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DOI
10.1093/jcmc/zmab015

Publication date
2022

Document Version
Final published version

Published in
Journal of Computer-Mediated Communication

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Link to publication

Citation for published version (APA):
Valkenburg, P. M., Beyens, I., Pouwels, J. L., van Driel, I. I., & Keijsers, L. (2022). Social Media Browsing and Adolescent Well-Being: Challenging the "Passive Social Media Use Hypothesis". *Journal of Computer-Mediated Communication*, *27*(1), Article zmab015. https://doi.org/10.1093/jcmc/zmab015

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Social Media Browsing and Adolescent Well-Being: Challenging the "Passive Social Media Use Hypothesis"

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A recurring hypothesis in the literature is that "passive" social media use (browsing) leads to negative effects on well-being. This preregistered study investigated a rival hypothesis, which states that the effects of browsing on well-being depend on person-specific susceptibilities to envy, inspiration, and enjoyment. We conducted a three-week experience sampling study among 353 adolescents (13–15 years, 126 assessments per adolescent). Using an advanced N = 1 *method of analysis, we found sizeable heterogeneity in the associations of browsing with envy, inspiration, and enjoyment (e.g., for envy ranging from* $\beta = -.44$ *to* $\beta = +.71$*). The Passive Social Media Use Hypothesis was confirmed for 20% of adolescents and rejected for 80%. More adolescents with browsing-induced envy experienced negative effects on affective well-being (25%) than adolescents with no browsing-induced envy (13%). Conversely, more adolescents with browsing-induced enjoyment experienced* positive *effects on affective well-being (47%) than adolescents with no browsing-induced enjoyment (9%).*

Lay Summary

'A recurrent question among academics is whether social media browsing negatively affects teens' well-being. Some scholars believe that this browsing can lead to envy and declines in well-being. Others think that it can also lead to inspiration and enjoyment, and to increases *in well-being. To investigate which scholars are right, we asked 353 teens to report six times a day for a period of three weeks how often they had browsed Instagram and Snapchat in the past hour. Furthermore, we asked them how much envy, inspiration, and enjoyment they had experienced in that hour, and how well they felt at that moment. We found sizeable differences among teens in the effects of browsing on well-being at that moment. While one group of teens (20%) felt worse after browsing, another group (17%) felt better. More teens who had felt envy while browsing, experienced negative effects on well-being than teens who did not feel such envy while browsing. Conversely, more teens who had felt enjoyment while browsing, experienced positive effects on well-being than teens who had not felt such enjoyment.*

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Editorial Record: First manuscript received on 8 January 2021; Revisions received on 4 November 2020; 12 May 2021; Accepted by Andrew Flanagin on 9 August 2021; Final manuscript received on 3 February 2021

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Open Science Framework awards

Open Materials
The components of the research methodology needed to reproduce the reported procedure and analysis are publicly available for this article.

Open Data
Digitally shareable data necessary to reproduce the reported results are publicly available for this article.

Preregistered
Research design was preregistered.

The past decade has witnessed a burgeoning empirical literature into the relation of adolescents' social media (SM) use with indicators of well-being, such as life satisfaction (Orben et al., 2019), depressed mood (Frison & Eggermont, 2017), or affective well-being (Beyens et al., 2020). In addition, several narrative reviews have attempted to integrate the results of these studies (e.g., Dienlin & Johannes, 2020; Verduyn et al., 2017). An important hypothesis forwarded in these reviews is that passive SM use may lead to decreases in well-being, because it induces upward social comparison and envy, whereas active SM use may elicit positive feedback and social connectedness, which subsequently lead to increases in well-being (Verduyn et al., 2017, 2020).

Although appealing at first sight, these opposite hypotheses for active and passive SM use create a dichotomy that has long been challenged by communication theories (e.g., Hall, 1980). In fact, both selective exposure and media effects theories reject the notion of "passive" media use. These theories consider the reception of media messages as active, in the sense that individual recipients have autonomy over the way they select, process, and interpret media messages. These theories argue that (a) people can only attend to a limited number of media messages out of the constellation of messages that can potentially attract their attention, (b) they select media messages in response to psychological, social, and situational antecedents that differ from person to person, and (c) because only those messages they select have the potential to influence them, the effects of these messages also differ from person to person (for a review, see Valkenburg et al., 2016).

The Passive Social Media Use Hypothesis is not only theoretically disputable, but also difficult to verify empirically, at least among adolescents. Whereas several studies have indeed found small overall negative effects of browsing on well-being at the aggregate level (e.g., Escobar-Viera et al., 2018; Orben & Przybylski, 2019), two recent studies adopting a person-specific within-person ($N = 1$) approach suggest that the Passive Social Media Use Hypothesis only holds for a small subset of youth. In a first experience sampling (ESM) study by Beyens et al. (2020), only 10% of adolescents experienced the hypothesized negative effect of passive use on affective well-being, whereas the remaining adolescents experienced no effect or even a positive effect. In a subsequent study, which was based on the same data set as used in the current study, Beyens et al. (2021) found that among 11% of adolescents *both* active and passive use led to negative effects on affective well-being. Conversely, among 12% of adolescents *both* active and passive use led to *positive* effects on affective well-being. Perhaps most remarkable, though, was their finding that less than one percent of adolescents experienced the hypothesized positive effect of active use and the hypothesized negative effect of passive use on well-being.

The results of the two studies of Beyens et al. (2020, 2021) concur with the observations from several authors who have recently criticized the active & passive dichotomy in SM research (e.g.,

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Bayer et al., 2020; Ellison et al., 2020; Kross et al., 2020; Valkenburg et al., 2021). The aim of the current study was to further build on the studies by Beyens et al., by focusing on the question *why* adolescents may respond differently to *passive* SM use, hereafter called browsing. To do so, we investigated a rival hypothesis, which argues that the positivity or negativity of the effects of browsing on well-being does not depend on passive SM use per se, but on person-specific susceptibilities to how SM messages are processed. In fact, we expected that three important mechanisms identified in earlier studies may lead to differential effects of browsing on well-being: envy, inspiration, and enjoyment (Krasnova et al., 2015; Meier et al., 2020). Specifically, we expected that some adolescents are more susceptible than others to the *negative* effects of browsing on well-being, because they experience more envy, less inspiration, and less enjoyment during browsing than their peers. Conversely, we expected that other adolescents are more susceptible to the *positive* effects of browsing on well-being, because they experience less envy, more inspiration, and more enjoyment during browsing than their peers.

