

Parental knowledge of children's screen time:

The role of parent-child relationship and communication

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Cite as:

Marciano, L., Petrocchi, S., & Camerini, A.-L. (2020). Parental Knowledge of Children's Screen Time: The Role of Parent-Child Relationship and Communication. *Communication Research*, 0093650220952227. <https://doi.org/10.1177/0093650220952227>

Abstract

The ubiquity of media in children's lives makes it increasingly difficult for parents to keep track of their children's screen time, leading to considerable discrepancies in parent- and child-report. In the present study, we aimed to examine if and how these discrepancies can be explained by parent-child communication, in terms of children's self-disclosure, secrecy, and parental solicitation, and to what extent the quality of the parent-child relationship can influence these communication patterns. We tested two structural equation models to investigate the absolute discrepancy between parent and child estimates of children's screen time and parental underestimation, using dyadic data from 854 11-year-olds and their parents, in Switzerland. Our results showed that children's self-disclosure and secrecy behaviors were significantly associated with parental knowledge, where the relationship between self-disclosure and parental knowledge of children's screen time was the stronger among the two. Moreover, a good parent-child relationship, especially parents' ability in perspective taking, was significantly related to increased self-disclosure and decreased secrecy behaviors by children.

Keywords: parent-child communication, media use, screen time, parental knowledge, dyadic data

Introduction

Nowadays, children in affluent societies spend more time with media than with any other activity (Süss et al., 2018). Despite beneficial outcomes, such as increased social capital, peer and family connection, improved self-expression and self-identity associated with social media use (Bolton et al., 2013), and civic engagement associated with news media consumption (Pasek, Kenski, Romer, & Jamieson, 2006), adverse outcomes have received far more attention in the scientific and public debate. These include, among others, poorer academic achievements (Anderson & Subrahmanyam, 2017; Camerini, Schulz, & Jeannet, 2018; Uncapher et al., 2017), increased levels of aggression (Ferguson & Kilburn, 2009; Paik & Comstock, 1994), and higher levels of anxiety, depression, stress, and sleep disturbances (Cain & Gradisar, 2010; Hoge, Bickham, & Cantor, 2017; Lee, Chang, Lin, & Cheng, 2014) as well as physical problems that come with a sedentary lifestyle (Boone, Gordon-Larsen, Adair, & Popkin, 2007; Mark & Janssen, 2008). Both positive and negative outcomes have been linked to media use by considering overall use but also specific contents and functionalities such as online games, entertainment formats, and social media. Especially with social media on the rise, both children and parents are worried about the risks around online safety, privacy, and increasingly reported instances of sexting, grooming, and cyberbullying (Hermida, 2019; Livingstone et al., 2017). That said, parental knowledge about children's screen time, defined here as the time spent using a device such as a smartphone, computer, television, or games console, has become an important issue. It presents the first step towards a variety of parental mediation strategies including restrictive mediation, co-use, active mediation, technical restrictions, and supervision (for a more detailed description see Livingstone & Helsper, 2008; Nathanson, 1999; Valkenburg, Krcmar, Peeters, & Marseille, 1999). Parental mediation strategies can focus on screen time *per se* and the need to monitor the *quantity* of media use, following the notion that screen time takes away valuable time for alternative offline activities such as physical activity,

homework, or sleep associated with positive consequences for child development. At the same time, parental mediation strategies can apply to the *quality* of media use where parents may limit the use of specific contents and functionalities, such as inappropriate websites, while soliciting the use of educational contents. For example, several studies have focused on restrictive mediation (i.e. setting rules to delimit time and contents of media consumption) and active mediation (i.e. discussing with the child about media contents, including a critical reappraisal) (e.g., De Morentin, Cortés, Medrano, & Apodaca, 2014). These studies are based on self-report (i.e., parent- or child-report). However, parents tend to overestimate the frequency of both restrictive and active mediation when compared to child-report (Beyens & Valkenburg, 2019). In addition, restrictive mediation and active mediation follow a curvilinear pattern during childhood (Beyens, Valkenburg, & Piotrowski, 2019), reflecting parental adaptation of mediation practices to children's developmental stage. What is central is that parental monitoring of children's media use requires, first and foremost, parental knowledge of children's screen time.

Parental knowledge of children's screen time cannot be taken for granted. Like in the case of parental mediation strategies, several studies have reported considerable inconsistencies between parent- and child-report media use, with parents usually underestimating the total time of children's media use. For example, 52% of US parents claim they only know 'sometimes' what their child does online, and 20% of children claim parents do not know at all (StrategyOne, 2010). Additionally, parents underestimate the time spent with specific media contents and functionalities (Gentile, Nathanson, Rasmussen, Reimer, & Walsh, 2012; Vittrup, 2009), including risky online behaviors, which can be harmful to children's health and development (Byrne, Katz, Lee, Linz, & McIlrath, 2014). However, evidence on the parental underestimation of children's screen time is still scarce. Hence, the aim of this study is to understand how the

parent-child relationship and communication can facilitate parental knowledge of children's screen time.

