



The influence of parents and peers on adolescents' problematic social media use revealed

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ABSTRACT

Nowadays, parents, caretakers, teachers and researchers have an increasing interest in the development and consequences of problematic social media use, especially among adolescents. A growing body of research investigates factors that may influence the development of problematic social media use. This study examined the role of the broader context of parental (time spent with parents and family support), peer (peer support and peer pressure), and individual factors (perceived self-control) in the development of adolescents' risky and problematic social media use (ref = normative), as well as the moderating role of self-control by using a longitudinal design. Adolescents ($N = 1384$) aged 11–19 years ($M_{age} = 14.1$, $SD = 1.03$) were included and completed a self-report questionnaire twice (6-month interval). A Multinomial Logistic Regression showed that parent and peer factors predicted risky social media use, but not problematic use of social media. Adolescents' level of self-control did not modify these relationships. However, low self-control did increase the odds of developing risky or problematic social media use directly. In conclusion, this study provides preliminary evidence that general parent and peer factors can help to prevent risky social media use, but to a lesser extent problematic use of social media. For the latter, the individual factor self-control, however, seems to play a role.

1. Introduction

Scrolling on Instagram, making a video on TikTok and keep friends posted on Snapchat: there is no doubt that youth spend a lot of time on social media (.). A large scale study across 29 European, North American and Middle East Countries shows that the average prevalence for adolescents to use social media intensely is 34% (Boer et al., 2020). In the Netherlands, data from a large representative study shows that 31% of the of the Dutch adolescents between age 12 and 16 indicated to be in contact on social media all day long. In comparison, for students in elementary school (children between age 4–12) the average was 14,9% (Stevens et al., 2017). More striking, 7.4% of all 12-16-year-old Dutch adolescents report to experience problematic social media use of which also this percentage doubled compared to the 3,5% elementary school children (Stevens et al., 2017). This highlights the importance to focus on social media use of adolescents in particular.

It is therefore not surprising that many researchers not only focus on the advantages, but also on the possible harmful consequences of social media use to adolescents wellbeing, such as lowered self-esteem, depression and increased sleep problems (Levenson et al., 2016;

Valkenburg et al., 2017; Woods & Scott, 2016). Moreover, though most adolescents do use social media without any problems, social media use can become problematic when a person shows compulsive behaviors (e. g. thinking a lot about using it), neglects everyday necessities (e.g. sleeping and eating) and is not able to control the use of it (Demetrovics et al., 2008). As problematic social media use is a relative new phenomenon, not much empirical evidence is available about the relationship with parental and peer factors.

Based on the Ecological model of Bronfenbrenner (1979), there is always an interaction between the individual and context, indicating that next to individual factors such as loneliness (Darcin et al., 2015, 2016), also social factors play a role in the development of problematic social media use. Up to now, research on problematic social media use has investigated mostly individual factors, and only some of them contextual factors such as internet-specific parental mediation (Koning et al., 2018; Leung, 2011). However, based on research on the role of social factors in other risk behaviors, where mostly contextual factors were investigated, and the Bronfenbrenner's Ecological model it is likely that also more general social factors such as family support, time spent with parents, peer support and peer pressure may play a role in

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adolescents' problematic social media use.

Previous studies that have investigated the role of contextual in adolescents' risk behavior demonstrate an important contribution of e.g., parents and peers (Barnes, Hoffman, Welte, Farrell, & Dintheff, 2007; Cambron, Kosterman, Catalano, Guttmanova, & Hawkins, 2017). The contribution of the current study to existing knowledge on important predictors of problematic social media use is twofold. First, the role of contextual factors can be investigated specifically for the behavioral outcome (e.g., *internet-specific* rules) or in general (e.g. *general* support), also referred to as internet-specific factors and general factors respectively (Koning et al., 2018). Overall, research demonstrate that the behavior-specific factors relate more strongly to the behavioral outcome compared to general factors (e.g. Van der Vorst et al., 2006). However, for problematic social media use the contribution of general contextual factors remains relatively unknown (Gecková et al., 2005; Koning et al., 2018; Reiner et al., 2017).

