



The relationship between narcissism, intensity of Facebook use, Facebook flow and Facebook addiction



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ABSTRACT

Introduction: The present study investigated mechanisms that may contribute to the enhanced risk of narcissistic individuals to develop Facebook addiction.

Methods: In a sample of 449 Facebook users (age: $M(SD) = 31.07(9.52)$, range: 18–65) the personality trait narcissism, Facebook flow, intensity of Facebook use, and Facebook addiction were assessed by an online survey. **Results:** In a moderated mediation analysis, the positive relationship between narcissism and Facebook addiction was positively mediated by the level of flow experienced on Facebook. Intensity of Facebook use moderated the positive association between Facebook flow and Facebook addiction.

Conclusions: Excessive Facebook use may cause psychological dependence. Narcissistic individuals are at enhanced risk for this form of dependence that is fostered by experience of flow during Facebook use and intensity of Facebook use. Current results should be taken into account, when assessing individuals at risk for pathological Facebook use and when planning specific interventions to deal with it.

1. Introduction

In the 21st century, use of social networking sites (SNSs) belongs to daily life of many people (Pew Research Center, 2018). With more than 2.4 billion members and more than 1.59 billion daily users, Facebook is currently the largest SNS (Roth, 2019). Many individuals often engage in intensive social interaction on Facebook by posting updates of their daily life and by commenting updates of other members. The online exchange contributes to feelings of connectedness, belonging, and social support (Bayer, Ellison, Schoenebeck, Brady, & Falk, 2018; Brailovskaia & Margraf, 2018; Ellison & Vitak, 2015). Moreover, positive comments and “Likes” set by Facebook friends to the uploaded postings enhance feelings of own popularity (Nadkarni & Hofmann, 2012) – an important reason why particularly individuals with high levels of the personality trait narcissism often tend to intensive Facebook use (Brailovskaia & Bierhoff, 2016, 2018; Buffardi & Campbell, 2008; Gentile, Twenge, Freeman, & Campbell, 2012). Narcissistic individuals are characterized by an inflated self-view, sense of entitlement and of own grandiosity, as well as a high need for attention and

admiration (Rogoza, Żemojtel-Piotrowska, Kwiatkowska, & Kwiatkowska, 2018; Rohmann, Neumann, Herner, & Bierhoff, 2012; Twenge, Konrath, Foster, Campbell, & Bushman, 2008). Facebook offers them various functions for self-presentation in superficial social interactions where they get positive feedback that satisfies their need for popularity (Brailovskaia & Margraf, 2019; Carpenter, 2012; Gnams & Appel, 2018; Marshall, Lefringhausen, & Ferenczi, 2015; McCain & Campbell, 2018; Ong et al., 2011; Ryan & Xenos, 2011).

However, positive experiences gained on Facebook may foster the development of a strong emotional bond to the SNS (Casale & Fioravanti, 2018; Taylor & Strutton, 2016). This bond is linked to a problematic need to stay permanently online, to continuously upload own updates, and to check the activities of other users, even when this behavior disturbs the observance of obligations at home and at work, contributes to interpersonal difficulties, and impairs social relationships (Andreassen, Pallesen, & Griffiths, 2017; Kimpton et al., 2016). This phenomenon was termed Facebook addiction (Andreassen, Torsheim, Brunborg, & Pallesen, 2012). Based on the core components of addictive (online) behavior (Griffiths, 2005), Facebook addiction was

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defined by six typical characteristics (Andreassen et al., 2012): salience (i.e., permanent thinking about Facebook), tolerance (i.e., heightened amounts of Facebook activity are required to attain previous positive effect), mood modification (i.e., mood improvement by Facebook use), relapse (i.e., reverting to higher amounts of Facebook activity after unsuccessful attempts of Facebook use reduction), withdrawal symptoms (i.e., becoming nervous without Facebook use), and conflict (i.e., interpersonal problems caused by intensive Facebook use). Note that Facebook addiction is not recognized as a formal psychiatric disorder (Brailovskaia & Margraf, 2017).

