Problematic social networking site use and associations with anxiety, attention deficit hyperactivity disorder, and resilience

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ABSTRACT

Background: Social networking sites (SNSs) such as Facebook, Snapchat, and Instagram are now used frequently by millions of people worldwide. However, there are concerns of problematic social networking site use (PSNSU) and psychopathological symptoms that may be co-morbid with this behaviour. The present study investigated the interactions between PSNSU severity, time spent on SNSs, anxiety severity, attention deficit hyperactivity disorder (ADHD) severity, and resilience levels.
Method: A total of 458 SNS users (mean age = 32.35 years, SD = 10.44) completed an online survey consisting of measures assessing PSNSU severity, anxiety severity, ADHD severity, and resilience levels.
Results: Bivariate correlations identified moderate positive correlations between PSNSU severity, time spent on SNSs, anxiety severity, and ADHD severity, and a negative correlation between PSNSU severity and resilience levels. The moderated regression analyses revealed that anxiety severity as well as the interaction of anxiety severity and resilience levels significantly explained 28.6% of the variance in PSNSU severity. The simple slopes analysis was calculated indicating the main effect of anxiety severity. Furthermore, ADHD severity was also a significant predictor of PSNSU severity, but there was no significant interaction effect with resilience levels. Additional analysis illustrated that both variables investigating psychopathological symptoms significantly interact in predicting PSNSU severity. There was no significant effect of the three-way interaction between anxiety severity, ADHD severity, and resilience levels.
Conclusion: The study showed that anxiety severity and ADHD severity are risk factors in the development of PSNSU severity and resilience levels may have a preventive effect, which must be investigated in further studies.

1. Introduction

Social networking sites (SNSs) are an essential part of everyday life, allowing users to connect and socialise with friends, family, and work colleagues. There are now more than 2 billion SNS users worldwide (Statista.com, 2018). However, public health concerns have been voiced concerning the propensity of problematic SNS use (PSNSU) and potential associations with clinical disorders among a minority of users (World Health Organization, 2015). Andreassen and Pallesen (2014, p.4054) have described PSNSU "*as being overly concerned about SNSs, driven by a strong motivation to log on to or use SNSs, and to devote so much time and effort to SNSs that it impairs other social activities, education and/or occupation, interpersonal relationships, and/or psychological health and wellbeing*". Other than gaming disorder (King & Potenza, 2019; Pontes et al., 2019), PSNSU is not formally recognised as a clinical

disorder. However, researchers have argued that the eleventh edition of the International Classification of Diseases (ICD-11; World Health Organization, 2019) designation of "other specified disorders due to addictive behaviours" to be useful for diagnosing and investigating problematic behaviour, even if the designation outlines that more research regarding clinical impairments and underlying mechanisms is needed (Brand et al., 2020). In line with this, it has been highlighted that there is increasing evidence showing that PSNSU is detrimental to mental health and so requires further investigation (Hussain et al., 2020; Hussain & Griffiths, 2018).

1.1. Theoretical embedding of PSNSU

To investigate PSNSU in more detail, a theoretical embedding is needed, which describes and mainly explains key components and

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underlying mechanisms of the problematic behaviour, and for PSNSU an addiction framework has been used widely (Brand et al., 2020). For example, the compensatory internet use model (Kardefelt-Winther, 2014) explains this problematic behaviour by suggesting that PSNSU is a reaction by the individual to his/her negative life situation (i.e., experiencing anxiety). This is in line with the idea of two interacting pathways named the fear-driven and reward-driven hypotheses resulting in PSNSU by Wegmann and Brand (2019). The authors argue that for the fear-driven hypothesis based on negative reinforcement mechanisms, feelings of anxiety and the desire to gratify or compensate unsolved needs are key factors for PSNSU, whereas the reward-driven pathway is mainly based on positive reinforcement and the experience of gratification (Wegmann & Brand, 2019). Comparably, the I-PACE (Interaction of Person-Affect-Cognition-Execution) model (Brand et al., 2016, 2019) describes how psychiatric symptoms interact with cognitive and affective mechanisms, which could result in a loss of control when using SNSs, consequently leading to PSNSU. The theories encourage empirical investigations of wellbeing and potential preventive factors in the context of PSNSU by keeping predisposing variables, for example psychopathological symptoms, and underlying mechanisms such as reinforcement, interacting processes in mind. The theories also show that psychopathological symptoms (such as anxiety, depression, and ADHD) may be associated with PSNSU.