Second, the vast majority of studies investigating the role of parents and peers in adolescents' problematic social media use applied a cross-sectional design (Li, Zhang, Li, Zhen, & Wang, 2010; Reiner et al., 2017; Xie et al., 2019). This makes it impossible to draw conclusions on the directionality of the relations, and therefore longitudinal studies are warranted. Thus, the study of general and internet-specific factors in a longitudinal design increases our understanding of the development of adolescent's problematic social media use and its subsequent relevant mechanisms for intervention.

1.1. Parental factors

One-way parents can influence an optimal development of their offspring is by providing support (Rilling & Young, 2014). Several studies have demonstrated the relevance of social support for internet-related behaviors such as online gaming (King & Delfabbro, 2017; Prievara et al., 2018) and Internet addiction (Cetinkaya, 2018; Gioia et al., 2021; Lo et al., 2021; Wang et al., 2018). For example, Wang et al. (2018) showed that a good parent-adolescent relation (proxy of parental support) was negatively associated with Internet addiction. Though empirical evidence on the contribution of parental support for adolescents' problematic social media use is currently lacking, it is expected that also for problematic social media use, parental support is likely to be a protective factor.

In addition to parental support, also the time adolescents spent with their parents may be a protective factor for preventing problematic social media use. Studies have revealed the importance of time spent with family in the relation to internet addiction (Barnes, Hoffman, Welte, Farrell, & Dintheff, 2007; Cruz López et al., 2015; Gunuc & Dogan, 2013; Koronczai, Urbán & Davies, Kuipers, Junger, & Kunst, 2017; Wang, Xu, & He, 2021) and other risk behaviors such as sexual activity and substance use (Barnes, Hoffman, Welte, Farrell, & Dintheff, 2007; Miller & Volk, 2002). For example, Gunuc and Dogan (2013) found in a cross-sectional study that spending more time with the mother (e.g. watching television together) lowered the risk of developing Internet addiction. On the other side, Chung et al. (2019) found that adolescents with an internet addiction, noticed lower family cohesion which is a result of spending less time together as a family. Therefore, it is likely that time spent with parents is also be a protective factor for problematic social media use and that's why the first hypothesis was: Family support and time spent with parents decrease the risk of developing problematic social media use.

1.2. Peer factors

Next to parental factors, peers also have an important role in adolescent development. In fact, during adolescence, peers become increasingly important (Fuligni & Eccles, 1993), for example by the level of support or pressure from peers. A longitudinal study among a small sample of adolescents found that a higher level of peer support is

associated with less risk-taking behavior in general (Telzer et al., 2015). More specifically, cross-sectional studies demonstrated the importance of (offline) support from peers against the increase of problematic Internet use (Chak & Leung, 2004) and problematic Facebook use (Assunção et al., 2017). A recent study demonstrated that a higher increase in the level of peer support predicted faster reduction of problematic internet use symptoms over a period of 3 years (Choo et al., 2021). Therefore, it seems plausible that the level of peer support also plays an important protective role in the development of problematic social media use.

On the other hand, peers can also be a risk factor when it comes to the development of risk behaviors such as problematic social media use, via for example the perceived pressure from peers. That is, adolescents who perceive more peer pressure are more likely to report a greater level of Internet use (Wei Wu, Ko, Wong, Wu, & Po Oei, 2016), - addiction (Esen & Gündoğdu, 2010) and problematic social media use (Wei Wu, Ko, Wong, Wu, & Po Oei, 2016). Also, more recent cross-sectional studies show that adolescents who reporting more peer pressure (Kim & Lim, 2021) or social pressure (Mérrelle et al., 2017) notices higher levels of problematic of social media use. Given these results about the impact of peer support and peer pressure on problematic internet use, the second hypothesis of this study is: peer support decreases, and peer pressure increases the risk of developing problematic social media use.

