



Full length article

"I don't want to miss a thing": Adolescents' fear of missing out and its relationship to adolescents' social needs, Facebook use, and Facebook related stress

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ABSTRACT

This survey study among adolescents ($N = 402$) investigates an integrative model that examines (1) the mediating role of adolescents' fear of missing out (FoMO) in the relationships of adolescents' need to belong and need for popularity with adolescents' Facebook use and (2) the relationships of adolescents' FoMO with adolescents' perceived stress related to the use of Facebook. Structural equation modeling results indicated that an increased need to belong and an increased need for popularity were associated with an increased use of Facebook. These relationships were mediated by FoMO. Increased FoMO was associated with increased stress related to Facebook use. These results emphasize the important role that FoMO plays in adolescents' media use and well-being.

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1. Introduction

Social networking sites (SNSs) are highly integrated in many adolescents' lives (e.g., Lenhart, 2015; Sampasa-Kanyinga & Lewis, 2015) and are considered important channels to seek and maintain social connections (e.g., Shapiro & Margolin, 2013). A recent American report revealed that Facebook is the most popular and widely used online social network among adolescents; more than 71% of 13- to 17-year-olds uses Facebook (Lenhart, 2015). The popularity of Facebook among adolescents raises questions about what motivates them to use Facebook. In this respect, social needs may be important, as scholars (e.g., Lee & Chiou, 2013) argue that individuals are becoming increasingly dependent on SNSs to gratify their social needs. In particular, the need to belong (i.e., the need to develop and maintain significant and stable interpersonal relationships; Baumeister & Leary, 1995) and the need for popularity (i.e., the need to do certain things aimed at increasing one's popularity; Santor, Messervey, & Kusumakar, 2000) may be

important motivations for adolescents' Facebook use in particular, since these are key concerns in adolescence (Santor et al., 2000).

Although previous studies confirmed this suggestion (e.g., Utz, Tanis, & Vermeulen, 2012), our understanding of potential underlying mechanisms that could explain this relationship is still limited. However, given the potential harmful outcomes of using Facebook for young people's well-being (e.g., Kross et al., 2013), scholars agree that it is important to better understand how certain factors relate to adolescents' Facebook use. Przybylski, Murayama, DeHaan, and Gladwell (2013) recently proposed that fear of missing out (FoMO) or "a pervasive apprehension that others might be having rewarding experiences from which one is absent", may be an important explanatory mechanism. They suggest, in line with self-determination theory (SDT; Deci & Ryan, 1985; Ryan & Deci, 2000), that deficits in psychological needs may increase people's sensitivity to fear missing out on things, which in turn may drive people towards social media, as social media may provide individuals an effective self-regulation tool to satisfy their psychological needs (Przybylski et al., 2013). Therefore, the first aim of the present study is to investigate the mediating role of FoMO in the association between adolescents' social needs (i.e., need to belong and need for popularity) and Facebook use.

Recently, studies reported associations between FoMO and

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perceived stress (e.g., Jones, 2014). At the same time, scholars argued that SNSs may function as a new setting for perceiving stress (e.g., Fox & Moreland, 2015), as peer interactions increasingly take place in an online setting (e.g., Shapiro & Margolin, 2013) and are often accompanied by peer-related or interpersonal stress (e.g., Byrne, Davenport, & Mazanov, 2007). Because Facebook may be a new stress-inducing platform for teens (e.g., Fox & Moreland, 2015) and given the harmful correlates of perceived peer-related stress in adolescence (e.g., Sontag & Graber, 2010), it is critical to determine potential risk factors of perceived stress related to new settings for peer interactions, such as Facebook. Therefore, the second aim of the present study is to examine whether FoMO may predict increases in adolescents' perceived stress related to a Facebook setting.

In sum, the present study aims to test an integrative model that examines (1) the mediating role of FoMO in the relationships between need to belong and need for popularity and adolescents' Facebook use and (2) the relationships between FoMO and adolescents' perceived stress related to the use of Facebook. We integrate these closely related needs in an integrative model as this allows us to control for the need for popularity when examining the relationship between the need to belong and adolescents' Facebook use, and vice versa, and as this enables a more comprehensive understanding of the relationships between adolescents' social needs and their Facebook use than considering single needs alone.

