Parental knowledge of adolescents online content and contact risks

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Abstract

Parental knowledge about adolescents' activities is an identified protective factor in terms of adolescent adjustment. While research on parental knowledge has focused on adolescents' offline behavior, there is little empirical understanding of parental knowledge about adolescents' online behavior. This study investigates parental knowledge about adolescents' online activities and experiences with online risks, as well as the correlates of such knowledge. Building on former research, open communication and knowledge-generating monitoring practices are investigated as potential correlates of parental knowledge. Use is made of triadic data, relying on reports from children aged 13 to 18, mothers and fathers within the same family (N = 357 families; 54.9% female adolescents). The results showed that parents have little knowledge about the occurrence of online risks and their children's online activities. While mothers did not have more accurate knowledge compared to fathers, they did perceive themselves to be more knowledgeable than fathers. Associations between parental knowledge and hypothesized correlates were tested by means of one-way ANOVA tests and stepwise logistic regression models. Limited evidence was found for associations with parents' accurate knowledge about the occurrence of online risks. Engagement in knowledge-generating monitoring practices was linked to mothers and fathers' self-perceived knowledge about their children's online activities. For mothers, open communication with the child was linked to self-perceived knowledge. The findings suggest that parents need to be more aware of the possibility that online risks might occur and that more research needs to be done in order to understand what parents can do to improve their accurate knowledge.

Keywords

Parental monitoring; parent-child communication; social networking; social media; adolescent internet use; multi-actor design

Introduction

The popularity of the internet, and especially social media, among adolescents has been linked to the fact that they offer a platform for rehearsing and practicing self-presentation and self-disclosure; skills that are further related to the development of adolescents' identity, intimacy and sexuality (Valkenburg and Peter 2011). At the same time, young people may engage in potentially or actually harmful behaviors when they are online, such as cyberbullying, contact with strangers, and exposure to age-inappropriate content. A review of the literature shows a median prevalence rate of cyberbullying among 12 to 18 year olds of 23% (Hamm et al. 2015). The prevalence of cyberbullying peaks between 12 and 15 years, while the risk of sex-related harassment increases over adolescence (Livingstone and Smith 2014). With regard to content risks, studies conducted in the US and Europe indicate that the majority of adolescents have been exposed to internet pornography (Sabina et al. 2008; Ševčíková and Daneback 2014). Further, the internet offers a venue for exposure to violent content, such as hate sites and websites showing violent crimes against humans or animals. An American study found that among 10 to 15 year olds, 38% had visited this type of websites. Moreover, exposure to online violence was linked to engagement in serious violent behavior (Ybarra et al. 2008).

Parents can play an important role in the prevention of online risk behavior and harmful online experiences (e.g., Livingstone and Helsper 2008; Khurana et al. 2015). In the case of cyberbullying, parental involvement can be beneficial for the child both in terms of stopping the bullying and in terms of emotional support (Fridh et al. 2015; Özdemir 2014). In order for parents to offer adequate guidance and support, parental knowledge about the child's online activities and experiences is essential. In practice, parents are largely unaware of their children's engagement in risky online activities, including the consultation of violent or pornographic web content and experiences with cyberbullying (Byrne et al. 2014; Dehue et al. 2008). The increased privatization of internet use may contribute to this lack of parental knowledge. For example, among American teens aged 13 to 17, 88% reported personal ownership of a smartphone (Lenhart 2015), and a European study shows that smartphones are the most commonly used device by adolescents to access the internet (Mascheroni and Ólafsson 2013). Given current trends in mobile internet use, it is important

for parents to understand how they can gather the knowledge they need in order to adequately parent their child's internet use. As discussed in depth below, research on parental knowledge has focused on children's *offline* activities while research on parental knowledge about online activities remains scarce. Furthermore, available studies on parental knowledge of internet use tend to include information from only one parent, usually the mother. The present study offers much needed new insights into the sources of parental knowledge about adolescents' online behavior, thereby drawing from the literature on parental knowledge about offline behavior. The focus goes to adolescent experiences with potentially and actually harmful online behavior, including cyberbullying perpetration and victimization, accepting friend requests from strangers and watching pornographic and violent content. The study makes use of triadic data, including reports from (1) the mother, (2) the father and (3) the child within the same family. Ultimately, the study serves theoretical purposes and also has practical implications in the field of prevention and youth wellbeing.

Parental Knowledge of Children's Offline Behavior

Parental awareness about their adolescent's daily whereabouts is an established protective factor in terms of adolescent adjustment. As such, a lack of parental knowledge has been related to a range of problematic outcomes, including substance use, low academic achievement, delinquent behavior and association with problematic peers (Kerr and Stattin 2000; Lippold, Coffman and Greenberg 2014; Lippold, Greenberg, Graham and Feinberg 2014; Racz and McMahon 2011; Stattin and Kerr 2000). The protective effect of parental knowledge in the field of adolescent problem behavior was overlooked for a long time and confused with the protective effect of parental monitoring (Kerr and Stattin 2000; Stattin and Kerr 2000). This error was consequential to the way in which parental monitoring tended to be operationalized, namely as what parents *know* about their child's daily whereabouts rather than what parents *do* to monitor their child's behavior. More recent studies conceptualize parental knowledge as resulting from monitoring activities, with some studies suggesting that the protective effect of parental monitoring runs entirely (Lippold, Greenberg, Graham and Feinberg 2014) or partially (Criss et al. 2015) through the amount of knowledge that monitoring generates. It should be noted, however, that a lack of conceptual clarity continues to blur the research field. A review of the literature on parental monitoring and parental knowledge suggests that many

studies still include parental knowledge as an indicator of parental monitoring rather than as the outcome of it (Racz and McMahon 2011). The present study defines parental monitoring in line with Dishion and McMahon's (1998) approach, namely as parental practices that both structure and track the child's behavior, and thus as a predictor of parental knowledge. Structuring the child's behavior can be done by imposing rules on what type of behavior is allowed or by intervening in the child's environment (e.g., turning off the television).

