



Rules, role models or overall climate at home? Relative associations of different family aspects with adolescents' problematic social media use

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ABSTRACT

Aim: This study aimed to enhance knowledge on which aspects of the family context are most relevant in identifying at-risk/problematic social media users among adolescents. Therefore, we examined the relative contribution to adolescents' at-risk/problematic social media use (SMU) of general and Internet-specific family factors related to three different family (sub)systems: parent-child (*Internet-specific rule-setting, reactive restrictions towards Internet use, co-use, adolescents' involvement in rule-setting and positive parenting*), parent (*parental screen time, phubbing, stress, anxiety and depression*) and family (*family functioning, family intactness and SES*) (sub)system. **Methods:** Questionnaire data came from 403 adolescents ($M = 13.51$, $SD = 2.15$) and 396 parents ($M = 46.59$, $SD = 5.29$) who participated in wave 1 of the Dutch 'Digital Family project'.

Results: Logistic regression analyses showed that only factors related to the parent-child subsystem remained significant in predicting being an at-risk/problematic social media user when examining predictors related to the parent-child, parent and family (sub)system simultaneously. Specifically, general and Internet-specific parenting practices contributed to the prediction above and beyond each other. Positive parenting and Internet-specific rule-setting seem protective, while parental reactive restrictions towards Internet use could be a risk factor. Positive parenting showed the largest effect size.

Conclusion: The results suggest that parental behaviors directed towards the child should be a focus of attention in prevention of adolescents' problematic SMU. In addition, our findings highlight the importance of untangling restrictive mediation (impulsive, in the moment, attempts to limit SMU versus communicating clear rules in advance) when examining its effects.

1. Introduction

Nowadays, social media use (SMU) is one of the most popular leisure activities in the lives of adolescents globally. In the Health Behavior in School-aged Children (HBSC) survey, 35% of European and Canadian adolescents were found to have online contact via social media almost all the time throughout the day [111]. Recently, social media have become even more prominent because of the ongoing global COVID-19 pandemic, as social media help to maintain social interaction when face-to-face contact is limited [38,78,85]. The increasing amount of time adolescents spend online has led to concerns of parents, scholars and professionals about adolescents who are no longer able to control their SMU and, as a result, experience problems in important life domains (e. g., school, social life, wellbeing). This so-called problematic SMU is a

relatively new phenomenon which is generally defined as being preoccupied with and unable to regulate SMU despite the adverse consequences of its use [44]. Problematic SMU has been linked to, for example, attention problems [17,18], poorer academic performance [3], lower life satisfaction [91] (Van den Eijnden et al., 2018), lower mental wellbeing [12,97,110], and poorer sleep quality [110]. For this reason, identifying adolescents at risk for developing problematic SMU to facilitate early detection and prevention, as well as identifying factors to target in (early) intervention, is paramount.

Up to now, prior studies have mainly focused on individual risk and protective factors of problematic SMU [6]. The association with personality factors has been well established [6]. For example, narcissism, neuroticism, extraversion and impulsivity have been positively associated with problematic SMU (Wilson et al., 2010) [7,8,14,23,112]. In

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addition, problematic SMU was found to be correlated with several psychosocial factors, including depression, stress and hyperactivity disorder (Hussain & Griffiths, 2018) [12]. Surprisingly, the influence of the social environment on problematic SMU is much less investigated, while from numerous studies on predictors of problematic behavior in adolescence, we know that the family context plays a crucial role [34,71,92] (e.g. Lin et al., 2016). Moreover, a meta-analysis of Nielsen et al. [79] revealed similar effect sizes for family factors (i.e., quality of parent-child relationship and family support) in relationship to problematic Internet use and problematic gaming as individual factors (self-esteem and social anxiety). This substantiates that the role of the family in adolescents' problematic SMU should be investigated more thoroughly.

The aim of this study is to extent our knowledge about which family aspects differentiate adolescent at-risk/problematic social media users from normative users. Our study will add to the existing literature in at least three important ways. First, we will focus on problematic use of social media specifically instead of generalized problematic Internet use. Previous studies are consistent about some relationships between certain family factors and problematic Internet use in general Li et al., 2014 [57]. As problematic Internet use and problematic SMU are related, these findings are relevant to take into account in order to understand the relationships between family aspects and problematic SMU specifically. However, such findings cannot simply be generalized to this specific subtype of problematic Internet use. Social media have unique features such as creating and sharing content, facilitating intense and prolonged social interaction without predefined beginning and end times, and getting validation of others in the form of 'likes' and 'followers' which distinguishes social media from other Internet applications. Because of these unique characteristics, other risk and protective factors might be involved.

Second, we will discriminate between normative social media users on the one hand and at-risk and problematic users on the other hand. These two groups are differentiated based on the number symptoms present. The symptoms of problematic SMU consist of preoccupation, persistence, tolerance, withdrawal, displacement, problems, escape, deception and conflict [106]. We will use the cut-off scores based on a Latent Class Analysis conducted by Boer et al. [16] on data from a large representative sample of 6626 Dutch adolescents. This study concluded that adolescents who reported zero to one out of the nine symptoms can be considered as normative users, those who reported two to five symptoms as at-risk users and those who reported six or more symptoms as problematic users. While only a small percentage of Dutch adolescents seemed to be a problematic social media user (3.6%), a substantial group could be considered at-risk users (34.7%; [16]). Additionally, this study demonstrated that not only problematic, but also at-risk users were at greater risk for mental health, school and sleep problems than normative users. Therefore, in the current study, we will identify potential family risk and protective factors for at-risk/problematic SMU.

Third, since family factors do not occur in isolation from each other, we will simultaneously examine a variety of family factors to be able to determine their relative contribution to the prediction of being an at-risk/problematic social media user. This will yield knowledge on the key family aspects that differentiate at-risk/problematic social media users from normative users. The conceptual framework of the family systems theory [19] and the levels of interacting family environmental subsystems framework [81] are both (commonly) used for understanding family influences on children's outcomes. Guided by these frameworks, we will examine general as well as Internet-specific factors related to three different family (sub)systems: the parent-child subsystem, the parent subsystem and the family system. This will enable us to investigate how we can discriminate between at-risk/problematic versus normative users based on their family context in a more systematic and comprehensive way.

1.1. Factors related to the parent-child subsystem

The parent-child subsystem entails the dyadic relationship and daily interactions between children and their parents [81]. With respect to this subsystem, we will cover Internet-specific (Internet-specific rules, reactive restrictions, adolescents' involvement in Internet-specific rule-setting) and general parenting (positive parenting).

1.1.1. Internet-specific parenting

Parents play an important role in adolescents' development by, among others, the way they socialize their child [29]. Socialization can be aimed at influencing and regulating a specific behavior, such as online behavior, by applying behavior-specific parenting practices. Regarding Internet-specific parenting practices, often referred to as parental mediation, two types of practices are usually distinguished: restrictive (e.g. rule-setting) and active (i.e. communication about Internet use, co-use) mediation practices (e.g. Lukavská et al., 2021) [65]. In this study, we will examine three practices that are related to restrictive mediation, namely rule-setting (applying rules regarding adolescents' access to the Internet), reactive restrictions (ad-hoc restrictive responses to adolescents' Internet use; [48]) and adolescents' involvement in Internet-specific rule-setting (the extent to which parents involve adolescents' opinion in rule-setting regarding Internet use). Besides, we will include one form of active mediation, namely co-use (parents and adolescents' engage in Internet use together). So far, Internet-specific parenting practices have been mainly investigated in relation to the intensity of use and to Internet or media use in general. The research findings are not conclusive about the effectiveness of Internet-specific parenting practices in reducing the intensity of use (see for review Jago, Edwards, Urbanski, & Sebire, 2013) and preventing problematic use (see for review [80]). The few studies that did investigate the relationship between Internet-specific parenting and adolescents' problematic SMU specifically showed inconsistent findings as well. In the cross-sectional study of Albeladi and Palmer [1], rule-setting, monitoring, technical restrictions and co-use were not found to significantly predict problematic SMU among adolescents in Saudi Arabia. In the longitudinal study of Koning et al. [48] on the bidirectional relationships between quality and frequency of communication regarding Internet use, Internet-specific rules and reactive restrictions on the one hand, and problematic SMU on the other hand, only a small protective effect of strict rule-setting was found for girls. Nevertheless, as Internet-specific parenting practices are aimed at guiding adolescents towards healthy use of the Internet and some of these practices directly limit opportunities to use social media, we expect that adolescents who experience more strict Internet-specific rule-setting, reactive restrictions, co-use and involvement in rule-setting regarding Internet use are less likely to show at-risk/problematic SMU.