1.1. The relationships of adolescents' social needs with adolescents' Facebook use

Adolescence is a critical developmental period, marked by an increased importance of the peer group (Brown & Larson, 2009; Pombeni, Kirchler, & Palmonari, 1990). During this stage of life, adolescents rely more and more on their peers and less on their parents. Peer networks expand and interactions with peers become more intimate (Steinberg, 2005). As a result, peers become primary sources of social support (Bokhorst, Sumter, & Westenberg, 2010). Adolescents in particular feel a strong need to affiliate with their peers and belong to their peers, as well as to feel popular among their peers. According to SDT (Deci & Ryan, 1985; Ryan & Deci, 2000), adolescents, and people more generally, seek to gratify their need to feel socially connected with others. In this vein, scholars have suggested that SNSs may be excellent tools for adolescents to gratify their need to belong (Nadkarni & Hofmann, 2012) and their need for popularity (Utz et al., 2012). This is very likely, since media connect adolescents to their peers and contribute to their socialization with peers (Arnett, 1995; Suoninen, 2001).

First, indications exist that young people's need to belong is associated with an increased use of Facebook. More specifically, studies found empirical support for a link between individuals' need to belong and willingness to join a SNS (Gangadharbatla, 2008), the preference for passive browsing on SNSs (Reich & Vorderer, 2013), and the disclosure of more intimate information in status updates (Winter et al., 2014). Second, indications exist that adolescents' need for popularity is associated with an increased Facebook use. In particular, research reported a positive relationship between individuals' need for popularity and online self-disclosure (Christofides, Muise, & Desmarais, 2009; Utz et al., 2012) as well as with various SNS behaviors, including socializing behaviors on SNSs and routine SNS use (Utz et al., 2012). Based on SDT (Deci & Ryan, 1985; Ryan & Deci, 2000) and evidence from previous studies (Utz et al., 2012; Winter et al., 2014), we hypothesize that:

H1: Adolescents' need to belong is positively associated with

adolescents' Facebook use.

H2: Adolescents' need for popularity is positively associated with adolescents' Facebook use.

1.2. The mediating role of adolescents' fear of missing out

One of the mechanisms that has been proposed to link individuals' social needs with their engagement on SNSs is individuals' fear of missing out (FoMO; Przybylski et al., 2013). Individuals who fear to miss out on social opportunities want to stay continually connected with others and updated about what others are doing (Przybylski et al., 2013). Based on SDT (Deci & Ryan, 1985; Ryan & Deci, 2000), Przybylski et al. (2013) argue that deficits in psychological need satisfaction may predict a fear of missing out. Adolescents' fear to miss out on events, in turn, likely drives their Facebook use, as Facebook enables adolescents to stay continually connected with their peers (Shapiro & Margolin, 2013).

In line with these assumptions, studies have found empirical evidence for the role of FoMO as the mediating mechanism that explains the relationships of adults' and college students' needs with their engagement in social media (Alt, 2015; Przybylski et al., 2013). For instance, in a sample of adults, Przybylski et al. (2013) found that FoMO was the mechanism linking adults' need satisfaction with social media engagement. More specifically, adults who experienced less need satisfaction experienced higher overall levels of FoMO, which, in turn, was associated with seeking out social media engagement. More recently, Alt (2015) confirmed the evidence for the mediating role of FoMO, as she found support for a mediating role of FoMO in the relationship between college students' academic motivations and social media engagement.

In line with the premises of SDT (Deci & Ryan, 1985; Ryan & Deci, 2000) and based on evidence accumulated by previous studies (Alt, 2015; Przybylski et al., 2013), it can be assumed that FoMO mediates the relationships between adolescents' social needs and Facebook use. Therefore, we hypothesize that:

H3: Adolescents' fear of missing out (FoMO) mediates the relationships of need to belong and need for popularity with Facebook use.

1.3. The relationships of adolescents' fear of missing out with adolescents' Facebook related stress

According to the social selection hypothesis (Hurst, 2007), emotional problems negatively affect individuals' social position or factors associated with one's social position, including stressful life events. In line with this hypothesis, Kim, Conger, Elder, and Lorenz (2011) found that anxiety symptoms predicted higher levels of stressful life events among adolescents. Based on the premises of the social selection hypothesis (Hurst, 2007) and empirical evidence (e.g., Kim et al., 2011), we expect that FoMO may predict higher levels of perceived stress related to Facebook use among adolescents.