Considering that parental knowledge is an important factor in adolescent adjustment, much research has been devoted to the question of what drives this knowledge. In their initial studies on parental knowledge, Stattin and Kerr (Kerr and Stattin 2000; Stattin and Kerr 2000) argued that the role of the child had been overlooked and that active parental monitoring efforts (i.e., parental solicitation for information and parental control, which is operationalized as rule-setting and behavioral restrictions) are less important as compared to the information the child is willing to share about his or her activities (i.e., child disclosure). There is no consensus, however, about the relative importance of these respective knowledge-generating activities. A longitudinal study found that child disclosure predicts parental knowledge about daily activities and whereabouts while active parental monitoring efforts did not (Kerr et al. 2010). Another longitudinal study found that child disclosure and active parental monitoring both constitute parental knowledge (Lippold, Greenberg, Graham, & Feinberg, 2014). It is also suggested that child disclosure should not be singled out as a separate predictor of parental knowledge, but that the knowledge-generating practices that take place within the family all work together. For example, the amount of information a child discloses to the parents is found to be related to the child's evaluation of the parents' monitoring efforts, i.e., the extent to which the child believes that their parents make sufficient monitoring efforts when comparing to "what a good parent might do" (Cottrell et al. 2015). Another study found that child disclosure is more likely to occur when parents also engage in certain knowledge-related behaviors, such as parental attempts to solicit information (Lippold et al. 2013). A longitudinal Dutch study found a reciprocal relationship overtime between parental solicitation for information and adolescents' disclosure, whereby both constructs positively predicted each other over time (Keijsers et al. 2010).

However, the study by Kerr et al. (2010) did not find a causal relationship between parental monitoring and youth disclosure.

While the results on the predominant factors that constitute parental knowledge are inconclusive, it is clear that parental knowledge is both a parent- and child-driven process and that in addition to parental monitoring efforts, an open parent-child communication is essential. Parents may promote such communication by installing a warm and responsive environment. For example, child disclosure is stimulated in the context of high parental responsiveness, high behavioral control, and low psychological control (Soenens et al. 2006). Specifically in relation to the victimization of bullying, parental knowledge about this is most likely in an open and affectionate family climate (Matsunaga 2009).

Parental Knowledge of Children's Online Behavior

Extent of parental knowledge. The extent to which parents are aware of their children's online activities and experiences is particularly well illustrated by studies that include reports from both the child and (one of) the parents. Five prior studies like this have been identified, each pointing to a parental underestimation of the child's problematic internet use and potentially harmful experiences. Studies conducted in the US by Cho and Cheon (2005) and in Singapore by Liau et al. (2008) found a discrepancy between parents' beliefs about their child's exposure to inappropriate internet content (referring to violent, aggressive and pornographic content) and the child's own reported exposure to such material. Also the UK results of the EU kids online study (Livingstone and Bober 2004) found that children systematically report higher levels of problematic online experiences as compared to what is perceived by their parents (e.g. visiting pornographic websites or giving out personal information online). With regard to cyberbullying, the study found that 33% of the children declared having been the victim of cyberbullying while only 4% of the parents believed that this had happened to their child. A study conducted in the Netherlands by Dehue et al. (2008) found that 4.8% of the parents believed that their child had been engaged in cyberbullying, while 17.3% of the children reported having done this. Regarding victimization, the study found that 11.8% of the parents believed that their child was bullied online against 22.9% of the children reporting this. Finally, a study conducted in the US by Byrne et al. (2014) found that both with regard to victimization of

cyberbullying as with regard to the perpetration of it, around one in three parents accurately knew whether this had happened.

When taking a closer look at the respondents in the abovementioned studies, one gap in the literature is that a lot more is known about maternal as compared to paternal knowledge. This is due to the fact that it is usually the mother who participates in research when the participation of only one parent is required. In the EU kids online study, the parent (or carer) who was most aware of the child's internet use was selected for participation. For all 25 participating countries taken together, this was the mother in three out of four instances (Livingstone et al. 2011). In the abovementioned study conducted by Cho and Cheon (2005), 178 parent-child pairs were involved of which 116 pairs included the mother. In the Byrne et al. (2014) study, 454 parent-child dyads were questioned, with 94.1% of the participating parents being mothers, and in the Dehue et al. (2014) study one questionnaire was provided for both parents. The only study in which parental knowledge was studied taking into account the gender of the parents is the study of Liau and colleagues conducted in 2008. In that study, 169 dyads were involved, consisting of children aged 12 to 16 and one of their parents, of which 52.1% were mothers. The study found significant differences between mothers and fathers, with mothers tending to make a better assessment of their child's online experiences than fathers. The lower level of fathers' knowledge as compared to that of mothers can be understood from the fact that mothers appear to be more involved in their children's internet behavior. As compared to fathers, the internet parenting style of mothers shows more elements of parental control (referring for example to supervision and setting restrictions) as well as parental warmth (referring to support and communication; Valcke et al. 2010).

In addition to the parent's gender, the child's gender may play a role in parents' perceptions of engagement in risky online activities. A Swedish study found that parents worry more about girls having contacts with dangerous people, that they would be bullied or that they would feel distressed due to online material. For boys, parents were more worried about becoming passive or inactive, about losing friends and about being exposed to erroneous information (Sorbring 2014). Not much is known about the relevance of the child's gender when it comes to parents' knowledge of the actual occurrence of online risks. The Bryne et al. (2014) study did not find any effect of the child's gender

on parent's underestimation of online risks. The Liau et al. (2008) study found that parental knowledge about the adolescents' frequency of internet use was lowest among fathers with regard to their son's internet use. In all the other parent-child gender constellations, a comparable level of parental knowledge was found. This suggests that not only the child's gender but also the parent-child gender constellation may matter when studying parental knowledge.

It can be concluded that parental knowledge about children's online behavior tends to be suboptimal. Furthermore, what is known about parental knowledge is mostly derived from reports from the mother whose knowledge tends to be superior to that of the father. There is a need to investigate parental knowledge on the level of the family, including reports from both parents and the child, which also allows for a further understanding of the relevance of the parent-child gender constellation.