1.1.2. General parenting

In addition to behavior-specific parenting practices, general parenting practices such as support and behavioral control that can also have an influence on the development of problematic SMU. General parenting captures the broad pattern of attitudes and behaviors of parents related to socializing their children and thus can be seen as the broader context in which behavior-specific parenting practices occur [30]. Unlike other adolescent problem behaviors such as alcohol drinking, using social media is normative behavior across all ages and is not limited to specific moments during the day or week (e.g., after-school hours, weekends). Besides, SMU comes with many benefits, not only for adolescents themselves, but also for parents (e.g., it can be convenient for parents that social media occupies their children; [[116]]). Because of this, Internet-specific parenting practices may vary from moment to moment. Taking all this into account, the general parenting approach might even be more strongly linked to adolescents' problematic SMU, as this refers less to *what* parents do to socialize their children, but more to *how* parents do this overall.

The literature distinguishes three core dimensions of general parenting: responsiveness (relates to parental warmth, acceptance and support), demandingness (relates to parental supervision, rules, structure and disciplinary efforts; [15]; Maccoby & Martin, 1983) and autonomy granting (relates to promoting the development of independence by encouraging children to express their own thoughts, interests and ideas; [100]). Parenting behavior characterized by high levels on all three dimensions is referred to as positive parenting, since this is considered to create an optimal emotional climate for a healthy development of children (Darling & Toyokawa, 1977). Positive parenting contributes to satisfying three essential psychological needs for adolescents development and wellbeing; competence, autonomy and relatedness (self-determination theory; [27,28,33]). If positive parenting is low, than the psychological needs of adolescents are less satisfied. In response, adolescents will try to satisfy their needs in other social contexts [33]. The compensatory satisfaction theory [63] and compensatory Internet use model [47] both argue that the Internet might serve as such a context and that adolescents in this way might become dependent on the Internet for psychological need satisfaction.

In line with this reasoning, several studies showed that problematic Internet use is negatively associated with aspects of positive parenting including parental emotional warmth, empathy and support (see for meta-analysis [56]), and positively associated with parental overprotection, rejection and harsh punishment which entails little positive parenting [59]. Other studies found support for parenting characterized by high responsiveness and high demandingness as being a protective factor (Dogan et al., 2015) [68,76,104], and parenting with low levels on one or more of the three core dimensions as being risk factors for problematic Internet use (Dogan et al., 2015) [68,98,104]. These findings suggest that general parenting could also be an important factor in affecting problematic SMU. Based on the discussed previous findings and theory, we expect that adolescents who experience more positive parenting are less likely to be at-risk/problematic social media users.

1.2. Factors related to the parent subsystem

The parent subsystem includes characteristics of the individual parent. Specifically parents' media use (intensity of media use and smartphone use during parent-child interactions) as well as their mental health problems (depression, anxiety and stress) seem particularly relevant for problematic SMU.

1.2.1. Parents' media use

Since digital devices such as smartphones are thoroughly integrated in our lives, parents also tend to use these devices regularly and, most likely, often in the presence of their children. Nevertheless, the impact of this parental behavior on adolescents' problematic social media or Internet use has received little attention in previous research [4,79]. However, as suggested by the social learning theory [11], parents' behavior may have a significant influence on the behavior of their children through modelling [11]. That is, children learn by observing the behavior of their parents. Observing the behavior of others influences children's evaluations of the (dis)advantages of the particular behavior [62]. Additionally, with engaging in media use, parents' give a signal of approval of this behavior to their children [52], even when parents actually would like to discourage this behavior. A study among 1819 American parents of children aged 8–18 years found a strong association between parents' media (computer, television, smartphone, tablet, video games, etc.) use and their children's media use [54]. Furthermore, a study in Hong Kong among 13- to 17-year-olds and their parents demonstrated that adolescents showing moderate to severe problematic Internet use were almost three times as likely to have parents with moderate to severe problematic Internet use themselves [52]. These findings provide evidence that children's media use is likely to be a reflection of their parents' media use.

Besides that parents' media use could provide a model for

adolescents' behavior, parents' media use during parent-child interactions (parental phubbing) can lead to feelings of exclusion [32]. This lack of parents' attention for their children could result in adolescents turning to social media in an attempt to compensate the lack of parental attention. In this way, adolescents may become increasingly dependent on social media because they search for attention and feelings of belongingness. In line with this reasoning, Xie et al. (2019) found that parental phubbing was linked to adolescents' smartphone addiction as a result of poorer parent-child attachment. Based on the foregoing discussed theory and empirical findings, we expect that adolescents whom parents use media more intensively and use their smartphone during parent-child interactions more frequently are more likely to be at-risk/problematic social media users.

1.2.2. Parents' mental health problems

Parents' mental health is another important factor of the parent subsystem to take into account, as children of parents with mental health problems have an increased risk for the development of mental disorders [72]. Although problematic SMU is not included in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), many researchers conceptualize problematic, addictive-like use of social media as a negative mental health condition [13,90,106]. One of the reasons why adolescents of parents with poor mental health may have a higher risk of poor mental health themselves is that parents' mental health problems can adversely affect the quality of parent-child relationships and interactions. Stressed, depressed or anxious parents might react less responsive to their children, communicate less effectively and have less or more negative interactions with their children [66]. Some studies indeed showed a positive relationship between mothers' mental health problems and adolescents' problematic Internet use [25,51]. Thus, we expect that adolescents with parents that experience higher levels of stress, anxiety or depressive feelings are more likely to suffer from at-risk/problematic SMU.

1.3. Factors related to the family system

The family system refers to the family as a whole, such as family functioning, family intactness and family socioeconomic status (SES).

1.3.1. Family functioning

A broader aspect of the family context than discussed so far is family functioning. Family functioning describes how family members interact with and treat other family members, but goes beyond dyadic family interactions and relationships [61,94]. It pertains the overall dynamics of the family which shape the social-emotional climate at home. Following the idea of the family systems theory that the family as a whole is greater than the sum of its parts [19], also accounting for broader family processes such as family functioning is essential for a thorough assessment of the family environment.

Previous studies have linked poor family functioning with general problematic Internet use (see for review [57,]). Similar to general parenting, the compensatory Internet use model [47] can explain the link between family functioning and problematic SMU. Adolescents in homes with poor family functioning, might go online to seek for the warmth and emotional support they lack in their family environment. We, therefore, expect that better family functioning is associated with a lower likelihood of adolescents' at-risk/problematic SMU.

1.3.2. Family intactness

Beside family functioning, we also consider family intactness as a potential risk factor of adolescents' problematic SMU. In general, adolescents from non-intact families (adolescents who do not live with both biological parents in one home) show more problem behavior than adolescents who live in intact families [9,55,96], because they are more likely to suffer from economic disadvantage, interparental conflicts and/or less adequate (authoritarian) parenting (Lukavská et al., 2021) [53].

This could also predispose them to involvement in problematic SMU. Some studies showed that adolescents with problematic Internet/social media use are more likely to have divorced parents and to live in single-parent households [95,101,107]. Thus, we expect that adolescents from non-intact families are more likely to be at-risk/problematic social media users.

1.3.3. Family SES

Although family socio-economic status (SES) has been extensively investigated as risk factor of adverse mental and physical health outcomes in adolescents [88,99], the association between family SES and problematic SMU hasn't received much attention. The HBSC study showed that secondary school students from lower SES families are more likely to use social media intensively than those from higher SES families, but no significant association was found with problematic SMU [101]. The few studies on family SES and problematic Internet use in general show inconsistent findings (Lam et al., 2009) [22,108,114]. However, adolescents from lower SES families are more likely to experience lower wellbeing and more difficulties in life [102]. For them, SMU might be a way to cope with their relatively more disadvantaged situation [105]. Moreover, parents with lower SES may have less knowledge and skills regarding appropriate Internet use and, therefore, may be less likely to adequately mediate their children's SMU [67]. Therefore, we expect that adolescents who live in low SES families are at greater risk for at-risk/problematic SMU.

