The Effect of Active and Passive Social Media Use on Sleep Quality, Moderated by Social Media Self-Regulation Failure

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Samenvatting

Onderzoek toont aan dat sociale media gerelateerd is aan slaapproblemen, maar het is onduidelijk of dit effect verschilt per type sociale media gebruik en mogelijk afhankelijk is van falende sociale media zelfregulatie (SMSRF). Daarom werd in deze studie onderzocht of actief en passief sociale media gebruik verschilden in hun effect op de kwaliteit van slaap onder adolescenten, en of het effect van sociale media gebruik op de slaapkwaliteit sterker was voor adolescenten met hoge niveaus van SMSRF in vergelijking met adolescenten met lage niveaus van SMSRF. In dit longitudinale onderzoek vulden 660 Nederlandse adolescenten in de leeftijd van 11-17 jaar een online vragenlijst in. De bevindingen van hiërarchische lineaire regressieanalyse toonden aan dat actief gebruik van sociale media niet significant de slaapkwaliteit voorspelde. Passief gebruik van sociale media was negatief geassocieerd was met slaapkwaliteit over tijd, maar deze associatie was niet significant. SMSRF modereerde significant de associatie tussen passief sociale media gebruik en slaapkwaliteit, waarbij het effect van passief gebruik van sociale media op verminderde slaapkwaliteit sterker was voor adolescenten met hogere niveaus van SMSRF. Meer onderzoek naar de verschillende effecten van actief en passief sociale media gebruik is nodig om de impact van sociale media op adolescenten te verminderen door middel van interventies.

Trefwoorden: actief sociale media gebruik, passief sociale media gebruik, falen van sociale media zelfregulatie, slaapkwaliteit, adolescenten

Abstract

Research shows that high usage of social media is related to sleep disorders, but it is unclear if this effect differs by type of social media use and may depend on social media self-regulation failure (SMSRF). Therefore, this study examined whether active and passive social media use differed in their effect on the quality of sleep among adolescents, and if the effect of social media use on sleep quality was stronger for adolescents with high levels of SMSRF compared to adolescents with low levels of SMSRF. In this analysis of a two-wave longitudinal study, 660 Dutch adolescents aged 11-17 years, completed an online questionnaire. The findings of hierarchical linear regression analysis showed that active use of social media did not significantly predict sleep quality over time. Passive social media use was negatively associated with sleep quality over time, but this association was not significant. SMSRF significantly moderated the association between passive social media use and sleep quality, where the effect of passive social media use on decreased sleep quality was stronger for adolescents with higher levels of SMSRF. More research into the different effects of active and passive social media use is needed to potentially reduce the impact of social media on adolescents through interventions.

Keywords: active social media use, passive social media use, social media self-regulation failure, sleep quality, adolescents

The Role of Active and Passive Social Media Use on Sleep Quality, Moderated by Social Media Self-Regulation

Sleep is essential for adolescents as longer sleep duration is associated with better emotional regulation, better academic achievement, and higher well-being (Chaput et al., 2016). Besides, sleep serves a critical role in brain function, learning and memory, metabolism, and immune function (Adamantidis & Lecea, 2008; Blask, 2009; Czeisler & Gooley, 2007; Horne, 1985; Kyriacou & Hastings, 2010). Consequently, disturbed sleeping patterns (e.g. problems falling asleep, staying asleep, or achieving restorative sleep) seem to negatively impact mental and physical health (Van Meter & Anderson, 2020). Specifically, insufficient sleep is related to poorer school performance, depressive symptoms, obesity, and alcohol and drug abuse (Colrain & Baker, 2011).

Nowadays, concerns have been raised regarding the negative influence of social media use on adolescents' sleep quality (Zimmerman, 2008). Social media is a computer-based technology that facilitates the sharing of ideas, thoughts, and information through the building of virtual networks and communities (Obar & Wildman, 2015). Adolescents' use of social media platforms, such as Facebook, Instagram, Snapchat, WhatsApp, and TikTok, has increased markedly over the last decade and now infuses their everyday social lives (Thorisdottir et al., 2019).