To investigate our rival hypothesis, we conducted an ESM study among 353 middle adolescents (13–15 years), whom we surveyed six times a day for three weeks (126 measurements per person, 32,755 assessments in total). We investigated early and middle adolescents because this is the age group that is especially prone to envy and to situationally induced fluctuations in well-being (Maciejewski et al., 2015). We focused on the two platforms that Dutch adolescents most often use for browsing: Instagram and Snapchat (van Driel et al., 2019). Although both platforms also afford private interactions, in this study we focused on their affordance to browse (semi-)public posts and stories of fellow users. Such (semi-)public posts and stories are subject to a "positivity bias" (Reinecke & Trepte, 2014, p. 95), the tendency of SM users to share more positive messages and emotions in (semi-)public SM interactions than in private SM interactions and in offline public interactions (Reinecke & Trepte, 2014; Waterloo et al., 2018). Browsing such (semi-)public SM messages may provide adolescents with ample opportunity to experience envy, inspiration, and/or enjoyment.

Like most earlier ESM studies on SM use (e.g., Bayer et al., 2018; Verduyn et al., 2015; Wenninger et al., 2019), we investigated affective well-being as the outcome, defined as an adolescent's current feelings of happiness (e.g., Tov, 2018, hereafter called well-being). In addition, we focused solely on browsing, firstly because the two recent studies of Beyens et al. (2020, 2021) already compared the effects of both active and passive SM use on affective well-being, and secondly, because envy and inspiration, two of our investigated mechanisms, are hypothesized to be induced by browsing and not by active SM use. To capture adolescents' person-specific susceptibilities to the effects of browsing on envy, inspiration, enjoyment, and well-being, we employed Dynamic Structural Equation Modeling (DSEM), an advanced method of analysis that combines the strengths of $N = 1$ time-series analysis with multilevel and Structural Equation Modeling (Asparouhov, Hamaker, & Muthén, 2018).

Social Media Browsing, Envy, and Well-Being

The Passive Social Media Use Hypothesis (e.g., Verduyn et al., 2017) is based on two successive mechanisms: It firstly assumes that browsing induces upward social comparison, which, subsequently, provokes envy. Envy is a painful and hostile emotion that arises when a person "lacks another's superior quality, achievement, or possession and either desires it or wishes that the other lacked it" (Parrott & Smith, 1993, p. 908). In some SM studies, a distinction is made between benign and malicious envy

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(e.g., Meier et al., 2020; Wu & Srite, 2021), while others have focused only on malicious envy (e.g., Lin et al., 2018). Whereas benign envy motivates us to try to achieve similar achievements or possessions as the person we envy, malicious envy makes us wish that the envied person lacks or does not deserve these achievements or possessions (van de Ven et al., 2009). Because benign envy is strongly correlated with inspiration (e.g., Meier et al., 2020), and because our aim was to compare the effects of SM-induced envy on well-being with those of SM-induced inspiration and enjoyment, we focused on malicious envy, hereafter simply called envy.

Some studies have investigated the *indirect* effect of browsing on envy, via upward social comparison. Most of these studies have yielded a positive indirect effect, meaning that browsing elicited upward comparison, which in turn resulted in envy (e.g., Noon & Meier, 2019). Other studies have (only or also) examined the *direct* association of browsing with envy, yielding a nonsignificant (e.g., Scherr et al., 2019) or a positive effect (e.g., Wang et al., 2019) of browsing on envy. In the current study, we also focused on the direct effects of browsing on envy, which allowed us to compare these effects with those on inspiration and enjoyment, which do not necessarily result from social comparison.

A possible explanation for the mixed findings in earlier studies into the effects of browsing on envy may be that many prior studies have used suboptimal methods of analysis to establish these effects. Most of these studies, including our own early work, have investigated the overall *between*-person associations of browsing with envy (e.g., do frequent browsers report less envy than infrequent browsers). However, such between-person methods of analysis overlook an important proposition of media effects theories, namely that media effects are conceptualized as *intra*-individual changes in cognitions, emotions, or behavior within persons as a result of their media use (Valkenburg et al., 2016). Therefore, the effects of browsing on envy (and any other outcome) could best be investigated by identifying potential changes *within* persons due to their browsing.

In adjacent disciplines, it has been recognized for quite a while that changes due to individuals' interactions with their environment should be conceptualized as an idiographic process, that is, a within-person process that differs across individuals (Lerner & Lerner, 2019; Molenaar, 2004). Just like in media effects research, in these disciplines it has long been assumed that nomothetic (i.e., aggregate between-person) results are generalizable to idiographic (i.e., person-specific within-person) results. However, more recently, it has been demonstrated that this assumption is only valid under two very strict conditions that are highly improbable in the social sciences (for a discussion of these conditions, see Molenaar, 2004; Molenaar & Campbell, 2009). It is therefore likely that the person-specific within-person associations of browsing with envy and/or well-being are unrelated to or even opposite to their analogue between-person associations. However, because the effects of SM involve within-person changes, they should preferably be investigated by idiographic methods of analysis (cf. Molenaar & Campbell, 2009).