1.4. Current study

We will examine the relative associations between different aspects of the family context and adolescents' at-risk/problematic SMU. A distinction will be made between factors related to the parent-child subsystem (*Internet-specific rule-setting, reactive restrictions towards Internet use, co-use, adolescents' involvement in rule-setting and positive parenting*), the parent subsystem (*parental screen time, phubbing, stress, anxiety and depression*) and the family system (*family functioning, intactness and SES*). This will provide information about which family aspects are most important in differentiating between normative and at-risk/problematic social media users and, thus, could be potential risk or protective factors. Based on theory and previous empirical findings, we expect that a higher likelihood of adolescents being an at-risk/problematic social media user is associated with 1) less strict parental Internet-specific rule-setting, 2) less parental reactive restrictions towards Internet use, 3) less co-use, 4) less adolescent involvement in rule-setting regarding Internet use, 5) less positive parenting, 6) more parental screen time, 7) more parental phubbing, 8) more parental stress, 9) anxiety or 10) depression, 11) poorer family functioning, 12) living in a non-intact family and 13) living in a low SES family. This study was pre-registered on the Open Science Framework (OSF | The family context and adolescents' problematic social media use_Pre-registration.docx).

2. Method

2.1. Participants and procedure

Data from the first measurement wave (April–July 2020) of an ongoing Dutch research project called 'Digital Family project' were used. The Digital Family project primarily investigates digital media use among youth in the context of the family. Families were recruited through contact with schools and sport clubs, advertisement on social media and websites, word of mouth and door-to-door flyer distribution in several places in the Netherlands. Families were allowed to participate with at least one parent or caregiver (hereafter referred to as 'parent') and one child (with a maximum of two parents and two children). Adolescents and their parents were instructed to fill in an online questionnaire at home, independently of each other. Participants

provided active informed consent at the beginning of the questionnaire. Active parental informed consent was obtained through the register form. Completion of the questionnaire took 30 ± 45 min. Families were compensated with a gift card (€5 per participating family member) and were eligible to win a voucher for a Dutch family theme park. The study was approved by the Ethics Committee of the Faculty of Social and Behavioral Science at Utrecht University (FETC20–192).

In total, 403 adolescents (including siblings) and 396 parents participated in wave 1. Of the adolescents, 53.3% were girls and adolescents' age ranged from 9 to 19 years old ($M = 13.51$, $SD = 2.15$). Almost all adolescents were born in the Netherlands (96.5%). In terms of educational level, 25.3% were in primary school, 15.9% in lower, 21.1% in middle and 32% in higher level secondary education, 4.5% in secondary vocational education and 1.2% in higher professional education. Over 83% of the adolescents lived in a traditional two parent household. Of the parents, 58.1% was female and parents' age ranged from 25 to 69 years old ($M = 46.59$, $SD = 5.29$). Ninety-three percent was born in the Netherlands. The majority of the parents was highly educated: 69.9% graduated from college or university.

2.2. Measures

2.2.1. Adolescents' problematic SMU

Adolescents' problematic SMU was assessed by adolescents' self-reports using the Social Media Disorder Scale comprised of nine dichotomous (1 = *yes* and 0 = *no*) items [106] that cover nine symptoms of addiction, namely preoccupation, persistence, tolerance, withdrawal, displacement, problems, escape, deception and conflict. For example, to measure displacement, adolescents were asked "During the past year, have you regularly had no interest in hobbies or other activities because you would rather use social media?". As already discussed in the introduction, we used the cut-off scores based on a recent representative Dutch study [16]: participants who reported zero or one symptom were classified as normative users and participants' who reported two or more symptoms were classified as at-risk/problematic users. Because of the dichotomous nature of the items of the SMD scale, ordinal alpha based on the tetrachoric correlation was used as reliability index [40]. Tetrachoric ordinal alpha was 0.81.

2.2.2. Internet-specific parenting practices

Internet-specific rule-setting among adolescents were assessed by asking them to what extent they were allowed to "use the Internet or play games as long as they wanted", "use the Internet or play games for more than three hours", "use the Internet or play games while their homework was not finished yet", "use the Internet or play games in the hour before going to sleep", "bring their smartphone or tablet to their bedroom when going to sleep at night", "keep their smartphone or tablet with them while doing homework", "keep their smartphone or tablet with them during dinner" and "keep on using their smartphone or tablet while talking with their parents" in the past 2 weeks. This scale was derived from Koning et al. [48] and extended with the three last mentioned items. The items of this scale correspond to findings of qualitative studies demonstrating what kind of rules parents of adolescents have regarding Internet use (e.g. [87,103]). Response options ranged from 1 (*never*) to 5 (*very often*) and were reverse coded, so that higher mean scores represented more strict parental rules about Internet use. Cronbach's α was 0.80.

Reactive restrictions towards adolescents' Internet use was also measured among adolescents using a scale of Koning et al. [48]. This scale exists of four items (e.g., "that you have to turn off the computer, tablet or smartphone") asking adolescents how often their parents react in a specific way when they want to use/keep on using the Internet or games. Response options ranged from 1 (*hardly never*) to 5 (*more than 5 times a day*). Higher mean scores indicated more reactive restrictions towards adolescents Internet use. Cronbach's α was 0.84.

Co-use was measured by asking adolescents to think about the past 2

weeks and answer the following questions: “How often did you spend time with your parents doing the following activities: (1) watching television, a movie, serie or vlog together, (2) playing an online game together, (3) making a vlog together?”. Response options were 1 (*not once*), 2 (*less than once a week*), 3 (*once a week*), 4 (*a few times a week*), 5 (*several times a week*) and 6 (*(almost) every day*). Higher mean scores reflected more co-use. The internal consistency of this scale was not assessed, since it entails a formative scale. This means that not all items were expected to be (highly) correlated with each other and that each item adds conceptually to the construct co-use [36].

Adolescents' involvement in Internet-specific rule-setting was measured by asking parents to answer on a 5-point scale (ranging from 1 'never' to 5 'always') to what extent they involve their children's opinion in setting rules regarding Internet use. When data from two parents were available, a mean score of both parents was used. Higher scores indicated that parents involve their children in Internet-specific rule-setting to a greater extent.

2.2.3. Positive parenting

To measure positive parenting, adolescents were asked to fill out 11 items of the Parenting Style Inventory II [1]. It included three subscales to assess the three dimensions of parenting style: responsiveness (three items; “I can count on my parents or caregivers to help me out if I have a problems”, “My parents or caregivers hardly ever praise me for doing well”, “My parents or caregivers and I do things that are fun together”), demandingness (four items; “My parents or caregivers expect me to follow family rules”, “My parents or caregivers let me get away with things”, “If I don't behave myself, my parents or caregivers will punish me”, “My parents or caregivers point out ways I could do better”) and autonomy granting (four items; “My parents or caregivers respect my privacy”, “My parents or caregivers give me a lot of freedom”, “My parents or caregivers make most of the decisions about what I can do”, “My parents or caregivers believe I have a right to my own point of view”). Response options ranged from 1 (*totally disagree*) to 5 (*totally agree*) with a midpoint of 3 (*neither disagree nor agree*). Depending on the wording of the items, some items were reverse coded. The mean scores on each dimension were used to calculate a mean score for positive parenting, with higher scores indicating higher levels of positive parenting. Cronbach's α was 0.70.

2.2.4. Parents' media use

Parents' screen time was measured by asking parents how much time they spent on average sitting in front of a screen (e.g., using a smartphone, laptop or I-pad) for recreational as well as work-related purposes on a weekday and on a weekend day in the past 2 weeks. Response options ranged from 1 (*hardly any time*) to 7 (*more than 8 h*). We computed the average daily screen time of parents by first multiplying screen time on a weekday by 5 and screen time on a weekend day by 2, adding up these two products and then dividing this score by 7. When data from two parents were available, a mean score of both parents was used. Higher scores indicated a higher amount of parents' screen time.

Parental phubbing was measured by asking adolescents three items: “In the past two weeks, how often did it occur that your parents or caregivers used their smartphone...” followed by ‘while having dinner together?’, ‘while you were talking with each other?’, while you were doing something fun together?’. Response options ranged from 1 (*never*) to 5 (*very often*). Scores were averaged, with higher scores representing more parental smartphone use during parent-child interactions. Cronbach's α was 0.66.