1.3. Self-control

The influence of parents and peers on adolescents' social media use is different for subgroups of adolescents. According to Bronfenbrenner's Ecological Model (1979), behavior should be considered in the interaction between individual and contextual factors; individual behavior takes place in a social context. Moreover, supported by the differential susceptibility hypothesis, this behavior in social contexts is different for some adolescents (Barnes, Hoffman, Welte, Farrell, & Dintheff, 2007), depending on e.g. the level of self-control. Self-control is a related, yet distinct aspect of the larger concept 'self-regulation'. Self-regulation includes three main ingredients (Baumeister & Vohs, 2003; Carver & Scheier, 1989): standards (desired outcome), monitoring (monitor progress from current and desired state) and operating (the ability to actually control the behavior in the desired direction). In line with the latter ingredient, self-control can be defined as everything that one does to reach the desired outcome (Gillebaart, 2018). Adolescents with a lower level of self-control are impacted by the social context for better and for worse (Barnes et al., 2007). For digital media use, several studies have demonstrated that lower level of self-control is associated with problematic use of it (Servidio, 2019; Zahrai et al., 2021; Zhi et al., 2019). Perceived self-control is a well-known predictor of the development of several addictive behaviors (Guerra & Bradshaw, 2008), amongst which Internet use dependence (Özdemir et al., 2014). Self-control is also related concurrently and longitudinally to parenting, where self-control also influences subsequent parenting behaviors (Li et al., 2019). In fact, several studies showed the moderated influence of self-control on the relation between parental support and adolescent behaviors (Jones et al., 2007; Li et al., 2013a; Liu et al., 2019). For example, Jones et al. (2007) reported that the protective influence of support from parents on antisocial behavior is strongest for those adolescents who reported a lower level of self-control. Furthermore, a study by Li and colleagues (2013) showed that self-control moderated the indirect effect of school connectedness on problematic internet use via deviant peer affiliation. In line with the differential susceptibility hypothesis and previous empirical research, the third hypothesis reads: For individuals with less self-control, the impact of parent factors (i.e. time spent with parents and parental support) and peer factors (pressure and support) on problematic social media use is stronger.

In conclusion, this study aims to investigate to what extent parent (support and time spent with parents) and peer factors (support and pressure) influence adolescents' risky and problematic social media use

and the extent to which this relation is moderated by adolescents' self-control (Fig. 1). Where previous studies mostly included only parental or only peer factor in relation to adolescent's problematic social media use or made use of a cross-sectional design, this study is unique by (1) looking at general factors instead of internet-specific behavior, (2) taking parental, peer and individual factors in one framework, (3) make use of a longitudinal design and (4) be one of the first studies that distinguish three different group of social media users (normative, risky and problematic).

2. Methods

2.1. Procedure and participants

This longitudinal study was part of an ongoing community-based alcohol intervention study (LEF; Koning et al., 2021; Koning & Rijst, 2018). For the LEF-project, two secondary schools in the municipality of Edam-Volendam participated in the survey. Before the data collection started, approval of the Faculty Ethical Review Committee (FETC18-060) was obtained. Furthermore, the target group were underage students, so extra care was required regarding the data collection and analysis. Therefore, the data were anonymized, which means that the researchers cannot trace the results to an individual. Parents were informed about the study in a letter send to their home address and were given the opportunity to refuse participation of their child in the study. Online questionnaires were administered twice (May 2018: T1 and November 2018: T2) during regular school hours in the school's computer rooms under supervision of a teacher and a trained research assistant.

At T1, 2166 adolescents and at T2, 2069 adolescents filled out the online questionnaire. A sample of 1384 adolescents participated at both waves and were therefore included in our analysis. Loss-to-follow up at T2 (N = 782) was due to exclusion of students who were in their exam year and an additional N = 16 students reported missings on at least one of the included variables. This resulted in a sample size of N = 1368 eligible for analysis.

Attrition analyses showed that non-responders at T2 were significant younger ($t = -28.83, p < .001$), higher educated ($t = 7.38, p < .001$) and reported more family support ($t = 3.59, p < .001$). For the other variables, no significant differences were found: time spent with parents ($t = 1.77, p = .077$), peer support ($t = 1.75, p = .080$), and peer pressure ($t = 1.19, p = .235$) compared to responders at T2. The average age of participants was 14.1 years (SD = 1.03), and about an equal number of males (48%) and females participated (52%).