First, anxiety is an important component of FoMO, as FoMO refers to fears, worries, and anxieties people have about missing out (Przybylski et al., 2013). In this respect, Rosen, Whaling, Carrier, Cheever, and Rökkum (2013) found support for a relationship between anxiety and not being able to check in with various technologies. In addition, Cheever, Rosen, Carrier, and Chavez (2014) found an association between anxiety and not being able to use wireless mobile devices. Because FoMO is closely related to anxiety and anxiety is often associated with feelings of stress among adolescents (e.g., Kim et al., 2011), it is very likely that adolescents'

FoMO is related with higher levels of perceived stress.

Second, the feelings of stress that adolescents likely experience when they feel that they do not belong to their peers or feel that they are not popular among their peers (Frankel, 1990; Leary, 1990), may be particularly salient on SNSs, since adolescents can easily be socially excluded by their peers on SNSs (e.g., not being invited by peers to an upcoming event on Facebook) or not being perceived as popular by their peers on SNSs (e.g., receiving no or few *likes* on a Facebook post) (e.g., Fox & Moreland, 2015). For adolescents, being excluded from interactions with their peers and being neglected by peers is stressful (Frankel, 1990) and creates feelings of stress (Leary, 1990). Therefore, feelings of missing out from peer interactions can be perceived as very stressful for adolescents. As such, adolescents' FoMO likely increases adolescents' stress related to using Facebook, in particular stress due to not belonging to peers on Facebook and stress due to not being popular on Facebook.

No study thus far has investigated the relationships between FoMO and perceived stress related to a Facebook context. However, previous studies have reported a link between individuals' (fear of) missing out and perceived stress related to an offline context (e.g., Australian Psychological Society, 2015; Chiou, Lee, & Liao, 2015; Jones, 2014). For instance, in experiments involving Facebook users, Chiou et al. (2015) found that thinking about the unavailability of SNSs intensified distress due to being socially excluded. In line with these findings, Jones (2014) found that students reported to feel stressed when they did not carry their cell phones with them. In line with several indications in the literature (e.g., Fox & Moreland, 2015; Rosen et al., 2013), and based on the empirical evidence provided by previous studies (e.g., Chiou et al., 2015; Jones, 2014), we expect that:

H4: Adolescents' fear of missing out (FoMO) is positively associated with perceived stress related to Facebook use.

2. Method

2.1. Participants and procedure

We conducted a cross-sectional study among adolescents. A total of 402 adolescents (43% boys) participated in the study and completed a paper-and-pencil survey. Completion of the survey took approximately 20 minutes. Study participants were recruited from different high schools in Belgium offering different educational levels, including general education (i.e., education preparing students for college or university education), technical education (i.e., education with a focus on technical skills), and vocational education (i.e., education preparing students for specific professions). Students in grades nine to twelve were eligible to participate in the study. As is customary in Belgium, informed consent for the study was received from the school principals.

After school principals had granted permission to participate in the study, a trained research assistant visited the school and distributed paper surveys. Participants were informed that the study was anonymous and were guaranteed that all responses to the survey would be processed confidentially. All participants completed the survey at school during regular school hours. Students who completed the survey were offered a chance to win a raffle. On average, participants were 16.41 years old ($SD = 1.43$ years). A total of 371 adolescents had a Facebook account (92.29%).

2.2. Measures

2.2.1. Need to belong

Adolescents' need to belong was measured with the Need to Belong Scale (NTBS; Leary, Kelly, Cottrell, & Schreindorfer, 2013).

Adolescents indicated their agreement with the ten items of the NTBS, including "I want other people to accept me," "I have a strong need to belong," and "It bothers me a great deal when I am not included in other people's plans" (Cronbach's $\alpha = 0.83$; $M = 3.19$, $SD = 0.76$). Response options ranged from *strongly disagree* (1) to *strongly agree* (5). Confirmatory factor analysis indicated that seven items of the original scale loaded on the need to belong factor and showed that the construct validity of the scale was good (CFI = 0.95, RMSEA = 0.05, SRMR = 0.05). Three items that did not load on the need to belong factor were removed from the scale.

2.2.2. Need for popularity

Adolescents' need for popularity was assessed using 11 items of the popularity scale of Santor et al. (2000), including "I have done things to make me more popular, even when it meant doing something I would not usually do," "It's important that people think I'm popular," and "At times, I've hung out with some people, so others wouldn't think I was unpopular" (Cronbach's $\alpha = 0.91$; $M = 2.15$, $SD = 0.76$). Participants rated their responses on a scale ranging from *strongly disagree* (1) to *strongly agree* (5). Confirmatory factor analysis indicated that all items loaded on the need for popularity factor and showed that the construct validity of the scale was very good (CFI = 0.98, RMSEA = 0.03, SRMR = 0.03).