Investigating the idiographic associations of browsing with envy is consistent with theories of envy (Cohen-Charash, 2009), which argue that some individuals may experience no or little envy during or after an envy-inducing experience, whereas others may experience much envy during or after the same experience. It is also consistent with recent media effects studies that adopted an idiographic approach, which have demonstrated that the effect of browsing on well-being differs strongly from adolescent to adolescent (Beyens et al., 2020, 2021). Based on envy theory (Cohen-Charash, 2009) and these earlier results, it is conceivable that the association of browsing with envy also differs considerably from adolescent to adolescent. Therefore, we investigated the following research question:

(RQ1). To what extent does the within-person association of adolescents' browsing in the past hour with envy in that hour differ from adolescent to adolescent?

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While the Passive Social Media Use Hypothesis assumes that passive SM use leads to decreases in well-being, our rival hypothesis argues that the effects of browsing on well-being depend on person-specific susceptibilities to SM-induced envy. Based on this hypothesis, we expected that especially adolescents who are susceptible to envy while browsing experience *negative* effects on well-being. Moreover, while envy can be situationally induced during browsing, it has also been conceptualized as a relatively stable disposition that differs across individuals (Smith & Kim, 2007). Based on situational (Cohen-Charash, 2009) and dispositional theories of envy (Smith & Kim, 2007), it is therefore possible that the person-specific within-person effects of browsing on well-being do not only depend on differences in SM-induced envy but also on differences in dispositional envy:

(H1). Adolescents with SM-induced envy (H1a) or higher dispositional envy (H1b) experience more negative within-person effects of browsing on well-being than adolescents without SM-induced envy or lower dispositional envy.

Social Media Browsing, Inspiration, Enjoyment, and Well-Being

Although the conclusions of most reviews confirm the Passive Social Media Use Hypothesis, several recent studies have demonstrated that browsing cannot only lead to envy, but also to inspiration (Meier et al., 2020) and enjoyment (Krasnova et al., 2015), which can both lead to positive rather than negative effects on well-being (Meier et al., 2020; Schueller & Seligman, 2010). In fact, SM-induced inspiration and enjoyment seem to be at least as common as SM-induced envy. For example, Krasnova et al. (2015) found that college-aged Facebook users experienced more positive than negative emotions in response to the self-presentation of their Facebook friends: About 25% experienced envy in response to these self-presentations, whereas about half of them experienced pleasure and enjoyment, and another 6% inspiration and admiration. It is therefore surprising that the literature on the effects of browsing on inspiration and enjoyment is so much scarcer than that on envy.

Inspiration is an experience of enthusiasm that is often evoked spontaneously by someone or something, and which may elicit a moment of clarity or a sudden insight (Thrash et al., 2014). Although inspiration is not universally regarded as an emotion, it does involve emotions such as admiration and awe (Thrash et al., 2014). Because inspiration is included in the Positive and Negative Affect Scale (PANAS, Watson et al., 1988), it is assumed to fluctuate within persons. Although enjoyment is also not universally viewed as an emotion, in our study we follow Ekman (1992), who considers enjoyment as one of the seven basic emotions. Based on Vorderer et al. (2004), we define enjoyment as a pleasurable emotional response to an enjoyment-inducing message.

Like envy, inspiration (Thrash et al., 2014) and enjoyment (Watson et al., 1988) can be situationally induced as well as dispositional, and both types of inspiration and enjoyment can differ across individuals. It is therefore conceivable that the effects of browsing on inspiration and enjoyment differ from adolescent to adolescent, meaning that some adolescents experience more inspiration or enjoyment during browsing than other adolescents do. Moreover, it is likely that the effects of browsing on *well-being* differ for adolescents who vary in SM-induced and dispositional inspiration and enjoyment. Therefore, for both inspiration and enjoyment, we investigated the same research question and hypothesis as we did for envy:

(RQ2). To what extent do the within-person associations of adolescents' browsing in the past hour with inspiration (RQ2a) and enjoyment in that hour (RQ2b) differ from adolescent to adolescent?

(H2). Adolescents with SM-induced inspiration (H2a) or SM-induced enjoyment (H2b) and with higher dispositional inspiration (H2c) or higher dispositional enjoyment (H2d)

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experience more positive within-person effects of browsing on well-being than adolescents without SM-induced inspiration or enjoyment and lower dispositional inspiration or enjoyment.

Method

This preregistered (https://osf.io/eahrx/) ESM study is part of a larger project on the psychosocial consequences of SM use for adolescents. It is based on a three-week ESM wave of this project, which was fielded in December 2019. It builds upon an earlier study by Beyens et al. (2021), which used data of the same ESM wave. Beyens et al. (2021) already demonstrated sizeable heterogeneity in the within-person effects of browsing (i.e., named passive public SM use) on well-being. The current ESM study extends that of Beyens et al. (2021) in that it focuses on the person-specific effects of browsing on envy, inspiration, and enjoyment. Moreover, it investigates to what extent the person-specific effects of browsing on well-being could be explained by SM-induced and dispositional envy, inspiration, and enjoyment.

Data Availability

The data set underlying this study is available at Figshare: https://doi.org/10.21942/uva.13547441.

Participants

The sample of this study consisted of 353 Instagram and/or Snapchat users (58% girls, $M_{age} = 14.11$, $SD = 0.68$) from a large secondary school in the southern part of the Netherlands. The initial sample consisted of 387 early and middle adolescents. Because the current study focused on the effects of Instagram and Snapchat browsing, it only included the 92% of adolescents who used these platforms more than once a week. For more details about the sample and its representativeness, see Beyens et al. (2021).

Sampling Scheme and Compliance

In total, participants received 126 ESM surveys (i.e., 21 days * 6 assessments a day) at random time points within fixed intervals. Our notification scheme with the response windows is uploaded on the Open Science Framework (OSF; https://osf.io/tbdjq/). On average, participants completed 92.79 ESM surveys (SD = 22.59). We reached a compliance rate of 74%, which is high in comparison with previous ESM studies among adolescents (van Roekel et al., 2019). For more details about our procedure, monitoring and incentives plan, a priori power analyses, and methods of analysis, see Supplement 1 and Beyens et al. (2021).