2.2. Measures

2.2.1. Problematic social media use

The SMD-scale consisted of nine items to measure problematic social media use at T1 and T2 (van den Eijnden, Lemmens & Valkenburg, 2016). The scale assesses nine symptoms of addiction to social media: preoccupation, tolerance, withdrawal, persistence, displacement, problem, deception, escape, and conflict. Respondents indicated, for example, whether, in the past year, they regularly could not think about anything else but social media (preoccupation), with a dichotomous response scale (0 = no and 1 = yes). A higher score for this scale indicated a stronger degree of problematic social media use. A recent study on the validation of the SMD-scale demonstrated that it has good psychometric properties across different groups of adolescents and is therefore a valid measure to assess problematic social media use among adolescents (Boer et al., 2021). Due to the skewed distribution, the variable was recoded into three subgroups of users, based on the proportion of positive scores on the 9 items; Normative (0 or 1 symptom = 0), Risky (2 to 5 symptoms = 1) and Problematic (6 or more symptoms = 2) users. Cronbach's $\alpha = 0.750$ at T1 and a $\alpha = 0.775$ at T2.

2.2.2. Family support

The level of family support was measured by the subscale Family Support of the Multidimensional Scale of Perceived Social Support (Zimet et al., 1988) at T1. The scale included four items with different statements about family support, for example "The people in my family really try to help me". The respondents answered the four items on a 7-point Likert scale (1 = strongly disagree and 7 = strongly agree). The mean score was calculated, in which a higher score represented more family support. The Family and Support Scale has been used and validated in diverse (cultural) contexts and demonstrated good psychometric properties in all of the studies (e.g. Lin et al., 2019; Trejos-Herrera et al., 2018). The internal consistency of this sample was found to be reliable (Cronbach's $\alpha = 0.887$).

2.2.3. Time spent with parents

Time spent with parents was assessed at T1 by asking "How much time do you spend together with your parent(s) each day?" for "school days" and "weekend days" separately. The respondent could answer on a 7-point Likert-scale (1 = less than 5 min and 7 = more than 4 h). A sum score of both items was calculated in which a higher score indicated more time was spent with the parents. Last, the internal consistency was found reliable ($r = 0.702, p < .01$).

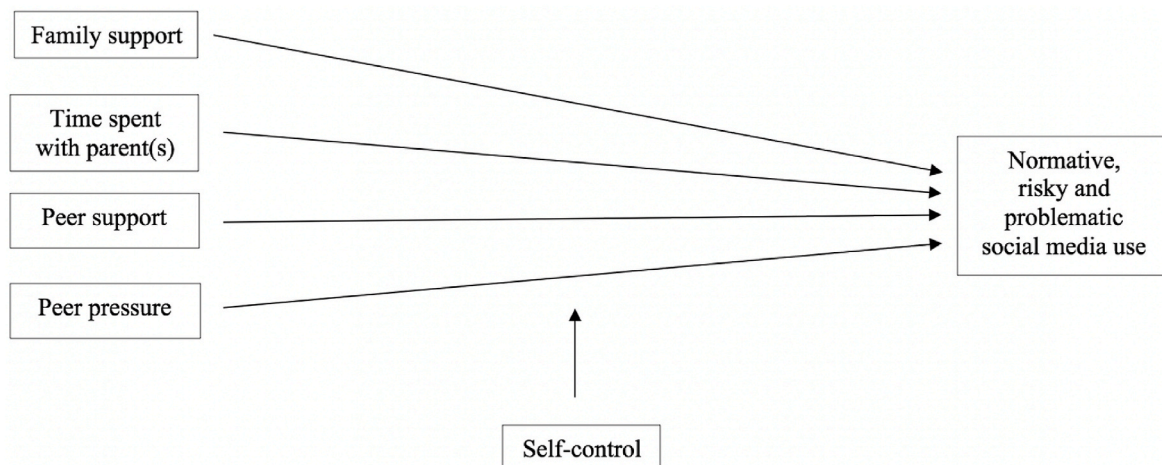


Fig. 1. Conceptual model of parents and peers factors on problematic social media use.