2.2.5. Parents' mental health problems

Parents level of depression, anxiety and stress were measured as an indication for their mental health problems. Depression and anxiety were measured with the ultra-brief Patient Health Questionnaire for Depression and Anxiety [50] that consists of four items that cover the two core criteria for depressive disorder (e.g., “I had little interest or

pleasure in doing things) and generalized anxiety disorder (e.g., “I felt nervous, anxious or on edge”). The items included a 4-point scale (1 = *not at all*, 2 = *several days*, 3 = *more than half the days*, 4 = (*nearly*) *every day*). Mean scores were calculated with higher scores representing higher levels of depression and anxiety. When data from two parents were available, a mean score of both parents was used. Spearman-Brown coefficient was 0.74 for depression reported by parent 1 and 0.70 for depression reported by parent 2. Spearman-Brown coefficient was 0.76 for anxiety reported by parent 1 and 0.83 for anxiety reported by parent 2.

Parental stress was assessed with four items of the stress subscale of the Depression Anxiety Stress Scale 21 [83]. The four items were: “I felt that I was rather touchy”, “I found it difficult to relax”, “I found it hard to wind down” and “I tended to over-react to situations.” Those items were answered on the same 4-point scale as the items measuring depression and anxiety, with higher mean scores representing higher levels of stress. When data from two parents were available, a mean score of both parents was used. Cronbach's α was 0.77 for parent 1 and 0.75 for parent 2.

2.2.6. Family functioning

Parents were asked to provide information on family functioning by filling in the following four items of the Family Assessment Device [39]: “We regularly do activities with the whole family”, “There is little shared interest in our family”, “Within our family we can express feelings to each other” and “Family members are accepted for who they are”. Response options ranged from 1 (*totally agree*) to 5 (*totally disagree*). The mean score of the four items was used. Three items were reverse coded, so that higher scores indicated better family functioning. When data from two parents were available, a mean score of both parents was used. Cronbach's α was 0.64 for parent 1 and 0.60 for parent 2. Inter-rater reliability between both parents was moderate (ICC = 0.591).

2.2.7. Family intactness

Family intactness was measured by asking adolescents about their living situation. A dummy variable was created with 1 if adolescents live in a traditional two-parent household (*family intactness*) and 0 if adolescents live in a one-parent household or a two-parent step or blended household (*family non-intactness*). See Table 1 for an overview of the study variables.

Table 1
Overview of the variables included in the current study.

(sub)system	Variable	Reported by
	<i>Dependent</i>	
	Adolescents' problematic SMU	Adolescent
	<i>Independent</i>	
Parent-child subsystem	Internet-specific parenting	Adolescent
	Reactive restrictions	Adolescent
	Co-use	Adolescent
	Input children Internet-specific rules	Parent
	General parenting	Adolescent
	Positive parenting (responsiveness, demandingness, autonomy granting)	Adolescent
Parent subsystem	Parents' media use	Parent
	Parental phubbing	Adolescent
	Parents' mental health problems	Parent
	Parental depression	Parent
Family system	Parental anxiety	Parent
	Family functioning	Parent
	Family intactness	Parent
	Family SES	Parent

Note. problematic SMU = problematic social media use.

2.2.8. Family SES

Family SES is measured with the Family Affluence Scale (FAS; [20]) comprising four items that refer to the following family material assets: car/van ownership (no/yes one/yes two or more), child(ren) having own unshared bedroom (no/yes), frequency of holidays in the past 12 months (not at all/once/twice/more than twice) and number of computers/laptops/tablets at home (none/one/two/three/four/more than four). The last item slightly differs from the original item, since we added 'laptops/tablets' to the question and 'four' and 'more than four' to the answer options. Items were answered by parents and were added up to form an index of family SES with higher scores representing higher family SES. When data from two parents were available, a mean score of both parents was used. Internal consistency was not assessed, as the Family Affluence Scale is a formative scale consisting of separate independent items [20,36]. Inter-rater reliability between both parents was excellent (ICC = 0.912).

2.2.9. Control variables

Data collection took place during the COVID-19 pandemic. Given that the set of restrictive measures imposed by the Dutch government to slow down the spread of COVID-19 changed during data collection, we controlled for date of participation. Till May 11th, primary and secondary schools were closed. From May 11th till June 8th primary schools were partly reopened. On June 8th primary schools were fully reopened. Secondary schools were partly reopened on June 2th, but they remained at reduced capacity till the end of data collection. Therefore, primary school students who participated after June 7th were coded 1, the rest was coded 0. In addition, age (*in years*) and sex (0 = *girl*, 1 = *boy*) were included as control variables, because older adolescents and girls have been found to be at greater risk for problematic SMU (Mérille et al., 2017) [16,101].

2.3. Data analysis

First, descriptive statistics were calculated for the total sample and for normative and at-risk/problematic social media users separately. Second, we performed independent sample *t*-tests to compare normative and at-risk/problematic users on continuous family variables (or Mann-Whitney *U* test if not normally distributed) and Chi-Square (X^2) tests to compare the two groups on categorical family variables. Because of the multiple significance testing undertaken, the Bonferroni correction was applied ($\alpha = 0.05/13$). Accordingly, with respect to findings of the *t*-tests/Chi-Square tests, a *p*-value of <0.004 was regarded as significant. Third, correlations between all study variables were obtained for the total sample. Fourth, logistic regression analyses were performed in Mplus version 8 [77] to examine which family factors predict being an at-risk/problematic social media user among adolescents. More specifically, four separate logistic regression analyses were performed with adolescents' at-risk/problematic SMU as dichotomous outcome variable, sex, age and date of participation as control variables and the predictors varying across the four regression analyses. In the first regression analysis, factors related to the parent-child subsystem (Internet-specific rule-setting, reactive restrictions towards adolescents' Internet use, co-use, adolescents' involvement in Internet-specific rule-setting and positive parenting) were included as predictors. In the second regression analysis, factors related to the parent subsystem (parental depression, anxiety, stress, screen time and phubbing) were included as predictors. In the third regression analysis, factors related to the family system (family functioning, intactness and SES) are included as predictors. In the fourth regression analysis, the predictors that appeared significant in the previous three analyses were included to identify the relative predictive role of family factors related to the three different (sub)systems in adolescents' at-risk/problematic SMU. The correlation matrix showed no problems with multicollinearity ($r > 0.80$; Field, 2018) among the predictors. In the analysis sample, 6.5% of the participants had missing data on at least one study variable. The highest percentage of missing

values on a variable was 3.6%. To retain these cases, missing data were imputed with full information maximum likelihood procedure. To adjust for the clustered nature of the data (participants within families), maximum likelihood estimation with robust standard errors was used in all regression analyses (MLR; [77]). A *p*-value of <0.05 was used to determine statistical significance. Effect sizes were calculated by dividing the log of the odds ratios by 1.81 [24] and interpreted them as Cohen's *d* effect sizes (≥ 0.20 is small, ≥ 0.50 is medium and ≥ 0.80 is large; [26]).

Sensitivity analyses were performed to evaluate whether the results were influenced by multivariate outliers or careless responders. Multivariate outliers were identified using Mahalanobis distances. Careless responders include participants who showed careless, inattentive responding that might have been caused by e.g. survey fatigue. To identify careless responders, we took into account response time, response variability and response consistency [42]. No response time was below the absolute minimum amount of time that was needed to complete the questionnaire. Response invariability was checked using scales for which non-varying answers were not plausible (e.g. because the scale consists of both positively and negatively worded items or different subscales). Zero participants had non-varying answers on more than one of the selected scales. Therefore, no participants were classified as careless responder based on response invariability. Response inconsistency was checked using psychometrically synonymous item pairs [35]. A cut-off score of $r > 0.50$ for the adolescent data and a cut-off score of $r > 0.60$ for the parent data was used to select these item pairs on which an inconsistency index variable was based. This inconsistency index variable was computed as the sum of the absolute difference between the scores on each item pair (e.g. [2]). Participants with +2SD on this index variable were identified as careless responder, as these participants contradict themselves to a large extent which may indicate a lack of attention. Fourteen adolescents and 13 parents were identified as careless responder based on response inconsistency. For these 14 adolescents, their scores on variables reported by themselves (except for demographic variables) were replaced by missing values. Adolescents' scores on variables reported by their parents were replaced by missing values in case their parent(s) were identified as careless responders. These data were then handled as all other missing values through full information maximum likelihood [42].