1.2. Empirical evidence regarding psychopathological symptoms, resilience, and PSNSU

When focusing on the environmental structure and features of SNSs and the empirical evidence, it can be observed that communication in SNSs invariably takes place online; this is an environment that may be suited to people with anxiety (Prizant-Passal et al., 2016; Shaw et al., 2015). Research has shown that individuals with high levels of anxiety view online communication to be significantly less threatening than face-to-face communication (Lee & Stapinski, 2012). Recent SNS studies have reported significant associations between PSNSU and anxiety among large study samples (e.g., Andreassen et al., 2016; Atroszko et al., 2018; Hussain & Griffiths, 2019; Van Rooij et al., 2017; Worsley et al., 2018). Related to the subject, clinical research studies utilising Young's Internet Addiction (Young, 1998) have reported the prevalence of problematic Internet use with attention deficit hyperactivity disorder (ADHD) and anxiety (Bernardi & Pallanti, 2009; Enagandula et al., 2018; So et al., 2017). SNSs encourage users to post messages, update their status, upload content, respond to notifications, and continue to monitor their SNS profile. These activities may cause inattention, distraction, and disorganisation (Andreassen et al., 2016); symptoms that are associated with ADHD. Andreassen et al. (2016) conducted a large online survey study showing that correlations between symptoms of PSNSU and the mental disorder symptoms of ADHD, OCD, anxiety, and depression were all positive. Regression analysis demonstrated that the mental health variables explained 15% of the variance in PSNSU. Turel and Bechara (2016) reported that ADHD symptoms promoted increased stress and reduced self-esteem, which in turn, together with ADHD symptoms, increased craving to use SNSs. Similarly, Settanni et al. (2018) found that ADHD symptoms positively predicted PSNSU. Hussain and Griffiths (2019) reported that ADHD and anxiety were significant predictors of PSNSU, the researchers argued that ADHD may be comorbid with anxiety. Together, these studies show that psychopathological symptoms tend to be associated with PSNSU. However, besides the predisposing variables increasing the risk of the development and maintenance of PSNSU, it is in addition important to consider potential factors that could help prevent negative consequences. One factor that may be essential to positive health and wellbeing is resilience. Resilience has become a focus of research in the behavioural and medical sciences (Charney, 2004; Masten, 2001). Several studies already outlined that resilience was negatively associated with PSNSU (Choi et al., 2015; Hou et al., 2017; Kim et al., 2014; Kim & Roh, 2016).

However, besides the direct relationship between resilience and PSNSU, a small number of studies have investigated resilience as a moderating or mediating factor in online behaviour. They illustrate that the effect of specific predisposing variables such as perceived stress, mental, and health issues on problematic online behaviour was moderated by resilience, which showed that resilience could buffer the impact of those predisposing factors (Canale et al., 2019; Chen et al., 2018; Choi et al., 2014; Hou et al., 2017).

1.3. Aim of the current study

In summary, specific risk factors such as anxiety and ADHD have been shown to be related to PSNSU. Based on this, it is therefore important to identify factors that mitigate associations between psychiatric disorder symptoms and PSNSU, as it is important to prevent the vulnerable position where people with psychopathological symptoms become even worse (by becoming a problematic SNS user). Previous studies suggest that resilience could be a positive factor in preventing maladaptive behaviours such as PSNSU. In understanding people who are faced with health problems relating to SNS use, it is important to identify whether these people exhibit resilience. Examining resilience among SNS users may provide unique and important information about coping with PSNSU. The present study investigated the interactions between PSNSU severity, time spent on SNSs, anxiety severity, ADHD severity, and resilience levels. Therefore, it is assumed that psychopathological symptoms such as anxiety severity and ADHD severity may lead to a higher chance of tendencies towards PSNSU as well as time spent on SNSs. In addition, it is hypothesized that the relationship between psychopathological symptoms and PSNSU severity or time spent on SNSs is moderated by resilience levels showing that resilience will mitigate the association between psychiatric disorder symptoms and PSNSU symptoms (see Fig. 1).

2. Method

2.1. Participants

There were 490 responses, after a reliability check to screen for attentiveness and accuracy of responses (i.e., participants were asked to respond to a question assessing attentiveness and honesty) there were 483 valid responses, a similar type of reliability analysis was utilised in past research and was associated with more reliable responses (Rouse, 2015). Partial responses were then removed leaving a total sample of 458 participants.