Sources of parental knowledge. A review of the literature (Ang 2015) showed that—parallel to adolescent offline behavior—parental knowledge about online behavior can be protective against problematic internet use. Parental knowledge about online activities also increases the likelihood of child disclosure about experiences with cyberbullying (Cerna et al. 2015). However, parental practices in the field of children's internet use have been mainly studied in terms of the prevention of risky online behavior, rather than in terms of parental knowledge about such behavior. These practices are captured under the term "parental mediation," which is understood as *"the parental management of the relation between children and the media; usefully it extends the parental role beyond simple restrictions to encompass also conversational and interpretative strategies as well as parental monitoring activities"* (Livingstone and Helsper 2008, p. 581). There exists no conformity in the ways in which such strategies are categorized, but a common and widely accepted distinction is the one between active mediation versus restrictive mediation (Ang 2015). Active mediation refers to parents discussing the risks related to internet use and teaching their children how to avoid online risks. Restrictive mediation refers to all sorts of practices that restrict or track the child's internet use, e.g., setting rules about when or where the child can be online, who the child can talk to or which websites the child can visit, supervising the child's internet behavior and making use of blocking or monitoring software (e.g., Livingstone and Helsper 2008; Sonck et al. 2013; Valkenburg et al. 2013).

Research results on the effectiveness of parental mediation strategies are inconsistent, which might be due to the variety both in the specific mediation practices and in the outcome behaviors that are included. Overall, it is suggested that active mediation strategies are more successful in the prevention of online risks as compared to restrictive mediation strategies (Ang 2015). Nevertheless, the protective effect of restrictive practices has also been shown (Lee 2012; Navarro and Jasinski 2012; Navarro et al. 2013; Williams and Merten 2011). A potential explanation for the apparent dominant success of active mediation could be that this is a better strategy for knowledge acquisition as compared to restrictive mediation. Indeed, active mediation has more in common with open parent-child communication as compared to restrictive mediation, which can be seen as the equivalent of parental monitoring. The link between parental mediation and parental knowledge is not well-researched, but a recent study by Cerna et al. (2015) supports this idea. This study found that active mediation—in terms of internet safety communication—increased the probability that the child would disclose about cyberbullying victimization, while restrictive mediation had no such effect. Another study found that if the child perceived the communication with the parents about internet risks to be more difficult, parents were less likely to know about worrisome online approaches by a stranger (Byrne et al. 2014).

While many practices that are studied under the umbrella of parental mediation explicitly refer to rule-setting and knowledge-acquisition practices, a framework of parental knowledge about online behavior is largely absent. This may explain why the role of an open parent-child communication style, a key factor of parental knowledge in the context of offline behavior, remains understudied. Some studies, which include aspects of the parent-child internet communication, support the idea that this is highly relevant when it comes to understanding internet parenting and safe internet use. For example, child disclosure about online experiences has been linked to less engagement in online risk behavior (Law et al. 2010; Liau et al. 2005), and a good perceived quality of internet communication with the parents can be a buffer against engagement in online verbal aggression among adolescents with high internet use (Appel et al. 2014). Furthermore, it is important to acknowledge that parental knowledge-generating practices do not occur in isolation from such broader parent-child dynamics. Research suggests that parental engagement in internet monitoring

practices have the potential to improve as well as worsen the parent-child relationship. For example, parents' attempts to regulate the time the child can be online can increase arguments over internet use (Mesch 2006) while sharing online activities can improve the parent-child connectedness (Williams and Merten 2011). A good perceived quality of internet communication with the parents has been related to a greater acceptance by the child of parental mediation measures (Byrne and Lee 2011), hence creating the conditions in which parents can acquire more knowledge. Thus, the quality of communication between the parent and the child does not stand isolated from the knowledge-generating practices which parents may engage in. On the contrary, reciprocity can be expected between parents' engagement in knowledge-generating practices on the one hand and the quality of the parent-child communication on the other hand.

Current Study

Based on the literature discussed in the introduction, it can be concluded that parental knowledge about adolescents' online behavior and experiences is far from optimal. At the same time, little is known about the factors that may improve such knowledge. The present study contributes to the empirical understanding of parental knowledge in the field of adolescents' online activities. A first aim of the study is to investigate the extent to which parents have accurate knowledge about their children's risky online experiences. It is expected that parents' perceptions of the occurrence of online risks differ according to a child's gender and that mothers have more accurate knowledge than fathers. Second, the study aims to identify the factors that are associated with parental knowledge about the child's online behavior. Departing from the literature on parental knowledge about offline behavior, distinction is made between an open parent-child internet communication on the one hand and knowledge-generating monitoring practices (including rule-setting, supervision and tracking practices) on the other hand. Correlations between these factors are expected. Further, it is expected that an open communication style is more important in terms of parental knowledge as compared to knowledge-generating monitoring practices.

For achieving these goals, we rely on triadic data including reports from children aged 13 to 18, mothers and fathers. This method allows for making a reliable comparison between parents' perceptions on their children's online behavior versus children's actual reports. Further, it allows

understanding of the differences in parental knowledge according to the parents and children's gender. For the measurement of knowledge-generating monitoring practices, use is made of the parents' reports as children may be unaware of the practices engaged in by the parents. For the measurement of open parent-child communication, it is argued that the child's perspective is most relevant considering that it is the child who needs to feel motivated to share information.

Method

A multi-actor approach of data collection was used, following a procedure as outlined in the Relationships between Mothers, Fathers and Children (RMFC) study (Ponnet 2014; Ponnet and Wouters 2014). Given the high rate of non-response associated with the collection of multi-actor data (Kalmijn and Liefbroer 2011), the study employed a non-probabilistic sampling design.

Procedure

Families were recruited in Flanders, the northern, Dutch-speaking region of Belgium. Two-parent families were recruited in order to achieve a report from a mother, a father and a child in the age group of 13 to 18 years old. In the case of newly composed families, it was requested that both partners shared the same house for at least three years prior to the survey. If there was more than one child in the family between 13 and 18 years old, the parents were asked to keep one specific child in mind when completing the questionnaire.

Families were recruited with assistance from undergraduate students from the Higher Education Institution where the researchers are based. Each recruited family received an envelope consisting of the three questionnaires for the participating family members, together with a plain-language statement and a written informed-consent form. The first page of the questionnaire instructed the target participants to complete the booklets individually and not to discuss the content of the questionnaire with one another. In order to protect the respondents' privacy, separate envelopes were provided which could be sealed and used for each completed questionnaire. After completion, the three questionnaires were sent back by mail, for which a (stamped) envelope was provided. By means of a code on the back of the questionnaires, it was ensured that the three questionnaires from the same household were linked in a correct manner when inputting the data. Data were gathered

between December 2015 and February 2016. The study protocol was approved by the ethics committee of XXXX *[name of University deleted for the purpose of anonymous peer review]*.