Earlier research demonstrated Facebook addiction to be positively associated with poor sleep quality, depression and anxiety symptoms (Andreassen et al., 2012; Atroszko et al., 2018; Błachnio, Przepiórka, & Pantic, 2015; Brailovskaia & Margraf, 2017; Brailovskaia, Velten, & Margraf, 2019; Koc & Gulyagci, 2013; Marino, Gini, Vieno, & Spada, 2018a, 2018b; Ryan, Chester, Reece, & Xenos, 2014; Xie & Karan, 2019). Experience of daily stressors at home and at work positively predicted the level of Facebook addiction (Brailovskaia, Teismann, & Margraf, 2018; Marino, Gini, Vieno, & Spada, 2018a). Moreover, a recent longitudinal study found Facebook addiction to positively predict the level of depression symptoms and of insomnia up to six weeks later (Brailovskaia, Rohmann, Bierhoff, Margraf, & Köllner, 2019). In addition, life satisfaction and resilience were negatively linked to Facebook addiction (Błachnio, Przepiórka, & Pantic, 2016; Brailovskaia, Schillack, & Margraf, 2018).

Narcissistic individuals were described to be at enhanced risk for the development of Facebook addiction. High intensity of Facebook use was reported to be one of the main causes of this finding (Brailovskaia, Margraf, & Köllner, 2019; Brailovskaia, Schillack, et al., 2018; Koc & Gulyagci, 2013). However, considering that narcissists typically exactly plan and control their social activities (Emmons, 1987), the question arises which further hidden mechanisms may explain why those individuals tend to lose control over their behavior, to experience withdrawal when Facebook usage is not possible, and to neglect their offline social interactions. Thorough identification of such mechanisms might contribute to the protection of narcissistic individuals from the formation of Facebook addiction. This seems to be of great importance for the overall protection of their well-being with regard to the previously reported negative side effects of Facebook addiction (see for example Marino et al., 2018a; Marino, Gini, Vieno, & Spada, 2018b), specifically its contribution to insomnia, depression and anxiety symptoms (Brailovskaia, Rohmann, et al., 2019). Therefore, the main aim of the present study was to understand the factors and mechanisms that link the personality trait narcissism with Facebook addiction.

Considering previous research on online media use – particularly online video gaming –, experience of flow might be such a factor. Video gaming behavior was described to be related to a state of intensive intrinsic enjoyment, also designated as flow experience (Hull, Williams, & Griffiths, 2013; Sweetser, Johnson, & Wyeth, 2012). Following the definition of Csikszentmihalyi (1990; p. 4), a flow experience is “the state in which people are so involved in an activity that nothing else seems to matter; the experience is so enjoyable that people will continue to do it even at great cost, for the sheer sake of doing it.” Thus, people engaging in intensive video gaming have an autotelic experience, i.e., they experience intrinsic reward (Csikszentmihalyi, 1975), that generates considerable pleasure and increases the probability that they will repeat this behavior (Rau, Peng, & Yang, 2006).

Based on the positive association of flow experience with gaming behavior, research has set out to investigate the relevance of flow in other forms of media use (Khang, Kim, & Kim, 2013). For instance, flow was found to be positively related to general Internet use (Hoffman & Novak, 2009), as well as online shopping (Bridges & Florsheim, 2008; Jiang & Benbasat, 2004). Several studies focused on use of SNSs (e.g., Chang & Zhu, 2012). Kaur, Dhir, Chen, and Rajala (2016) found empirically a positive association between Facebook use and flow experience. Flow experienced during Facebook use was defined by five

core characteristics (Brailovskaia, Rohmann, Bierhoff, & Margraf, 2018): curiosity (i.e., experience of curiosity and interest during Facebook use), enjoyment (i.e., experience of enjoyment and fun during Facebook use), time-distortion (i.e., losing sense of time during Facebook use), focused attention (i.e., intensive focus on the activities conducted on Facebook), and telepresence (i.e., deep immersion into the Facebook world and simultaneously forgetting of the requirements of the offline world). Facebook flow was positively related to self-disclosure on Facebook and had a positive impact on post hoc interpersonal relationships (e.g., becoming closer) (Kwak, Choi, & Lee, 2014).

At a relatively early stage of the investigation of reasons for excessive gaming behavior, similarities between gaming flow and addictive symptoms such as for example experience of enjoyment and distorted sense of time have attracted research attention (Chou & Ting, 2003). Moreover, several investigations reported flow to be a positive predictor of gaming addiction. Individuals who had high levels of gaming flow exhibited an enhanced risk to develop gaming addiction (Hull et al., 2013; Khang et al., 2013; Trivedi & Teichert, 2017; Wu, Scott, & Yang, 2013). Similar results were obtained by Brailovskaia, Rohmann, et al. (2018) who focused on Facebook use. They found flow experienced during Facebook activity to positively predict the level of Facebook addiction. The association between one of the core components of Facebook flow namely “telepresence” – that previously was identified as one of the main factors that create flow in the online environment (Hoffman & Novak, 2009; Kwak et al., 2014) – and Facebook addiction was conspicuously strong. On the basis of these findings the authors hypothesized that individuals who tend to deeply immerse into the online world during Facebook use exhibit a specific risk to develop Facebook addiction. Furthermore, in the same study, intensity of Facebook use moderated the link between Facebook flow and Facebook addiction (Brailovskaia, Rohmann, et al., 2018).