2.2. Design and materials

An online survey design was utilised, the survey comprised of four psychological instruments that together assessed the associations between PSNSU severity, anxiety severity, ADHD severity, and resilience levels, these instruments are described below.

2.2.1. Bergen Social Media Addiction Scale

PSNSU severity was assessed using the Bergen Social Media Addiction Scale (BSMAS) which is a modified version of the Bergen Facebook Addiction (BFAS; Andreassen et al., 2012). Scale questions were modified by Andreassen et al. (2016) by using the word 'social media'. There are six questions that assess the six criteria of addiction outlined by Griffiths (2005), i.e., salience, conflict, mood modification, withdrawal, tolerance, and relapse. Example questions include: 'How often during the last year have you felt an urge to use social media more and more?' and 'How often during the last year have you used social media to forget about personal problems?' Participants rate all items on a 5-point Likert scale form 1="very rarely" to 5="very often". Internal consistency of the BSMAS was very good in the present study (Cronbach's α=.81).
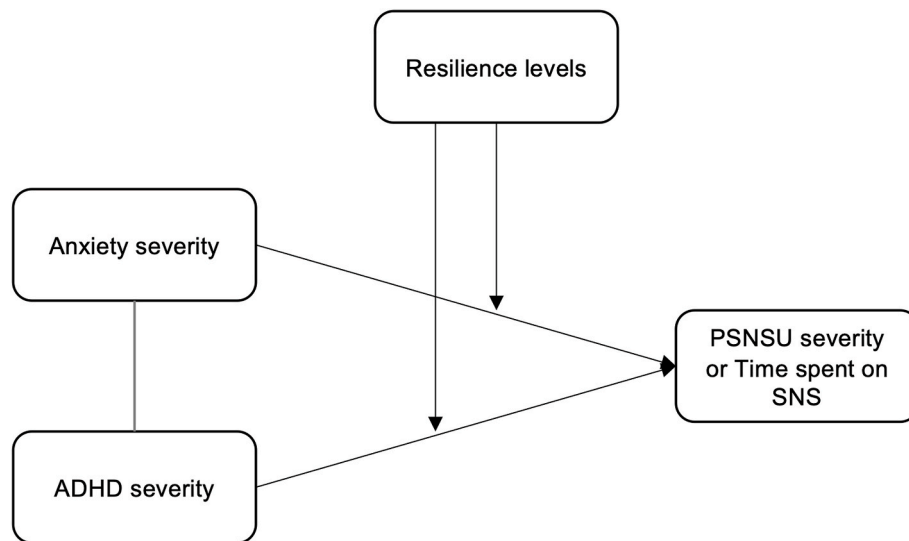
Fig. 1. The operationalized model to analyse the main assumptions with PSNSU severity as well as Time spent on SNS (hours per day) as dependent variables. It is assumed that the effect of anxiety severity and ADHD severity on PSNSU severity and time spent on SNS is moderated by resilience.

2.2.2. Beck Anxiety Inventory

Anxiety severity was assessed using the Beck Anxiety Inventory (BAI; Beck et al., 1988). The BAI measures the frequency of one experiencing anxiety symptom severity. The scale consists of 21 items which describe common symptoms of anxiety, participants rated all items on a 4-point Likert scale ranging from 0="not at all" to 3= "severely – it bothered me" on how much they had experienced the symptoms. Example items include 'numbness or tingling', 'unable to relax', 'difficulty in breathing', 'hot/cold sweats'. Internal consistency of the BAI was excellent in the present study (Cronbach's α=.97).

2.2.3. ADHD Self-Report Scale

ADHD severity were assessed using the Adult ADHD Self-Report Scale (ASRS, version 1.1; Kessler et al., 2005). The ASRS is a 18 item scale developed by the WHO for adult ADHD and is designed to evaluate current ADHD symptoms. It consists of 18 items based on DSM IV criteria adapted for adults with ADHD (American Psychiatric Association, 1994), and are measured on a 5-point Likert scale (0= "never" to "4= very often"). Items 1–9 evaluate the symptoms of inattention; items 10–18 evaluate the symptoms of hyperactivity/impulsivity. Since our participants did not have any other comorbid disorders for the last 6 months, the ASRS was accepted as the ADHD severity score for the last six months. Example scale questions were as follows; 'How often do you have difficulty keeping your attention when you are doing boring or repetitive work?', 'How often do you have problems remembering appointments or obligations?', and 'How often do you feel restless or fidgety?'. Overall scores ranged from 0 to 72. Internal consistency of the ASRS was excellent (Cronbach's α = .92).