2.2.4. Peer support

The level of perceived peer support was measured at T1 by the subscale Peer Support of the Multidimensional Scale of Perceived Social Support (Zimet et al., 1988). The measure contained four items such as “My friends are really trying to help me”. The respondents answered the items on a 7-point Likert-scale (1 = *strongly disagree* and 7 = *strongly agree*). A mean score was calculated in which a higher score represented more peer support. Last, the internal consistency was found satisfactory for this sample (Cronbach’s $\alpha = 0.912$).

2.2.5. Peer pressure

The level of perceived peer pressure was measured at T1 by the newly developed measure the Peer Pressure Scale (Franken et al., 2016). Respondents were asked to answer six items which included different claims on the question “Some young people do certain things that they would not do because otherwise they..”. An example of one item was: “.. will be ridiculed by friends.” The respondent had the possibility to answer the statements on a 5-point Likert-scale (1 = *definitely does not apply to me* and 5 = *applies to me very often*). The mean score was calculated which resulted in a score between 1 and 5. A higher score indicated more perceived peer pressure. The internal consistency of this sample was reliable (Cronbach’s $\alpha = 0.876$).

2.2.6. Self-control

The Self-control Scale was used to measure the respondent’s level of self-control (Tangney et al., 2004) at T1. This scale contained 13 items which the respondent could answer by a 5-point Likert scale (1 = *never* and 5 = *very often*). An example of an item was: “I say things that I do not need to say”. Out of 13 items, 9 items were recoded so that a mean score could be calculated with a higher score reflecting a higher degree of self-control. The Self-control Scale has been validated in multiple samples (Muraven, Baumeister, & Tice, 1999; Frijns et al., 2005). A Cronbach’s $\alpha = 0.798$ showed that the internal consistency was reliable.

2.2.7. Level of education

Level of education was measured by asking the adolescent in which level of education the child is currently in. Response items ranged from 1 = VMBO (practice-oriented) to 6 = VWO (pre-university). This measure was recoded into low (0 = 1, 2 and 3: practice-oriented levels) and high (1 = 4, 5 and 6: pre (applied) university levels).

2.3. Analysis

To investigate to what extent parental and peer factors influenced adolescents’ problematic social media use and to what extent this relation was moderated by self-control, a Multinomial Logistic Regression (MLR) was performed in IBM SPSS 24. Before conducting the analyses, assumptions of the MLR were checked.

First, descriptives and correlations of all variables of interest were provided for each wave and across types of social media users (normative, risky and problematic). To investigate the influence of parents and peers on risky and problematic social media use separate models were tested. In every model, the MLR was run for the normative, risky and problematic group with the normative group as reference group. First, the influence of parental factors (times spend with parents and support) at T1 on risky and problematic social media use (reference group is normative use) at T2 use was tested by an MLR while controlling for age, gender and social media use at T1. Second, a similar MLR was conducted for peer factors (support and pressure) and a third MLR for self-control as individual factor. Then, a fourth MLR included both parental and peer factors and model 5 tested interaction effects of self-control with each of the parent and peer factors. Self-control at T1 and the centered interaction terms of independent variables*self-control were separately added to model 5.

3. Results

3.1. Problematic social media users

As descriptive statistics show in Table 1, respondents (N = 1368) can be divided into three categories of the outcome variable, namely normative users (N = 941), risky users, (N = 332) and problematic users (N = 95). At T2 the normative users are more often male, whereas the risky users are more often female compared to normative users. However, there was no clear gender difference between normative and problematic users. With respect to the level of education, at T2 the normative group consists of higher educated youngsters (50.9%), in comparison to the risk group at T2 (16.2%). Yet, among problematic users there is a slight increase in the number of adolescents in lower levels of education compared to normative users.

Correlations between all variables of interest are depicted in Table 2. For family factors, time spent with parents is not, and family support is positively significantly related to problematic social media use (T2). Furthermore, it’s found that peer pressure at T1 is positively associated with problematic social media use (T2), whereas no relation was found with peer support. Finally, perceived self-control at T1 shows a negative correlation with problematic social media use (T2), indicating that a higher score on self-control decreases the risk of problematic social media use.