Considering this empirical background, the question arises whether it is possible to combine findings considering the relationship between narcissism and Facebook addiction, on the one hand, and Facebook flow and Facebook addiction, on the other hand, to explain the enhanced risk of narcissistic individuals to develop Facebook addiction. Might it be that the link between narcissism and Facebook addiction is mediated by Facebook flow? Positive self-presentation in front of large audiences belongs to the main characteristics of narcissistic persons. With the introduction of SNSs narcissists received for the first time the possibility to reach quickly a large audience regardless of location and time. Investigations that analyzed Facebook activity reported that pages of individuals with enhanced levels of narcissism systematically differ from pages of people with lower narcissism levels. More specifically, narcissists engage in intensive online self-presentation by uploading many attractive pictures, writing many updates, sending many private messages, and joining many discussion groups where they frequently write comments (Brailovskaia & Bierhoff, 2016, 2018; Mehdizadeh, 2010). They typically spend much time on Facebook self-presentation and intensively focus on their online activities. This behavior pattern makes it possible for them to reach a high level of happiness and enjoyment (Brailovskaia & Margraf, 2019). Thus, the process of self-presentation might contribute to their experience of flow on Facebook, and Facebook flow might predict Facebook addiction. The strength of this link might be moderated by intensity of Facebook use – the higher the use intensity, the closer the link between Facebook flow and Facebook addiction (Brailovskaia, Rohmann, et al., 2018; Wu et al., 2013).

Based on the considerations presented and previous findings, the following hypotheses are formulated to investigate mechanisms that may enhance the risk of narcissistic individuals to develop Facebook addiction. We assume narcissism to be positively linked to Facebook addiction (Hypothesis 1a) and to Facebook flow (Hypothesis 1b); Facebook flow is expected to be positively related to Facebook addiction (Hypothesis 1c). Moreover, Facebook flow is expected to positively mediate the relationship between narcissism and Facebook addiction

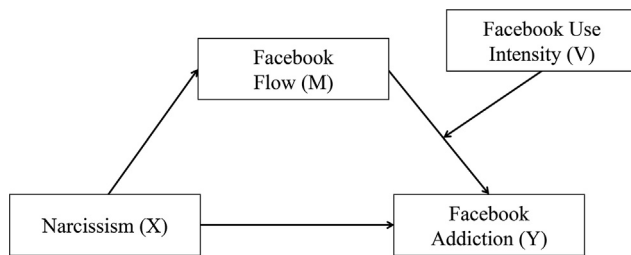


Fig. 1. Relationship between narcissism (X), Facebook flow (M), Facebook use intensity (V) and Facebook addiction (Y) (moderated mediation model).

(Hypothesis 1d). Facebook use intensity is assumed to be positively linked to Facebook flow (Hypothesis 2a) and to Facebook addiction (Hypothesis 2b). Moreover, based on previous findings, Facebook use intensity is expected to moderate the association between Facebook flow and Facebook addiction (Hypothesis 2c). Fig. 1 visualizes the assumed relationships as a moderated mediation model (cf., Hayes, 2013; p. 450).

2. Materials and Methods

2.1. Procedure and participants

Data of 449 Facebook users (72.2% women; age (years): $M = 31.07$, $SD = 9.52$, range: 18–65; occupation: 54.1% employees, 35.9% university students, 3.8% trainees for different professions like baker, 5.1% unemployed persons, 1.1% retirees), who were recruited by participation invitations displayed at public places, like bakeries, and online on various SNSs, have been collected from January to February 2018 via an online survey. The only requirement for participation, which was voluntary and could be compensated by course credits for students, was a current Facebook membership. Implementation of the present study was approved by the responsible Ethics Committee. Participants were properly instructed and provided online their informed consent to participate. No data were excluded. A priori conducted power analyses (G*Power program, version 3.1) revealed that the sample size was sufficient for valid results (power > 0.80, $\alpha = 0.05$, effect size $f^2 = 0.15$; cf., Mayr et al., 2007).

