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Fear of Missing Out (FoMO) and social media's impact on daily-life and productivity at work: Do WhatsApp, Facebook, Instagram, and Snapchat Use Disorders mediate that association?

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HIGHLIGHTS

- FoMO correlated positively with social media's (negative) impact on daily-life and productivity.
- FoMO correlated with WhatsApp, Facebook, Instagram, and Snapchat Use Disorders (UDs).
- WhatsApp, Facebook, and Instagram UDs mediated FoMO's link with social media's negative impact.
- Snapchat UD was not a significant mediator.

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ABSTRACT

Fear of Missing Out (FoMO) is the tendency to experience anxiety over missing out on rewarding experiences of others. It has been associated with daily-life disruptions, such as distractions during driving. FoMO has also consistently been a predictor of Internet, smartphone, and social networks use disorders. In the current work, we investigated the association between FoMO and social media use's impact on daily-life and productivity at work. In addition, we aimed to determine whether WhatsApp, Facebook, Instagram, and Snapchat Use Disorders mediate that relationship. The effective sample comprised 748 German-speaking study participants from the general population (age M = 38.63, SD = 12.10; 336 men, 412 women) who took part in an online survey study. Bivariate analyses showed that severity of all social networks use disorders were positively correlated with FoMO and social media's negative impact on daily-life and productivity at work. Furthermore, controlling for age and gender, mediation analyses showed that out of all platforms, only Snapchat Use Disorder did not mediate the association between FoMO and social media's negative impact on daily-life and productivity at work. These results provide further evidence about FoMO's central role in digital technology use-related disorders.

1. Introduction

Social media can be defined as computer-mediated applications where users generate content (and user-specific profiles), designed and maintained to function as connecting users, their profiles and content with others (Obar & Wildman, 2015). Therefore, social media encompasses both messenger applications as well as social networking sites. It has been estimated as of October 2019 that there are approximately 3.7 billion (approximately 48% of world's population) active social media users in the world (We Are Social Ltd, 2019). The top five social media platforms are Facebook (2.4 billion users; Facebook Messenger: 1.3 billion users), Youtube (2 billion users), WhatsApp (1.6 billion users), WeChat (1.1 billion users), and Instagram (1 billion users); in addition, Snapchat has been estimated to have approximately 314 million active users (We Are Social Ltd, 2019). These data undoubtedly show that social media plays a large role in humans' lives. However, there are adverse consequences from using too much social media reported in the literature, but less emphasis has been placed on the potentially mediating effects of social media on the relationship between predisposing characteristics (e.g., Fear of Missing Out) and

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daily-life outcomes.

Social media allows users to connect with each other through various ways – be it communicating via phone or video calls, text messaging, or by consuming, creating and sharing content. Some of these functions are more enhanced in particular social media platforms, while other features are more in use in others. In the current study, we focused on four social media platforms: Facebook, WhatsApp, Instagram, and Snapchat. Facebook is probably the most all-encompassing social media platform, as one can communicate with others (via video and phone calls, instant messaging) as well as create and share posts, and even purchase and sell products (Facebook, 2020). Other social media platforms are more focused on features such as instant messaging and communication, e.g., WhatsApp (WhatsApp Inc., 2020), while arguably Instagram's main function is picture- or video-based content sharing and viewing (Instagram Inc., 2020). Finally, Snapchat's primary feature is the availability of shared pictures and messages for a short period of time before becoming inaccessible to the recipients (Snap Inc, 2019). Social media platforms are, in general, designed to increase and maintain engagement in social media use to maximize profits from ad revenue (Montag, Lachmann, Herrlich, & Zweig, 2019); therefore, it may not be surprising that many people tend to feel “hooked” on social media use (Eyal, 2014).

In fact, with the wider diffusion of social media use, researchers began studying individuals who reported feeling “addicted” to social media use. While researchers have moved (or are moving) away from “addiction” terminology regarding digital technology use (e.g., see Panova and Carbonell (2018), and Montag, Wegmann, Sariyska, Demetrovics, and Brand (2019) for further discussions on this matter), the potentially negative effects of social media overuse have nonetheless received substantial attention over the past years. Recently, researchers have started implementing “Internet/smartphone use disorder” terminology to describe the adverse effects and relations of excessive Internet or smartphone use on daily-life and inter- and intrapersonal functioning (Peterka-Bonetta, Sindermann, Elhai, & Montag, 2019; Sha, Sariyska, Riedl, Lachmann, & Montag, 2019). Similarly, “social networks use disorder” (SNUD) has been proposed (Hussain, Wegmann, Yang, & Montag, 2020; Montag, Lachmann, et al., 2019). This terminology aims to bring consistency to this line of research for studying similar constructs, and is largely inspired by the inclusion of Gaming Disorder into the 11th revision of the International Classification of Diseases (ICD-11; World Health Organization. (2018), 2018; see also Montag, Lachmann, et al., 2019, and Pontes et al., 2019). It is important to note, however, that SNUD is not an official diagnosis (Billieux, Schimmenti, Khazaal, Maurage, & Heeren, 2015).