2.2.4. Brief Resilience Scale

Resilience levels was assessed using the Brief Resilience Scale (BRS; Smith et al., 2008). The BRS is a 6-item scale, example items include 'I tend to bounce back quickly after hard times', 'I have a hard time making it through stressful events', 'I tend to take a long time to get over set-backs in my life'. Participants rated all items on a 5-point Likert scale ranging from 1="strongly disagree" to 5= "strongly agree". Overall scores ranged from 6 to 30, internal consistency of the BRS was good (Cronbach's α = .74).

2.2.5. Time spent on social networking sites

Time spent on social networking sites was measured by asking participants to state how many minutes they spent on SNSs each day.

2.3. Procedure

An online survey was used in the present study for the collection of data and was developed with the use of *Qualtrics* online survey software. Data collection took place between September and October 2018. A recruitment message was posted on the online crowdsourcing website *Amazon Turk* inviting SNS users to participate in the study. The online recruitment post included information about the purpose of the study and a hyperlink to the online survey. The hyperlink directed participants to the survey where they were presented with a participant information page followed by clear instructions on how to complete the survey. All participants were assured that their data would remain anonymous and confidential. A debriefing statement at the end of the survey reiterated the purpose of the study and informed participants of their right to withdraw from the study.

2.4. Ethics

The study was carried out in accordance with the Declaration of Helsinki and the British Psychological Society ethical guidelines. The first author's university ethics committee approved the study. All participants were informed about the study and all provided informed consent.

2.5. Analytic strategy

Statistical analyses were carried out in IBM SPSS Statistics 26.0 for Windows (IBM SPSS statistics). Pearson correlations were calculated by testing bivariate correlations between the variables, with $r \geq 0.10$ indicating a small, $r \geq 0.30$ indicating a medium, and $r \geq 0.50$ indicating a large effect (Cohen, 1988). Multiple hierarchical moderated regression analyses were conducted to test the effects of predictors, moderator variables, and their interactions on the dependent variable. All predictors and moderator variables were mean centered (according to Cohen et al., 2013). The significance value was $p \leq .05$.

3. Results

3.1. Demographic information, descriptive values, and correlation analyses

The mean age of the participants was 32.35 (SD = 10.44), 49.6% (*n*

= 227) were male and 50.4% (*n* = 231) were female. Most participants (69%, *n* = 316) were in employment, 14.8% (*n* = 68) said they were self-employed, 7.2% (*n* = 33) stated they were unemployed, 6.6% (*n* = 30) stated they were students, and 2.4% (*n* = 11) stated they were retired. Most participants (76.6%, *n* = 351) stated they were in a relationship. The mean scores and the standard deviations of all scales as well as the correlations between the variables are shown in Table 1. As expected, the variables showed inter-correlations with small to medium effect sizes with PSNSU severity and anxiety severity, ADHD severity, and resilience levels. There was no significant correlation between time spent on SNSs (hours per day) and resilience.

3.2. Moderated regression analyses

To investigate if the relation between anxiety severity and PSNSU severity and the relation between ADHD severity and PSNSU severity is moderated by resilience levels, we analysed two hierarchical moderated regression analyses. We also calculated two further hierarchical moderated regression analyses with time spent on SNSs as a dependent variable. Afterwards, we also performed two additional moderated regression analyses investigating the interaction between anxiety severity and ADHD severity predicting PSNSU severity as well as using three-way interaction between anxiety severity, ADHD severity, and PSNSU severity to test the overall interaction effect.