2.2. Measures

Narcissism. The personality trait narcissism was assessed with the brief German Narcissistic Personality Inventory (G-NPI-13) (Brailovskaia, Bierhoff, & Margraf, 2019). The G-NPI-13 consists of 13 forced-choice items (0 = low narcissism, e.g., “I am not particularly interested in looking at myself in the mirror”, 1 = high narcissism, e.g., “I like to look at myself in the mirror”). Its internal scale reliability was reported to be Cronbach’s $\alpha = 0.67/0.73$ (Brailovskaia, Bierhoff, et al., 2019; Gentile et al., 2013). Current reliability: $\alpha = 0.67$ (confidence interval: 95% CI [0.62, 0.71]).

Facebook use intensity. In correspondence with Wu et al. (2013) and Brailovskaia, Rohmann, et al. (2018), to assess intensity of Facebook use, we included four indicators: duration of Facebook membership (in months); frequency of daily Facebook use; duration of daily Facebook use (in minutes); emotional connection to Facebook and its integration into the daily life as assessed with the six items of the Facebook Intensity Scale (FIS) (Ellison, Steinfield, & Lampe, 2007), which are rated on a 5-point Likert scale (1 = disagree strongly, 5 = agree strongly; e.g., “Facebook is part of my everyday activity”; earlier reported internal scale reliability: $\alpha = 0.85$, current reliability: $\alpha = 0.84$, 95% CI [0.81, 0.86]). A composite index of these four indicators was attained by computing the mean of the z-transformed indicators. The internal reliability of the composite index of $\alpha = 0.61$ (95% CI [0.55, 0.66]) is tenable given the small number of items.

Facebook flow. Following Brailovskaia, Rohmann, et al. (2018), flow experience related to Facebook use was assessed with the modified version of the “Facebook flow” questionnaire adopted from Kwak et al. (2014). This instrument includes eleven items divided into five subscales based on the core characteristics of Facebook flow (Brailovskaia, Rohmann, et al., 2018). The subscale curiosity (e.g., “Using the Facebook excites my curiosity”), the subscale enjoyment (e.g., “I enjoy using the Facebook”), the subscale time-distortion (e.g., “Time flies when I am using the Facebook”), and the subscale focused attention (e.g., “While using the Facebook, I am deeply engrossed”) comprise two items each. Further three items belong to the subscale telepresence (e.g., “Using the Facebook often makes me forget where I am”). Items are rated on a 5-point Likert scale (1 = disagree strongly, 5 = agree strongly). Internal reliability of the eleven items was previously reported to be $\alpha = 0.88$ (Brailovskaia, Rohmann, et al., 2018). Current reliability: $\alpha = 0.86$ (95% CI [0.84, 0.88]).

Facebook Addiction. To assess the level of Facebook addiction over a time frame of the last year, the brief version of the Bergen Facebook Addiction Scale (BFAS) (Andreassen et al., 2012) was used. The BFAS includes six items (e.g., “Felt an urge to use Facebook more and more?”) which are based on the six core addiction features of Facebook addiction (i.e., salience, tolerance, mood modification, relapse, withdrawal, conflict) and are rated on a 5-point Likert scale (1 = very rarely, 5 = very often). This brief version was found to have similarly good psychometric properties as the full-length 18-item version. Earlier studies reported the BFAS to have an internal reliability of $\alpha = 0.83-0.86$ (Andreassen et al., 2013; Andreassen et al., 2012; Pontes, Andreassen, & Griffiths, 2016). Current reliability: $\alpha = 0.87$ (95% CI [0.85, 0.89]).

2.3. Statistical analyses

Statistical analyses were conducted with the Statistical Package for the Social Sciences (SPSS 24) and the macro Process version 2.16.1 (www.processmacro.org/index.html; Hayes, 2013).