Several studies showed that increased social media use is associated with shorter sleep duration (Garmy et al., 2012; Pea et al., 2012), longer sleep latencies (Shochat et al., 2012), later bedtimes and rise times (Garmy et al., 2012; Shochat et al., 2010; Van den Bulck, 2004a), and increased daytime tiredness in adolescents (Garmey et al., 2012; Van den Bulck, 2004a). However, the effect of social media use on sleep quality may depend on the type of social media use. Specifically, the effects of social media use may be different for active and passive social media use. Active social media use refers to the conscious decision to share information, comment, fact check, or engage in related activity. By contrast, passive social media use refers to the act of merely reading and observing information on a users' feed (Gainous et al., 2020). Research indicated that particularly passive social media use may interfere with adolescents'

sleep quality as passive social media use may result in unfavorable comparisons with peers. (Levenson et al., 2016; Krasnova et al., 2015; Verduyn et al., 2015).

Besides the type of social media use, also characteristics of adolescents may influence the effect of social media use on sleep quality. Studies have proposed that the effects of social media on cognitions, emotions, attitudes, and behavior can be enhanced or reduced by individual differences (e.g., gender, temperament, developmental level) and social-context variables (e.g., peers, parents) (Valkenburg & Peter, 2013). One moderator on the effect of social media use on sleep quality could be social media self-regulation failure (SMSRF). Self-regulation is defined as the cognitive capacity for planning, guiding, and monitoring behavior within changing circumstances. It facilitates goal-directed behavior and enables a person to delay gratification to achieve desired outcomes (Carey et al., 2004). Adolescents with high SMSRF may be less able to resist the temptations of using social media, which may then intrude on the time that is available to sleep (Kroese et al., 2016). Since little is known about the different effects of passive and active social media use on sleep quality and the moderating role of SMSRF, this longitudinal study will examine these effects.

Social Media Use and Sleep Quality

Research showed that most adolescents do not get enough sleep and that their sleep duration has declined over the last two decades (Gibson et al., 2006; Zimmerman, 2008). There are several factors that affect sleep duration during adolescence. First of all, puberty itself causes increased sleepiness during the day, without any change in night-time sleep (Carskadon, 1990). Secondly, school schedules influence adolescent sleep patterns, as imposing earlier rise times as the school day begins earlier during the adolescent years. Finally, emotional and academic stress negatively impact sleep (Lund et al., 2010).

Overall, studies have shown that high usage of social media is related to sleep disorders (Van den Bulck, 2004a; Levenson et al., 2016; Choi et al., 2009). Three underlying mechanisms could explain this impact of social media use on sleep quality (Cain & Gradisar, 2010). First, the time adolescents spent on social media may actually intrude on the time that is available to sleep. Second, social media use increases arousal (Cain & Gradisar, 2010; Mauri et al., 2011), which may make it more difficult for

adolescents to fall asleep (Van den Bulck, 2004b). Third, when adolescents engage in social media use they are exposed to bright screen lights (Mortazavi et al., 2018), which has been shown to cause people to fall asleep later and sleep worse at the beginning of the night (Van Kerkhof et al., 2017).

However, despite the generally negative impact of social media use on sleep quality, differences can be seen in the effects of active and passive social media use. For example, the study of Levenson et al. (2016) found that adolescents with higher social media use had significantly greater odds of having sleep disturbance. However, active and passive social media use impacted sleep among these adolescents differently. As far as known, no research has been done on the different effects of active and passive social media use on sleep quality. Nevertheless, research has found that there is a strong relationship between declines in subjective well-being and passive social media use, but not between subjective well-being and active social media use (Gainous et al., 2020; Verduyn et al., 2017).

These differences in the effect of active and passive social media use may be explained by social comparison. Specifically, passive social media use results in unfavorable comparisons with peers, resulting in increased envy and declines in subjective well-being (Krasnova et al., 2015; Verduyn et al., 2015). Because people tend to portray themselves in overly flattering ways on social media, they communicate positive life developments more frequently than negative ones (Verduyn et al., 2015). Exposing oneself to positive information about others could provoke envy, and emotions linked to lower well-being (Smith & Kim, 2007). In contrast, active social media use creates and reinforces feelings of connectedness with others, resulting in the generation of more substantial social capital and improved subjective well-being (Thorisdottir et al., 2019; Johnston et al., 2013; Steinfield et al., 2008). Given the fact that subjective well-being and sleep quality have a great influence on one another (Gothe et al., 2020), the effects of active and passive social media use may also differ on sleep quality and show a similar effect. Therefore, it is hypothesized that active social media use has a positive effect on sleep quality, whereas passive social media use has a negative effect on sleep quality.