2.2.3. Fear of missing out

The Fear of Missing Out scale (FoMOs; Przybylski et al., 2013) was used to measure adolescents' fear of missing out. Items included "I get anxious when I don't know what my friends are up to" and "It bothers me when I miss an opportunity to meet up with friends". Two highly similar items of the original scale (i.e., "I fear others have more rewarding experiences than me" and "I fear my friends have more rewarding experiences than me") were combined in one item, resulting in a scale with nine items. This version of the scale turned out to be reliable (Cronbach's $\alpha = 0.84$; $M = 2.50$, $SD = 0.76$). Confirmatory factor analysis indicated that all items loaded on the fear of missing out factor and showed that the construct validity of the scale was very good (CFI = 0.99, RMSEA = 0.02, SRMR = 0.03). Participants rated the nine items on a scale ranging from *strongly disagree* (1) to *strongly agree* (5).

2.2.4. Facebook use

The Facebook Intensity Scale (Ellison, Steinfield, & Lampe, 2007) was used to measure adolescents' Facebook use. The scale comprises three measures: 1) the number of 'Facebook friends', 2) the amount of time spent on Facebook, and 3) a series of six attitude items, including items such as "Facebook has become part of my daily routine," "I feel out of touch when I haven't logged onto Facebook for a while," and "I would be sorry if Facebook shut down," that were assessed using response options ranging from *strongly disagree* (1) to *strongly agree* (5). Following Ellison et al.'s (2007) approach, we first standardized the items of the Facebook Intensity scale before averaging all items to create a total score, because of the different scale ranges of the three measures. Confirmatory factor analysis indicated that all items loaded on the Facebook use factor and showed that the construct validity of the scale was very good (CFI = 0.97, RMSEA = 0.03, SRMR = 0.04). The scale showed good reliability (Cronbach's $\alpha = 0.78$).

2.2.5. Perceived stress related to Facebook use

A perceived stress related to Facebook use scale was developed for this study to measure the extent to which adolescents experience stress related to feedback from peers in the context of their Facebook use. Two types of perceived stress related to Facebook use were measured. First, perceived stress due to not belonging on Facebook was assessed using two items. Items included "Not being

Table 1
Zero-order correlations.

	1.	2.	3.	4.	5.	6.	7.	8.
1. Age	1	0.09	−0.23***	−0.19***	−0.10	−0.02	−0.15**	−0.04
2. Gender		1	−0.02	0.17**	0.15**	0.07	0.22***	0.01
3. Need for popularity			1	0.43***	0.48***	0.31***	0.43***	0.40***
4. Need to belong				1	0.53***	0.24***	0.54***	0.41***
5. Fear of missing out					1	0.50***	0.88***	0.74***
6. Facebook use						1	0.39***	0.33***
7. Perceived stress due to not being popular on Facebook							1	0.50***
8. Perceived stress due to not belonging on Facebook								1

Note. * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

invited for a Facebook group” and “Not being invited for an event through Facebook”. Participants rated their responses on a scale ranging from *not stressful at all* (1) to *extremely stressful* (5). The scale showed good reliability (Cronbach’s $\alpha = 0.80$; $M = 2.02$, $SD = 0.95$). Second, perceived stress due to not being popular on Facebook was assessed using three items. Items included “Receiving little or no ‘likes’ on a post, picture, or video that I posted on my timeline” and “Receiving no reactions on a post, picture, or video that I posted on my timeline”. Participants rated their responses on a scale ranging from *not stressful at all* (1) to *extremely stressful* (5). The scale showed good reliability (Cronbach’s $\alpha = 0.82$; $M = 2.66$, $SD = 1.10$). Confirmatory factor analysis confirmed the two-factor structure of the perceived stress related to Facebook use measures, with two items loading on the perceived stress due to not belonging factor and three items loading on the perceived stress due to not being popular factor and showed that the construct validity of the scales was very good (CFI = 0.99, RMSEA = 0.03, SRMR = 0.02). Both types of stress were included separately in the models.