In the first step, descriptive statistics of the investigated variables and zero-order bivariate correlations were computed. In the next step, an analysis that integrated the hypothesized mediation model and the hypothesized moderation model (that is a moderated moderation analysis including a conditional indirect effect, see Fig. 1) (Edwards & Lambert, 2007) was run to examine the multiple effects simultaneously (Borau, El Akremi, Elgaaied-Gambier, Hamdi-Kidar, & Ranchoux, 2015) using Process “Model 14”. The moderated mediation effect was assessed by the bootstrapping procedure (10,000 samples) that provides accelerated confidence intervals (CI 95%). The analyses included narcissism (predictor, X), Facebook flow (mediator, M), Facebook use intensity (moderator, V) and Facebook addiction (outcome, Y), controlling for the covariates age and gender. Path *a* denoted the relationship between narcissism and Facebook flow; path *b* denoted the relationship between Facebook flow and Facebook addiction; path *c*’ (the direct effect) denoted the relationship between narcissism and Facebook addiction after the inclusion of Facebook flow and Facebook use intensity in the model.

3. Results

3.1. Descriptive analyses and correlation analyses

On average, participants were members on Facebook for 89.22 months ($SD = 28.49$; range: 0–168); they visited the SNS on average 7.89 times ($SD = 12.23$; range: 0–100) a day, and spent there daily on average 80.45 min ($SD = 83.15$, range: 0–900). The mean FIS level was $M = 15.56$ ($SD = 5.21$, range: 6–30). As presented in Table 1, narcissism (range: 0–13) was significantly positively correlated with Facebook flow (range: 11–48) and Facebook addiction (range: 6–29). Facebook flow and Facebook addiction were also significantly positively correlated. The composite index representing Facebook use

Table 1
Descriptive statistics and correlations of gender, age, narcissism, Facebook flow, Facebook use intensity and Facebook addiction.

	<i>M (SD)</i>	(2)	(3)	(4)	(5)	(6)
(1) Gender		0.04	0.17**	-0.09	-0.07	0.08
(2) Age	31.07 (9.52)		-0.02	0.11*	0.12*	-0.02
(3) Narcissism	3.72 (2.54)			0.12*	0.10*	0.22**
(4) FB Flow	26.87 (7.45)				0.50**	0.62**
(5) FB Use Intensity	0.00 (0.68)					0.47**
(6) FB Addiction	9.34 (4.17)					-

Notes. *N* = 449; FB = Facebook; *M* = mean, *SD* = standard deviation; the variable “FB Use Intensity” represents the composite index of the four indicators: duration of Facebook membership, frequency of daily Facebook use, duration of daily Facebook use, Facebook Intensity Scale.

* *p* < .05.

** *p* < .01.

intensity (range: -1.65–5.16) was significantly positively correlated with Facebook flow, Facebook addiction, and narcissism.

3.2. Moderated mediation analysis (narcissism, Facebook flow, Facebook use intensity, and Facebook addiction)

Table 2 shows results of the moderated mediation analysis. The overall model was significant ($F(6,442) = 46.769, p < .001$). The explained variance of the overall model was substantial ($R^2 = 0.50$). The direct effect (path *c'*) of narcissism on Facebook addiction was significant ($p = .019$) after controlling for Facebook flow, Facebook use intensity, and their interaction. The conditional indirect effect of narcissism on Facebook addiction through Facebook flow was significant in people with low, medium, and high levels of Facebook use intensity. However, as shown in Table 2, this effect was stronger for participants who expressed a high level of Facebook use intensity (one *SD* above mean = 0.678), than for participants that expressed a medium level of Facebook use intensity (mean = 0), or a low level of Facebook use intensity (one *SD* below mean = -0.678). As indicated by the index of moderated mediation, the test of moderated mediation was also significant indicating a significant moderated mediation effect.

4. Discussion

The present study investigated the relationship between the personality trait narcissism, Facebook flow, intensity of Facebook use, and Facebook addiction in a German sample. The statistical model employed – that is the moderated mediation model – represents a promising approach to examine the hypotheses. The significant results confirm our hypotheses and contribute to a better understanding why narcissistic individuals are at enhanced risk to develop Facebook addiction.

In line with previous findings (Brailovskaia, Schillack, et al., 2018;

Casale & Fioravanti, 2018), the personality trait narcissism was positively related to Facebook addiction (confirming Hypothesis 1a). Furthermore, as expected we found a positive link between narcissism and Facebook flow (confirming Hypothesis 1b), as well as between Facebook flow and Facebook addiction (confirming Hypothesis 1c). Facebook flow served as a mediator between narcissism and Facebook addiction (confirming Hypothesis 1d). Additionally, our results revealed a positive association of intensity of Facebook use with Facebook flow (confirming Hypothesis 2a) and with Facebook addiction (confirming Hypothesis 2b). Moreover, Facebook use intensity moderated the link between flow and addiction (confirming Hypothesis 2c).