The Moderating Role of Social Media Self-Regulation Failure

The relationship between active and passive social media use and sleep quality among adolescents may be moderated by SMSRF. Several studies showed that the constant availability of social media challenges adolescents' self-regulation in situations where their social media use conflicts with other goals and obligations (Meier et al., 2016; Reinecke et al., 2016). The desire to use social media appears to be one of the most difficult desires to resist next to the desire for food, sleep, and sex (Hofmann et al., 2012). Self-regulation failure could increase the negative effect of social media use on sleep quality. For instance, people who have high self-regulation failure are more likely to keep watching on social media platforms, despite knowing that the duration of sleep suffers (Kroese et al., 2016). Specifically, people with high self-regulation failure have a lower cognitive capacity for planning and delay gratification and are more sensitive to distractions or temptations in the environment (Carey et al., 2004; Kroese et al., 2016). In contrast, individuals with low levels of self-regulation failure may have the willpower to resist short-term gratification with to peruse a long-term goal (Gökçearslan et al., 2016), enabling them to resist their desire to use social media.

There is a lack of research on self-regulation failure as a moderator in the relationship between social media use and sleep quality. However, a study among Malaysian adults found that the entertainment needs of individuals with higher self-regulation were less likely to lead to Facebook addiction compared to individuals with lower self-regulation (Foroughi et al., 2019). This suggests that self-regulation could buffer the negative effect of social media. Besides, SMSRF may increase the negative effect of social media, as people with high SMSRF may be more likely to use social media while it conflicts with other goals and obligations compared to people with low SMSRF (Kroese et al., 2016). These findings suggest that high levels of SMSRF could decrease the positive effects of active social media use on sleep quality, whereas high levels of SMSRF could increase the negative effects of passive social media use on sleep quality.

The Current Study

This study will examine the effect of active and passive social media use on the quality of sleep among Dutch adolescents, and if these effects differ for adolescents with high levels of SMSRF compared to adolescents with low levels of SMSRF. The research question is: 'Does passive use of social media have a greater negative impact on sleep quality than active use of social media, and is the relationship between active and passive social media use and sleep quality moderated by social media self-regulation failure?'. The theoretical model is shown in figure 1. The study hypothesizes are that active social media use has a positive effect on sleep quality over time (H1), whereas passive social media use has a negative effect on sleep quality over time (H2). Higher SMSRF lowers the association between active social media use and sleep quality (H3), where SMSRF strengthens the effect of passive social media use on sleep quality (H4).

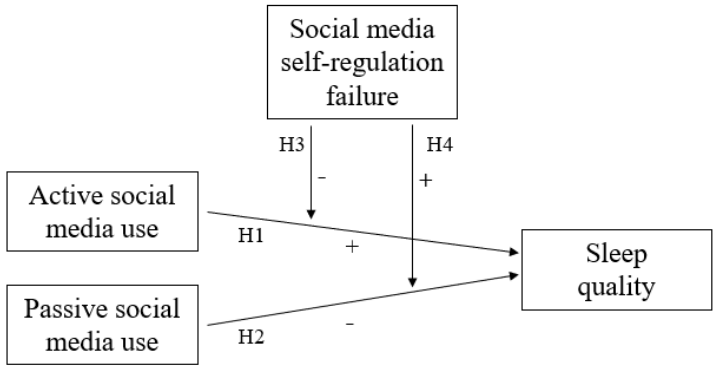


Figure 1. Explanatory model

Method

Design and Participants

To answer the research question, data is used from the Digital Youth Project (DYP) (Boer et al., 2020). The DYP is an ongoing quantitative and longitudinal study that monitors online behaviors and mental health of Dutch adolescents based on self-report measures since 2015. For this study, wave 4 (2018) and wave 5 (2019) of the DYP were included (now referred to as T1 and T2), to see the longitudinal effect of active and passive social media use on sleep quality.