Measures

Browsing

Browsing was measured by the following two items: "How much time in the past hour have you spent viewing posts/stories of others on Instagram?" and "viewing stories of others on Snapchat?". Response options ranged from 0 to 60 min, with 1-minute intervals.

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Well-being

In each ESM survey, adolescents were asked to respond to the question "How happy do you feel right now?" using a 7-point scale ranging from 0 (*not at all*) to 6 (*completely*) with 3 (*a little*) as the midpoint. This single item has been reliably used in previous ESM studies and has high convergent validity (Beyens et al., 2020).

Envy, inspiration, and enjoyment

Envy, inspiration, and enjoyment were measured with the following three items: "How jealous of someone did you feel in the past hour?" "How inspired by someone did you feel in the past hour?" and "How much did you like what you did in the past hour?". For each item, we used a 7-point scale ranging from 0 (*not at all*) to 6 (*completely*), with 3 (*a little*) as the midpoint. SM-induced envy, inspiration, and enjoyment were operationalized as the person-specific associations of browsing with envy, inspiration, and enjoyment. Dispositional envy, inspiration, and enjoyment were operationalized as the latent person means of the 126 ESM assessments. Emotions like envy and enjoyment are typically fleeting, and therefore especially prone to recall bias (Diener, 1990). Therefore, investigating the average of momentary measures of these emotions may be more reliable and valid than one-shot trait survey measures (Fleeson, 2001).

In everyday Dutch language, no distinction is made between envy and jealousy, and certainly not among middle adolescents (cf. Lennarz et al., 2017). Moreover, even in the top Dutch dictionary (Van Dale), envy and jealousy are treated as synonyms. We therefore used the Dutch term for jealousy to measure envy because this term is more ubiquitously used, and certainly in the context of SM browsing.

Method of Analysis

We employed Dynamic Structural Equation Modeling (DSEM) for intensive longitudinal data in M*plus* Version 8.4 (Asparouhov et al., 2018). We first ran a concurrent DSEM model (Model 1) to investigate person-specific differences in SM-induced envy, inspiration, and enjoyment. At the within-person level of this model, we modeled envy, inspiration, and enjoyment as the outcomes, and browsing as the time-varying covariate (i.e., predictor). At the between-person level, we investigated the associations between the latent person means of browsing with the latent person means of envy, inspiration, and enjoyment. In addition, we added random slopes to investigate whether the person-specific within-person associations of browsing with envy, inspiration, and enjoyment would differ across adolescents (to investigate RQ1 and RQ2).

In a second DSEM model (Model 2), we modeled well-being as the outcome, controlled for the autoregressive effect of well-being, and predicted by browsing as the time-varying covariate. To investigate the extent to which the person-specific effects of browsing on well-being depend on adolescents' SM-induced envy, inspiration, and enjoyment (H1a, H2a, H2b) and their dispositional envy, inspiration, and enjoyment (H1b, H2c, H2d), we included adolescents' SM-induced envy, inspiration, and enjoyment (i.e., the person-specific slopes of model 1), as well as their dispositional envy, inspiration, and enjoyment (i.e., person-mean scores) as time-invariant covariates of the person-specific effects of browsing on well-being. A more elaborate description of our analyses, including our inference criteria for our within- and between-person effects, can be found in our preregistration and Supplement 1.

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Results

Descriptives and Correlations

The range, means, standard deviations, within-person, between-person, and intraclass correlations of all variables in the study are included in Supplement 2. As the Table in Supplement 2 shows, the means for envy and inspiration were around 1.00 (range 0–6) and those for enjoyment and well-being around 4.00 (range 0–6). Enjoyment was the most common emotion among participants. During 94% of all ESM observations, adolescents experienced some enjoyment (rating ≥ 1), during 30% some envy, and during 33% some inspiration.

At both the between- and within-person level, browsing was positively associated with envy (b: $r = .40$, w: $r = .09$) and inspiration (b: $r = .38$, w: $r = .08$), but not with enjoyment (b: $r = -.09$, w: $r = .01$). Contrary to expectations, envy and inspiration were positively related at both the between- ($r = .86$) and within-person level ($r = .40$). Finally, enjoyment was negatively associated with envy at the between- and within-person level (b: $r = -.26$; w: $r = -.07$), and negatively associated with inspiration at the between-person level ($r = -.16$), but positively at the within-person level ($r = .07$).

Investigating Person-Specific Effects (RQ1 and RQ2)

Our first DSEM model, with envy, inspiration, and enjoyment as the outcomes and browsing as the predictor converged well before 5,000 iterations: The Potential Scale Reduction (PSR) value was close to 1 (PSR = 1.001). Table 1 presents the results of the DSEM analysis. Our first and second research question asked to what extent the within-person effects of browsing on envy, inspiration, and enjoyment would differ from adolescent to adolescent. The significant random effects of browsing on envy, inspiration, and enjoyment revealed striking differences in person-specific effects. As Figure 1 shows, the person-specific standardized effects (betas) ranged from $\beta = -.44$ to $\beta = +.71$ for envy, from $\beta = -.45$ to $\beta = +.67$ for inspiration, and from $\beta = -.16$ to $\beta = +.20$ for enjoyment.

Explaining Person-Specific Effects (H1 and H2)

Our second DSEM model also converged well before 5,000 iterations (PSR = 1.005). Table 2 summarizes the results of the DSEM analysis with well-being as the outcome, browsing as the predictor, and SM-induced and dispositional envy, inspiration, and enjoyment as the six hypothesized time-invariant moderators. As Table 2 shows, our second DSEM model yielded a negative *between*-person association of browsing with well-being ($\beta = -.12$), as has already been reported in Beyens et al. (2021). This association meant that adolescents who spent more time on browsing than their peers across the three weeks, reported lower average levels of well-being than these peers.