Current findings might point to one explanation why narcissistic members of Facebook are at risk to develop Facebook addiction. Narcissistic individuals have the talent to present themselves as charming interaction partners and to initiate many superficial social relationships (Campbell, Rudich, & Sedikides, 2002; Paulhus, 2001). In contrast to face-to-face interactions that typically allow only the presence of a limited audience and limited ways of self-presentation, on Facebook narcissists receive the possibility to realize their need for self-promotion in front of a large audience. They may close online friendship to as many Facebook users as they want to in a short period of time, may upload as many attractive photos that present different facets of their life as they want to, may write as many status updates as they want to and also as often as they want to, and may write comments in as many discussion groups as they want to in parallel (Brailovskaia & Bierhoff, 2016). As a consequence, they are likely to get online much more attention and admiration that enable them the experience of intensive enjoyment and satisfaction more than in the offline world. These feelings match closely the flow experience (cf., Csikszentmihalyi, 1975). The more admiration narcissistic users perceive to receive on Facebook, the deeper they immerse into the online world which fosters the experience of telepresence. Note that telepresence belongs to core characteristics of online flow and is particularly closely linked to addictive symptoms such as withdrawal when the Facebook world has to be temporarily left (Brailovskaia, Rohmann, et al., 2018). Correspondingly, an additional analysis of the subscales of flow in connection with Facebook addiction revealed that the highest correlation occurred between the scale telepresence and Facebook addiction ($r = 0.671, p = .001$). Thus, narcissistic users who experience high levels of flow during Facebook use, particularly telepresence, might be at specific risk to develop a psychological dependence to Facebook use. Therefore, flow might be one of the key factors that enhance the relationship between narcissism and Facebook addiction.

Note that in accordance with previous findings on gaming behavior and Facebook activity (Brailovskaia, Rohmann, et al., 2018; Wu et al., 2013), Facebook use intensity – that is typically high in narcissistic individuals because of their pronounced desire to be admired by a large audience (Campbell et al., 2002; Paulhus & Williams, 2002) – seems to moderate the relationship between flow and addiction in narcissistic individuals: the higher the use intensity, the stronger Facebook flow

Table 2
Moderated mediation model.

	β	<i>SE</i>	<i>t</i>	<i>p</i>	95% <i>CI</i>
Path <i>a</i> : Narcissism → FB Flow	0.410	0.160	2.562	0.012	[0.100, 0.725]
Path <i>b</i> : FB Flow → FB Addiction	0.274	0.028	9.724	0.001	[0.218, 0.329]
Interaction: FB Flow*FB Use Intensity → FB Addiction	0.149	0.033	4.584	0.001	[0.085, 0.213]
Path <i>c'</i> (direct effect): Narcissism → FB Addiction	0.151	0.064	2.365	0.019	[0.025, 0.276]
<i>Conditional Indirect Effects: Narcissism → FB Addiction</i>					
Narcissism → FB Flow → FB Addiction					
FB Use Intensity:					
Low (one SD below mean = -0.678)	0.071	0.031			[0.017, 0.138]
Medium (mean = 0)	0.112	0.046			[0.028, 0.207]
High (one SD above mean = 0.678)	0.154	0.063			[0.039, 0.282]
<i>Index of Moderated Mediation</i>	0.061	0.028			[0.014, 0.121]

Notes. *N* = 449; covariates: age and gender, β = standardized beta, *SE* = standard error, *t* = *t*-test, *p* = significance, *CI* = confidence interval; FB = Facebook.

may contribute to symptoms of Facebook addiction.

Present findings that contribute to the explanation of the link between narcissism and Facebook addiction are of significant importance, considering that Facebook addiction may negatively impact offline life by increasing interpersonal problems and well-being by contributing to insomnia, depression and anxiety symptoms (Atroszko et al., 2018; Brailovskaia, Rohmann, et al., 2019; Kircaburun & Griffiths, 2018a; Marino et al., 2018b). They may be consulted when assessing individuals at risk for problematic Facebook use. In addition, they may inform the planning of specific interventions to deal with problematic Facebook use. Note that earlier research revealed the potential of physical/sportive activities such as jogging, cycling and swimming to reduce the risk of Facebook addiction (Brailovskaia, Teismann, et al., 2018) and to foster well-being (Wunsch, Kasten, & Fuchs, 2017). Narcissists might particularly benefit from this protective factor. Similar to Facebook use, sportive activities contribute to the experience of flow (Drane & Barber, 2016) that is linked to enjoyment and happiness (Csikszentmihalyi, 1975, 1990). Therefore, it may be hypothesized that the replacement of online flow (that fosters Facebook addiction in narcissistic individuals) by sportive flow can support narcissistic individuals in reducing their emotional bond to the SNS. Narcissistic need for attention and admiration that drives intensive Facebook use (Davenport, Bergman, Bergman, & Fearington, 2014), might be at least partly satisfied by positive feedback from their offline environment when achieving sportive goals. Moreover, the more time is spent on sportive activities, the less time remains for Facebook use. Overall this strategy might not only reduce the risk of Facebook addiction, but also protect the well-being of narcissistic individuals.