T1 contains 2073 participants (52.1% boys, 47.9% girls) with a mean age of 14.37 years (*SD* = 1.50; range 11-18). T2 contains 1327 participants (46.1% boys, 53.9% girls) with a mean age of 13.85 years (*SD* = 1.46; range 11-18). In the current study, only participants who participated in both T1 and T2 are included because SMSRF was only measured in T2. Participants who participated in one wave were removed from the data as well as participants with missing data on one of the variables from this study. The final sample of this study contains 660 participants (46.4% boys, 53.6% girls) with a mean age of 13.25 years (T1) (*SD* = 1.10; range 11-17). Most participants in the final sample (98.0%) were born in the Netherlands. Dropouts between T1 and T2 were mainly because individual students had left school, or because they were absent on the measurement day (Peeters, Koning, & Eijnden, 2018).

Procedure

The board of ethics of the Faculty of Social Sciences at Utrecht University approved this study (FETC16-076 Eijnden). Parents were informed about the content and purpose of the study and could refuse participation of their child by withholding informed consent. Adolescents were informed about the anonymous and voluntary nature of the study and could stop participation at any moment. They completed an online survey during school hours under the supervision of a research assistant.

Measurements

Active Social Media Use

The independent variable active social media use (T1) was measured by three questions on a seven-point Likert-scale (ranging from 1 - *never or less than once a week* to 7 - *more than 40 times a week*): “How often per week do you personally post a message, photo or video on social networking sites?”, “How often per week do you ‘like’ posts, photos, or videos of others on social networking sites?” and “How often per week do you respond to (or share) others’ posts, photos, or videos on social media?”. Higher scores indicate more active use of social media. Cronbach’s alpha did not indicate a good reliability (α = .59). Cronbach’s alpha if item deleted showed that the first question, “How often per week do you personally post a message, photo or video on social networking sites?”, lowered the reliability of the scale. Posting something on social media appears to be done less (*M* = 1.71; *SD* = 1.39) than liking (*M*

= 4.87; *SD* = 2.11) or responding to (*M* = 3.23; *SD* = 1.87) someone else's post. However, it was decided to keep all three of these questions in the construct since they do all measure active use of social media.

Passive Social Media Use

For the independent variable passive social media use (T1), two questions were asked on a seven-point Likert-scale (from 1 - "*less than once a day*" to 7 - "*more than 80 times a day*"). Asked questions are, "How often per day do you look at social networking sites?" and "How many times per day do you check your smartphone to see if a message, photo, or video has arrived?". Higher scores indicate more passive use of social media.

Sleep Quality

The dependent variable sleep quality (T2) was assessed using a Dutch translation of the Pittsburgh Sleep Quality Index (PSQI). The PSQI measures sleep by including the factors subjective sleep quality, sleep latency, sleep duration, usual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction (Krystal & Edinger, 2008; Buysse et al., 1989). Unlike the original PSQI, the use of sleeping medication was not included in the DYP questionnaire since the use of sleep medication among adolescents (11-18 years) is not common (Austic et al., 2015). Besides, the measurement of sleep disturbances was shortened in the DYP questionnaire (e.g. not being able to breathe comfortably at night, and having pain at night were not included in the DYP questionnaire). Subjective sleep quality, sleep disturbances, and daytime dysfunction was asked with five questions on a five-point Likert-scale (from 1 - "*never*" to 5 - "*always*"), with a lower score indicating a worse sleep quality.

Social Media Self-Regulation Failure

SMSRF was measured using the social media self-control failure (SMSCF) scale of Koningsbruggen, which contains three questions (Du et al., 2018). The SMSCF scale assesses how often social media users give in to the desire to use social media, even though its use at that moment conflicts with other goals, makes them use their time less efficiently, and delays other things they want or need to do. Within the DYP questionnaire, the three questions of the SMSCF scale are measured on a five-point Likert-scale (from 1 - "*never*" to 5 - "*very often*"), whereby a higher score indicated more SMSRF.

Gender

Gender was a control variable in this study, where participants indicated whether they were a boy (= 1) or a girl (= 2).

Analysing Strategy

Descriptive statistics and correlations were computed first. Second, two separate hierarchical linear regression analyses were performed to test the effects of active and passive social media use on sleep quality (T2), while controlling for gender and sleep quality at T1. The interaction effects between active social media use and SMSRF, and passive social media use and SMSRF were added in the last step of the hierarchical linear regression analyses, again controlling for gender and sleep quality at T1.