Description of the Sample

After the deletion of 8 incomplete triads (with missing data from one of the family members), a total of 357 valid triads was achieved. The sample consisted of 54.9% female adolescents. The child's age ranged from 13 to 18 (M = 15.73; SD = 1.50) with 27 respondents aged 13, 62 aged 14, 65 aged 15, 79 aged 16, 74 aged 17, and 50 aged 18. The majority of the adolescent respondents (85.4%) lived with both biological parents, 6.5% lived alternately with the mother and the father, 5.1% lived full time with the mother and 0.6% lived full time with the father. An additional 2.5% lived in another situation not further specified.

The mother's age ranged from 31 to 59 (M = 44.19; SD = 4.72) and the father's age ranged from 31 to 70 (M = 46.67; SD = 5.65). A paired samples t-test revealed that fathers were significantly older than mothers ($t(333) = -10.33$; $p < .001$). Education was measured as the highest level of education achieved. A McNemar-Bowker Chi-square test revealed that the mothers' highest educational levels differed significantly from that of fathers ($\chi^2(11) = 55.71$, $p < .001$). Among mothers, 60.9% achieved a higher education degree (high school or university) against 51.2% of the fathers. As for employment status, a McNemar-Bowker Chi-Square test showed significant differences between mothers and fathers ($\chi^2(3) = 130.76$, $p < .001$). Among mothers, 37.1% worked fulltime against 85.2% of the fathers. Only a minority of the mothers (11.4%) and fathers (4.7%) were unemployed. Finally, respondents were asked to indicate their religious affiliation. Among mothers, 60.8% reported to be Catholic against 49.9% of the fathers. The second largest group was respondents who were not religious, with 29.6% for the mothers and 39.9% for the fathers. Other religious affiliations were Muslim, Christian but not Catholic, Protestant and "other religion not further specified."

Measures

All univariate results of the study variables can be found in table 1 and are discussed in the results section.

Child's experience of online risks. The study includes contact and content risks, two categories of online risks as distinguished by Livingstone and Haddon (2008). Contact risks refer to cyberbullying victimization ("I was bullied by someone through the internet or mobile phone"), cyberbullying perpetration ("I have bullied someone through the internet or mobile phone") and accepting friend requests from strangers ("I have accepted friend requests from people I have never met in person"). The questions about cyberbullying were introduced by a clarification of the use of the term "bullying," stating that it refers to a situation in which there is an intention to cause harm or to make the other person feel bad, and excluding situations of harmless teasing or arguing. Content risks refer to having watched violent content and having watched sexual content. For each item the respondent was asked to indicate on a five-point scale how often this occurred, going from "never" (score 1), to "rarely," "sometimes," "often" and "very often" (score 5). There was no restriction with regard to the time frame in which this behavior occurred.

Parental knowledge of online behavior. Parents were asked for the same range of online risks and whether or not they were experienced or engaged in by their child (e.g. "My child has been the victim of bullying through the internet" and "My child has visited (on purpose) websites with sexual content"). All items could be answered by "yes," "no" or "I don't know." For the purpose of the present study, the category "I don't know" was merged with the category "no." The rationale for this is that parents need to have knowledge in order to adapt their practices. Furthermore, across all items, the number of respondents who replied "I don't know" ranged from 4 to 15, rendering this category too small to include as a separate group in the analyses. Also, parents who left items blank were included as parents with no knowledge about the occurrence of the particular online risk. This adjustment was made only for parents who completed the consecutive items in order to avoid an erroneous inclusion of parents who dropped out of the questionnaire. Item non-response ranged from $N = 31$ to $N = 173$ before recoding and $N = 5$ to $N = 18$ after recoding.

Parents were also asked to indicate their self-perceived knowledge about online behavior. This was measured by the items "I know which websites my child visits" and "I know with whom my child shares personal information online." Answering categories included "yes" (score 1) and "no" (score 0).

Open parent-child internet communication. Three items were used, derived from the open parent-child communication scale as developed by Barnes and Olsen (1985) and translated in Dutch by Ponnet et al. (2013). The original items were adapted to the specific context of communication about the internet. The child's report was filled in twice: once with reference to the mother and once with reference to the father. With reference to the mother, the items are "I am very satisfied with the way in which my mother and I talk about my internet use," "I find it easy to talk with my mother about my internet use" and "I talk in an open manner with my mother about what I do, read or see on the internet." The items were answered on a six-point scale going from "totally disagree" (score 1) to "totally agree" (score 6). Use is made of the aggregated mean scores. The scale had a good internal consistency, with Cronbach's alpha = 0.78 for the items referring to the mother and Cronbach's alpha = 0.88 for the items referring to the father.

Knowledge-generating monitoring practices. Four strategies are included which parents may engage in in order to gain knowledge about their child's online activities. Use is made of the parents' reports and each strategy refers to the aggregated mean score of the items that apply. The first strategy refers to interaction restrictions. This is measured by four items: whether or not rules apply about the pictures the child can post online, the information the child can share online, with whom the child may have online chat conversations and who the child can add to the personal network. Answering categories are "yes" (score 1) and "no" (score 0), with a Chronbach's alpha = 0.86 for the mother's report and Chronbach's alpha = 0.89 for the father's report.

The second strategy, restrictions on internet access, is measured by three items: whether or not rules apply about the amount of time the child can spend online, the time of day the child can go online and using the internet in the bedroom. All items were answered by "yes" (score 1) and "no" (score 0), with a Cronbach's alpha = 0.76 for the mothers' reports and a Cronbach's alpha = 0.77 for the fathers' reports.

The third strategy, supervision and co-use, is measured by asking how often the parents engaged in three activities: helping the child when he/she needs to look something up on the internet, watching when the child uses the internet and being around when the child uses the internet. All items were answered on a five-point scale going from "(almost) never" (score 1) to "(almost) always" (score

5). For the mothers' reports Cronbach's alpha = 0.73 and for the fathers' reports Cronbach's alpha = 0.68.