Studies have linked SNUD with severity of depression (Brailovskaia, Rohmann, Bierhoff, Margraf, & Köllner, 2019; Lin et al., 2016) and psychological distress (Marino, Gini, Vieno, & Spada, 2018), social anxiety (Lee-Won, Herzog, & Park, 2015), poorer subjective well-being (Satici, 2019), as well as more distractions in academic settings (Feng, Wong, Wong, & Hossain, 2019) and insomnia (Brailovskaia et al., 2019). Higher levels of SNUD have been associated with personality traits, such as more neuroticism (Blackwell, Leaman, Tramposch, Osborne, & Liss, 2017; Marengo, Poletti, & Settanni, 2020; Rozgonjuk, Elhai, Ryan, & Scott, 2019) and impulsivity (Ferda & Savci, 2016; Sindermann, Elhai, & Montag, 2020). Increased SNUD has also been associated with higher levels of rumination as well as higher levels of fear of missing out on rewarding experiences (FoMO) (Dempsey, O’Brien, Tiamiyu, & Elhai, 2019).

In fact, FoMO has been shown to be consistently associated with problematic digital technology use in several recent Internet and smartphone use disorder studies (Alt & Boniel-Nissim, 2018; Elhai, Rozgonjuk, Liu, & Yang, 2020; Sha, Sariyska, Riedl, Lachmann, & Montag, 2019; Wolniewicz, Rozgonjuk, & Elhai, 2019). FoMO involves the subjective perception of missing out on the rewarding experiences of others, accompanied by the perceived need to stay constantly connected with one’s network (e.g., family and friends). FoMO is correlated with negative affect, typically anxiety symptoms (Elhai, Levine, Dvorak, & Hall, 2016; Przybylski, Murayama, DeHaan, & Gladwell, 2013). Higher levels of FoMO have been linked to increased disruptions due to smartphone notifications that could, eventually, lead to a more superficial approach to studying among college students (Rozgonjuk, Ryan, Kuljus, Täht, & Scott, 2019). It has been hypothesized that people with greater FoMO may be more vigilant towards notifications, and because some of their attentional resources are occupied, this may result in more distractions and poorer concentration (at least it has been shown that smartphone use disorder goes along with lower self-reported productivity potentially being mediated by daily interruptions driven by higher levels of FoMO; see Duke & Montag, 2017). Nevertheless, the potential impact of FoMO on one's daily-life activities and productivity is relatively less researched.

A theoretical framework that can explain findings between psychological variables and digital technology use described in this paper is the Interaction of Person-Affect-Cognition-Execution model (I-PACE; Brand, Young, Laier, Wölfling, & Potenza, 2016, 2019). The I-PACE model is relatively comprehensive, as it outlines the role of core predisposing factors as well as interactions between core characteristics and subjectively perceived situations, coping style, affective and cognitive responses, and the decision to use a specific Internet-based application for rewarding experiences. This framework has become well-accepted in scientific literature over the past years in explaining findings involving Internet, smartphone, and social networks use disorder (Elhai, Yang, & Montag, 2019; Jung et al., 2019; Lachmann et al., 2018; Loid, Täht, & Rozgonjuk, 2020; Rozgonjuk & Elhai, 2019; Sindermann, Sariyska, Lachmann, Brand, & Montag, 2018). It is important to note, however, that the I-PACE model does not equate social media use that is highly frequent or of long duration to a use disorder; in fact, the model posits that in some people, objectively measurable frequency and duration of digital technology use may result in daily-life disturbances, but not for others (Brand et al., 2016, Brand et al., 2019).

Within the framework of the I-PACE model, it could be hypothesized that the relationship between FoMO and daily-life outcomes (e.g., more distractions) could be explained by the indirect effects of SNUD symptoms. The tendency to experience FoMO could be viewed as a predisposing factor for developing a (specific) SNUD which, in turn, could have adverse consequences on daily-life and productivity.

Individuals with higher (trait) FoMO are more prone to react to push notifications (Rozgonjuk, Elhai et al., 2019), whereas persons with low FoMO may be able to better resist reacting to such stimuli. Therefore, showing higher levels of FoMO could lead the person to engage more in SNS use which may develop into a SNUD. This, in turn, could hamper one's productivity because the person is preoccupied by SNS use, as well as may have conflict with themselves (e.g., the loss of control over SNS use) or with others (e.g., other people telling the person about excessive SNS use may lead to arguments). However, this potential mechanism has not been tested thus far. Furthermore, it would also be useful to assess if specific platform-related SNUDs mediate the relationship between FoMO and self-reported social media's impact on normal daily-life activities and productivity at work differently.

The aim of the current work is to provide insights into how FoMO is associated with self-reported social media impact on daily-life and productivity at work, and if WhatsApp, Facebook, Instagram, and Snapchat Use Disorders (WAUD, FBUD, IGUD, and SCUD, respectively) mediate that relationship. Because the hindering role of FoMO has been relatively consistently demonstrated in the context of everyday life, e.g., distracted driving (Przybylski et al., 2013), psychological well-being (Roberts & David, 2020), as well as educational factors (Alt & Boniel-Nissim, 2018; Rozgonjuk, Elhai, et al., 2019), and FoMO is associated with Internet, smartphone, and SNUDs (Dempsey et al., 2019; Stead & Bibby, 2017; Wolniewicz et al., 2019), we have posed the following hypotheses:

H1: Higher scores on FoMO measure are associated with higher

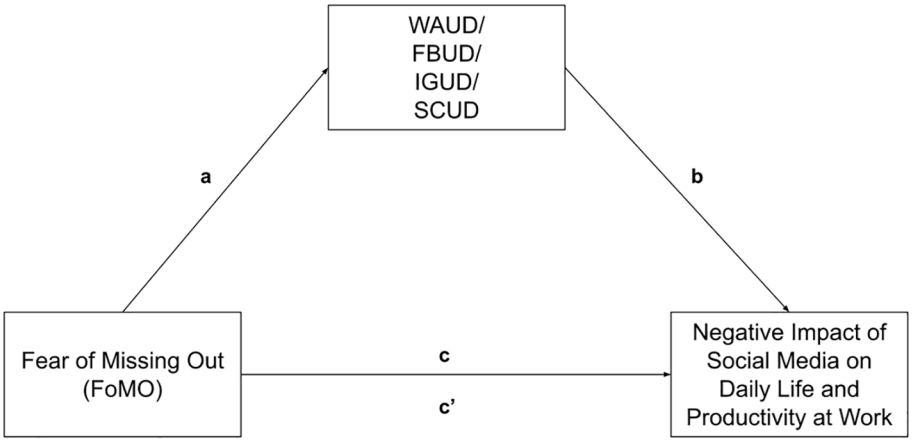

Fig. 1. Graphical representation of mediation models. *Notes*. WAUD = WhatsApp Use Disorder; FBUD = Facebook Use Disorder; IGUD = Instagram Use Disorder; SCUD = Snapchat Use Disorder. All models were controlled for age and gender (not depicted on the figure). Each model only used one of the social networks use disorder variables.

(negative) impact of social media on daily-life activities and productivity at work.

H2: Higher scores on FoMO are correlated with higher levels of WAUD, FBUD, IGUD, and SCUD.

H3: Higher scores on SNUD scales are associated with higher (negative) impact of social media on daily-life activities and productivity at work.

H4: SNUD scales mediate the relationship between FoMO and social media's impact on daily-life and productivity.

A graphical depiction of the general research model can be seen in Fig. 1. FoMO scores are treated as the predictor variable for SNUD scales and social media's impact on daily-life and productivity; SNUD scales as treated as mediating variables. Importantly, there are four models in total, with each SNUD scale being treated as a mediator variable. In addition, since there could be age and gender effects in FoMO, SNUDs, and social media's impact on daily-life and productivity (Balta, Emirtekin, Kircaburun, & Griffiths, 2018), we also controlled for age and gender in the models.

2. Materials and methods

2.1. Sample and procedure

German-speaking smartphone users were invited to a take part in an online study, hosted on the SurveyCoder platform which was developed by Christopher Kannen (https://ckannen.com/). The possibility to participate in the study was advertised on various types of primarily German-language based media, such as print media, online environments, as well as television. To motivate people to take part in the study and provide credible responses, feedback was provided at the end of the survey regarding participants' social media and smartphone use variables. The data used in this paper is part of a larger project, e.g., see another work from this project in Marengo, Sindermann, Elhai, and Montag (2020)

Among the sample of 821 respondents who completed the survey, we discovered that some age values did not seem credible (e.g., values like 0 or 600), or the participants marked themselves as being younger than 12 years old (the lowest age threshold allowed for participation), or older than 99 years old. Furthermore, as the focus of our study was the association between FoMO and social networks use disorder across specific platforms (WhatsApp, Facebook, Instagram, Snapchat), participants who did not use any of these platforms were excluded from the data set. Therefore, the total sample comprised 748 people (age M = 38.63, SD = 12.10, age range 12–79; 336 men, 412 women). 633 (84.6%) people reported being employed at the time of the study, whereas 115 (15.4%) participants were not employed. There were 505 (67.5%) people who had a university degree, and 243 (32.5%) who had not graduated from a university. The sample included 664 (88.8%) people from Germany, and the rest of the sample was from other neighboring German-speaking countries. 73 (9.8%) people were from Austria, 10 (1.3%) people from Switzerland, and 1 (0.1%) person from Liechtenstein. Fig. 2 illustrates sample distribution based on the number of people who provided their responses to social networks use disorder scales; multiple platforms could be endorsed by a given participant. Each SNUD scale could only be filled out if the participants stated that they used the specific SNS.

The study procedures were carried out in accordance with the Declaration of Helsinki, and the project was approved by the Institutional Review Board of Ulm University. Participants were informed about the study procedures and they provided their electronic informed consent; if the participant was in the age range of 12–17 years, parental/legal guardian's electronic consent was needed. In detail, minor-aged individuals were explicitly asked to discuss this study with their legal guardians and state that their legal guardians approved on their participation. Beyond that, we explicitly state that participation was completely anonymous. Participants did not receive financial compensation for taking part in the study, but they received feedback on their social media and smartphone use scores after filling in the questionnaire.

3. Measures

Participants provided responses about socio-demographic variables (age, gender, job status, education level, and country). In addition to the measures described below, we used other measures in the larger project, outside the scope of this paper. All measures were administered in German language.