Sources of Parental Knowledge

Past research on parental knowledge applied a rather narrow perspective by investigating parental knowledge in terms of "parental monitoring" (Crouter & Head, 2002; Racz & McMahon, 2011). Parental monitoring has been historically defined as "a set of correlated parenting behaviors involving attention to and tracking of the child's whereabouts, activities, and adaptations" (Dishion & McMahon, 1998, p. 61). This definition emphasizes that parents actively use diverse strategies to keep track of their children's activities. Since then, parental monitoring has been re-conceptualized (Kerr & Stattin, 2000; Kerr, Stattin, & Burk, 2010) acknowledging that "the process by which parents get knowledge is more an activity of children than of parents" (Kerr & Stattin, 2000, p. 367). In other words, parental knowledge is more a byproduct of what the child discloses rather than the active monitoring of parents *per se*. Parental monitoring becomes progressively harder when children enter adolescence (Keijsers & Poulin, 2013). In this phase, children's social circles expand (Collins, Harris, & Susman, 1995), making it harder for parents to keep up with their offspring's whereabouts. However, parental monitoring represents only one source of parental knowledge. Other sources are related to parent-child communication, i.e., parental solicitation and child's self-disclosure (Stattin & Kerr, 2000).

Parental solicitation is defined as the extent to which parents obtain information about their child's activities and whereabouts either by directly asking their child or by asking relevant others. Parental solicitation has been found to be informative when adolescents tend to spend a lot of time unsupervised or when they are less willing to accept the legitimacy of their parents' authority (Laird, Marrero, & Sentse, 2010). On the contrary, self-disclosure is the spontaneous

disclose of information by the child on activities carried out outside the supervision of their parents. Numerous studies have revealed a strong and positive relationship between child disclosure and parental knowledge (Eaton, Krueger, Johnson, McGue, & Iacono, 2009; Keijsers, Branje, Van der Valk, & Meeus, 2010; Keijsers, Frijns, Branje, & Meeus, 2009; Kerr, Stattin, & Trost, 1999; Soenens, Vansteenkiste, Luyckx, & Goossens, 2006; Vieno, Nation, Pastore, & Santinello, 2009; Willoughby & Hamza, 2011). Parent-child communication may also be characterized by a third dimension, i.e. secrecy behaviors in children. Secrecy, or non-disclosure, happens when children are purposively hiding information from their parents either by not responding to parental solicitation or by not actively disclosing information from themselves. This can be observed especially in situations when children do not want to worry their parents or want to avoid unpleasant discussions (Finkenauer, Engels, & Meeus, 2002).

Given these three sources of parental knowledge, it is important to consider that, during adolescence, teenagers tend to disclose less information to their parents and engage in more secrecy behaviors in response to a growing need for self-regulation and autonomy (Allen, Hauser, Bell, & O'Connor, 1994; Keijsers, Frijns, Branje, & Meeus, 2008; Ryan & Deci, 2000). Thus, parents that aim at obtaining or soliciting information can be considered authoritarian, in line with Baumrind's classification (Baumrind, 2005), especially when the solicitation is kept at a high level of intrusiveness (Barber, 2002; Grusec & Davidov, 2007) and the level of responsiveness is low (Barber & Harmon, 2002). However, when the solicitation is kept at a medium level, it can be seen as a genuine and positive engagement of parents in the life of their children (DeVore & Ginsburg, 2005). For this reason, parental solicitation has been found to be a less informative source of parental knowledge in previous research (Kerr & Stattin, 2000; Stattin & Kerr, 2000), including longitudinal studies (Keijsers et al., 2010; Kerr, Stattin, & Burk, 2010). In fact, among parental monitoring, solicitation, and self-disclosure (including secrecy), self-disclosure has been repeatedly considered the strongest predictor of parental

knowledge (Crouter & Head, 2002; Kerr & Stattin, 2000; Smetana & Metzger, 2008; Stattin & Kerr, 2000), highlighting the importance of a good parent-child communication during puberty.