The model did not yield an overall *within*-person effect of browsing on well-being ($\beta = -.004$), which was also already reported in (Beyens et al., 2021). This latter result meant that, overall, the time adolescents spent on browsing in the previous hour did not lead to increases or decreases in momentary well-being (compared to their average level of well-being). However, the significant random effect indicated that the effect of browsing on well-being differed considerably from adolescent to adolescent. The person-specific effects of browsing on well-being ranged from $\beta = -.17$ to $\beta = +.27$ (see Figure 2, lower left histogram). Expressed in percentages (based on our preregistered inference

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Table 1 Main Outcomes DSEM Model of Browsing With Envy, Inspiration, and Enjoyment

Envy: Fixed effects	*b*	*β*	*p*	95% CI
Within-person effect	.103	**.079**	.000	[.063, .096]
Browsing → Envy (= SM-I. envy)				
Between-person associations				
Browsing & Disp. Envy	.327	**.411**	.000	[.316, .496]
Browsing & SM-I. envy	.000	−.003	.484	[−.124, .120]
Disp. envy & SM-I. envy	.012	.050	.222	[−.075, .177]
Envy: Random effects	σ^2		*p*	95% CI
Browsing → Envy (RQ1)	**0.056**		.000	[0.044, 0.072][a]
Inspiration: Fixed effects	*b*	*β*	*p*	95% CI
Within-person effect				
Browsing → Inspiration (= SM-I. inspiration)	.113	**.081**	.000	[.064, .098]
Between-person associations				
Browsing & Disp. Inspiration	.330	**.388**	.000	[.293, .476]
Browsing & SM-I. inspiration	−.007	−.035	.286	[−.157, .089]
Disp. inspiration & SM-I. inspiration	.003	.013	.421	[−.112, .144]
Inspiration: Random effects	σ^2		*p*	95% CI
Browsing → Inspiration (RQ2a)	**0.063**		.000	[0.048, 0.080][a]
Enjoyment: Fixed effects	*b*	*β*	*p*	95% CI
Within-person effect				
Browsing → Enjoyment (SM-I. enjoyment)	.023	.013	.045	[−.002, .028]
Between-person associations				
Browsing & Disp. Enjoyment	−.061	−.094	.042	[−.200, .013]
Browsing & SM-I. enjoyment	−.003	−.026	.362	[−.172, .121]
Disp. enjoyment & SM-I. enjoyment	−.019	−.138	.074	[−.310, .052]
Enjoyment: Random effects	σ^2		*p*	95% CI
Browsing → Enjoyment (RQ2b)	**0.027**		.000	[0.018, 0.040][a]
Other between-person associations	*b*	*β*	*p*	95% CI
SM-I. envy & SM-I. inspiration	.043	**.723**	.000	[.609, .814]
SM-I. envy & SM-I. enjoyment	−.009	−.227	.025	[−.434, .000]
SM-I. enjoyment & SM-I. inspiration	.000	−.001	.497	[−.230, .230]

Notes: *b*s are unstandardized and *β*s are standardized betas; *p*-values are one-tailed Bayesian *p*-values (McNeish & Hamaker, 2020); Significant effects are depicted in bold; SM-I.= SM-induced; Disp.=Dispositional.

[a]The 95% Credible Interval of the variances around the within-person effect of browsing on envy, inspiration, and enjoyment signifies that these effects differed among adolescents.

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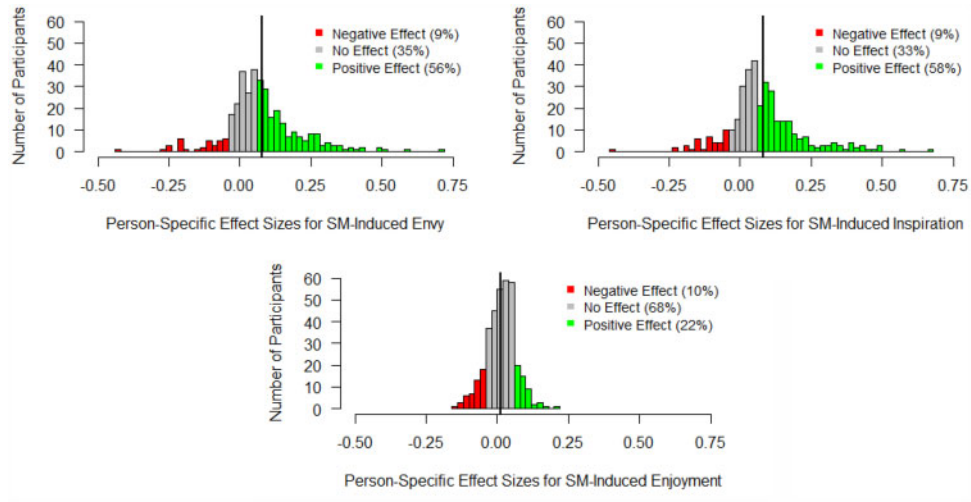

Figure 1 The ranges of the person-specific effect sizes of browsing on envy, inspiration, and enjoyment.

Notes. The *y*-axes represent the number of adolescents; the *x*-axes represent the person-specific effect sizes of browsing on envy, inspiration, and enjoyment, which ranged from $\beta = -.44$ to $\beta = +.71$ for envy (upper left plot), from $\beta = -.45$ to $\beta = +.67$ for inspiration (upper right plot), and from $\beta =$ -.16 to $\beta = +.20$ for enjoyment (bottom plot). The vertical black lines are the average within-person effects of browsing on envy ($\beta =$.08), inspiration ($\beta =$.08), and enjoyment ($\beta =$.01).

criteria, see Supplement 1), we found that 20% of adolescents experienced a negative effect of browsing on well-being (i.e., $\beta < -.05$), whereas another 17% experienced a positive effect (i.e., $\beta > .05$).