In the first step of the moderated regression analyses, anxiety severity as a predictor alone explained 15.9% of the variance of PSNSU severity, $R = .159$, $F(1, 456) = 86.45$, $p \leq .001$. In the second step, anxiety severity and resilience levels as moderators together did not significantly increase the variance explanation, $\Delta R^2 \leq .001$, $\Delta F(1, 455) = 0.06$, $p = .805$. In the third step, the interaction effects of these variables multiplied, significantly accounting for an increase in the explanation of PSNSU severity variance, $\Delta R^2 = .009$, $\Delta F(1, 455) = 4.77$, $p = .029$. Overall, the regression model significantly explained 16.8% of the variance, $F(3,457) = 30.61$, $p \leq .001$. The β-coefficients are shown in Table 2. Since the interaction effect was significant, simple slopes analysis was conducted (Fig. 2). The analysis illustrates that both slopes had the same direction. For PSNSU severity, we attained a positive slope for both regression lines representing high and low resilience levels. The slopes were significantly different from zero, when values one standard deviation above ($t = 9.73$, $p \leq .001$) and below ($t = 5.36$, $p \leq .001$) the mean were used. It emphasizes that participants with low anxiety severity as well as high resilience levels are at the lowest risk of developing PSNSU severity. Participants with high anxiety severity as well as high resilience levels showed the highest risk. Furthermore, it could be also shown that participants with low anxiety severity and high resilience levels are also low risk compared to participants with high anxiety severity, independently of high or low resilience levels. The differences between high and low resilience levels were not significant.

Table 1
Bivariate Correlations (and *p*-values in brackets) among the scores of the Bergen Social Media Addiction Scale to assess PSNSU severity and the applied scales and their descriptive statistics.

	M (SD)	2.	3.	4.	5.
1. PSNSU severity	15.12 (5.03)	.316 (≤ .001)	.399 (≤ .001)	.535 (≤ .001)	-.170 (≤ .001)
2. Time spent on SNS (hours per day)	128.76 (118.11)		.100 (.033)	.199 (.011)	-.058 (.215)
3. Anxiety severity	22.63 (17.32)			.578 (≤ .001)	-.401 (≤ .001)
4. ADHD severity	28.86 (12.94)				-.358 (≤ .001)
5. Resilience levels	3.14 (0.72)				

* *p* ≤ .050
** *p* ≤ .01

Table 2
β-coefficients of the hierarchical moderated regression analyses.

		B	SE(B)	T	β	p
PSNSU severity as dependent variable	Anxiety severity	0.12	0.01	8.67	.409	≤.001
	Resilience levels	0.31	0.37	0.82	.044	.412
	Interaction	0.05	0.02	2.19	.107	.029
PSNSU severity as dependent variable	ADHD severity	0.21	0.02	12.81	.544	≤.001
	Resilience levels	0.16	0.31	0.53	.023	.599
	Interaction	≤ −0.01	0.02	-.017	-.007	.866
Time spent on SNS (hours per day) as dependent variable	Anxiety severity	0.65	0.35	1.84	.095	.067
	Resilience levels	-1.30	9.52	-0.14	-.008	.892
	Interaction	0.28	0.56	0.50	.026	.619
Time spent on SNS (hours per day) as dependent variable	ADHD severity	1.02	0.46	2.25	.112	.025
	Resilience levels	-3.06	8.44	-0.36	-.019	.717
	Interaction	-0.03	0.55	-0.05	-.003	.958
PSNSU severity as dependent variable	Anxiety severity	0.04	0.01	3.02	.143	.003
	ADHD severity	0.17	0.02	9.11	.434	≤.001
	Interaction	≤.001	≤.001	4.14	.161	≤.001
Time spent on SNS (hours per day) as dependent variable	Anxiety severity	0.30	0.39	0.78	.044	.436
	ADHD severity	0.90	0.52	1.71	.098	.088
	Interaction	-0.02	0.02	-0.98	-.046	.329

In the second moderated regression analyses, ADHD severity as predictor explained 28.6% of the PSNSU severity variance, $F(1, 456) = 182.69$, $p \leq .001$. ADHD severity and resilience levels as moderator $\Delta R^2 = .001$, $\Delta F(1, 455) = 0.34$, $p = .560$ as well as the interaction of these variables $\Delta R^2 \leq .001$, $\Delta F(1, 454) = 0.03$, $p = .866$ did not explain additional variance in the second and third step. Even, if the overall regression model significantly explained 28.7% of the variance $F(3,457) = 60.80$, $p \leq .001$, no further simple slopes analyses were calculated. The β-coefficients are shown in Table 2. We conducted the analyses repeatedly using the time spent on SNSs per day as a dependent variable. Overall, no further significant interaction effects were found (see Table 2).