The SNUDs for different platforms were measured with scales developed from the German Short Smartphone Use Disorder Scale (d-KV-SSS; Montag, 2018). This 10-item questionnaire (Likert-type response scale: 1 = "strongly disagree" to 6 = "strongly agree") is based on the short version of the Smartphone Addiction Scale (Kwon, Kim, Cho, & Yang, 2013), a widely-used measure in smartphone use disorder research. The d-KV-SSS measures the severity of excessive smartphone use-related adversities, with higher scores reflecting more (frequent) problematic aspects of smartphone use. This scale has demonstrated sound reliability and validity against other Internet and Smartphone use-related measures (Montag, 2018; Sha et al., 2019). In essence, we used the reworded d-KV-SSS in the current work, since the SNUD scales were developed from the d-KV-SSS. Specifically, the word "smartphone" was replaced with either "WhatsApp", "Facebook", "Instagram", or "Snapchat". Some of these scales were used and validated

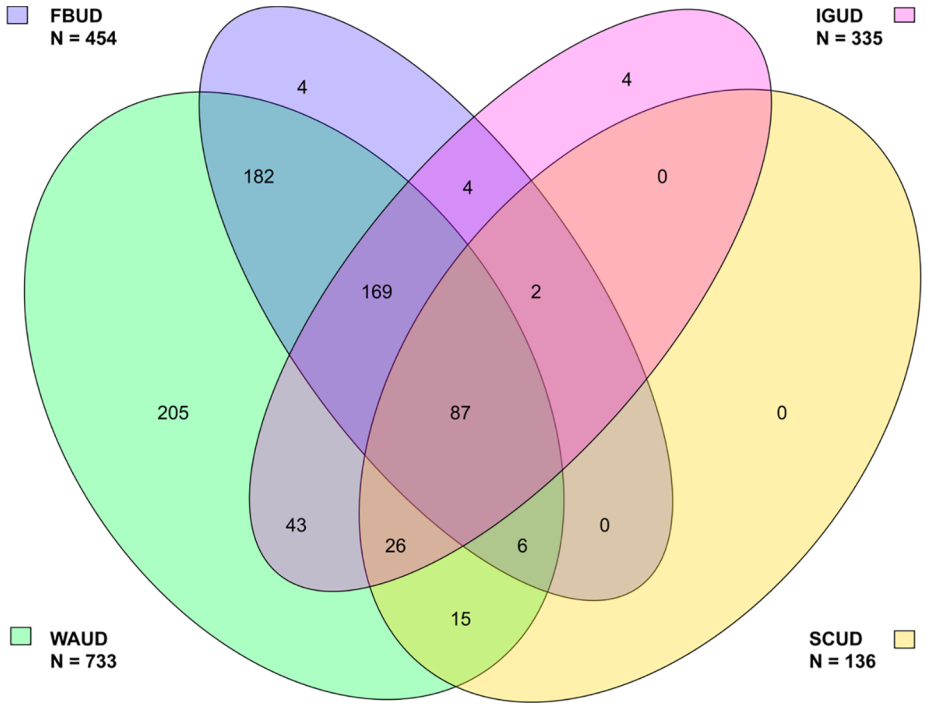

Fig. 2. The number of respondents for social networks use disorder scales in the effective sample. WAUD = WhatsApp Use Disorder; FBUD = Facebook Use Disorder; IGUD = Instagram Use Disorder; SCUD = Snapchat Use Disorder.

Table 1
Descriptive statistics of the key variables for the sample.

Variable	Total sample (N = 748)				Age and gender by Variable		
	N	M	SD	alpha	M (age)	SD (age)	% male
WAUD	733	22.34	9.68	0.90	38.50	12.07	44.5
FBUD	454	16.62	7.73	0.90	37.69	11.35	44.7
IGUD	335	20.04	11.18	0.94	34.49	11.83	41.5
SCUD	136	16.50	10.67	0.96	29.04	12.06	38.2
FoMO	748	22.97	6.13	0.77	38.63	12.10	44.9
ILP	748	3.07	2.22	–	38.63	12.10	44.9
Age	748	38.63	12.10	–	–	–	44.9

Notes. WAUD = WhatsApp Use Disorder; FBUD = Facebook Use Disorder; IGUD = Instagram Use Disorder; SCUD = Snapchat Use Disorder; FoMO = Fear of Missing Out; ILP = social media's impact on daily-life and productivity. M (age), SD (age), and % male mark the descriptive statistics of subsamples of people who responded to specific scales.

elsewhere (e.g., Sindermann et al., 2020). Example items include "The people around me tell me that I use [platform] too much" and "I am constantly checking [platform] so as not to miss conversations", where [platform] denotes either WhatsApp, Facebook, Instagram, or Snapchat. Internal consistency (reflected by Cronbach's alphas) statistics for the effective samples (see Table 1) were adequate.

The Fear of Missing Out (FoMO) scale (Przybylski et al., 2013) measures the extent of apprehension of missing out on rewarding experiences of others (e.g., one's friends). The German version we used was presented in Spitzer (2015). It is a 10-item (Likert-type response scale: 1 = "not at all true of me" to 5 = "extremely true of me") unidimensional scale that has demonstrated good internal consistency. The FoMO scale has been shown to be positively associated with measures of smartphone use (Elhai et al., 2020) as well and negative affect (Elhai et al., 2020). Example items include "I fear others have more rewarding experiences than me" and "I get anxious when I don't know what my friends are up to". Cronbach's alpha for the effective sample responses was 0.77.