Our first and second hypotheses predicted that the person-specific effects of browsing on well-being would be more negative for adolescents with SM-induced envy (H1a) or higher dispositional envy (H1b), and more positive for adolescents with SM-induced inspiration (H2a) and enjoyment (H2b), and for adolescents with higher dispositional inspiration (H2c) or enjoyment (H2d). These hypotheses were partly supported. Contrary to hypotheses H1b, H2c, and H2d, dispositional envy, dispositional inspiration, and dispositional enjoyment could not explain the differences in person-specific effects of browsing on well-being, and neither could SM-induced inspiration (H2a). This meant that the effects of browsing on well-being did not depend on adolescents' trait-like envy, inspiration, and enjoyment, and neither on SM-induced inspiration.

The effects of browsing on well-being could be explained by *SM-induced* envy (H1a, $\beta = -.13$) and *SM-induced* enjoyment (H2b, $\beta = .43$). Although the credibility intervals for the moderating effect of SM-induced envy contained zero, the effect size was below the $\beta \leq -.10$ threshold, and, therefore, according to our preregistered inference criteria, we interpreted it as a negative association. Doing so enabled us to compare the small moderating effect of SM-induced envy with the strong one of SM-induced enjoyment. As Figure 2 shows, more adolescents with SM-induced envy (i.e., a person-specific within-person effect of $\beta = .05$ or stronger) experienced negative effects of browsing on well-being (25%, see upper right plot) than adolescents without SM-induced envy (13%, see upper left plot). Conversely, more adolescents with SM-induced enjoyment experienced *positive* effects of browsing on well-being (47%, lower right plot) than adolescents without SM-induced enjoyment (9%, lower middle plot).

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Table 2 Main Outcomes DSEM Model of Browsing on Well-being With Envy, Inspiration, and Enjoyment as $N = 1$ Moderators

Fixed effects	*b*	*β*	*p*	95% CI
Within-person effects				
Browsing → Well-being (Beta)	−.007	−.004	.319	[−.018, .012]
Well-Being (t-1) → Well-being (t) (Phi)	.278	**.278**	.000	[.264, .293]
Between-person associations				
Browsing & Well-being	−.101	**−.119**	.013	[−.228, −.013]
Beta & SM-I. envy (H1a)	−.002	−.134	.065	[−.307, .038]
Beta & Disp. envy (H1b)	−.009	−.069	.201	[−.228, .088]
Beta & SM-I. inspiration (H2a)	.000	.007	.472	[−.166, .179]
Beta & Disp. inspiration (H2c)	−.006	−.042	.312	[−.205, .117]
Beta & SM-I. enjoyment (H2b)	.003	**.432**	.000	[.284, .564]
Beta & Disp. enjoyment (H2d)	−.006	−.052	.291	[−.228, .126]
Beta & Well-being	−.026	**−.183**	.020	[−.347, −.009]
Beta & Browsing	−.004	−.042	.280	[−.183, −.101]
Random effects	σ^2		*p*	95% CI
Browsing → Well-being (Beta)	0.018		.000	[0.012, 0.026][a]
Well-Being (*t*−1) → Well-being (t) (Phi)	0.053		.000	[0.044, 0.064]
Variances Predictor and Outcome				
Browsing (within-person)	0.717		.000	[0.706, 0.728]
Browsing (between-person)	0.653		.000	[0.562, 0.770]
Well-being (within-person, residual)	1.093		.000	[1.077, 1.112]
Well-being (between-person)	1.113		.000	[0.955, 1.300]

Notes: *b*s are unstandardized and *β*s are standardized betas; *p*-values are one-tailed Bayesian *p*-values; Significant fixed effects are depicted in bold; SM-I.=SM-induced; Disp.=Dispositional.

[a]The 95% Credible Interval of the variance around the effect of browsing on well-being (Beta) indicates that the within-person effect of browsing on well-being differed among adolescents.

Sensitivity Analysis

As preregistered, we conducted a sensitivity analysis to examine whether our findings were robust against outliers and potentially untrustworthy answer patterns based on inconsistency of response patterns, outliers, and unserious responses to the open question in the ESM study. These criteria pertained to five participants. We reran the DSEM analysis without these participants. The results did not deviate from those of the full sample.

Discussion

The aim of this study was to extend the work of Beyens et al. (2020, 2021) by investigating *why* adolescents may respond differently to the effects of passive social media use, and why the Passive Social Media Hypothesis may apply to only a minority of adolescents. By adopting an $N = 1$ time-series

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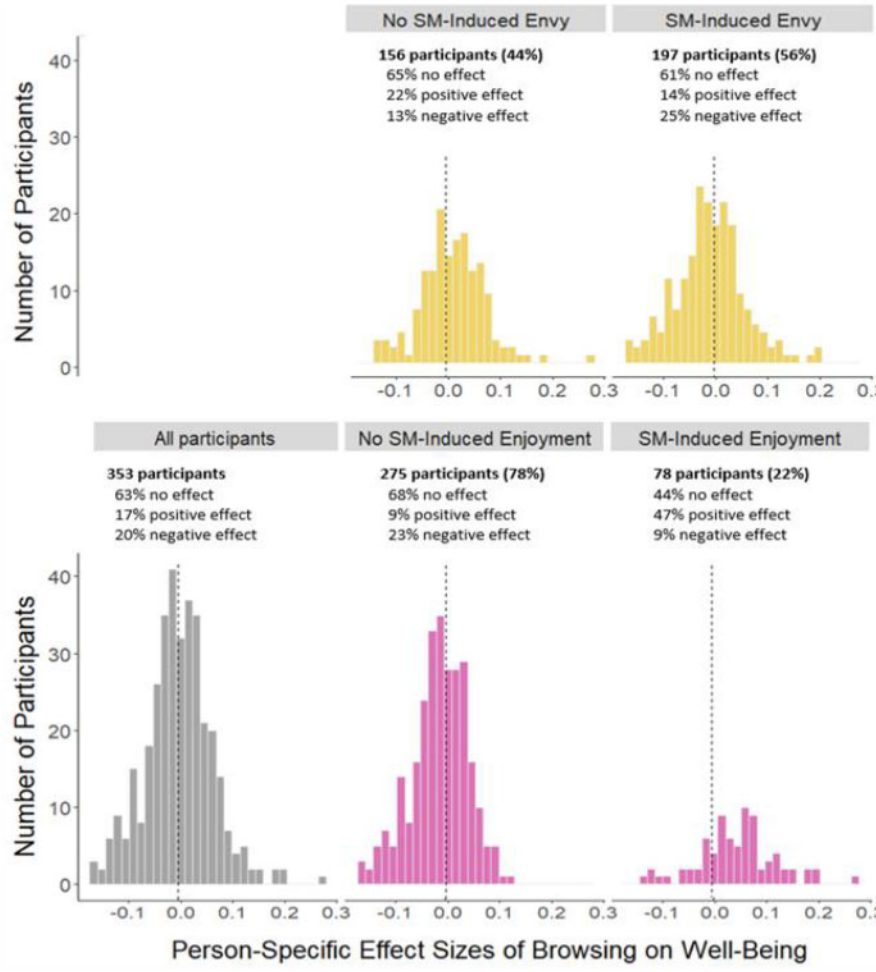