The fourth strategy, active tracking, is measured by asking how often the parents engaged in three activities: logging in to the social network profile of the child in order to read personal messages, checking the social network profile of the child in order to know the type of information the child is sharing and checking which contacts the child has added to the social network profile. All items were answered on a five-point scale going from "(almost) never" (score 1) to "(almost) always" (score 5). For the mothers' reports Cronbach's alpha = 0.81 and for the fathers' reports Cronbach's alpha = 0.81.

Analyses

Analyses were performed in IBM SPSS statistics 22. The univariate results of the study variables are presented according to the respondent's gender, including appropriate test statistics in order to test for significant gender differences. McNemar's chi-square tests are applied for testing differences in binary-level variables between paired samples (McCrum-Gardner 2008). Relations between the hypothesized correlates of parental knowledge are tested by Pearson correlations.

To measure the accuracy of parents' knowledge of online risks, a parent-child discrepancy score is calculated for each online risk and for each parent. This discrepancy score takes into account the frequency with which the online risk occurred according to the child's report. The first category, "no discrepancy" includes all mothers/fathers whose child had any experience with the online risk and who indicated that they knew about this. The category "low discrepancy" includes mothers/fathers whose child engaged in the behavior only "rarely" and who did not indicate that they knew about this. The category "high discrepancy" refers to mothers/fathers whose child engaged in the behavior more frequently ("sometimes" to "very often") and who did not indicate that they knew about this. Differences in discrepancy scores between both parents were measured by McNemar-Bowker's Chi-square tests for testing differences in categorical variables between paired samples. Differences according to the child's gender were tested by Chi-square tests.

We test the association between parental knowledge on the one hand and the hypothesized correlates on the other hand in two ways. First, we estimate the associations between parents' accurate

knowledge of the prevalence of online risks (using the discrepancy scores described above) and the hypothesized correlates using one-way ANOVA tests. For each online risk, we test whether parents who fall in the categories "no discrepancy," "low discrepancy" and "high discrepancy" differ from each other on the hypothesized correlates. Second, we estimate associations between parents' self-perceived knowledge of the child's online activities and the hypothesized correlates using a series of logistic regression analyses with a stepwise introduction of demographic variables (step one) and hypothesized correlates (step two).

Supplementary Analyses

For the sake of accuracy, we have used confirmatory factor analyses to verify whether the items of the discerned measures "open communication," "interaction restrictions, "access restrictions," "active tracking" and "supervision and co-use" are indeed separate concepts and whether the items we hypothesized will load on these different factors effectively do so. Our analyses, performed in Mplus 7.0 (Muthén & Muthén, 2016), show that all factor loadings are significant and above the .40 minimum-threshold (the lowest factor loading was .593).

Results

Univariate and Bivariate Results of the Study Variables

The univariate results for all the study variables are presented in table one. First, the child's reports on their experiences with five types of online risks are presented according to gender, including independent samples *t*-tests. Significant differences between boys and girls were found in that girls, on average, reported being bullied more often than boys. Boys and girls did not differ in the frequency with which they had cyberbullied somebody else, but the occurrence of this behavior was very rare. In total, only 27 respondents (7.5%) indicated ever having cyberbullied somebody else. Accepting friend requests from strangers was more common, and boys and girls did not differ in the frequency with which they had done this. With regard to content risks, boys reported on average more frequent viewing of both violent and sexually explicit content.

Second, parents' reports of their children's experience with online risks are presented, as well as their self-perceived knowledge of their children's online activities. McNemar's chi-square tests indicate that mothers and fathers did not differ from each other with regard to the perceived

occurrence of online risks. Mothers were more likely than fathers to say that they knew with whom their child had shared personal information, but they were not more likely to say that they know which websites their children visit. We performed further analyses in order to understand whether mothers' and fathers' reports on these variables differed according to the children's gender. Chi-square tests indicate that fathers are more likely to indicate that their daughters have been the victims of cyberbullying (11.6%) than their sons (2.0%) ($\chi^2(1) = 11.38$, $p < .01$). Further, both mothers and fathers were more likely to indicate that their sons had been exposed to pornographic content as than their daughters. Among mothers, 12.7% believed that their sons had done this compared to 1.0% for daughters ($\chi^2(1) = 20.25$, $p < .001$). Among fathers, 9.3% believed that their sons had watched pornographic content compared to 3.7% for daughters ($\chi^2(1) = 4.56$, $p < .05$). Fathers were also more likely to believe that their sons had watched violent content (13.3%) than their daughters (2.6%) ($\chi^2(1) = 13.99$, $p < .001$). Mothers' and fathers' self-perceived knowledge of their children's online activities (i.e. the websites visited and with whom the child shared personal information) did not differ according to the children's gender.

[INSERT TABLE 1 ABOUT HERE]

Finally, table one presents the univariate results for the hypothesized correlates of parental knowledge. The child's perception of openness of communication with each parent is presented with regard to the mother and the father, respectively. A paired samples *t*-test indicates that children perceive communication with the mother as being more open than communication with the father. The four knowledge-generating monitoring practices are presented for the mother and the father separately, including paired samples t-tests. For each practice, mothers reported more engagement than fathers. The difference was most pronounced with regard to the variable active tracking, followed by the variable supervision and co-use.

We tested correlations between the variables using Pearson's correlations, as presented in table two. The four knowledge-generating monitoring practices correlated with each other in a weak to moderate manner. Thus, parents who engaged in one type of practice were also more likely to engage in another practice. The perceived openness of communication (as reported by the child)

correlated very weakly with the parents' engagement in interaction restrictions and weakly with parents' engagement in supervision and co-use.

[INSERT TABLE 2 ABOUT HERE]

Parents' Accurate Knowledge about Online Risks

As described in the analyses section, we calculated parents' accurate knowledge of the occurrence of online risks by comparing each parent's report with the child's reports. Table three presents mothers' and fathers' discrepancy scores for each respective online risk. No discrepancy means that the risk occurred (according to the child) but that the parent had knowledge of it; low discrepancy means that the risk occurred rarely and that the parent had no knowledge of it; and high discrepancy means that the risk occurred more often than rarely and that the parent had no knowledge of this. Note that the table only includes data for those parents whose child indicated that the risk occurred. McNemar-Bowker chi-square tests indicate the significance of the differences between mothers' and fathers' discrepancy scores.