3.2. Influence of parental and Peer Factors on problematic social media use

Using a multinomial logistic regression, we investigated the effect of parental and peer factors at T1 on risky and problematic social media use among adolescents at T2, while controlling for gender, age, education level and risky/problematic social media use at T1. In the first model, including parental factors, the results show that more family support at T1 lowered the odds of being a risky user at T2, compared to normative users (OR = 0.830, $p = .001$). Also, for risky users compared to normative users, more time spent with parents had a marginally significant effect (OR = 1.408, $p = .065$). Family support (OR = 0.900, $p = .281$) and time spent with parents (OR = 1.057, $p = .846$) at T1 did not significantly predict the odds of being a problematic user at T2 compared to normative users.

In the second model, including peer factors, a significant negative effect was found for peer support T1 (OR = 0.889, $p = .043$) and a positive effect was found for peer pressure T1 (OR = 1.273, $p = .021$) on the odds of being a risky user at T2 compared to normative users.

Table 1

Mean (M) and percentages (%) of the total sample on T1 and the categories of the outcome variable problematic social media use (T2).

Variable	Total N=1368	Normative N= 941	Risk N= 332	Problematic N= 95
Age (M)	14.1	14.2	14.1	14.0
Gender (%)				
Female	51.6	32.7	15.2	3.7
Male	48.4	36.2	9.1	3.1
Education (%)				
Low	30.2	17.9	8.0	3.7
High	69.9	50.9	16.2	3.3
Problematic social media use T1 (M)	1.36	0.90 ^a	2.03 ^b	3.26 ^c
Time spent w parents T1 (M)	4.66	4.71	4.69	4.59
Parental support T1 (M)	6.09	6.27 ^a	5.92 ^b	5.94 ^{b,c}
Peer support T1 (M)	5.66	5.75	5.60	5.64
Peer pressure T1 (M)	1.68	1.62 ^a	1.81 ^b	1.96 ^{b,c}
Self-control T1 (M)	3.47	3.60 ^a	3.28 ^b	3.06 ^c

Note. Different superscripts indicate significant differences between the groups based on t-tests.

Table 2

Correlations Between problematic Social Media Use (T2), Age, Gender, Education Level, Problematic Social Media Use (T1), Time Spent with Parents, Family Support, Peer Support, Peer Pressure and Self-Control.

Variables	1	2	3	4	5	6	7	8	9	10
1 Problematic social media use (T2)	–									
2 Age	–.055*	–								
3 Gender	.102**	–.009	–							
4 Education level	–.159**	.216**	–.042	–						
5 Problematic social media use (T1)	.394**	–.015	.094**	–.152**	–					
6 Family support	–.131**	–.069**	–.036	.086**	–.193**	–				
7 Time spent with parents	–.005	.028	.108**	.121**	–.076**	.157**	–			
8 Peer support	–.043	–.001	.322**	.003	–.061*	.085**	.284**	–		
9 Peer pressure	~	–.046	–.174**	–.086**	.278**	–.072**	–.181**	–.281**	–	
10 Self-control	–.297**	–.093**	–.017*	.100**	–.394**	.136**	.312**	.181**	–.323**	–

Note. N=1355. *p < .05, **p < .01.

However, no significant effects were found of peer support (OR = 0.980, p = .843) and peer pressure (OR = 1.270, p = .142) at T1 on the risk of problematic use at T2 compared to normative users.

The third model included self-control as individual factor in the model. The result showed a strong effect of self-control (T1) on risky social media use (OR = 0.524, p = <.001) as well as on problematic social media use (OR = 0.347, p = <.001), compared to normative use. Thus, higher levels of self-control decreased the risk of becoming a risky and problematic social media user.

In the fourth model (Table 3), including both parental and peer factors at T1, the odds of being a risky user at T2 (compared to being a normative user) was significantly increased by time spent with the parents (p = .021). However, no significant effects were found for the peer factors at T1 for the risk group compared to the normative group. Also, none of the parental and peer factors at T1 were found to be significant for problematic users compared to normative users at T2.