2.2.6. Control variables

Respondents indicated their gender (1 = *boys*, 2 = *girls*) and date of birth, which we converted into age. Gender and age were included in the model as control variables. In particular, gender was controlled for by including paths from gender to FoMO, Facebook use, and the two measures concerning perceived stress related to Facebook use; age was controlled for by including paths from age to Facebook use and the two measures concerning perceived stress related to Facebook use.

2.3. Analyses

We tested the hypothesized relationships with Structural Equation Modeling (SEM) by using Amos (Arbuckle, 2010). The goodness of fit of the models was determined using the ratio of chi-square to degrees of freedom (χ^2/df), the comparative fit index (CFI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR). Indirect effects were computed by calculating the product of the relevant standardized path coefficients (Cohen & Cohen, 1983). To examine the significance of the indirect effects, we conducted bootstrapping analysis for indirect effects (Arbuckle, 2010) based on 1000 bootstrap resamples and a 95% bias-corrected confidence interval.

In order to account for missing values, multiple imputation was performed before proceeding with the bootstrapping method (Honaker & King, 2010) using the SPSS multiple imputation procedure to impute missing values. In the multiple imputation procedure, multiple data sets were produced in which the missing values were imputed based on the data available. The fully conditional specification (FCS) method was applied, which is an iterative Markov chain Monte Carlo (MCMC) algorithm that uses all other

available variables to fit a univariate model and imputes missing values. The imputed values were saved to the imputed dataset after 10 iterations were performed (i.e., the maximum number of iterations reached).

3. Results

On average, 33.7% of the adolescents (fully) agreed with the items concerning the need to belong and 4.7% of the adolescents (fully) agreed with the items concerning the need for popularity. Approximately one in ten adolescents (fully) agreed with the items concerning FoMO (8.8%). On average, adolescents reported that they had 400 to 500 friends on Facebook ($M = 4.94$, $SD = 2.56$) and spent one to two hours using Facebook a day, on average ($M = 4.48$, $SD = 2.64$). On average, adolescents did not agree nor disagree with the items assessing their attitude towards Facebook ($M = 2.75$, $SD = 0.81$), but one in five adolescents (strongly) agreed with the attitude items (20.1%). Approximately one in ten adolescents reported that the feeling of not belonging to their peers on Facebook was stressful to extremely stressful (9.3%) and one in four adolescents indicated that not being popular on Facebook was stressful to extremely stressful (24.8%).

Zero-order correlations of all variables included in the model are provided in Table 1. Adolescents’ age was negatively related to both adolescents’ need to belong and need for popularity, indicating that these needs decrease with age. Adolescents’ perceived stress due to not being popular on Facebook also decreased with adolescents’ age. Furthermore, girls reported higher levels of need to belong, fear of missing out, and perceived stress due to not being popular on Facebook. In addition, strong positive relationships were found between adolescents’ need for popularity, need to belong, fear of missing out, Facebook use, perceived stress due to not being popular on Facebook, and perceived stress due to not belonging on Facebook.

Structural equation modeling showed that the hypothesized model yielded a good fit, $\chi^2(3915) = 7327.96$, $\chi^2/df = 1.872$, $p < 0.001$, CFI = 0.90, RMSEA = 0.02, SRMR = 0.06. In the first part of the model, which comprises the relationships among social needs, FoMO, and Facebook use (see Fig. 1), the direct relationships between adolescents’ social needs and Facebook use were not significant ($\beta = 0.02$, $B = 0.01$, $SE = 0.03$, $p = 0.87$ for need to belong; $\beta = 0.02$, $B = 0.01$, $SE = 0.03$, $p = 0.87$ for need for popularity). Thus, H1 and H2 were not supported.¹

However, the results indicated an indirect relationship between

¹ In a structural equation model including need to belong, need for popularity, and Facebook use (and excluding FoMO), the direct relationships of adolescents’ need to belong ($\beta = 0.23$, $B = 0.08$, $SE = 0.03$, $p < 0.05$) and need for popularity ($\beta = 0.26$, $B = 0.08$, $SE = 0.03$, $p < 0.01$) with Facebook use were significant. However, when FoMO was considered (i.e., in the full structural equation model that was tested), the direct relationships of adolescents’ need to belong and need for popularity with Facebook use were not significant.