Finally, we measured the impact of social media on daily-life and productivity at work with two items. Specifically, we asked participants the following questions: (1) "How strongly has your social media/messenger activity (e.g. WhatsApp, Facebook, Instagram) affected your productivity at work in the last 7 days (includes not only work, but also education at school, university, etc.)? Think of days when you were limited in the amount or type of work you could have done, days when you did less than you wanted, or days when you were not doing your job as thorough as usual. If your social media/messenger activity has had a minor impact on your work, choose a low number. If your social media/messenger activity has had a major impact on your work, choose a high number. Please exclusively take into account how much your social media/messenger activity has affected your productivity at work.", and (2) "How strongly has your social media/messenger activity (e.g. WhatsApp, Facebook, Instagram) affected your ability to carry out your normal daily activities in the last 7 days, excluding work (education at school, university is also excluded, etc.)? By normal activities we mean the usual activities that you do, such as housework, buying groceries, childcare, gymnastics/physical activity, learning, etc. Think of times when you were limited in the amount or type of activities you could have done and times when you did less than you wanted. If your social media/messenger activity has had little impact on your activities, choose a low number. If your social media/messenger activity has had a major impact on your activities, choose a high number." Both of these instructions were followed by: "Please exclusively take into account how much your social media/messenger activity has affected daily-life *or* productivity at work." These items (but concerning smartphone use) have also been used in Duke and Montag (2017). A note on causality in the present work: Clearly, the design of the present study is of correlational nature, given the cross-sectional design. Therefore, causality cannot be derived from the variables *per se*. Beyond that, we mention that the items presented in this section ask for causality – hence for the impact of a person's social media use on daily life activities and productivity. Therefore, if we speak of impact of social media on productivity, it always needs to be seen in light of the items' wordings.

The responses ranged from 0 = "social media/messenger use had no impact on my work/daily activities" to 10 = "social media use

Table 2
Correlations between the key variables of this study.

Variable	1	2	3	4	5	6
1. WAUD						
2. FBUD	0.496***					
3. IGUD	0.577***	0.370***				
4. SCUD	0.420***	0.116	0.543***			
5. FoMO	0.471***	0.334***	0.456***	0.259**		
6. ILP	0.555***	0.430***	0.564***	0.342***	0.460***	
7. Age	−0.267***	0.014	−0.341***	−0.441***	−0.327***	−0.339***

Notes. Pearson correlation coefficients were used. Sample sizes for pairwise correlations are in Table 1. WAUD = WhatsApp Use Disorder; FBUD = Facebook Use Disorder; IGUD = Instagram Use Disorder; SCUD = Snapchat Use Disorder; FoMO = Fear of Missing Out; ILP = social media's impact on daily-life and productivity. *p < 0.05, **p < 0.01, ***p < 0.001.

hindered me to work/do my daily activities (completely). For technical reasons, the scale was recoded to have a range of 1–11, instead of 0–10. Because these two variables were highly correlated (r = 0.677, p < 0.001), we aggregated them into a single "social media's impact on daily-life activities and productivity" index by taking the average of these two scores.

3.1. Analysis

We analyzed data in R software version 3.5.1 (R Core Team, 2019). Because participants were required to fill out an SNUD scales if they said they used a corresponding social media platform, there were no missing data in the respective SNUD scales. For example, if a person marked that they use Facebook (but not Snapchat), they needed to fill out all FBUD scale items in order to proceed with the study, whereas SCUD items were not displayed.

We computed internal consistency (Cronbach's alphas) using the *alpha()* function from the *psych* package (Revelle, 2018). Then, we computed summed scores for WAUD, FBUD, IGUD, SCUD, and FoMO scales. For the summed scores, skewness and kurtosis were in the range of normality (Kim, 2013); therefore, we computed Pearson correlation coefficients as measures of association between variables. We also used independent-samples t-tests to assess for gender differences in SNUD scales, as well as FoMO, and social media's impact on daily-life and productivity. Cohen's d-s were computed as the group differences effect size measure using the *cohensD()* function in the *lsr* package (Navarro, 2015).

Finally, we conducted a series of mediation analyses using the *mediate()* function from the *psych* package (Revelle, 2018). We used social media's impact on daily-life and productivity at work index as the dependent variable, with FoMO scores as the predictor. One of the specific SNUD scale scores (either WAUD, FBUD, IGUD, or SCUD) was used as the mediator in each model separately. This procedure led to a total of four mediation models. Age and gender were used as covariates in all these models, as younger and female participants report more engagement in social media use (van Deursen, Bolle, Hegner, & Kommers, 2015). The standard errors of indirect effects were bootstrapped across 5000 samples.

The analysis script as well as data set are available in the Open Science Framework: https://osf.io/tm8de/?view_only=d8c520e262524ec7b03fd12c5afb1a95.

4. Results

4.1. Descriptive statistics, gender differences, and correlations

Descriptive statistics for the variables of interest are in Table 1.

As could be seen from Table 1, out of four SNUD scales, the most frequently used social media platform in the sample was WhatsApp, and the least used social media platform was Snapchat. It could also be observed that the average age of study participants was the lowest among Snapchat users. The total sample as well as subsamples tended to be skewed towards more females. Table 1 also shows that the average score on each SNUD scale was rather low, as the theoretical maximum score for these scales is 60 and theoretical average score is 30.