3.3. The interaction of self-control with parent and Peer Factors

To investigate whether adolescents' self-control moderated the effects of parent and peer factors on risky and problematic social media use, interaction terms of every independent variable with self-control were added separately to the model. The results show that no significant interaction effects were found between self-control and either family support (OR = 0.857, p = .114), time spent with parents (OR = 0.603, p = .104), peer support (OR = 0.918, p = .332) and peer pressure

Table 3

Multinomial Logistic Regression Analyses of Parent and Peer Factors on Risk and Problematic Social Media Users (Reference Group are Normative Users).

	Risky group B			Problematic group		
	(SE)	OR	95% CI	B (SE)	OR	95% CI
Age	–.14 (.07)*	.87	.76–.99	–.28 (.12)	.76	.60–.96
Gender	.65 (.15)***	1.91	1.41–2.57	.20 (.26)*	1.22	.74–2.03
Problematic social media use T1	.29 (.04)***	1.34	1.23–1.46	.48 (.06)***	1.61	1.44–1.80
Self-control	–.65 (.14)***	.52	.40–.68	–1.06 (.22)***	.35	.23–.54
Family support	–.08 (.06)	.92	.81–1.04	–.08 (.10)	1.01	.82–1.24
Time spent with parents	.44 (.19)*	1.55	1.07–2.23	.16 (.29)	1.18	.67–2.06
Peer support	–.07 (.06)	.93	.83–1.05	–.03 (.11)	1.03	.84–1.27
Peer pressure	.11 (.10)	1.12	.90–1.39	.07 (.17)	1.08	.77–1.49

Note.. R² = 0.158 (Cox & Snell), 0.199 (Nagelkerke). Model $\chi^2(14) = 232,33$, *p < .05, **p < .01, ***p < .001.

(OR = 1.211, p = .280) at T1 on risky social media use at T2. Also, no significant interaction effects were found between self-control and either family support (OR = 1.113, p = .525), time spent with parents (OR = 0.647, p = .365), peer support (OR = 1.164, p = .312) and peer pressure (OR = 0.919, p = .758) on T1 on problematic social media use at T2. This demonstrates that the influence of parent and peer factors on adolescents' problematic social media use does not depend on the degree of adolescents' self-control.

4. Discussion and conclusion

4.1. Discussion

This study is, as far as we know, one of the first that investigated longitudinally both parental and peer factors (e.g. parent support, time spent with parents, peer support and peer pressure) in relation to adolescent's risky and problematic social media use and how this may differ across adolescents' level of self-control. Results indicate that for adolescents, family and peer factors increased the risk of being a risky social media user, more so than problematic user compared to normative users. Furthermore, the role of parental and peer factors in problematic social media use does not seem to depend on the level of self-control. Self-control, however, seems to reduce the odds of developing risky and problematic social media use. These results imply that general parent and peer factors can help to prevent the development of risky social media use, but not problematic use.

Where earlier research found strong evidence for family support and time spent with parents as protective factors against internet addiction (Cruz López et al., 2015; Gecková et al., 2005; Li, Zhang, Li, Zhen, & Wang, 2010), the results of the current study indicate that the protective role of these family factors is particularly found for moderate levels of problematic use, here referred to as risky use, and not extremer levels of problematic use. In a similar vein, peer factors (i.e., peer support and peer pressure) lowered the risk of moderate (risky) problematic use, but not problematic use when compared to normative users. When testing parent and peer factors simultaneously, peer support no longer predicted the odds of risky social media use. In conclusion, parents and peers play an important protective role in lowering the risk of moderate levels of problematic social media use, yet for the prevention of problematic social media use this could not be established.

There may be several possible explanations for the effects of parental and peer factors to mostly risky and not problematic social media use. The first could be due to the operationalization of social media disorder. Whereas previous research used a continuous scale of problematic internet/social media use (Anderson & Teens, 2018; Gecková et al., 2005; Li et al., 2010; Telzer et al., 2015; Wei Wu et al., 2016), this study distinguished three categories of use (i.e. normative, risky and problematic). Hence, the findings of previous studies may also have resulted from effects among particularly the moderately problematic users.