3. Results

3.1. Descriptive results

The percentage of the total sample that was classified as at-risk/problematic social media user was 39.6%: 36.5% at-risk users (2–5 symptoms) and 3.1% problematic users (6 or more symptoms). At-risk/problematic users reported to use their smartphone, on average, 3–4 h a day, whereas normative users reported an average of 2–3 h of smartphone use per day. Descriptive data are presented in Table 2. Table 3 shows the correlations between all study variables.

3.1.1. Differences in family factors between normative and at-risk/problematic social media users

Independent sample *t*-tests/Mann Whitney *U* tests showed that at-risk/problematic social media users significantly (Bonferroni correction, $p < .004$) differ from normative users in terms of parental Internet-specific rule-setting, parental reactive restrictions, perceived positive parenting and parental phubbing. At-risk/problematic social media users reported significantly less strict Internet-specific rule-setting ($t(398) = 0.56, p = .001, d = 0.34$), more parental reactive restrictions ($U = 14,929, z = -3.770, p < .001, r = 0.19$), and less positive parenting ($t(298.31) = 4.22, p < .001, d = 0.60$) than normative users. At-risk/problematic social media users also reported more parental phubbing ($U = 15,717, z = -3.085, p = .002, r = 0.15$). The means and standard deviations are presented in Table 2.

Table 2

Means, standard deviations and independent samples t-tests/Mann Whitney U tests results for all variables of interest.

	Total group			Normative social media users			At-risk/problematic social media users		
	n (%)	M (SD)	Range	n (%)	M (SD)	Range	n (%)	M (SD)	Range
Age	403	13.51 (2.15)	9–19	241	13.41 (2.19)	9–19	160	13.66 (2.13)	9–18
Sex (girls)	215 (53.5%)	–	–	116 (48.1%)	–	–	99 (61.9%)	–	–
Adolescents' smartphone use per day	368	4.91 (2.10)	1–10	216	4.56 (2.04)	1–10	152	5.41 (2.09)	1–10
Parent-child subsystem									
Internet-specific rule-setting	400	3.52 (0.85)	1–5	241	3.64 (0.85)	1–5	159	3.35 (0.81)	1–5
Reactive restrictions	400	1.86 (0.80)	1–5	241	1.75 (0.78)	1–5	159	2.02 (0.81)	1–5
Co-use	400	6.61 (0.41)	3–14	241	6.54 (1.69)	3–14	159	6.70 (1.99)	3–14
Adolescents' involvement in Internet-specific rule-setting	402	3.51 (0.71)	1–5	237	3.52 (0.69)	1–5	153	3.47 (0.68)	1–5
Positive parenting	398	4.04 (0.41)	1–5	241	4.14 (1.49)	1–5	157	3.90 (0.43)	1–5
Parent subsystem									
Parental screen time	399	5.60 (1.57)	2–11	236	5.42 (1.48)	2–11	152	5.79 (1.63)	2–11
Parental phubbing	400	1.80 (0.68)	1–5	241	1.73 (0.66)	1–5	159	1.92 (0.69)	1–5
Parental depression	399	1.33 (0.46)	1–4	236	1.30 (0.43)	1–4	152	1.36 (0.49)	1–4
Parental anxiety	399	1.50 (0.54)	1–4	236	1.48 (0.53)	1–4	152	1.51 (0.55)	1–4
Parental stress	399	1.49 (0.41)	1–4	236	1.47 (0.41)	1–4	152	1.49 (0.41)	1–4
Family system									
Family functioning	400	4.07 (0.49)	1–5	236	4.12 (0.46)	1–5	152	3.97 (0.50)	1–5
Family intactness (intact)	337 (83.6%)	–	–	209 (86.7%)	–	–	127 (79.4%)	–	–
Family SES	402	12.42 (1.72)	6–15	237	12.51 (1.79)	6–15	153	12.27 (1.60)	6–15

Note. Two-tailed. Significant ($p < .05$) mean differences between normative and at-risk/problematic users are indicated in bold. Clustered nature of data (participants within families) is not taken into account. Since the parent-reported data is linked to the adolescent-reported data and the adolescent-reported data consist (to a great extent) of sibling data, parent-reported data is included twice when two children of the same family participated. Therefore, it should be noted that the scores of those parents weigh heavier in the means for parent-reported variables (adolescents' involvement in Internet-specific rule-setting, parental screen time, parental depression, parental anxiety, parental stress, family functioning and family SES).

3.2. Logistic regression analyses examining possible predictors of adolescents at-risk/problematic social media use

3.2.1. Family factors related to the parent-child subsystem

Results of the logistic regression analysis including predictors related to the parent-child subsystem are shown in Table 4. Internet-specific rule-setting, reactive restrictions and positive parenting were significant predictors of being an at-risk/problematic social media user, while controlling for age, sex and date of participation. That is, more strict Internet-specific rule-setting by parents and more perceived positive parenting were associated with a lower likelihood of at-risk/problematic SMU, whereas more parental reactive restrictions was associated with a higher likelihood of at-risk/problematic SMU. Internet-specific rule-setting and reactive restrictions had small effect sizes, while positive parenting showed a large effect size. Co-use and adolescents' involvement in Internet-specific rule-setting were not significantly related to adolescents' at-risk/problematic SMU. The predictors explained 23% of the variance in at-risk/problematic SMU.

3.2.2. Family factors related to the parent subsystem

Results of the logistic regression analysis including predictors related to the parent subsystem are shown in Table 5. More parental screen time and more parental phubbing were associated with a significantly higher likelihood of at-risk/problematic SMU, with small to very small effect sizes. Parental depression, anxiety and stress were not significantly related to adolescents' at-risk/problematic SMU. The predictors explained 7.3% of the variance in at-risk/problematic SMU.

3.2.3. Family factors related to the family system

Results of the logistic regression analysis including predictors related to the family system are shown in Table 6. Better family functioning was

associated with a significantly lower likelihood of at-risk/problematic SMU, but showed a small effect size. Family intactness and SES were not significantly related to adolescents at-risk/problematic SMU. The predictors explained 6.3% of the variance in at-risk/problematic SMU.

3.2.4. Relative predictive role of factors related to different family (sub) systems

In the fourth logistic regression analysis, we included all factors that appeared significant in the previous three analyses for each (sub)system in order to examine the relative predictive role in adolescents' at-risk/problematic SMU of factors related to the three different family (sub) systems (see Table 7). Only the factors related to the parent-child subsystem, i.e. Internet-specific rule-setting (small effect size), reactive restrictions (small effect size) and positive parenting (medium effect size) remained significant. The predictors explained 23.5% of the variance in at-risk/problematic SMU.

3.3. Sensitivity analyses

Sensitivity analyses were conducted excluding multivariate outliers and yielded similar results (see Appendix A). The same applies to the sensitivity analyses without careless responders (see Appendix B). The only remarkable difference is that we did not find a significant association between parental screen time and adolescents' at-risk/problematic social media use in the analysis without careless responders ($OR = 1.114$, $p = .144$, 95% $CI [0.963, 1.287]$; see Table B.2 in Appendix B).

4. Discussion

Adolescents earliest and closest social environment is the family context where also most of their social media use takes place. Therefore,

Table 3
Correlations between all study variables.