No significant differences were found between the mothers' and fathers' discrepancy scores, suggesting that mothers and fathers did not differ in terms of their accurate knowledge of the occurrence of online risks. Overall, parental knowledge was low, and the majority of parents was not aware of the occurrence of any of the online risks. Parents were most likely to know about the occurrence of cyberbullying victimization. Nevertheless, only about one in four mothers and one in three fathers knew about the occurrence of this risk. Parents were the least likely to know that their child had watched violent content.

[INSERT TABLE 3 ABOUT HERE]

Using chi-square tests, we tested whether parents' discrepancy scores differed significantly according to the child's gender. Significant differences were found for both content risks (i.e. watching online porn and watching violent content) for both parents. Mothers as well as fathers were more likely to know that their sons had watched online porn than their daughters ($\chi^2(2) = 15.92$, $p < .001$ for mothers and $\chi^2(2) = 12.32$, $p < .01$ for fathers). Among mothers, 21.6% had accurate knowledge of this for boys compared to 4.9% for girls. Among fathers, 15.5% knew about their sons' online porn use compared to 5.0% who knew about their daughters'. Similar results were found for

watching violent content. Among mothers, 8.5% knew that their sons had watched violent online content compared to 4.5% for their daughters. Among fathers, 14.7% had accurate knowledge about this when it occurred with their son against 3.8% when it occurred with their daughter ($\chi^2(2) = 7.17$, $p < .05$ for mothers and $\chi^2(2) = 12.55$, $p < .01$ for fathers).

Factors Associated with Parental Knowledge

This section discusses the factors that are associated with parental knowledge. The hypothesized correlates include the child's perceived openness of communication with each parent and parents' reports of their engagement in four distinct knowledge-generating monitoring practices. First, we discuss the results for associations with parents' accurate knowledge, thereby using the knowledge discrepancy scores that were presented in the section above. Second, we discuss the results for parents' self-perceived knowledge about their child's online activities.

Factors associated with accurate knowledge of the occurrence of online risks. One-way ANOVA tests were used to determine whether parents with no knowledge discrepancies, low knowledge discrepancies and high knowledge discrepancies differ on each of the hypothesized correlates. For mothers, three significant differences were found. First, for accurate knowledge about cyberbullying perpetration, we found an overall significance with regard to the application of rules on internet use ($F(2) = 4.87$, $p < .05$). However, a post-hoc Bonferroni test did not show any significant between-group differences, which could be due to the high variability of *N* between the three groups. Second, mothers' accurate knowledge of whether or not the child accepted friend requests from strangers differed according to her engagement in interaction restrictions ($F(2) = 4.99$, $p < .01$). Post-hoc tests showed that mothers with low discrepancy scores applied more rules of this sort on average ($M = 0.57$) than mothers with high discrepancy scores ($M = 0.32$). Third, mothers' accurate knowledge about exposure to violent content differed according to the application of interaction restrictions ($F(2) = 4.40$, $p < .05$). Thus, mothers with low discrepancy scores applied more restrictions on average ($M = 0.63$) than mothers with high discrepancy scores ($M = 0.45$).

For fathers, one-way ANOVA tests revealed three significant differences. First, fathers' knowledge of their children accepting friend requests from strangers differed according to the application of the rules of internet access ($F(2) = 4.98$, $p < .01$). A post-hoc Bonferroni test showed

that fathers with no discrepancy applied more restrictions on internet access (M = 0.65) than fathers with high discrepancy scores (M = 0.34). Second, fathers' knowledge of whether their children watched online porn differed according to the application of interaction restrictions ($F(2) = 3.34$, $p < .05$). However, post-hoc tests showed no between-group differences, however. Third, knowledge on accessing violent content differed according to the application of interaction restrictions ($F(2) = 5.29$, $p < .01$). Against our expectations, fathers with no discrepancy applied fewer interaction restrictions (M = 0.31) than fathers with low discrepancy scores (M = 0.55).

Factors associated with self-perceived knowledge about online activities. We conducted a series of logistic regression analyses in order to understand which factors were associated with parents' self-perceived knowledge of their child's online activities (namely which websites the child visited and with whom the child shared personal information). Table four shows the results of the analyses. In a first step, the parents' and children's demographics are entered. In a second step, the correlates are entered.

[INSERT TABLE 4 ABOUT HERE]

Demographic variables did not have much effect on parents' self-perceived knowledge. Fathers were less likely to perceive having knowledge about the personal information their child shared online as the child got older. Mothers perceived less knowledge of the websites children visited as they themselves are older, although this effect was very small. The child's gender did not have any effect on self-perceived knowledge.

The openness of communication as perceived by the child was only related to the mothers' self-perceived knowledge. If the child perceived this communication to be more open, the mother was more likely to say that she had knowledge about what information the child shared online. Perceived openness of communication with the father did not have any effect on the father's self-perceived knowledge. Engagement in knowledge-generating monitoring practices was linked to higher self-perceived knowledge by both parents. Imposing interaction restrictions was strongly linked to self-perceived knowledge for fathers but not for mothers. Active tracking and supervision/co-use predicted self-perceived knowledge for both the mother and the father. Supervision and co-use only affected

knowledge of the websites the child visited but not knowledge of the information the child shared online. Parents' use of internet access restrictions was not related to their self-perceived knowledge.

Discussion

As young people have gained increasing access to the internet and their own mobile devices, it is clear that some will encounter adverse and risky experiences such as cyberbullying, contact with strangers and exposure to age-inappropriate content (Livingstone and Haddon 2008; Livingstone and Smith 2014). Parental mediation research gives some direction as to what parents can do to keep their children safe from harm when using the internet (Livingstone and Helsper 2008). A lack of parental knowledge about children's online activities may be an obstacle to adequate internet parenting, as it prevents parents from adapting their practices to the needs of their children or intervening when necessary. While much research has been devoted to parental knowledge of adolescents' offline behavior, however, there is a lack of research on parental knowledge about adolescents' online behavior. The present study contributes to closing this gap in the research literature by (1) investigating the extent to which parents have knowledge about their adolescent child's online experiences and (2) the factors that predict such knowledge. Informed by research on parental knowledge about children's offline behavior, we distinguished between an open parent-child communication style and specific knowledge-generating practices. By applying a multi-actor approach using reports from a child aged 13 to 18 and the child's mother and father – the study offers good opportunities for adequately measuring parental knowledge and taking into account different family members' perspectives.