We also computed a series of t-tests to assess gender differences in SNUD scales, as well as FoMO and social media's impact on daily-life and productivity at work. There were no gender differences in FBUD, SCUD, and FoMO. However, women tended to score higher in WAUD (women M = 23.76, SD = 10.16; men M = 20.56, SD = 8.74; t (727.27) = −4.587, p < 0.001, d = 0.335), IGUD (women M = 21.52, SD = 11.84; men M = 17.96, SD = 9.84; t (324.64) = −2.998, p = 0.003, d = 0.322), and social media's negative impact on daily-life activities and productivity (women M = 3.43, SD = 2.15; men M = 3.01, SD = 1.93; t (739.59) = −2.801, p = 0.005, d = 0.204).

The results of the correlation analysis are presented in Table 2.

It could be seen from Table 2 that, in general, SNUD scale scores are positively correlated with each other. With the exception of the association between FBUD and SCUD, all other correlations were statistically significant. In addition, all SNUD scale scores were positively correlated with more FoMO and more social media's negative impact on daily-life and productivity at work. Finally, all variables (except for FBUD) were negatively correlated with age.

4.2. Mediation effects

Using FoMO summed scores as the predictor and social media's impact on daily-life and work productivity as the dependent variable, we conducted four mediation analyses with either a summed score of WAUD, FBUD, IGUD, or SCUD as the mediator separately. All models were controlled for age and gender. The mediation analysis results are in Table 3.

First, it could be observed that in all models both the total as well as direct effect were statistically significant and positive. Second, models that included WAUD, FBUD, and IGUD had a statistically significant indirect effect via the mediating variable. However, judging by the 95% confidence intervals, there was no significant indirect effect of SCUD. Third, results show that the mediating effect of WAUD was the largest (β = 0.192; 95% CI [0.149; 0.237]), followed by IGUD (β = 0.181, 95% CI [0.110; 0.258]), and FBUD (β = 0.129; 95% CI [0.084; 0.179]). Fourth, it should be noted that these significant indirect effects implied to partial mediation, since also the total and direct effects were significant. Finally, the models explained between 22.6% (SCUD) to 34.5% (IGUD) of impact on the life and productivity variable variance, suggesting that a large proportion on the variance is not explained by the effects of FoMO, SNUD scale scores, age and gender.

5. Discussion

In the current study, we investigated how FoMO was associated

Table 3
Results of mediation analyses.

SNUD scale	Mediation model statistics			
WhatsApp UD	**β**	**SE**	**t (df)**	**95% CI for ab**
Direct effect (a)	0.429	0.034	12.706*** (729)	–
Direct effect (b)	0.444	0.033	13.560*** (729)	–
Direct effect (c')	0.219	0.034	6.463*** (728)	–
Total effect (c)	0.410	0.033	12.264*** (730)	–
Indirect effect (ab)	0.192	0.022	–	[0.149; 0.237]
Model statistics	**R**	**R-squared**	**F**	**df**
	0.581	0.338	185.718***	2; 728
Facebook UD	**B**	**SE**	**t (df)**	**95% CI for ab**
Direct effect (a)	0.371	0.046	8.028*** (450)	–
Direct effect (b)	0.350	0.039	8.802*** (450)	–
Direct effect (c')	0.334	0.041	8.059*** (449)	–
Total effect (c)	0.463	0.042	10.996*** (451)	–
Indirect effect (ab)	0.129	0.024	–	[0.084; 0.179]
Model statistics	**R**	**R-squared**	**F**	**df**
	0.572	0.327	109.199***	2; 449
Instagram UD	**B**	**SE**	**t (df)**	**95% CI for ab**
Direct effect (a)	0.388	0.049	7.951*** (331)	–
Direct effect (b)	0.462	0.051	9.011*** (331)	–
Direct effect (c')	0.235	0.050	4.739*** (330)	–
Total effect (c)	0.414	0.049	8.366*** (332)	–
Indirect effect (ab)	0.181	0.038	–	[0.110; 0.258]
Model statistics	**R**	**R-squared**	**F**	**df**
	0.587	0.345	86.920***	2; 330
Snapchat UD	**B**	**SE**	**t (df)**	**95% CI for ab**
Direct effect (a)	0.151	0.081	1.861 (132)	–
Direct effect (b)	0.194	0.082	2.371* (132)	–
Direct effect (c')	0.410	0.080	5.157*** (131)	–
Total effect (c)	0.440	0.078	5.647*** (133)	–
Indirect effect (ab)	0.029	0.025	–	[−0.010; 0.089]
Model statistics	**R**	**R-squared**	**F**	**df**
	0.476	0.226	19.161***	2; 131

Notes. Standardized coefficients are displayed. Standard errors of indirect effects are bootstrapped over 5000 samples. a, b, c, and c' correspond to paths in Fig. 2: a = FoMO -> SNUD scale score; b = SNUD scale score -> social media's impact on daily-life and productivity score. Averaged bootstrapped indirect effects are displayed. SNUD = social networks use disorder. WAUD model N = 733; FBUD model N = 454; IGUD model N = 335; SCUD model N = 136. The 95% CIs for indirect effects are in the brackets. All mediation models were controlled for participants' age and gender. *p < 0.05, **p < 0.01, ***p < 0.001.

with social media's impact on daily-life and productivity at work, and WhatsApp, Facebook, Instagram, and Snapchat Use Disorder symptoms. Specifically, in addition to bivariate relationships, we were interested in whether SNUD scales mediated the potential association between FoMO and social media's impact on daily-life and productivity.