Assumptions for linear regression were checked and found not to be violated. Multicollinearity was tested using VIF values. The normality of the distribution was tested using Shapiro Wilks test. Although the Shapiro Wilks test gave significant p-values for active social media use, passive social media use, SMSRF, and sleep quality (T2), normality is satisfied since the P-P plots did not depict any abnormalities. Linearity and homoscedasticity were examined using a scatter plot. The independent variables form a linear line with the dependent variable, and the scatter plot indicates a random distribution of the independent variables.

Finally, attrition analyses were conducted to examine differences between participants who dropped out and participants who participated in both waves. Significant differences were found within the variable of passive social media use ($t(1386.84) = 8.05$; $p < .001$), were participants who participated in one wave scored higher ($M = 4.45$; $SD = 1.46$) than participants who participated in both waves ($M = 3.93$; $SD = 1.34$). On the other variables included in this study, no significant differences were found between the participants who dropped out compared to the participants that participated in both waves.

Results

Table 1 shows the descriptive statistics of the variables included in this study. Social media is used more passively (reading and observing information on a users' feed) ($M = 3.93$; $SD = 1.34$) than

actively (share information, comment and fact check on social media) (M = 3.02; SD = 1.30). The average score on SMSRF was 2.67 (SD = 0.89), this can be considered as a normal score among adolescents (Du et al., 2018). A significant decrease in sleep quality ($t(630) = 4.23$; $p < .001$) was observed from T1 (M = 3.45; SD = 0.91) to T2 (M = 3.30; SD = 0.90).

Table 1 also shows the correlations between all variables of interest. Active social media use was not significant negatively correlated to sleep quality (T2), and more passive social media use was correlated to lower sleep quality (T2). Age was not significantly correlated to sleep quality (T2) and therefore age was not included as a control variable in this study.

Table 1

Descriptive Statistics and Bivariate Correlations for all Study Variables

	Mean (SD)	1.	2.	3.	4.	5.	6.	7.
1. Gender	46.4% boys	1.00						
2. Age	13.25 (1.10)	.04	1.00					
3. Active SMU	3.02 (1.30)	.19**	.03	1.00				
4. Passive SMU	3.93 (1.34)	.05	.11**	.66**	1.00			
5. SMSRF	2.67 (0.89)	.19**	.12**	.24**	.29**	1.00		
6. Sleep quality T1	3.45 (0.91)	-.11**	-.03	-.13**	-.20**	-.24**	1.00	
7. Sleep quality T2	3.30 (0.90)	-.14**	.02	-.07	-.16**	-.31**	.53**	1.00

Note. Spearman correlations were used for ordinal and continuous variables, Pearson correlations were used for dichotomous variables.

**. Correlation is significant at the 0.01 level (2-tailed)

*. Correlation is significant at the 0.05 level (2-tailed)

To test hypothesis 1 (active social media use has a positive effect on sleep quality over time) and hypothesis 3 (SMSRF lowers the association between active social media use and sleep quality), hierarchical linear regression analysis was performed (Table 2). Age and sleep quality at T1 were included as control variables (step 1), hereafter active social media use was added (step 2). Finally, SMSRF and the interaction between active social media use and SMSRF were added (step 3). Active social media use did not seem to significantly predict sleep quality (T2) (β = .01; $t(627) = 0.29$; p = .769; R^2 = .29). Also, the interaction effect between active social media use and SMSRF was also not

significant (β = -.01; t(625) = -0.28; p = .776; R^2 = .32). This indicates that active social media does not predict sleep quality and that the effect of active social media use on sleep was not different for adolescents with low or high levels of SMSRF. A visual representation of the interaction effect between active social media use and SMSRF is shown in figure 1.