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Date of participation ^a	1.00															
2. Age	-0.44**	1.00														
3. Sex ^b	0.00	-0.04	1.00													
4. Internet-specific rule-setting	0.21**	-0.57**	0.10	1.00												
5. Reactive restrictions	0.06	-0.27**	0.17**	0.32**	1.00											
6. Co-use	-0.05	-0.06	0.03	0.05	0.14**	1.00										
7. Adolescents' involvement in Internet-specific rule-setting	-0.09	0.11*	0.07	-0.06	-0.04	-0.02	1.00									
8. Positive parenting	-0.00	-0.09	-0.13*	0.12*	-0.15**	0.08	0.11*	1.00								
9. Parental screen time	0.06	-0.09	-0.04	-0.07	-0.07	0.09	0.05	-0.06	1.00							
10. Parental phubbing	-0.01	-0.03	-0.14**	0.07	-0.14**	0.09	-0.14**	0.05	1.00							
11. Parental depression	0.01	-0.02	0.01	0.04	0.13**	0.01	-0.11*	0.07	0.14**	1.00						
12. Parental anxiety	0.02	-0.08	0.07	0.05	0.13*	0.10	-0.04	0.12*	0.07	0.62**	1.00					
13. Parental stress	0.02	-0.14**	-0.01	0.13*	0.10*	0.09	-0.15**	-0.08	0.15**	0.09	0.56**	1.00				
14. Family functioning	-0.00	-0.07	-0.02	0.15**	-0.08	-0.01	0.25**	0.30**	-0.12*	-0.07	-0.11*	-0.06	1.00			
15. Family SES	-0.03	0.07	0.01	-0.03	0.01	0.10	0.15**	0.13**	0.04	-0.04	-0.18**	-0.14**	0.16**	1.00		
16. Family intactness ^c	-0.01	-0.04	0.08	0.13*	0.12*	0.14**	0.09	0.05	-0.10*	-0.07	0.03	0.08	0.05	0.25**	1.00	
17. At-risk/problematic SMU ^d	-0.05	0.05	-0.14**	-0.18**	0.19**	0.02	-0.02	-0.25**	0.10*	0.15**	0.07	0.02	0.01	-0.14**	-0.10	1.00

Note. Spearman's Rho was used for correlations with date of participation, sex and at-risk/problematic SMU. Pearson Correlation was used for correlations between all other variables.

** $p \leq .01$. * $p \leq .05$.

^a Reference category = others than primary school pupils who participated after June 7th.

^b Reference category = girl.

^c Reference category = non-intact families.

^d Reference category = normative SMU.

Table 4

Logistic regression analysis examining possible predictors of at-risk/problematic SMU related to the parent-child subsystem.

Variable	OR	95% CI	Effect size
Date of participation ^a	0.746	[0.339, 1.645]	0.16
Age	0.954	[0.835, 1.089]	0.03
Sex ^b	0.392***	[0.246, 0.623]	0.52
Internet-specific rule-setting	0.557***	[0.401, 0.774]	0.32
Reactive restrictions	1.915***	[1.403, 2.614]	0.36
Co-use	1.073	[0.939, 1.226]	0.04
Adolescents' involvement in Internet-specific rule-setting	1.032	[0.720, 1.478]	0.02
Positive parenting	0.226***	[0.125, 0.408]	0.82

Note. $N = 413$; $R^2 = 0.230$; OR = odds ratio; CI = confidence interval.

*** $p \leq .001$. ** $p \leq .01$. * $p \leq .05$.

^a Reference category = others than primary school pupils who participated after June 7th.

^b Reference category = girl.

Table 5

Logistic regression analysis examining possible predictors of at-risk/problematic SMU related to the parent subsystem.

Variable	OR	95% CI	Effect size
Date of participation ^a	0.784	[0.373, 1.650]	0.13
Age	1.040	[0.930, 1.163]	0.02
Sex ^{bc}	0.577**	[0.380, 0.877]	0.30
Parental screen time	1.168*	[1.020, 1.336]	0.09
Parental phubbing	1.488*	[1.098, 2.034]	0.22
Parental depression	1.406	[0.749, 2.640]	0.19
Parental anxiety	1.098	[0.617, 1.955]	0.05
Parental stress	0.667	[0.320, 1.392]	0.22

Note. $N = 413$; $R^2 = 0.073$; OR = odds ratio; CI = confidence interval.

*** $p \leq .001$. ** $p \leq .01$. * $p \leq .05$.

^a Reference category = others than primary school pupils who participated after June 7th.

^b Reference category = girl.

^c The effect size is the log of the odds ratio divided by 1.81.

Table 6

Logistic regression analysis examining possible predictors of at-risk/problematic SMU related to the family system.

Variable	OR	95% CI	Effect size
Date of participation ^a	0.760	[0.361, 1.601]	0.15
Age	1.022	[0.916, 1.140]	0.01
Sex ^b	0.568**	[0.375, 0.861]	0.31
Family functioning	0.547**	[0.358, 0.837]	0.33
Family intactness ^c	0.666	[0.372, 1.193]	0.22
Family SES	0.959	[0.845, 1.088]	0.02

Note. $N = 413$; $R^2 = 0.063$; OR = odds ratio; CI = confidence interval; SES = socio-economic status.

*** $p \leq .001$. ** $p \leq .01$. * $p \leq .05$.

^a Reference category = others than primary school pupils who participated after June 7th.

^b Reference category = girl.

^c Reference category = non-intact families.

in the current study we examined which aspects of adolescents' home environment (factors related to the parent-child subsystem, the parent subsystem, and the family system) are most relevant in differentiating between normative and at-risk/problematic social media users. Results

Table 7

Logistic regression analysis examining the relative predictive role of factors related to the three different family (sub)systems.

Variable	OR	95% CI	Effect size ^c
Date of participation ^a	0.727	[0.329, 1.605]	0.18
Age	0.972	[0.846, 1.116]	0.02
Sex ^b	0.408***	[0.258, 0.645]	0.50
Internet-specific rule-setting	0.588**	[0.417, 0.828]	0.29
Reactive restrictions	1.941***	[1.423, 2.648]	0.37
Positive parenting	0.259***	[0.137, 0.492]	0.75
Parental screen time	1.133	[0.989, 1.299]	0.07
Parental phubbing	1.108	[0.763, 1.610]	0.06
Family functioning	0.897	[0.537, 1.499]	0.06

Note. $N = 413$; $R^2 = 0.235$; OR = odds ratio; CI = confidence interval.

*** $p \leq .001$. ** $p \leq .01$. * $p \leq .05$.

^a Reference category = others than primary school pupils who participated after June 7th.

^b Reference category = girl.

^c Effect sizes are calculated by dividing the odds ratios by 1.81.

showed that in the parent-child system, Internet-specific rule-setting and positive parenting were significantly associated with a lower chance of being an at-risk/problematic social media user, whereas parental reactive restrictions towards Internet use was associated with a higher chance of being an at-risk/problematic social media user. Co-use and adolescents' involvement in Internet-specific rule-setting were not significantly related. Regarding the parent system, parental screen time and parental phubbing were associated with a higher chance of at-risk/problematic SMU. Parental depression, anxiety and stress were not significantly related. With respect to the family system, better family functioning was significantly associated with a lower chance of at-risk/problematic SMU, while family SES and intactness were not significantly related. When examining the significant predictors related to the three different family (sub)systems simultaneously, only the associations between Internet-specific rule-setting, reactive restrictions and positive parenting on the one hand, and at-risk/problematic SMU on the other remained significant. All significant predictors showed small effect sizes, except for positive parenting yielding medium (in the final model) to large effect sizes (in the first model). These results provide several insights that require further elaboration.

One of the most important findings is that only the factors related to the parent-child system remained significant when examining the factors related to the parent-child, parent and family (sub)system simultaneously. This could suggest that the parent and family factors (i.e. parental phubbing and family functioning) are more distal factors that are indirectly related to at-risk/problematic SMU through Internet-specific and/or general parenting practices (or other relevant mediators). The significant correlations of parental phubbing and family functioning with Internet-specific rule-setting and positive parenting support this. This assumption is also in line with the social interactional and ecological theoretical framework (Bronfenbrenner, 1986; Mollema et al., 2019) which state that proximal family factors (parent-child interactions) directly influence problem behavior while distal (parental characteristics) and contextual (family functioning) exert their influence via proximal factors.

Indeed, a cross-sectional study by Niu et al. [82] found that the positive association between parental phubbing and adolescent smartphone addiction was mediated by parent-child relationship; a concept that strongly correlates with parenting (Hart et al., 2019). Although the points mentioned above point out in this direction, future research is needed to be able to conclude that parental behaviors directed towards the child are indeed the most influential family environmental factors to consider in relation to adolescents' at-risk/problematic SMU. For example, future studies could test whether the associations between parent and family factors such as parental phubbing and family functioning on the one hand, and adolescents' at-risk/problematic SMU on the other hand is mediated by parenting factors.