According to our first hypothesis (H1), we expected FoMO to positively correlate with social media's impact on daily-life and productivity at work. We found support for this hypothesis from the data. Previously, social media use, FoMO, and, distracted driving have been linked to each other (Przybylski et al., 2013). In addition, FoMO has been associated with learning-related factors, such as a more superficial approach to studying and procrastination (Alt & Boniel-Nissim, 2018; Rozgonjuk, Elhai, et al., 2019; Rozgonjuk, Kattago, & Täht, 2018). Therefore, as these studies have demonstrated, FoMO is related to daily-life disturbances. This phenomenon could be due to higher levels of specific SNUDs. In fact, the data supported our second hypothesis (H2) where we found that FoMO was positively correlated with WAUD, FBUD, IGUD, as well as SCUD. As such, one might expect that these SNUDs could affect the extent of social media's impact on life and productivity at work, which was our third hypothesis (H3). That hypothesis, too, found support from our data.

Finally, in the fourth hypothesis (H4), we proposed a potential mechanism to explain these relationships. Specifically, we expected SNUDs to mediate the association between FoMO and social media's impact on daily-life and work productivity. We found that WAUD, FBUD, and IGUD were statistically significant partial mediators, while SCUD did not mediate that relationship. This finding is interesting, as all mediation models were controlled for age and gender. On the one hand, perhaps Snapchat may not be as ubiquitous as other social media platforms and could, therefore, have less influence on one's daily-life and work productivity. On the other hand, Snapchat is the only platform where content sharing has time constraints, with content becoming unavailable after, for instance, 24 hours. This would mean that a user might be more motivated to check Snapchat more often – potentially resulting in more problematic engagement in Snapchat use. On the other hand, these results could be potentially explained by the wording of the social media's impact on life questions, as when queried about the potential impact, examples of SNS platforms included specifically WhatsApp, Facebook, and Instagram, but not Snapchat. Therefore, this finding could have been an artifact of the data. In addition, since the sample size of people providing SCUD scale responses was relatively low, statistical power was low and may not have been sufficient to allow for robust interpretation of this particular result since the effect size was also relatively small. Finally, it could also be that Snapchat has fewer addictive features than other platforms, as indicated by lower scores of SCUD in comparison with WAUD, FBUD, and IGUD (in Table 1). Interestingly, Snapchat is not owned by Facebook Inc. It could be that the same parent company of several products (here: Facebook, WhatsApp, and Instagram) may promote using these social media platforms more (e.g., via linking accounts and the possibility to share content across platforms). This could potentially make these platforms more engaging. It is noteworthy, however, that all of the SNUD scores were relatively low in comparison to their theoretical average. This indicates to the need for a further discussion on conceptualizing these conditions.

The results also showed that the models presented in the current work did not explain most of the variance of the dependent variable. In other words, there may be other factors that could contribute to a higher impact of social media on daily-life and productivity. Among these factors could be individual differences in personality traits, as well as experiencing psychopathology. Studies have generally demonstrated that higher trait neuroticism (tendency to experience negative emotions; Costa & McCrae, 1985) is associated with more detrimental digital technology usage patterns (Blackwell, Leaman, Tramposch, Osborne, & Liss, 2017; Rozgonjuk, Ryan, et al., 2019; Vogel, Rose, Okdie, Eckles, & Franz, 2015). Importantly neuroticism is also positively linked with FoMO (Balta et al., 2018; Blackwell et al., 2017). People who have higher trait neuroticism may also experience more psychopathological conditions, such as depression and anxiety (Muris, Roelofs, Rassin, Franken, & Mayer, 2005; Saklofske, Kelly, & Janzen, 1995). Depression and anxiety are also often associated with digital technology use disorders (Elhai, Dvorak, Levine, & Hall, 2017; Hussain et al., 2020; Primack et al., 2017). Therefore, one potential explanation could be that people with higher trait neuroticism and/or who are experiencing depression and/or anxiety, may also have their daily life disturbed by these factors. However, whether this is the case, should be tested in future research.

With the exception of Facebook, younger social media users tended to have higher scores on SNUDs scales, as well as FoMO and social media's impact on daily-life activities and productivity. Again, it could be that a common underlying trait could drive these associations; one such trait could be neuroticism. Of interest, it has been demonstrated that neuroticism tends to decrease with age (McCrae et al., 1999; Mõttus & Rozgonjuk, 2019; Soto, John, Gosling, & Potter, 2011), potentially suggesting that older participants, in general, may be less apprehensive regarding missing out on experiences of others, and engage less in SNUDs.

Some gender differences are also present, with female study

participants scoring higher on WAUD and IGUD, as well as social media's impact on daily life activities and productivity. It has been demonstrated that women are more likely than men to use SNS for communication (rather than, say, information-seeking; Kimbrough, Guadagno, Muscanell, & Dill, 2013; Krasnova, Veltri, Eling, & Buxmann, 2017). WhatsApp is the only SNS application among the ones studied in this work with a sole purpose to facilitate communication via instant messaging as well as phone and video calls. Therefore, perhaps this also explains why women had higher scores on the WAUD scale. Secondly, since Instagram is largely an image-based SNS application, it may elicit more social comparison with others, potentially further fueling feelings of loneliness (Yang, 2016) and body dissatisfaction (Tiggemann, Hayden, Brown, & Veldhuis, 2018). It has previously been demonstrated that women score higher on the IGUD scale (Balta et al., 2018). Therefore, one hypothetical explanation to the results could be that women have a higher propensity towards IGUD, and this may have a higher impact on their life via social comparison-induced loneliness and body dissatisfaction. This, in turn, could affect their daily life and productivity. All in all, while these could be potential explanations for what was found in this study, gender differences were not the primary focus. Yet the results suggest that gender differences in SNUDs as well as social media's impact on daily life activities and productivity should be further investigated.