As an additional analysis based on the close link between anxiety severity and ADHD severity (Pliszka, 2019), also statistically illustrated by the significant correlation with medium effect, we additionally tested whether the interaction between both constructs significantly predicted PSNSU severity. Anxiety severity significantly explained 15.8% of the PSNSU severity variance, $F(1, 456) = 86.45$, $p \leq .001$, as well as ADHD severity, $\Delta R^2 = .139$, $\Delta F(1, 454) = 90.03$, $p \leq .001$. Moreover, the interaction between both psychopathological symptoms significantly explained additional variance in the third step, $\Delta R^2 = .025$, $\Delta F(1, 454) = 17.01$, $p \leq .001$. Overall, the regression model significantly explained 32.4% of the variance $F(3,457) = 72.43$, $p \leq .001$. The simple slopes analyses calculated showed that only the slope for high ADHD severity was different from zero ($t = 0.31$, $p \leq .001$) indicating participants with high anxiety severity as well as high ADHD severity showed the highest risk of PSNSU severity (see Fig. 2). No significant interaction effects have been found for time spent on SNSs per day. The β-coefficients are shown in Table 2.

Lastly, a further hierarchical moderated regression analysis was conducted calculating the three-way interaction between anxiety severity, ADHD severity, and resilience levels, which aimed to investigate the overall interaction effect between all variables. Anxiety severity
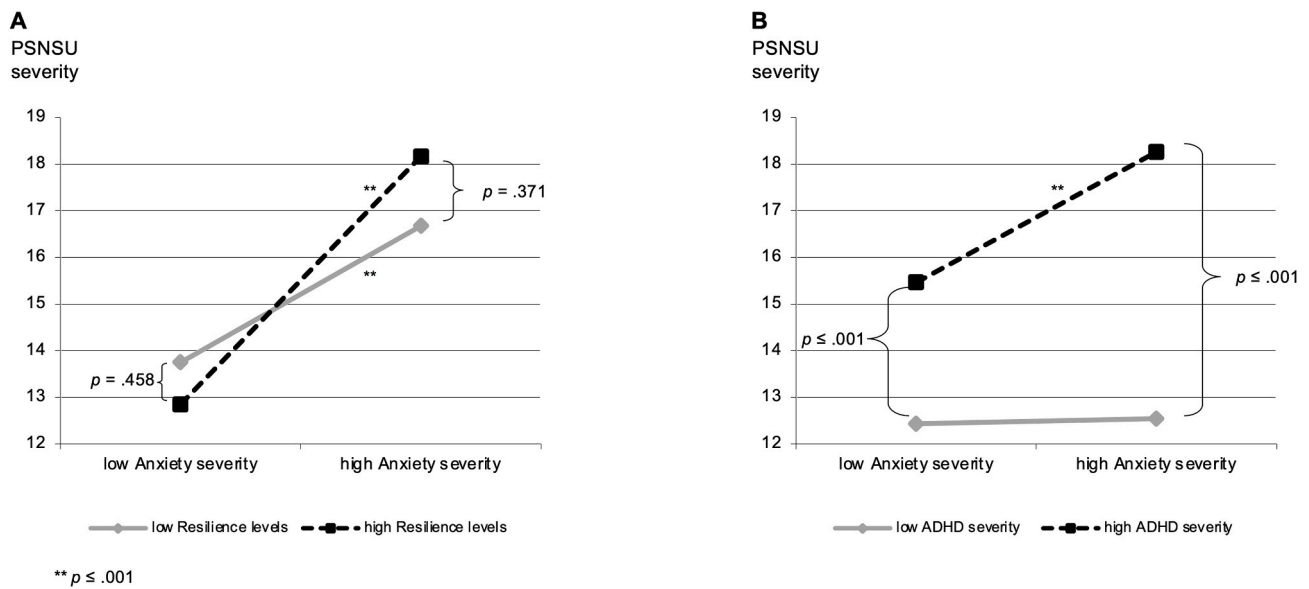
A

PSNSU severity

B

PSNSU severity

Fig. 2. Results of the simple slope analysis of the moderated regression analyses with PSNSU levels as dependent variable. The first simple slope analysis (A) illustrates anxiety severity as predictor, and resilience levels as moderator. The second simple slope analysis (B) shows anxiety severity as predictor, and ADHD severity as moderator. Points represent regression-weight-based estimated values for individuals who are 1 standard deviation above or below the mean.