Table 2

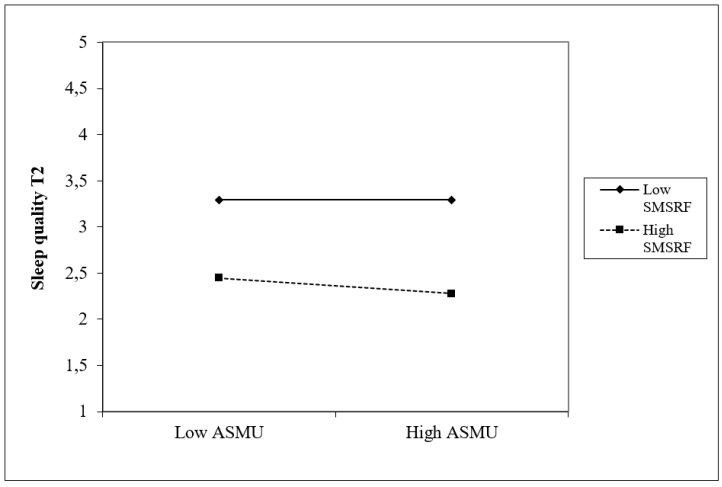
Relations Between Control Variables, Active Social Media Use, SMSRF and Sleep Quality at T2

	B	*β*	*SE*	*t*	*df*	*p*	R^2	*F*	*df*	*p*
Control variables					628		.29	126.77	2,628	<.001
Gender	-.14	-.08	.06	-2.22		.027				
Sleep quality T1	.52	.52	.03	15.43		<.001				
Main effects					627		.29	84.42	3,627	<.001
Gender	-.14	-.08	.06	-2.23		.026				
Sleep quality T1	.52	.52	.03	15.37		<.001				
ASMU	.01	.01	.02	0.29		.769				
Interaction effect					625		.32	59.54	5,625	<.001
Gender	-.09	-.05	.06	-1.39		.166				
Sleep quality T1	.48	.49	.03	14.26		<.001				
ASMU	.03	.04	.02	1.28		.200				
SMSRF	-.21	-.20	.04	-5.67		<.001				
ASMUxSMSRF	-.01	-.01	.03	-0.28		.776				

Note. *B* = unstandardized coefficient; β = standardized coefficient; *SE* = standard error; ASMU = active social media use (higher score is more active use of social media).

Figure 1

Visual Representation of the Interaction Between Active Social Media Use and SMSRF on Sleep Quality at T2



To test hypothesis 2 (passive social media use has a negative effect on sleep quality over time) and hypothesis 4 (SMSRF strengthens the association between passive social media use and sleep quality), hierarchical linear regression analysis was performed (Table 3). Age and sleep quality at T1 were included as control variables (step 1), hereafter the main effect of passive social media use was added (step 2), next the main effect of SMSRF and the interaction effect between passive social media use and SMSRF was added (step 3). The negative effect of passive social media use on sleep quality (T2) appeared not to be significant (β = -.05; t(624) = -1.52; p = .129; R^2 = .29). The interaction effect between passive social media use and SMSRF on sleep quality was significant (β = -.10; t(622) = -3.07; p = .002; R^2 = .33), revealing a stronger effect of passive social media use on decreased sleep quality for those adolescents with higher levels of SMSRF. A visual representation of the interaction effect between passive social media use and SMSRF is shown in figure 1.

Table 3

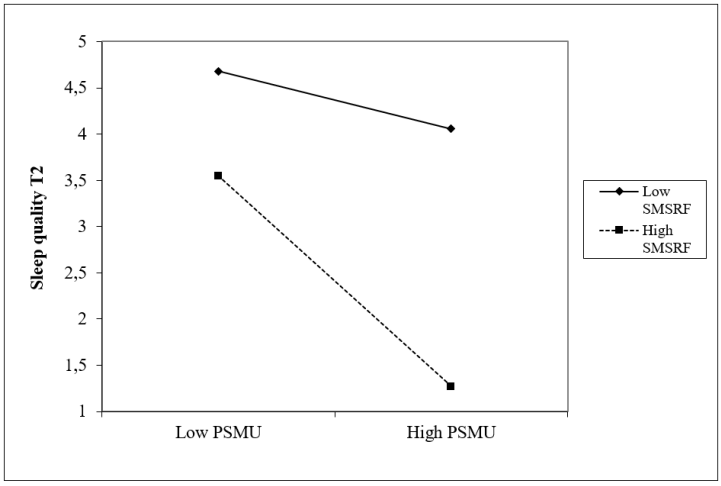
Relations Between Control Variables, Passive Social Media Use, SMSRF and Sleep Quality at T2