Figure 2 The ranges of the person-specific effects of browsing on well-being for all participants, and for adolescents with SM-induced and no SM-induced envy and enjoyment.

Notes. The *x*-axes represent the person-specific effect sizes of browsing on well-being for all adolescents (lower left plot), for adolescents with SM-induced envy ($\beta > +.05$) and no SM-Induced envy ($\beta = \leq +.05$), and for adolescents with SM-enjoyment and no SM-induced enjoyment. The effects of browsing on well-being ranged from $\beta = -.17$ to $\beta = +.27$ (lower left histogram). More adolescents with SM-induced envy experienced a negative effect of browsing on well-being (25%, upper right plot) than adolescents without SM-induced envy (13%, upper left plot). Conversely, more adolescents with SM-induced enjoyment experienced positive effects of browsing on well-being (47%, lower right plot) than adolescents without SM-induced enjoyment (9%, lower middle plot).

approach, we investigated firstly to what extent adolescents differed in their SM-induced envy, inspiration, and enjoyment (RQ1 & RQ2), and, secondly, to what extent the effects of browsing on well-being depended on these person-specific differences (H1 & H2). We indeed found remarkably strong differences in the person-specific effects of SM browsing on envy, inspiration, and enjoyment (RQ1 & RQ2, see Figure 1). Contrary to expectations, none of the dispositional variants of envy (H1b),

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inspiration (H2c), and enjoyment (H2d) moderated the person-specific effects of browsing on well-being, and neither did SM-induced inspiration (H2a). However, in support of H1a and H2b, adolescents with SM-induced envy were more likely to experience *negative* effects of browsing on well-being than their peers without SM-induced envy, whereas adolescents with SM-induced enjoyment were more likely to experience *positive* effects of browsing on well-being than those who experienced no enjoyment.

Comparing Between-Person and Within-Person Associations

In recent years, due to new methods of analysis, such as random-intercept cross-lagged panel models and multi-level models, it has become possible to assess media effects as within-person processes that differ across individuals (McNeish & Hamaker, 2020; Thomas et al., 2021). Therefore, the implications of the current study can best be understood by successively discussing and, when opportune, comparing our between-person results, within-person results, and $N = 1$ moderation results. As for the between-person results, we found a small negative association (β = -.12) of browsing with well-being, which is consistent with prior studies that also investigated between-person associations (e.g., Escobar-Viera et al., 2018; Pang, 2021) and the meta-analysis of Liu et al. (2019). This negative between-person correlation meant that adolescents who spent more time on browsing across the three-week period felt less happy than their peers who spent less time on browsing. At first sight, this negative association seems in line with the Passive Social Media Use Hypothesis.

Establishing a between-person association of browsing with well-being is important, for example if one wants to identify whether high or low SM users experience the lowest levels of well-being. Between-person studies can reveal that adolescents differ from each other, both in well-being and browsing, and that these differences are correlated. However, consistent with earlier studies (e.g., Beyens et al., 2020; Coyne et al., 2020) and the seminal account of Molenaar (2004), we indeed found that the average within-person effect of browsing on well-being deviated from the overall between-person association ($\beta = -.004$ vs. $\beta = -.12$). More importantly, our person-specific within-person results showed that the Passive Social Media Use Hypothesis was rejected for 80% of adolescents.

In all, a comparison of our between-person and person-specific within-person results indicates that the negative between-person associations of browsing with well-being reported in earlier studies, including our own early work, must be interpreted in light of what they are: differences *between* persons. Some caution is warranted when such between-person results are used to study the effects of media, because media effects involve within-person processes that may differ across individuals (Valkenburg et al., 2016).

$N = 1$ Moderation Approach

We introduced an $N = 1$ moderation approach in this study. An important advantage of such an approach is that it does not only enable researchers to demonstrate that the effects of SM on well-being differ from person to person, but also that the conditions to explain these differences can differ from person to person. Whereas traditional moderation approaches (e.g., by means of an interaction term) can reveal group-level differences based on moderating variables (e.g., gender, age), our $N = 1$ moderation approach can reveal for how many persons within these groups the hypothesized moderation effect holds (and does not hold).

Our $N = 1$ moderation approach has yielded unique insights into the effects of SM on well-being. As reported, we found a *small negative* association of SM-induced envy and a *strong positive* association of SM-induced enjoyment with the browsing-well-being effect. The small negative moderating

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effect of SM-induced envy meant that 25% of adolescents with SM-induced envy experienced the hypothesized negative effect of browsing on well-being, which is consistent with H1a. However, 75% of adolescents with SM-induced envy experienced no or even *positive* effects of browsing on well-being. The attentive reader could of course argue that these null or opposite effects may be due to the small magnitude of this moderating effect. But remarkably, such opposite effects also applied to the strong moderator, SM-induced enjoyment: 47% of adolescents with SM-induced enjoyment experienced the hypothesized positive effects of browsing on well-being (H2b). However, 9% of adolescents with SM-induced enjoyment experienced a *negative* effect of browsing on well-being, whereas 44% experienced no effect. This means that even for a strong moderator a considerable percentage of respondents within a presumedly homogenous subgroup experienced no or even opposite effects than hypothesized.