The study found that boys were more engaged in content risks, while girls were more at risk for cyberbullying victimization. This gender difference in cyberbullying victimization is in line with the findings of some previous studies (Beckman et al. 2013), although a review of the literature suggests that no clear gender difference exists (Tokunaga 2010). Boys' high engagement with online pornography as compared to girls is in line with what was found in previous studies (Vandenbosch and Peter 2016). Boys' high engagement in watching violent content as compared to girls can be explained by the fact that they are generally more sensation seeking than girls (Cross et al. 2013). Parents' perceptions of the occurrence of online risks was reflected in these gender-specific internet

experiences, especially among fathers. As such, fathers were more likely to think that their daughters had been the victim of cyberbullying than their sons, both mothers and fathers were more likely to think that their sons had watched pornographic content and fathers were also more likely to think that their sons had watched violent content.

Parental Knowledge

When comparing the child's report on the occurrence of online risks with their parents' estimates of these occurrences, it can be concluded that parental knowledge is very low. Parental knowledge was most accurate in the field of cyberbullying victimization. Still, most parents were not aware of their child's engagement in cyberbullying as a perpetrator nor as a victim, which is in line with previous studies (Dehue et al. 2008). Contrary to our expectations, mothers did not have more accurate knowledge than fathers. Both parents were less likely to have accurate knowledge about the occurrence of content risks (watching pornographic content and watching violent content) for girls. It is possible that parents are informed by gender stereotypes and that they find it more likely that their son will view pornographic or violent content than their daughter. Girls' consumption of online pornography and the meanings they attach to it have been largely overlooked, which might have created the impression that online porn is merely a boys' business (Scarcelli 2015).

About one-third to half of the parents indicated that they had knowledge of their child's online activities (referring to the websites their child visited and the information their child shared online). Therefore, mothers were more likely to think that they knew whom their child shared information online with than fathers. The gender of the child was not predictive of parents' self-perceived knowledge. It is possible that parents overestimate how much they actually know about their child's online experiences and whereabouts. Also, with regard to offline problem behavior such as sexual activity, substance use, and aggressive behavior, parents have a tendency to form an overly rosy understanding of their child's behavior (Stanton et al. 2000). Campaigns directed at parents should aim to increase their awareness that online risks might occur. Parents need to be more open to this possibility in order to pick up the signs when it actually occurs and intervene in a timely manner.

Correlates of Parental Knowledge

When looking at the factors that correlate with parental knowledge, we distinguished between open parent-child communication about internet use and knowledge-generating monitoring practices that parents engaged in. Almost none of the hypothesized correlates could be associated with parents' accurate estimates of the occurrence of online risks. Limited evidence was found for an association between parents' accurate knowledge and parental rule-setting, including restrictions on internet access and restrictions on the interactions allowed on social networks. A possible explanation for this lack of findings is that the use of modern media has become increasingly private. Concretely, the use of modern media has moved from the collective space of the living room to the private space of the bedroom. Not only do children and young people have access to their personal devices for going online, they also do it away from the prying eyes of their parents (Livingstone 2010). This evolution has implications in terms of what parents can do to monitor their child's internet use.

When looking at parents' self-perceived knowledge, several associations were found. For example, mothers were more likely to say that they had knowledge when the child perceived the communication with the mother to be more open. This is in line with the suggestion that parental knowledge is not only a product of what parents do to inform themselves but also of what children are willing to share with the parent (Kerr and Stattin 2000; Stattin and Kerr 2000). For fathers, there was openness of communication had no effect on self-perceived knowledge. Knowledge-generating monitoring practices were important for both the mother and the father as predictors of self-perceived knowledge. Based on these findings, it can be suggested that fathers get their (self-perceived) knowledge from monitoring practices, whereas both monitoring practices and communication are important to mothers. In a way, this is consistent with studies that found that adolescents were more satisfied with their communication with mothers than fathers (Jackson et al. 1998). This is also in line with the finding by Valcke et al. (2010), which was that mothers' internet parenting styles showed more warmth in terms of support and communication than fathers' internet parenting styles. Furthermore, it is possible that fathers make use of other strategies to acquire information about their child's online activities and experiences that weren't included in the present study. An American study showed that fathers relied more on mothers to acquire information about their adolescent child's daily experiences than mothers relied on fathers. This was especially the case for fathers who worked

longer hours (Crouter et al. 2005). Considering that the fathers in our sample were far more likely to be employed fulltime than mothers, it is not surprising that the parent-child communication style is more predictive of self-perceived parental knowledge for mothers.

Limitations

Some limitations need to be taken into account. First, the study only included dual-parent families, and most of these were original families. Therefore, no conclusions can be drawn regarding the role of family structure in parental knowledge of adolescents' online behavior. Research on parental knowledge about adolescents' offline behavior suggests that family structure is a significant factor to consider, with parental knowledge being lower in single-parent families and stepfamilies (Laird et al. 2003; Bumpus and Rodgers 2009). Also, no data were gathered among families with same-sex couples. The inclusion of same-sex couple families would offer opportunities to understand the differences that typically found between maternal and paternal practices. Studies also suggest a higher quality of parent-child relationships in same-sex couple families, at least from the perspective of the parents themselves (Tasker 2010). Therefore, it is possible that lesbian or gay parents have more knowledge about their child's online activities as than heterosexual parents.

Secondly, although it was not the focus of this study, the influence of several background variables associated with the adolescent and their family should be examined in a more sophisticated way. For example, parents' practices in terms of the child's media socialization differ according to their socioeconomic background (Notten and Kraaykamp 2009). Also, birth order and the quality of sibling relationships are important variables associated with both parenting and adolescents externalizing problem behavior (Begue and Roche 2005).

Thirdly, the present study included parents' reports on monitoring or knowledge-related practices. It should be kept in mind, however, that children may have different perceptions of these parental practices. The literature suggests that parents tend to report more monitoring and knowledge-related behaviors than adolescents but that adolescents' reports are more strongly related to behavioral outcomes than their parents' reports (Abar et al. 2015). Also, with regard to internet use, parents are found to report more monitoring practices such as rule-setting, technical mediation, safety communication and supervision (Liau et al. 2008; Wang et al. 2005; Sonck et al. 2013) than

adolescents. Future research could take into account the relevance of parent-child discrepancies in reports on monitoring practices in terms of parental knowledge.

