites Use	0.300	0.095	0.002	0.114	0.486
Psychological Distress → Desire Thinking → Craving → Problematic Social Network Sites Use	0.299	0.076	0.000	0.151	0.448
Psychological Distress → Desire Thinking → Problematic Social Network Sites Use	0.268	0.084	0.001	0.103	0.433

e., worry, rumination and desire thinking) could be involved in both men and women.

Overall, the findings of the present study suggest that, as for other addictive behaviors, adopting a theoretical framework that recognizes the relevance of cognitive and affective processes might prompt the understanding of the mechanisms that underpin PSNSU.

This study has several limitations that must be mentioned. First, it relies solely on self-report data, subject to measurement errors. Second, a cross-sectional design was adopted, which precludes causal inferences. Indeed, an inverse relation between PSNSU and psychological distress could exist based on previous findings that have linked excessive SNSs use and PSNSU to high levels of psychological distress, among other negative mental health outcomes (e.g., Keles et al., 2020). Future studies could provide much insight into the directionality of this relationship and further ascertain the role of extended thinking in the predisposition toward and maintenance of PSNSU by adopting longitudinal designs (e. g., using the Ecological Momentary Assessment procedure). Moreover, through experimental designs, future research should explore the effect of extended thinking induction on the craving experience for SNSs use and the perception of control over one's SNSs-related behavior. Third, the non-probability sampling method (i.e., convenience sampling) limited the results' generalizability. Further research is required to explore the role of extended thinking in the relationship between psychological distress and PSNSU across different populations of interest (e. g., adolescent populations and clinical populations). Moreover, potential confounders such as socio-economic status and income level of the participants were not controlled for. Finally, our study focused solely on extended thinking as a mediator in the association between psychological distress, craving and PSNSU. In line with the metacognitive formulation of addictive behaviors (Spada et al., 2015), attentional bias, thought suppression and metacognitive beliefs should also be explored in future studies.

4.1. Conclusions

The current study is the first to provide preliminary evidence for applying a comprehensive model accounting for the specific contribution of each form of extended thinking (i.e., worry, rumination and desire thinking) in eliciting craving and PSNSU for individuals who

experience psychological distress. If future studies with more accurate designs will confirm the current results, several implications for the assessment and treatment of PSNSU may be drawn. In terms of assessment, it may be helpful to gather information not only about negative affect and the experience of craving for SNSs use but also about the individual engagement in unhelpful cognitive coping strategies, like extended thinking. Concerning interventions, interventions aimed at attenuating the propensity to engage in worry, rumination and desire thinking and addressing psychological distress with more adaptive coping mechanisms might help reduce the risk of PSNSU. This could be addressed, for example, by applying Detached Mindfulness, which involves encouraging individuals to observe their emotions and thoughts without trying to control or change them, and using techniques to postpone extended thinking.

CRediT authorship contribution statement

Sara Bocci Benucci: Writing – original draft, Formal analysis, Data curation, Conceptualization. **Benedetta Tonini:** Investigation, Data curation. **Silvia Casale:** Writing – review & editing, Supervision. **Giulia Fioravanti:** Writing – review & editing, Supervision, Methodology, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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