4.1. Limitations and further research

Even though the current study has the advantage to be based on a quite heterogeneous sample in terms of age distribution and occupation, the gender composition limits the generalizability of present results, because about 72% of respondents were female. We controlled for the variable gender in our statistical analyses to tackle this limitation. Nevertheless, future studies should replicate our results on a basis of a more balanced gender composition.

Given the cross-sectional nature of the present data, we must emphasize that only limited insights into causal relationships may be gained from our results. Nevertheless, by employing a moderated mediation analysis we were able to gain deeper understanding of the psychological processes involved with respect to the link between narcissism and Facebook addiction. In order to draw truly causal conclusions about the determinants of Facebook addiction, the current research design must be extended by studies, which establish a temporal sequence of cause and effect, or by experimental studies (Kraemer et al., 1997). Additionally, future studies investigating Facebook addiction might include physiological markers, such as heart rate, skin conductance, and blood pressure, which are related to problematic Internet use (Reed et al., 2017; Romano et al., 2017). Discovering physiological markers of Facebook addiction could substantially contribute to a better understanding of its development and maintenance.

Furthermore, considering the low reliability of measures used to assess narcissism and intensity of Facebook use, interpretations of current results should be handled with caution. We recommend the planning of future studies to replicate our findings with more reliable instruments. For example, the full-length 40-item NPI version (Raskin & Terry, 1988) could be used to measure the level of narcissism on a highly reliable level. To assess intensity of Facebook use, further indicators such as the frequency of specific activities (for example writing of status updates) might be included in the composite index to enhance its internal consistency.

Facebook is currently the largest social platform where most available research on addictive/problematic social media use was conducted on (e.g., Marino et al., 2018b). However, some previous

studies reported addictive use tendencies on further SNSs such as Instagram (Kircaburun & Griffiths, 2018b) or Snapchat (Punyanunt-Carter, De La Cruz, & Wrench, 2017), and on general SNSs use (Andreassen et al., 2017; Casale, Fioravanti, & Rugai, 2016). Moreover, the focus of the current study was on the grandiose form of narcissism. Previous research reported a positive relationship between the vulnerable form of narcissism and addictive use of SNSs (Casale et al., 2016). Therefore, future studies should investigate whether current findings may be replicated on other social platforms and are applicable to addictive social media use in general, or whether they are specific for Facebook addiction. Furthermore, it should be investigated whether present results are also applicable to vulnerable narcissism.

To sum up, our results indicate that Facebook addiction is systematically related to the personality trait narcissism, Facebook flow, and Facebook use intensity. Although Facebook use provides many benefits for the members of the SNS, like initiating new relationships and keeping in touch with old friends, gathering new information about a plethora of topics, and presenting oneself in a positive light, that may contribute to happiness and pleasure (Kim & Lee, 2011; Liu & Yu, 2013), an excessive Facebook use may cause psychological dependence. Particularly narcissistic individuals seem to be at risk for this dependence. Our findings indicate that Facebook flow as well as intensity of Facebook use represent key factors in the development of Facebook addiction. Longitudinal studies are necessary to further elucidate how these key factors cause this dependency.

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Contributors

Julia Brailovskaia designed the study, conducted literature searches, provided summaries of previous research studies, and collected and prepared data. Julia Brailovskaia, Hans-Werner Bierhoff, and Elke Rohmann conducted the statistical analysis. Julia Brailovskaia wrote the first draft of the manuscript. Hans-Werner Bierhoff, Elke Rohmann, Friederike Raeder and Jürgen Margraf reviewed and edited the draft. All authors contributed to and have approved the final manuscript.

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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Appendix A. Supplementary material

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