Finally, there may have been errors in the measurement of online risk behavior. The items referred to parents' and adolescents' perceptions of the overall occurrence of several risks. As an alternative, working with items that refer to specific instances might render more accurate results and increase the possibility that parents and their children will provide more overlapping answers. Further, we acknowledge that parents and adolescents may apply different definitions to the risk behaviors that were included. Future research using multi-actor data could further investigate how these measurement issues could best be resolved.

Conclusions

While being a potential lever for safe internet use, parental knowledge of adolescents' online behavior is low. Parents may not have realistic expectations about the risks that their children may encounter online. This is remarkable considering that adolescents' engagement in online behavior largely takes place at home (Mascheroni and Ólafsson 2013), including problematic behavior such as cyberbullying (Dehue et al. 2008). Furthermore, knowledge-generating monitoring practices and an open parent-child communication style do not adequately explain parental knowledge. The increasing privacy of media use may impede parents' opportunities to acquire knowledge, and future research should pay more attention to internet parenting in this changing media environment.

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Table 1. Univariate results of the study variables

	Boys *M (SD)*	Girls *M (SD)*	*Independent t*
Online risks (range 1 – 5)			
Cyberbullying perpetration	1.08 (0.32)	1.09 (0.32)	-0.33
Cyberbullying victimization	1.13 (0.51)	1.38 (0.77)	-3.72***
Adding strangers to network	1.84 (0.93)	1.68 (0.77)	1.74
Watching pornographic content	1.86 (1.08)	1.27 (0.56)	6.18***
Watching violent content	2.31 (1.16)	1.89 (0.96)	3.71***
	Mothers % yes	Fathers % yes	*McNemar's* χ^2
Parental knowledge (yes/no)			
Cyberbullying perpetration	3.1%	2.4%	0.692
Cyberbullying victimization	6.8%	7.4%	0.474
Accepting friend requests from strangers	9.4%	9.4%	0.023
Watching pornographic content	6.3%	6.2%	0.043
Watching violent content	4.3%	7.4%	4.172
Knowledge of websites visited	44.0%	37.9%	0.17
Knowledge of information shared	47.7%	36.5%	11.65***
	Child with respect to mother *M (SD)*	Child with respect to father *M (SD)*	*Paired t*
Open communication (range 1 – 6)	4.56 (1.15)	3.96 (1.42)	8.236***
Knowledge-generating practices	Mothers *M (SD)*	Fathers *M (SD)*	*Paired t*
Interaction restrictions (range 0 – 1)	0.58 (0.41)	0.48 (0.43)	4.236***
Access restrictions (range 0 – 1)	0.59 (0.39)	0.53 (0.41)	2.938**
Supervision and co-use (range 1 – 5)	2.78 (0.84)	2.42 (0.80)	6.583***
Active tracking (range 1 – 5)	2.19 (0.93)	1.74 (0.83)	7.530***

Table 2. Pearson correlations between the correlates of parental knowledge

Mother / Father	Open communication	Interaction restrictions	Access restrictions	Active tracking	Supervision and co-use
Open communication	1	.130*	.077	.080	.126*
Interaction restrictions	.136*	1	.354***	.298***	.328***
Access restrictions	.080	.368***	1	.280***	.428***
Active tracking	.075	.405***	.237***	1	.325***
Supervision and co-use	.217***	.423***	.379***	.331***	1

* $p < .05$; *** $p < .001$

Table 3. Mothers' and fathers' accurate knowledge of the child's engagement in online risk behaviors*

	Cyberbullying perpetration		Cyberbullying victimization		Accepting friend requests from strangers		Watching pornographic content		Watching violent content	
	Mother (N = 27)	Father (N = 26)	Mother (N = 60)	Father (N = 58)	Mother (N = 178)	Father (N = 171)	Mother (N = 115)	Father (N = 111)	Mother (N = 216)	Father (N = 208)
No discrepancy	11.1%	15.4%	26.7%	32.8%	14.6%	15.2%	15.7%	11.7%	6.5%	9.1%
Low discrepancy	81.5%	73.1%	45.0%	39.7%	65.2%	62.0%	48.7%	50.5%	45.8%	45.7%
High discrepancy	7.4%	11.5%	28.3%	27.6%	20.2%	22.8%	35.7%	37.8%	47.7%	45.2%
McNemar-Bowker χ^2	3.00		2.00		1.89		1.89		1.14	

*The table only includes respondents whose children reported the occurrence of online risks

Table 4. Logistic regression analyses testing associations between self-perceived knowledge about online activities and hypothesized correlates

	Mother report				Father report			
	Knowledge of websites visited		Knowledge of personal information shared		Knowledge of websites visited		Knowledge of personal information shared	
	Exp(B)	95% C.I.	Exp(B)	95% C.I.	Exp(B)	95% C.I.	Exp(B)	95% C.I.
Step 1: demographics								
Child's age	0.957	0.811-1.129	0.881	0.751-1.034	0.906	0.762-1.077	0.741**	0.618-0.887
Child's gender (ref. boy)	1.175	0.734-1.881	1.298	0.820-2.054	0.643	0.395-1.047	1.100	0.667-1.815
Parent's age	0.903***	0.853-0.956	0.978	0.928-1.030	0.969	0.921-1.018	1.029	0.979-1.082
Nagelkerke R^2	0.069		.022		0.036		0.052	
Step 2: correlates								
Open communication	1.217	0.974-1.521	1.427**	1.143-1.782	1.050	0.873-1.263	1.115	0.923-1.347
Interaction restrictions	1.952	0.982-3.880	1.919	0.987-3.731	4.138***	2.001-8.555	3.594**	1.738-7.430
Access restrictions	0.546	0.256-1.163	0.822	0.396-1.707	1.106	0.526-2.329	1.280	0.598-2.736
Active tracking	1.659**	1.224-2.248	1.489**	1.109-2.001	0.994	0.711-1.390	1.585**	1.123-2.237
Supervision and co-use	1.639**	1.143-2.351	1.414	0.999-2.001	1.760**	1.189-2.606	1.373	0.922-2.043
Nagelkerke R^2	0.200		0.155		0.206		0.240	

* $p < .05$; ** $p < .01$; *** $p < .001$