Of these parental behaviors directed towards the child, both Internet-specific and general parenting practices seem to matter, yet general parenting showed the strongest effect size. On the one hand, our findings showed that when parents set more strict rules regarding when and how long their children can use the Internet (i.e. Internet-specific rule-setting), adolescents were less likely to show symptoms of problematic SMU. Likewise, when adolescents reported that their parents are responsive to their needs, respect their autonomy, but also set boundaries (i.e. positive parenting), adolescents were less likely to be an at-risk/problematic social media user. On the other hand, immediate restrictions by parents in response to adolescents' SMU (i.e. reactive restrictions) enhanced the odds of being an at-risk/problematic social media users. With positive parenting showing the greatest (medium to large) effect sizes, this parenting aspect seems more important than Internet-specific parenting. Nonetheless, the finding that Internet-specific rule-setting, parental reactive restrictions towards adolescents' Internet use and positive parenting all uniquely contributed to the prediction of being an at-risk/problematic social media user (above and beyond each other) should not be ignored.

The finding that Internet-specific rule-setting seems to be a protective factor and reactive restrictions a risk factor deserves further reflection. This finding suggests that whether limiting SMU has the desired preventive effect may depend on whether clear restrictive rules were set or whether restrictions occur impulsively in response to adolescents' SMU. This difference could possibly explain the current inconsistencies in the literature on the effectiveness of restrictive mediation [80]. One possible explanation for these opposing relationships could be that Internet-specific rules contribute to the development of effective self-control which, in turn, may help youngsters to control their SMU [74]. The self-control theory, consistently supported by research (e.g. Baek et al., 2020; Hay, 2001; Hay & Forrest, 2006) [75], proposes that some level of external control, such as parental rules, is needed for adolescents to develop self-control [43]. In turn, high self-control could prevent SMU from becoming problematic [84] as adolescents with high levels of self-control are assumed to be better able to resist the desire to use social media when it conflicts with more long-term goals such as passing school exams. The proposed mechanism has been found for parental rules about alcohol use and adolescents' weekly alcohol consumption (Koning et al., 2014) [69]. In contrast, parental intervening in adolescents ongoing SMU may relate to more inconsistent parenting, because situation factors might influence whether or not a parent chooses to intervene. For example, a qualitative study by Geurts et al. [116] revealed that parents' decision to intervene in their children's media use can depend on whether their children's media use is convenient to parents themselves at that moment (e.g. since digital media occupies children, parents are able to do tasks without being disturbed) or whether parents have energy to face possible conflicts/discussions with the child. Previous research has linked inconsistent parenting to low self-control in adolescents [86]. Besides, the unpredictability of parental reactive restrictions will make it harder for adolescents to be at peace with going offline. Spontaneous parental interference with the SMU of adolescents can be expected to increase compulsive thinking about social media (preoccupation) and feeling dissatisfied when not being online (withdrawal), for instance when parental interferences go at the expense of ongoing conversations with peers.

Another explanation for the positive association between reactive restrictions and at-risk/problematic SMU could be that reactive restrictions may result from adolescents' problematic SMU, rather than causing their problematic SMU, meaning that parents might apply restrictions in reaction to at-risk/problematic SMU. Based on the current study, with its cross-sectional design, we are not able to draw any conclusions about directionality. However, Koning et al. [48] investigated, among others, the longitudinal bidirectional relationships between problematic SMU and Internet-specific parenting practices using a measurement interval of 1 year. Although they did find a positive, cross-

sectional association, they did not find a significant longitudinal relationship between reactive restrictions and problematic SMU. Maybe the measurement interval of 1 year was too long to find an effect. More longitudinal research using e.g. ecological momentary assessments is desirable to test whether parental reactive restrictions have (more short term) effects on problematic SMU or vice versa.

Our finding that parental depression, anxiety and stress, family SES and family intactness were not significantly related to at-risk/problematic SMU (neither univariately nor multivariately) contradicts previous studies. An explanation for this could be the homogenous study sample. Low SES, non-intact families, and parents with high scores on mental health problems are highly underrepresented. Therefore, replication of this study in a more diverse sample is needed to validate our findings.

It is also noteworthy that the results for parental screen time differed in the initial and sensitivity analyses. We did find a significant relationship with at-risk/problematic SMU in the initial analysis. However, in the sensitivity analysis, in which careless responders were excluded, parental screen time failed to reach significance. Thus, the significant relationship found in the initial analysis may have resulted from careless responses. Since parental phubbing was a significant predictor in all analyses, it seems that not parents' screen use in general but only parents' screen use when interacting with their children may put them at risk for PSMU. These findings do not support the social learning theory (when adolescents see their parents using screen devices to a great extent, they will imitate this behavior and consequently develop problematic SMU), but substantiates the idea that adolescents whom parents often phub might become dependent on social media to compensate for feelings of neglect (compensatory satisfaction theory; [63]; Xie et al., 2019).

4.1. Strengths and limitations

Our findings should be seen in light of some limitations. First, the study design did not allow for conclusions regarding the direction of relationships. As already discussed earlier in the discussion, this means that, for example, we cannot conclude whether reactive restrictions towards Internet use precede or follow from at-risk/problematic SMU. However, the main goal of this study was to examine which family factors are most relevant in distinguishing between normative and at-risk/problematic social media users. For this aim, a cross-sectional design is sufficient. In addition, although we provided a comprehensive assessment of the family context in relation to adolescents' at-risk/problematic SMU, the set of family factors is not exhaustive. For example, we did not examine inter-parental conflict, which have been showed to be positively related to problematic SMU [109]. Besides, family functioning was based on parents' reports only, while this concept refers to the overall dynamics of the family [61]. Therefore, asking only parents to report on family functioning might not fully capture the definition of the family processes involved. Future research should benefit from using the reports of all family members. Another limitation with regard to the measures is that most concepts are measured with brief instruments in order to avoid making the questionnaire too lengthy. Once relevant family factors have been identified, future studies may have more insight into the focus of the study and inclusion of factors and, therefore, may use more extended instruments. Also, data were collected during the COVID-19 pandemic outbreak in the Netherlands and the restrictive measures imposed by the government changed during data collection. We took this into account to some extent by controlling for date of participation. Besides, the prevalence of problematic SMU in our sample corresponds to the prevalence found in a study with a representative sample of Dutch adolescents conducted before the COVID-19 pandemic [17,18]. However, the fact that data collection for this study took place during this extraordinary period of

time should still be taken into account. Furthermore, the prevalence of problematic SMU in our sample was low (3.1%; which corresponds to the prevalence found in a study with a representative sample of Dutch adolescents; [17,18]). To retain power, the variable problematic SMU was dichotomized into at-risk and problematic social media users reporting two or more symptoms of problematic SMU, and normative users reporting zero or one symptom. However, as the at-risk/problematic group includes less extreme cases, the difference between these two groups (normative versus at-risk/problematic users) is smaller, which might have resulted in weaker associations than when comparing normative and problematic users only. Moreover, our sample is not representative for families in the Netherlands in terms of parental educational level/SES and ethnic background. As a consequence, the findings are only generalizable to high SES families with a Dutch ethnic background. Related to this, as already mentioned earlier, the statistically insignificant findings regarding mental health, family SES and intactness could be the result of the high underrepresentation of low SES and non-intact families and parents with high scores on mental health problems. Replication of this study in a more diverse sample is needed to validate our findings.

Despite these limitations, this study sheds some light on which factors of the family environment matters most regarding adolescents' problematic SMU by examining the relative contribution of both general and Internet-specific factors related to different family (sub)systems. Two other strengths are the use of a sample including both primary and secondary school pupils and the fact that parent-reported factors were measured using both parents' reports (when available) which provides a more accurate picture than using only one parent report.

4.2. Conclusions

In sum, more than other parent and family factors, parental behaviors directed towards the child (Internet-specific rule-setting, reactive restrictions towards Internet use and positive parenting) should be the focus of attention in prevention of adolescents' problematic SMU. Our study points out that general and Internet-specific parenting practices complement each other, meaning that not only parental attempts to influence and regulate children's Internet use, but also the broader context in which this specific socialization takes place seems to play a role. Besides, the results suggest that it might be important for parents to be conscious of and to limit their own smartphone use when interacting with their children. In addition, our findings highlight the importance of untangling restrictive mediation (impulsive, in the moment, attempts to limit SMU versus communicating clear rules in advance) when examining its effects. A positive general parenting style in combination with clear Internet-specific rule-setting and avoidance of impulsive reactive restrictions towards adolescents' Internet use might be a promising approach for parents to prevent their children from developing problematic SMU. However, longitudinal research is needed to confirm these suggestive findings.