Strengths, Limitations, and Avenues for Future Research

Our study was one of the first to respond to recent calls for "causal effect heterogeneity," the proposition that individuals differ in how they respond to environmental influences (Bolger et al., 2019, p. 601). Most studies are still designed to answer questions about average group differences or average associations between variables. But an additional important question is: "How many people in my study behaved or responded in a manner consistent with theoretical expectation?" (Grice et al., 2020, p. 1). Our causal effects heterogeneity approach allowed us to show that a seemingly established hypothesis in the literature, the Passive Social Media Use Hypothesis, may be less universal than previously assumed. And it also allowed us to demonstrate for how many individuals weak and strong moderation effects hold and do not hold.

Despite its strengths, our study also has weaknesses. Consistent with theories on inspiration (Thrash et al., 2014) and affect (Watson et al., 1988), we conceptualized inspiration as a positive and envy as a negative experience/emotion. Because we conceptualized envy as malicious envy, it should result in a negative association with inspiration. However, we found a counterintuitive positive correlation between envy and inspiration. Therefore, we cannot exclude the possibility that some adolescents may have perceived envy as benign envy, which may explain why among 14% of the adolescents, SM-induced envy led to a positive association of browsing on well-being. We also cannot exclude the possibility that our participants failed to understand the Dutch translation of inspired. Although the word "inspired" is included as an emotion in the PANAS, this may not necessarily mean that Dutch adolescents understand the word "geïnspireerd" in the same way as English-speaking adolescents would understand the word inspired. Our inspiration item may have also been too narrowly defined. We asked adolescents whether they were inspired by *someone*. But inspiration can also result from other stimuli, such as aesthetic design or nature (Thrash et al., 2014). The aesthetic visual content on Instagram and Snapchat can easily be a source of inspiration. Future research may need to rethink whether and how to operationalize envy and inspiration in an ESM study, and further explore our unexpected positive association between envy and inspiration.

Affective Versus Cognitive Well-being. Like earlier ESM studies (e.g., Bayer et al., 2018; Verduyn et al., 2015; Wenninger et al., 2019), we focused on affective well-being, and did not include cognitive well-being measures, such as life satisfaction. Unfortunately, the trait-like capacities of cognitive well-being measures render them less suitable to employ in intensive ESM studies. What is crucial in any study design is to carefully match the pace in which a specific media effect takes place with the measurement frequency of this effect. Affective well-being fluctuates both across short- (e.g.,

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hourly) and longer-term time intervals (e.g., monthly, or yearly). Therefore, the effect of browsing on affective well-being may occur both in the short- *and* longer-term. However, investigating effects of SM use on cognitive well-being requires wider measurement intervals, because cognitive well-being measures only show longer-term within-person changes (e.g., Dienlin & Johannes, 2020). Therefore, what our field really needs are designs that combine the investigation of short- and longer-term effects, because only such designs can teach us whether, how, when, and for whom potential short-term media effects accumulate into longer-term effects.

Well-Being Versus Ill-Being. A recent scoping review of Valkenburg et al. (2021) found that about half of the existing studies into the associations of browsing or active SM use focused on *well*-being (e.g., life satisfaction, affective well-being, positive affect), whereas the other half focused on *ill*-being (e.g., depression, depressed mood, negative affect). In a recent meta-analysis on SM use and well-being, the measures of ill-being were reversed to collapse them with measures of well-being (Liu et al., 2019, p. 267). However, it is progressively acknowledged that well-being is not simply the flip-side of ill-being (Ryff et al., 2006). A low level of ill-being does not necessarily imply a high level of well-being, whereas a low level of well-being does not equal a high level of ill-being (e.g., Ryff et al., 2006). Therefore, there is a need for future ESM studies to investigate and compare the effects of SM use on affective well-being (e.g., happiness) with those on affective ill-being (e.g., sadness).

Heterogenous Content as an Explanation. Like all earlier survey and ESM studies on SM use and well-being, our study investigated adolescents' *time* spent on browsing (Valkenburg et al., 2021). We did not investigate how SM content encountered during browsing may have played a role in the sizeable heterogeneity in adolescents' responses. Some adolescents may have more often browsed cheerful content, such as funny memes, during the three-week ESM study whereas others may have more often browsed negative content or harmful content. But differences in encountered content cannot fully explain our results. After all, both adolescents and adults also (or even) display striking differences in responses to the same experimental content or treatments (Bolger et al., 2019; Thomaes et al., 2010). Therefore, future studies should try to measure both heterogeneity in content *and* heterogeneity in reception. In experiments, this can best be done by adopting a "causal effect heterogeneity approach" as proposed by Bolger et al. (2019). In survey research, this can best be realized by linking survey data to additional data collection methods, such as random screenshots (Reeves et al., 2019) or SM data downloads (Boeschoten et al., 2020).

Conclusion

Along with the studies of Beyens et al. (2020, 2021), the current study demonstrated that it is time to reconsider the Passive Social Media Use Hypothesis (cf. Burnell et al., 2020; Ellison et al., 2020; Kross et al., 2020; Valkenburg et al., 2021), by acknowledging that (a) passive use might not be the right term to describe the variety of active intra-individual processes that may occur during browsing, and (b) social media browsing may lead to positive, negative, or no effects among individuals, depending on a variety of dispositional, developmental, social, and situational antecedents, mediators, and moderators.

Acknowledgements

This preregistered study was funded by an NWO Spinoza Prize and a Gravitation grant (NWO Grant 024.001.003; Consortium on Individual Development) awarded to P.V. by the Dutch Research

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Council (NWO). Additional funding was received from a VIDI grant (NWO VIDI Grant 452.17.011) awarded to L.K.

Conflict of Interest

None of the authors have any conflicts of interest.

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