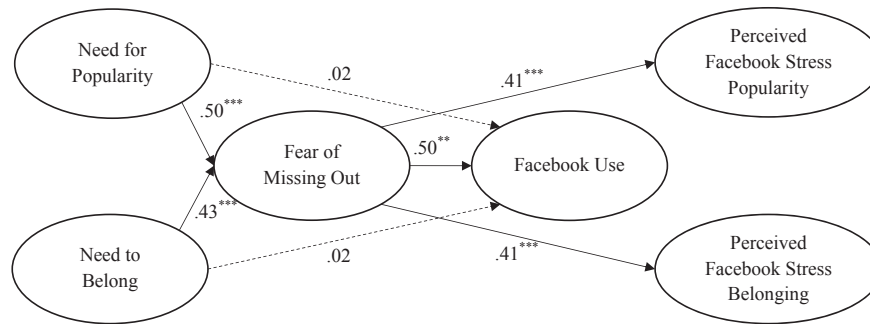


Fig. 1. Observed structural equation model for the relationships among social needs (i.e., need for popularity and need to belong), fear of missing out, Facebook use, and perceived stress related to Facebook use (i.e., perceived stress due to not being popular on Facebook and perceived stress due to not belonging on Facebook). Note. Path coefficients are presented in standardized form. Dashed lines represent insignificant paths. Ovals represent latent constructs. For clarity of presentation, control variables, observed indicators, and error terms are not shown. $^*p < 0.05$. $^{**}p < 0.01$. $^{***}p < 0.001$.

adolescents' social needs and Facebook use through FoMO (see Fig. 1). First, adolescents' social needs were significantly associated with FoMO. More specifically, the results indicated that an increased need to belong ($\beta = 0.43$, $B = 0.50$, $SE = 0.08$, $p < 0.001$) and an increased need for popularity ($\beta = 0.50$, $B = 0.51$, $SE = 0.07$, $p < 0.001$) were strongly associated with an increased fear of missing out. Need to belong and need for popularity collectively explained 69% of the variance in FoMO ($R^2 = 0.69$). Second, fear of missing out was significantly associated with Facebook use ($\beta = 0.50$, $B = 0.15$, $SE = 0.06$, $p < 0.01$). More specifically, the results indicated that adolescents who experienced more fear of missing out, reported a higher Facebook use. Bootstrapping analyses revealed that the relationships of adolescents' need to belong ($0.22 = 0.43 \times 0.50$; $CI = 0.11\text{--}0.35$) and need for popularity ($0.25 = 0.50 \times 0.50$; $CI = 0.12\text{--}0.40$) with Facebook use were significantly mediated by FoMO. As such, H3 was supported. Adolescents' need to belong, need for popularity, and fear of missing out collectively explained 26% of the variance in Facebook use ($R^2 = 0.26$).

In the second part of the model, which comprises the relationships among FoMO and perceived stress of social exclusion on Facebook, several significant relationships were found as well (see Fig. 1). In particular, the results showed that adolescents' fear of missing out was significantly associated with perceived stress of social exclusion on Facebook. More specifically, we found that an increased FoMO was significantly associated with increased stress due to not belonging ($\beta = 0.41$, $B = 0.54$, $SE = 0.17$, $p < 0.001$) and increased stress due to not being popular ($\beta = 0.41$, $B = 0.59$, $SE = 0.16$, $p < 0.001$). Thus, H4 was supported.

The predictors in the model collectively explained 63% of the variance in stress due to not being popular ($R^2 = 0.63$) and 45% of the variance in stress due to not belonging on Facebook ($R^2 = 0.45$).

3.1. Additional analyses

In addition, although not hypothesized by the theoretical assumptions driving this study, the results suggested that FoMO plays a mediating role in the relationships of adolescents' need to belong and need for popularity with adolescents' perceived stress due to not belonging and not being popular on Facebook. Additional post hoc bootstrapping analyses revealed that the relationships of adolescents' need to belong and need for popularity with perceived stress due to not belonging on Facebook (need to belong: $0.18 = 0.43 \times 0.41$; $CI = 0.07\text{--}0.30$; need for popularity: $0.21 = 0.50 \times 0.41$; $CI = 0.09\text{--}0.35$) and not being popular on Facebook (need to belong: $0.18 = 0.43 \times 0.41$; $CI = 0.08\text{--}0.29$; need for popularity: $0.21 = 0.50 \times 0.41$; $CI = 0.08\text{--}0.37$) were

significantly mediated by FoMO. That is, adolescents with a stronger need to belong and need for popularity experienced more FoMO, which, in turn, increased adolescents' perceived stress when being unpopular on Facebook and when not belonging on Facebook.