	B	*β*	*SE*	*t*	*df*	*p*	R^2	*F*	*df*	*p*
Control variables					625		.29	125.47	2,625	<.001
Gender	-.14	-.07	.06	-2.18		.030				
Sleep quality T1	.52	.52	.03	15.37		<.001				
Main effects					624		.29	84.59	3,624	<.001
Gender	-.13	-.07	.06	-2.11		.035				
Sleep quality T1	.51	.51	.04	14.77		<.001				
PSMU	-.04	-.05	.02	-1.52		.129				
Interaction effect					622		.33	61.44	5,622	<.001
Gender	-.07	-.04	.06	-1.15		.252				
Sleep quality T1	.48	.48	.03	13.99		<.001				
PSMU	-.01	-.01	.02	-0.22		.830				
SMSRF	-.21	-.21	.04	-5.80		<.001				
PSMUxSMSRF	-.07	-.10	.02	-3.07		.002				

Note. *B* = unstandardized coefficient; *β* = standardized coefficient; *SE* = standard error; PSMU = passive social media use (higher score is more active use of social media).

Figure 2

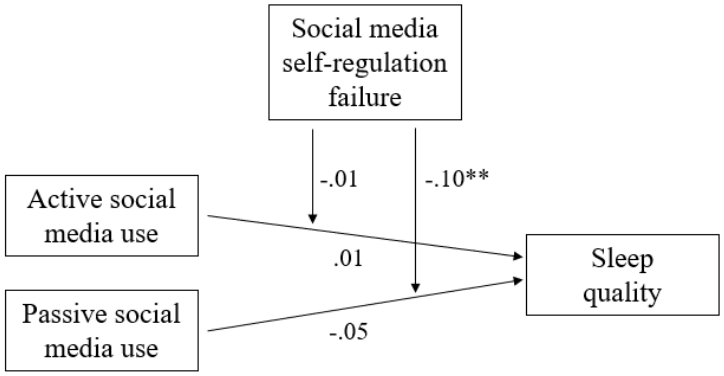
Visual Representation of the Interaction Between Passive Social Media Use and SMSRF on Sleep Quality at T2



In figure 3 the standardized coefficients of all the studied effects are shown. Only the moderating role of SMSRF on the negative effect of passive social media use on sleep appears to be significant.

Figure 3

Structural Equation Model of the Effect of Active and Passive Social Media Use on Sleep Quality, Moderated by SMSRF



Note. Values shown in the figure represent the standardized coefficient (*β)*, resulting from the separate hierarchical linear regression analyses for active (table 2) and passive (table 3) social media use on sleep quality (T2) with gender and sleep quality T1 as control variables.

** $p < .01$

Discussion

To the best of my knowledge, this is the first longitudinal study that investigated the different effects of active and passive social media use on sleep quality among adolescents. Additionally, this study examined if these effects differ for adolescents with high levels of SMSRF compared to adolescents with low levels of SMSRF. Results showed that active social media use did not significantly predict sleep quality over time. More passive social media use was associated with lower sleep quality over time, but this effect was not significant. SMSRF was a significant moderator of this relationship between passive social media use and sleep quality, revealing a stronger effect of passive social media use on decreased sleep quality for those adolescents with higher levels of SMSRF.

It was hypothesized that more active use of social media would improve the quality of sleep among adolescents. However, in contrast to hypothesis 1, the findings suggest that active social media use did not significantly predict sleep quality over time. An explanation for this finding could be that the negative influences of passive social media use on sleep quality outweigh the benefits of active social media use on sleep quality. Statistics have shown that active use of social media is in many cases accompanied by passive social media use. Conversely, passive social media use is not always supplemented by active social media use (CBS, 2020). Further experimental research should focus on active social media use (without passive social media use) and the effect on sleep quality.

Contrary to hypothesis 2, findings show that passive social media use was negatively associated with sleep quality over time, but this association was not significant. Within this study, passive use of social media was measured by the number of times that adolescents look at social networking sites. The time passively spent on social media platforms was not measured. However, time spent on social media was correlated to a decrease in several health problems (e.g. anxiety, depression), rather than the number of times that adolescents take a look on social media platforms (Thorisdottir et al., 2019). Given that time passively spent on social media could have a stronger effect on sleep quality compared to the number of times adolescents look at social media, future research should study ‘time spent on social media in a passive manner’ and the effect on sleep quality.