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Declaration of interests

None.

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Appendix A. Sensitivity analyses excluding multivariate outliers

Table A.1

Logistic regression analysis examining possible predictors of at-risk/problematic SMU related to the parent-child subsystem excluding multivariate outliers.

Variable	OR	95% CI	Effect size
Date of participation ^a	0.799	[0.361, 1.769]	0.12
Age	0.956	[0.837, 1.092]	0.02
Sex ^b	0.383***	[0.241, 0.608]	0.53
Internet-specific rule-setting	0.557***	[0.399, 0.777]	0.32
Reactive restrictions	1.988***	[1.416, 2.790]	0.38
Co-use	1.067	[0.932, 1.221]	0.04
Adolescents' involvement in Internet-specific rule-setting	1.044	[0.728, 1.496]	0.02
Positive parenting	0.234***	[0.129, 0.425]	0.80

Note. $N = 410$; $R^2 = 0.218$; OR = odds ratio; CI = confidence interval.

*** $p \leq .001$. ** $p \leq .01$. * $p \leq .05$.

^a Reference category = others than primary school pupils who participated after June 7th.

^b Reference category = girl.

Table A.2

Logistic regression analysis examining possible predictors of at-risk/problematic SMU related to the parent subsystem excluding multivariate outliers.

Variable	OR	95% CI	Effect size
Date of participation ^a	0.745	[0.347, 1.596]	0.16
Age	1.039	[0.929, 1.162]	0.02
Sex ^b	0.579*	[0.377, 0.891]	0.30
Parental screen time	1.164*	[1.015, 1.335]	0.08
Parental phubbing	1.455*	[1.035, 2.046]	0.21
Parental depression	1.489	[0.677, 3.278]	0.22
Parental anxiety	1.128	[0.557, 2.284]	0.07
Parental stress	0.625	[0.241, 1.620]	0.26

Note. $N = 404$; $R^2 = 0.066$; OR = odds ratio; CI = confidence interval.

*** $p \leq .001$. ** $p \leq .01$. * $p \leq .05$.

^a Reference category = others than primary school pupils who participated after June 7th.

^b Reference category = girl.

Table A.3

Logistic regression analysis examining possible predictors of at-risk/problematic smu related to the family system excluding multivariate outliers.

Variable	OR	95% CI	Effect size
Date of participation ^a	0.747	[0.354, 1.578]	0.16
Age	1.019	[0.913, 1.137]	0.01
Sex ^b	0.572***	[0.378, 0.866]	0.31
Family functioning	0.552**	[0.361, 0.844]	0.33
Family intactness ^c	0.675	[0.337, 1.210]	0.22
Family SES	0.950	[0.836, 1.081]	0.03

Note. $N = 412$; $R^2 = 0.063$; OR = odds ratio; CI = confidence interval; SES = socio-economic status.

*** $p \leq .001$. ** $p \leq .01$. * $p \leq .05$.

^a Reference category = others than primary school pupils who participated after June 7th.

^b Reference category = girl.

^c Reference category = non-intact families.

Table A.4

Logistic regression analysis examining the relative predictive role of factors related to the three different family (sub)systems excluding multivariate outliers.

Variable	OR	95% CI	Effect size
Date of participation ^a	0.785	[0.352, 1.748]	0.13
Age	0.975	[0.849, 1.120]	0.01
Sex ^b	0.398***	[0.251, 0.631]	0.51
Internet-specific rule-setting	0.600**	[0.421, 0.855]	0.28
Reactive restrictions	2.023***	[1.440, 2.841]	0.39
Positive parenting	0.278***	[0.144, 0.536]	0.71
Parental screen time	1.135	[0.991, 1.300]	0.07
Parental phubbing	1.082	[0.721, 1.622]	0.04
Family functioning	0.876	[0.519, 1.480]	0.07

Note. $N = 408$; $R^2 = 0.227$; OR = odds ratio; CI = confidence interval.

*** $p \leq .001$. ** $p \leq .01$. * $p \leq .05$.

- ^a Reference category = others than primary school pupils who participated after June 7th.
- ^b Reference category = girl.

Appendix B. Sensitivity analyses excluding careless responders

Table B.1

Logistic regression analysis examining possible predictors of at-risk/problematic SMU related to the parent-child subsystem excluding careless responders.

Variable	OR	95% CI	Effect size
Date of participation ^a	0.738	[0.334, 1.630]	0.17
Age	0.943	[0.821, 1.082]	0.03
Sex ^b	0.353***	[0.220, 0.567]	0.58
Internet-specific rule-setting	0.555***	[0.397, 0.775]	0.33
Reactive restrictions	1.895***	[1.383, 2.595]	0.35
Co-use	1.065	[0.928, 1.222]	0.03
Adolescents' involvement in Internet-specific rule-setting	1.024	[0.712, 1.473]	0.01
Positive parenting	0.242***	[0.132, 0.445]	0.78

Note. $N = 413$; $R^2 = 0.227$; OR = odds ratio; CI = confidence interval.

*** $p \leq .001$. ** $p \leq .01$. * $p \leq .05$

^a Reference category = others than primary school pupils who participated after June 7th.

^b Reference category = girl.

Table B.2

Logistic regression analysis examining possible predictors of at-risk/problematic smu related to the parent subsystem excluding careless responders.

Variable	OR	95% CI	Effect size
Date of participation ^a	0.794	[0.376, 1.676]	0.13
Age	1.031	[0.921, 1.154]	0.02
Sex ^b	0.506***	[0.332, 0.772]	0.38
Parental screen time	1.114	[0.963, 1.287]	0.06
Parental phubbing	1.511**	[1.099, 2.077]	0.23
Parental depression	1.411	[0.679, 2.935]	0.19
Parental anxiety	1.065	[0.587, 1.932]	0.03
Parental stress	0.760	[0.355, 1.625]	0.15

Note. $N = 413$; $R^2 = 0.075$; OR = odds ratio; CI = confidence interval.

*** $p \leq .001$. ** $p \leq .01$. * $p \leq .05$.

^a Reference category = others than primary school pupils who participated after June 7th.

^b Reference category = girl.

Table B.3

Logistic regression analysis examining possible predictors of at-risk/problematic SMU related to the family system excluding careless responders.

Variable	OR	95% CI	Effect size
Date of participation ^a	0.768	[0.366, 1.612]	0.15
Age	1.013	[0.906, 1.133]	0.01
Sex ^b	0.496***	[0.326, 0.754]	0.39
Family functioning	0.505***	[0.315, 0.809]	0.38
Family intactness ^c	0.964	[0.398, 1.330]	0.02
Family SES	0.728	[0.845, 1.099]	0.18

Note. $N = 413$; $R^2 = 0.078$; OR = odds ratio; CI = confidence interval; SES = socio-economic status.

*** $p \leq .001$. ** $p \leq .01$. * $p \leq .05$.

^a Reference category = others than primary school pupils who participated after June 7th.

^b Reference category = girl.

^c Reference category = non-intact families.

Table B.4

Logistic regression analysis examining the relative predictive role of factors related to the three different family (sub)systems excluding careless responders.

Variable	OR	95% CI	Effect size
Date of participation ^a	0.717	[0.326, 1.575]	0.18
Age	0.947	[0.823, 1.089]	0.03
Sex ^b	0.365***	[0.230, 0.578]	0.57
Internet-specific rule-setting	0.582***	[0.413, 0.821]	0.30
Reactive restrictions	1.875***	[1.365, 2.577]	0.35
Positive parenting	0.288***	[0.152, 0.548]	0.69
Parental phubbing	1.177	[0.809, 1.713]	0.09
Family functioning	0.754	[0.440, 1.292]	0.16

Note. $N = 413$; $R^2 = 0.229$; OR = odds ratio; CI = confidence interval.

*** $p \leq .001$. ** $p \leq .01$. * $p \leq .05$.

^a Reference category = others than primary school pupils who participated after June 7th.

^b Reference category = girl.

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