was included in the analysis in the first step, followed by ADHD severity and resilience levels in the second and third step. Then, all two-way interaction terms, and lastly, the three-way interaction term were included. PSNSU severity was used as a dependent variable. The overall model explained 34.4% of the PSNSU severity variance, $F(7,457) = 33.69$, $p \le .001$. The results of the analysis illustrate a significant effect of anxiety severity, $R = .159$, $F(1, 456) = 86.45$, $p \le .001$, together with ADHD severity, $\Delta R^2 = .139$, $\Delta F(1, 455) = 90.03$, $p \le .001$, no additional effect of resilience levels, $\Delta R^2 = .003$, $\Delta F(1, 454) = 1.82$, $p = .178$, a significant effect of the interaction between anxiety severity and resilience levels, $\Delta R^2 = .006$, $\Delta F(1, 453) = 4.23$, $p = .040$, additional effect of ADHD severity and resilience levels, $\Delta R^2 = .006$, $\Delta F(1, 452) = 4.07$, $p = .044$, as well as a significant effect of anxiety severity and ADHD severity. $\Delta R^2 = .028$, $\Delta F(1, 451) = 18.91$, $p \le .001$. There was no significant effect of the three-way interaction (for the model summary see Table 3).

4. Discussion

The present study investigated the relationship between PSNSU severity, anxiety severity, ADHD severity, time spent on SNSs, and resilience levels. The bivariate correlation results showed that PSNSU severity was associated with time spent on SNSs, anxiety severity and ADHD severity as well as with resilience levels, where, in addition to the significance level, the small to medium effect sizes in particular illustrate the relationships. Moderated regression analyses additionally illustrated

Table 3
β-coefficients of the hierarchical moderated regression analyses with three-way interactions between anxiety severity, ADHD severity, and resilience levels and using PSNSU severity as dependent variable.

	B	SE(B)	T	β	p
Anxiety severity	0.05	0.01	3.73	.185	$\le$.001
ADHD severity	0.15	0.02	7.27	.395	$\le$.001
Resilience levels	1.03	0.41	2.55	.147	.011
Anxiety severity x Resilience levels	0.08	0.03	3.08	.181	.002
ADHD severity x Resilience levels	-0.03	0.03	-0.90	-.054	.391
Anxiety severity x ADHD severity	$\le$0.01	$\le$0.01	3.89	.176	$\le$.001
Anxiety severity x ADHD severity x Resilience levels	$\le$ −0.01	$\le$0.01	-1.33	-.083	.184

that anxiety severity, ADHD severity, and their interaction were significant risk factors for the development and maintenance of PSNSU severity, moreover, the interaction between anxiety severity and resilience levels also significantly led to further explanations of the variance.

The results outline the importance of psychopathological symptoms such as anxiety severity and ADHD severity as predisposing risk factors of PSNSU severity. They are in line with previous research highlighting the relationship between anxiety severity and PSNSU severity (e.g. (Atroszko et al., 2018; Van Rooij et al., 2017; Worsley et al., 2018), as well as ADHD severity and PSNSU severity (e.g., Andreassen et al., 2016). It could be assumed that high levels of SNS use may intensify anxiety severity amongst some SNS users; these users may then use SNSs as a maladaptive coping strategy to alleviate negative psychological states (Vannucci et al., 2017). Therefore, anxious SNS users may prefer the online environment of SNSs or prefer online interaction instead of face-to-face interaction (Prizant-Passal et al., 2016). This is in line with theoretical approaches by Kardefelt-Winther (2014) as well as by Wegmann and Brand (2019) illustrating that SNS use could be related to fear-driven and compensatory factors resulting in problematic behaviour. The authors outline that the association between anxiety severity and PSNSU severity could be based on specific usage motives and expectancies for experiencing a social connection or for compensating (social) deficits or unfulfilled needs in real life. Based on this, SNS usage could be adopted as a coping strategy which could result in potential problematic behaviour. Besides the fear-driven and compensatory approaches, SNSs also provide a distraction from real world problems; they provide entertainment to keep users occupied. The constant checking and monitoring of SNSs are also related to symptoms of ADHD. SNS alerts may interrupt and distract users from daily tasks, users may be internalising the pressure to maintain SNS updates (Hampton et al., 2015; Rose & Tynes, 2015), which could be problematic for individuals suffering from ADHD and related mental health problems. Individuals who display ADHD symptoms may find it difficult to focus on everyday activities, these individuals are more likely to be drawn to the distraction provided by SNSs. Furthermore, recent research has reported associations between ADHD and anxiety with findings showing that the management of individuals with both disorders could be challenging for clinicians (D'Agati et al., 2019; Koyuncu et al., 2018; 2019). The relationship between these variables should be further investigated in the context of PSNSU. Taken together, the results suggest that ADHD

severity may directly lead to PSNSU severity, further research is needed to understand the mechanisms of SNSs, the neurobiological triggers of PSNSU should also be investigated because the present study findings have shed light on issues of mental health and wellbeing.