The current research is novel, as it tests four different SNS platform use disorders as mediators between FoMO and social media's impact on daily-life and productivity at work. The results could further advance the understanding of the interplay between FoMO, SNS use disorder, and its impact on daily-life and productivity. While FoMO seems to elicit more adverse effects of social media on one's everyday life and productivity, some SNS platforms (but, in this work, not Snapchat) may help to explain that relationship. It could be that people who have higher levels of FoMO may, for instance, experience more disruptions in their everyday tasks – this, in turn, could lead to lower productivity. In part, this explanation is supported by findings in an educational context where it has been demonstrated that experiencing more FoMO is associated with more disrupted activities due to notifications that could potentially be prompted by SNS apps (Rozgonjuk, Elhai, et al., 2019; Kushlev et al., 2016). However, in order to tackle the potential detrimental effects of FoMO, more extensive discussion on disentangling the effects of trait and state FoMO is needed (Wegmann, Oberst, Stodt, & Brand, 2017).

However, there are not only direct effects of FoMO on social media's impact on daily-life activities and productivity. As the results of this study showed, FoMO may also lead to experiencing more disordered SNS use in some cases; being preoccupied by SNS use and experiencing adversities due to that could also hamper one's daily-life task execution and productivity. Yet it is still interesting that this was not the case in Snapchat Use Disorder – even though, in general, the described mechanism above seems to have some empirical support from this study.

The contribution of the current study is that, first, experiencing greater FoMO tends to go hand-in-hand with a larger impact of social media on one's everyday life activities and productivity. In other words, one may find the correlation between higher levels of FoMO and lower productivity. Second, FoMO is consistently associated with different, SNS platform-specific use disorder symptoms in a similar magnitude. These findings may imply that FoMO represents a specific risk factor for SNUDs. Third, the possible effect of FoMO on social media's impact on daily-life activities and productivity is partially mediated by SNS use disorders (with the exception of Snapchat). Therefore, although SNUDs do affect one's daily-life and productivity negatively, there is still a unique effect of FoMO on daily-life activities and productivity present. This also makes sense, because the FoMO construct itself is conceptualized beyond the online-realm (see also a recent review by Elhai, Yang, & Montag, 2020). Therefore, even though one may aim towards improved productivity in daily-life activities, complete abstinence from social media may not necessarily be enough to increase productivity, since one may still have higher levels of FoMO potentially introducing adversities to everyday life. Therefore, FoMO should also be dealt with.

There are some limitations that need to be considered. Firstly, our study was cross-sectional and, therefore, causal interpretations should be made with caution. The justification for modeling potential mediating effects of SNUD scales was derived from the theoretical framework of the I-PACE model (Brand et al., 2016, 2019) that describes the role of predisposing factors (in the current study: trait FoMO) in developing problematic engagement in digital technology (SNUD scores) which could affect one's daily-life and productivity. However, future studies need to address these limitations with a longitudinal study design that should involve experimentation over a period of time. Secondly, we used self-report methods for all scales. Studies on, for instance, smartphone use disorder have shown that self-reports may reflect subjective components that may not necessarily reflect in actual, objectively measured smartphone use behavior (Ellis, Davidson, Shaw, & Geyer, 2019; Montag et al., 2015; Rozgonjuk, Levine, Hall, & Elhai, 2018; Rozgonjuk, Pruunsild, Jürimäe, Schwarz, & Aru, 2020; Wilcockson, Ellis, & Shaw, 2018). However, as also briefly mentioned in the Introduction, high numbers of phone-checking and screen time may not equate to a use disorder. As posited in the I-PACE model, some people who use their digital technology (be it the Internet, a smartphone, or social media) a lot (frequently, for a long time) may develop adverse effects of their technology use, while it may not be the case for others. Nevertheless, if possible, future studies should aim towards the inclusion of objectively measured social networking apps usage data to complement self-reports (for more discussions see also Montag, Duke, and Markowetz (2016) or Montag and Elhai (2019)). Similar limitation regards the social media's impact on daily-life and productivity at work measure; it would be highly informative if measures on subjective and objective well-being as well as productivity at work (or school) measures were included.

6. Conclusion

In conclusion, we studied how FoMO is associated with social media's impact on daily-life and work productivity, and whether specific social networks use disorders mediate that relationship. We found that, in general, higher levels of FoMO were associated with more impact of social media on daily-life and work productivity. Furthermore, both of these variables were positively correlated with WhatsApp, Facebook, Instagram, and Snapchat Use Disorders. Finally, controlling for age and gender, the results showed that, in general, SNUDs mediated the relationship between FoMO and social media's impact on daily-life and work productivity (with the exception of Snapchat).

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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.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.addbeh.2020.106487.

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