It was hypothesized that SMSRF would lower the positive effect between active social media use and sleep quality. However, contrary to hypothesis 3, SMSRF did not significantly moderate the association between active social media use and sleep quality. Because only the failure of social media self-regulation was measured within this study, no conclusion can be drawn about the effect of having high levels of social media self-regulation. Nevertheless, research found that the positive effects of social media use could be stronger for adolescents with high self-regulation (Li et al., 2015). Therefore, further research should investigate if the effect of having high social media self-regulation could increase the positive effects of social media use on sleep quality rather than only measuring having low levels of SMSRF.

However, the negative effect of passive social media use on sleep quality was stronger for adolescents with higher levels of SMSRF compared to adolescents with lower levels of SMSRF. This is in line with the fourth hypothesis and previous findings that show that adolescents with high levels of SMSRF have lower cognitive ability for planning and delaying gratification (Carey et al., 2004), and are more sensitive to distractions or temptations in the environment (Kroese et al., 2016). As a result, adolescents with high levels of SMSRF may be less able to resist the temptations of using social media and keep watching on social media platforms. Therefore, the negative effect of passive social media use on sleep quality is even stronger for those adolescents with higher levels of SMSRF.

Strengths and Limitations

The present study is based on a large sample and longitudinal data. Due to the longitudinal design, this study is better suited to examine causal relationships than cross-sectional studies. Furthermore, reliable instruments for measuring SMSRF and sleep quality were used (Du et al., 2018; Doi et al., 2000). Nevertheless, despite these strengths, the results of this study should be interpreted in light of some limitations.

Firstly, the constructs of active and passive social media use have not been measured with existing questionnaires that have proven reliable. For active use of social media, the Cronbach's alpha of the three questions was found to be unreliable, yet the construct with the three questions was chosen to be

retained. In addition, it appeared that the answer categories for the three questions of active social media use were not contiguous for the three questions and that the answer categories did not show a normal distribution. Besides, the attrition analysis revealed that the use of passive social media use was significantly different between participants participating in both waves (T1 and T2) compared to those participating in either wave. Hence, it is recommended that follow-up research use questionnaires that prove reliable for measuring active and passive social media use.

Secondly, data from adolescents' self-reports were used in this study which could have led to bias and errors of judgment, since it's hard to estimate how many times a day adolescents use social media platforms. As a result, the actual use of social media might differ from the answers given by the participants within this study.

Thirdly, because not all research variables were included in the questionnaire at both waves, SMSRF was assessed within the same wave as sleep quality T2. As a consequence, the longitudinal effect of SMSRF on sleep quality cannot be examined. Therefore, it is recommended for future research to retrieve longitudinal data to better understand the true effect of SMSRF.

Fourthly, within this study, it is not examined if the effects of active and passive social media use on sleep quality differ for boys and girls. Previous research has shown that girls are also more affected by the negative effects of social media use (e.g. low self-esteem, depressive symptoms, decreased well-being) (Guimond et al., 2007). Strengthening social media self-regulation skills appears from this study to potentially reduce the negative effect of passive social media use on sleep quality. For future research, it would be recommendable to test gender differences because it can have important implications for the content of interventions related to social media use and social media self-regulation failure.

Conclusions and Implications

In the current study, I examined if passive social media use has a greater negative impact on sleep quality compared to active social media, and if the relationship between active and passive social media use and sleep quality is moderated by SMSRF. The results showed that active social media use did not significantly predict sleep quality, whereas passive social media use was slightly negatively associated

with sleep quality over time, yet not significantly so. Despite not finding the hypothesized results, this study seemed to show that the negative effect of social media on sleep quality shown by previous studies, may not be as pronounced for active social media use. Furthermore, the effect of passive social media use on decreased sleep quality is stronger for adolescents with higher levels of SMSRF, indicating that interventions that focus on increasing social media self-regulation could increase the buffer the negative effect of passive social media use on sleep quality. This study hopes to stimulate further research on the different types of social media use and their effects on adolescents, so that intervention could target specific behavior and adolescents' characteristics to prevent adolescents to have a worse sleep quality.

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