The results also showed that resilience levels were negatively related with symptom severity of PSNSU, which is consistent with previous research (Hou et al., 2017). However, when having a closer look at the interaction effects, the regression analysis and the simple slope analysis revealed that participants with low anxiety severity and high resilience levels were at lowest risk of developing PSNSU severity; however, the differences between high and low resilience levels and low anxiety severity were not significant. It illustrates that the absence of psychopathological risk factors interacting with the additional presence of preventive mechanisms are the best combination for not developing problematic behaviour. Furthermore, participants with high anxiety severity and high resilience levels showed the highest risk of developing PSNSU severity. These findings showed that resilience may act as a preventive mechanism, but the effect was much less than expected and sometimes contradictory. The psychopathological factors (i.e., anxiety severity and ADHD severity) seem to be more influential risk factors that can lead to the development and maintenance of PSNSU. SNS use may be used to alleviate anxiety severity; this supports previous research that has shown associations between anxiety severity and feeling comfortable online, which could be also seen as an explanation for high resilience levels together with high anxiety severity as potential risk factors (Prizant-Passal et al., 2016). Further interaction effects between ADHD severity and resilience levels predicting PSNSU severity were not significant.

Altogether, the study findings show associations between psychopathological symptoms and PSNSU severity. The relevance of both factors was also emphasized in the last moderated regression analysis using three-way interactions. Since we found no further effects of resilience levels, the significant interaction between anxiety severity and ADHD severity illustrate that mental health problems seem to be co-morbid and associated with PSNSU severity and that their relevance should not be underestimated. The findings also revealed the first hint of the relevance of resilience as a preventive mechanism. However, keeping the current and previous empirical findings in mind, further research investigating the interplay of predisposing factors and potential preventive mechanisms in PSNSU is needed.

There are several limitations that need to be considered. The cross-sectional study design limits the conclusions that can be drawn regarding causality and directionality. The use of a non-clinical and convenience sample limits the generalisability of the findings. No clinical interviews were conducted with the participants, there is a possibility that current psychiatric diagnoses, or past diagnosis and treatment histories, may have affected the study results. There are also limitations associated with self-report methods such as social desirability bias and recall bias. However, it is important to note that self-report data was and will always be an important source when dealing with maladaptive behaviour of an individual (Montag et al., 2015). Future research should consider recruiting a clinical sample and should consider the use of clinical interviews and longitudinal methods. Given the ubiquitous nature of SNSs, it would be worthwhile to examine actual anonymised SNS data provided by users or SNS companies to gain a better understanding of user behaviour, this may help to promote the positive uses of SNSs.

Considering the study findings, the implications are that resilience may play a positive role in promoting positive health and wellbeing. This trait may help in the development of health interventions, however (as suggested earlier) future research must consider the early intervention possibilities of resilience in dealing with maladaptive behaviours. Innovative strategies to deal with anxiety and ADHD are needed to reduce the risk of PSNSU. One way of doing this, as suggested by Worsley et al. (2018), is that SNSs could be used by health practitioners to disseminate educational messages to vulnerable SNS users, this would be a positive use of SNSs. Future research needs to examine the

preventive mechanisms of resilience in more detail, obtaining data on resilience via the use of longitudinal and prospective study designs would be beneficial. Such study designs will help in examining the direction of the associations reported in the present study. Future research should also explore other factors, such as depression, stress, and sleep patterns of SNS users. It is important to provide a comprehensive understanding of SNSs and the impact on mental health and wellbeing. Overall, the study findings will be of interest to health professionals developing interventions programmes.

The present study has provided important insights into the role of anxiety severity, ADHD severity, and resilience levels in relation to PSNSU severity. Anxiety severity and ADHD severity were associated with PSNSU severity showing that these variables are influential in the development of PSNSU. The present study findings also showed that resilience levels may have a preventive effect, but the psychopathological factors of anxiety severity and ADHD severity illustrate a strong impact as risk factors in the development and maintenance of PSNSU. The study findings contribute to the growing body of research linking psychopathological variables to PSNSU severity. The findings can inform prevention and intervention programmes for healthy SNS use. The findings will be useful to health professionals, practitioners, policy makers, and SNS users.

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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.

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