4. Discussion

The aim of the present study was to investigate the relationships among adolescents' social needs, fear of missing out (FoMO), Facebook use, and perceived stress related to their use of Facebook. In a cross-sectional study among 402 adolescents, we tested an integrative model that examines (1) the mediating role of FoMO in the relationships between need to belong and need for popularity and adolescents' Facebook use and (2) the relationships between FoMO and adolescents' perceived stress related to their use of Facebook. Structural equation modeling revealed several strong relationships.

4.1. The mediating role of adolescents' fear of missing out

First, the present study increases our understanding of how adolescents' social needs are related to their Facebook use. In particular, the results indicate that a strong need to belong and need for popularity is associated with increased Facebook use. An explanation for this relationship that has emerged from this study involves adolescents' FoMO. More specifically, the results indicate that adolescents' need to belong and need for popularity were related with increased FoMO, which, in turn, was associated with increased Facebook use. As such, the present study highlights the importance of FoMO in explaining adolescents' Facebook use and extends prior research that focused on the role of FoMO among college students and adults (e.g., Alt, 2015; Przybylski et al., 2013).

By investigating the mediating role of FoMO, the present study offers a more comprehensive understanding of the associations between adolescents' social needs and Facebook use. Interestingly, the results indicated that when FoMO was taken into consideration, the direct associations of adolescents' social needs with their Facebook use disappeared: While we did find support for the direct associations between adolescents' social needs and their Facebook use when FoMO was not considered,¹ no support was found for these direct associations in the integrative model that we tested. This finding highlights the importance of FoMO as an explanatory mechanism in the association between adolescents' social needs and Facebook use and emphasizes the importance of investigating mediation models.

Individuals' FoMO represents a growing but relatively

understudied phenomenon, especially among adolescents. The possibility to socialize with peers through social media anywhere and anytime that is inherent to today's mobile media environment likely increases the prevalence of FoMO among adolescents. That is, the constant access to social media and the possibility to be continuously connected with others may further feed adolescents' FoMO. As such, a vicious circle may develop in which FoMO may drive people toward social media, which, in turn, may further increase adolescents' FoMO. Research is needed to test this idea of reinforcing spirals (Slater, 2007) in the relationship between adolescents' FoMO and social media use.

Also, the effects that FoMO may have on adolescents' behavior, well-being, and health, through affecting adolescents' media use, warrant further research. For instance, indications exist that adolescents may lose sleep or develop unhealthy eating patterns out of FoMO, because they increasingly feel a need to use media, likely out of FoMO. Adolescents' nighttime media use (Oshima et al., 2012; Van den Bulck, 2007) may be partially rooted in adolescents' FoMO, as research has shown that adolescents report keeping their mobile phones under their pillows in order to avoid missing messages at night (Lenhart, Ling, Campbell, & Purcell, 2010). In addition, adolescents may develop patterns of media-induced meal skipping or fast eating (Van den Bulck & Eggermont, 2006) due to FoMO. That is, adolescents who fear to miss out on events may skip a meal or eat faster so that they can connect with their peers through their media devices and cope with their FoMO. As such, adolescents' FoMO may be an unexplored explanation for adolescents' poor sleep hygiene and sleep problems, as well as their media-induced meal skipping and fast eating. Research is needed that tests these assumptions.

4.2. Fear of missing out and adolescents' perceived stress related to their Facebook use

Furthermore, the present study increases our understanding of the relationship between adolescents' FoMO and perceived stress related to their Facebook use. In particular, the results showed that adolescents' FoMO was related with increased perceived stress due to not belonging to their peers on Facebook and not being popular among their peers on Facebook.

As such, the current study adds to our understanding of the role of peer feedback on SNSs. Providing and receiving peer feedback is an important aspect of SNSs, and Facebook in particular. Facebook is oriented toward commenting and liking other users' messages, pictures, and videos. From prior research we know that, for the largest part, adolescents receive positive feedback from their peers on SNSs, and only to a limited extent negative feedback (e.g., Koutamanis, Vossen, & Valkenburg, 2015; Valkenburg, Peter, & Schouten, 2006). While receiving positive (Frison & Eggermont, in press; Lee, Kim, & Ahn, 2014) and negative (Valkenburg et al., 2006) peer feedback both affect adolescents' well-being, the findings of the current study indicate that *not receiving* peer feedback affects adolescents' well-being as well. That is, not receiving any comments or *likes* from peers on messages, pictures, or videos that adolescents post on Facebook increases feelings of stress among adolescents. Since adolescents are highly sensitive to feedback from their peers (Thomaes et al., 2010), it seems that both *receiving* peer feedback (i.e., positive and negative) and *not receiving* peer feedback affect adolescents' well-being.