Second, it is likely that parental and peer influence is stronger when

social media use is normative or risky, than once adolescents have developed more severe symptoms of problematic or addictive use. For the latter, individual factors may become relatively more imperative. For example, several studies have demonstrated that parental rules are more strongly related to the onset of drinking than to the level of drinking or drunkenness (Koning et al., 2010; Koning et al., 2011; van der Vorst et al., 2006). It seems plausible that the preventive effect of parental support is particularly relevant at the earlier phases of problematic social media use when adolescents social media use patterns are less extreme.

This also seem to apply to the role of peers; research has shown that peers can be more important during earlier states of adolescents' intensive social media use. For example, research has also shown that problematic social media use barely depends on national context (the extent to which others use social media intensively or problematically), while intensive (non-problematic use) is influenced by national context (Boer et al., 2020). This explains that peers can have an important influence for normative users, but not for problematic or risky users. Therefore, future studies should focus more on parental and peer factors during earlier phases of social media use, also including younger ages, that can protect future adolescents against the development of problematic social media use.

In line with the socio-ecological model, individual factors interact with contextual factors. In our study we investigated the moderating role of self-control in the relation between parent and peer factors and adolescents' problematic social media use. We found that the effects of parental and peer factors on risky and problematic use did not differ for adolescents with lower and higher levels of self-control. Interestingly, self-control did predict both risky and problematic social media users directly, with a somewhat stronger effect on problematic social media use. That is, a higher level of self-control predicted lower odds of risky and problematic social media use 6 months later. This significant effect of self-control and the absence of significant effects of peer and parental factors on problematic social media use supports our idea that individual factors are more important in predicting problematic social media use than contextual factors. However, a closer examination of the role of self-control, relative to parent and peer factors, in predicting risky and problematic social media use is warranted to gain a better understanding of important protective factors of problematic social media use.

4.2. Strengths and limitations

This study tried to get a deeper insight into the mechanisms related to the development of risky and problematic social media use among adolescents. By using a longitudinal design and a large sample of adolescents it was possible to gain a better understanding of the role of parental, peer and individual factors in the development of risky/problematic social media use. However, despite these strengths there are some limitations that should be mentioned as well. First, the results in this study are based on adolescents' self-reports which may have caused over- or underreporting of social media problems. In this regard, however, it should be noted that earlier research showed that self-reports of SMD are valid and reliable method (van den Eijnden, Lemmens & Valkenburg, 2016; Boer et al., 2021). Second, attrition analysis showed, for some variables, differences between the responders and non-responders on T2. Although, results were carefully interpreted, future research should look for methods to include more responders on T2. Third, as Table 3 show the variable peer pressure noticed equally high odds but does not appear to be significant. This can be probably explained by the low power in the study which has probably consequences for the results in the study. Therefore, results must be carefully interpreted. Fourth, because this study was based on a broader study of the LEF-project, respondents came from 2 municipalities in the Netherlands which means that the results could be biased due to demographic factors. Although, it was a large sample, future research would benefit from using a more demographic representative sample. Last, this study

contains a longitudinal design which is known for its possibilities to measure causality. Since it is not likely to exclude other potential confounders causal inferences cannot be drawn. However, the study attempted to minimize the influence of a possible confounder by including age and gender as control variables in the analyses in a longitudinal design so some direction of relations can be demonstrated.

4.3. Conclusion and implications

The current study investigated to what extent family and peer factors have an influence on adolescents' problematic social media use and how this relation is moderated by adolescents' self-control. It was found that parental and peer factors have no influence on the problematic group of social media users, but they do for the risky group. These results suggest that parents and peers are particularly important social influencers when adolescents haven't developed a pattern of more severe problematic use of social media yet. Therefore, future preventive measures may become more effective when focusing on family and peer factors during early adolescents, i.e. children <11 years. Besides that, the study also indicates that individual factors are more important for the development of problematic use than for the development of risky use. To get a better understanding of the individual factors, future studies should investigate to what extent parents and peers can influence social media use during childhood and how they can contribute to the improvement of individual factors like self-control.

Credit author statement

Leijse: Writing- original draft preparation, data analysis.; Koning: conceptualization, methodology, data collection, Writing-reviewing and editing.; Van den Eijnden: supervision, conceptualization, Writing-reviewing and editing, Supervision.

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