Together, the present study is among the first to identify FoMO as a correlate of perceived stress related to the use of Facebook among adolescents. Our findings show that adolescents' FoMO is associated not only with an increased use of Facebook, but also with feelings of stress related to this Facebook use. Future research is needed that investigates other potential correlates of adolescents'

experiences of stress related to the use of SNSs, since the prevalence rate of Facebook related stress among adolescents was relatively high, in particular stress related to being perceived as unpopular on Facebook, with one in four adolescents indicating that not being popular on Facebook was stressful to extremely stressful (24.8%). These high rates represent a cause for concern and call for further research that investigates determinants of perceived stress specific to the use of SNSs and Facebook. For instance, research is needed that identifies which adolescents are more susceptible to experience Facebook induced stress, looking at dispositional, developmental, and social susceptibility factors (Valkenburg & Peter, 2013).

4.3. Limitations and directions for future research

While the present study improves our understanding of the associations among adolescents' social needs, FoMO, Facebook use, and feelings of stress related to Facebook use, the study is not without limitations. First, the cross-sectional study design prevents us from making causal inferences. Studies using longitudinal data are needed to investigate the causal order of the relationships between adolescents' social needs and FoMO and adolescents' FoMO and perceived stress related to Facebook use.

Second, the generalizability of our findings beyond those studied is limited, as the present study relied on a relatively small sample. We therefore recommend that future research examine these relationships in a nationally representative sample to complement the data provided by the present study. However, although the sample was relatively small in size, the relationships observed in this study were particularly strong.

Third, the Facebook intensity scale (Ellison et al., 2007) that was used to assess adolescents' Facebook use may not fully capture the diversity of adolescents' Facebook use. While the Facebook intensity scale has been used and validated in a wide range of previous studies that investigate young people's Facebook use (e.g., Jenkins-Guarnieri, Wright, & Hudiburgh, 2012; Steinfield, Ellison, & Lampe, 2008), scholars (e.g., Frison & Eggermont, in press) have emphasized the need to differentiate between specific Facebook activities. Therefore, research is needed that investigates the associations among adolescents' social needs and different Facebook activities, as different Facebook activities may differently relate to adolescents' social needs. For instance, adolescents' need to belong, which reflects the need to develop and maintain significant and stable interpersonal relationships (Baumeister & Leary, 1995), may be particularly associated with sending private messages through the private Facebook chat environment. Adolescents' need for popularity, which reflects the need to increase one's popularity, may be particularly associated with posting status updates, pictures, and videos in the public Facebook environment, because adolescents may receive *likes* for these public messages, which likely increases their popularity.

Fourth, the present study is limited by the fact that we examined the relationship between FoMO and adolescents' perceived stress related to Facebook use, rather than focusing on general perceived stress in life or other well-being indicators. Although we may expect similar outcomes of stress perceived in an online and offline context, as Facebook may offer users a new context to perceive and experience stress (e.g., Fox & Moreland, 2015; Morin-Major et al., 2016), this is only an assumption. No study thus far has examined the health correlates or outcomes of perceiving stress in a Facebook context. We therefore recommend that future studies examine the association between adolescents' FoMO and well-being (e.g., general life stress, anxiety, depression) as well as empirically test our assumption that perceived stress related to the use of Facebook is a precursor for negative well-being outcomes.

4.4. Conclusion

The present study contributes to our understanding of the role of FoMO in the associations between adolescents' social needs and Facebook use and the relationship between adolescents' FoMO and perceived stress related to their Facebook use. The present study shows, on the one hand, that FoMO mediates the relationships between social needs (i.e., need to belong and need for popularity) and adolescents' Facebook use and, on the other hand, that FoMO is positively related with adolescents' perceived stress related to the use of Facebook. Based on these results, we can conclude that the impact of FoMO for adolescents may not be underestimated. The fact that adolescents have access to an accumulating set of SNSs, through an ever increasing range of devices, including laptops, tablet computers, and smartphones, implies a near constant connectivity to their peers through SNSs. This highly mediated environment requires a clearer understanding of the role of FoMO in adolescents' lives and the experience of stress related to the use of SNSs.

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