A good parent-child communication, in turn, is facilitated by a warm family climate and a satisfactory parent-child relationship (Barbato, Graham, & Perse, 2003; Fletcher, Steinberg, & Williams-Wheeler, 2004; Kerr, Stattin, & Trost, 1999; Smetana & Metzger, 2008). Children who have a good relationship with their parents tend to disclose more information and proactively talk about their thoughts, feelings, and activities (Crouter & Head, 2002; DeVore & Ginsburg, 2005; Kerr & Stattin, 2000; Stattin & Kerr, 2000). Furthermore, good levels of parental trust (Kerr, Stattin, & Trost, 1999; Rotenberg, Petrocchi, Lecciso, Marchetti, 2015; Smetana & Metzger, 2008), good parental responsiveness (Smetana & Metzger, 2008; Soenens et al., 2006) as well as engagement in gratifying family activities (Keijsers & Laird, 2010; Willoughby & Hamza, 2011) increase children's willingness to share information with their parents. In the same way, a good parent-child relationship is expressed by parents' genuine interest in their children's whereabouts through soliciting information while respecting children's privacy.

On the other side, parental unavailability, reluctance for conversation, and lack of perspective-taking are all behaviors that inhibit adolescents' self-disclosure (Tokić & Pećnik, 2011). Furthermore, a difficult parent-child relationship and negative parental reactions to disclosed information can reinforce secrecy behaviors (Finkenauer, Engels, & Meeus, 2002; Tilton-Weaver et al., 2010). Secrecy is also more likely in case of an authoritarian parenting style conveyed by high levels of solicitation, which are a potential threat to children's autonomy and increase child withdrawal and discontent (Power, 2013).

Current Study and Hypotheses

The present study aims at examining the association between parent-child relationship and communication and parental knowledge about children's screen time. More precisely, we look at self-disclosure, parental solicitation, and secrecy behaviors as direct indicators of parental knowledge of children's screen time and how these, in turn, are related to the perceived quality of the parent-child relationship and parents' ability in perspective-taking. In doing so, we use a full information approach and go beyond the investigation of individual relationships. We address the issue of measuring parental knowledge by using dyadic data, i.e., an index representing the extent to which parents and children differ in their estimates of children's media use. A strength of this measure is that it relies on the information of both children and their parents. The use of an index of parent-child discrepancy has been described as a reliable method to measure parental knowledge (Crouter & Head, 2002).

Starting from the cited literature, among the indicators of parent-child communication, children's self-disclosure is hypothesized to be the strongest and positive indicator of parental knowledge, thus, decreasing the discrepancy between parent- and child-report screen time. Likewise, parental solicitation is expected to increase parental knowledge, though, the effect can be by attenuated by children's reluctance to report since active solicitation is seen as an interference with their privacy (Barber, 2002; Grusec & Davidov, 2007). On the other hand, children's secrecy behaviors are hypothesized to be negatively related to parental knowledge. However, the effect can, once again, be attenuated by the fact that keeping secrets requires a certain level of self-control and personal choice, which adolescents typically reach with increasing age and experience (Buhrmester, 1990; Margolis, 1966). Perceived quality of the parent-child relationship and the ability of parents in perspective-taking as indicators of a good parent-child relationship are both expected to promote self-disclosure and withhold secrecy, while the directionality of the impact of a good parent-child relationship on parental solicitation remains to be explored. The hypothesized associations are summarized in a theoretical model

in Figure 1. Given that daughters have a higher propensity to disclose information to their parents than boys (Papini, Farmer, Clark, Micka, & Barnett, 1990), the entire model will be tested constrained by gender adding new insights on potential gender differences in the abovementioned relations among concepts.

<< Figure 1 about here >>

Methods

Data collection

We use cross-sectional data from the third wave, conducted in spring 2016, of an ongoing longitudinal study in Canton Ticino, Italian-speaking Switzerland. It was the first time that indicators of parent-child relationship and communication were first assessed in combination with estimates of children's screen time by both children and their parents. A detailed description of the longitudinal study design can be found elsewhere (Camerini, Schulz, & Jeannet, 2018). Data were collected through self-administered paper-and-pencil questionnaires. Each questionnaire included a unique identifier associated with the corresponding student name to which only collaborating school staff had access for distribution among children and their parents. While children completed the questionnaire at school, parents completed their form at home and sent it back in an enclosed envelope. Collected data from parent-child dyads were matched with the help of the unique identifier dissociated from any personal information. Following this procedure, students' and parents' anonymity were guaranteed, and the regional education administration approved the study design.

Sample

The initial sample included 1492 students in grade 7 from 35 public and two private middle schools in Canton Ticino. Successfully completed questionnaires returned from 1375 (92%) students and 854 (57%) parents. The attrition rate of students was mainly due to their absence from school during the day of data collection.

The analytical sample included only cases where both parent- and child-report estimates of children's screen time were available ($N = 854$). The mean age of students was 11.36 ($SD = .54$), and 54% were female. Nine in ten students reported that there is usually an adult at home when they come back from school. The parent questionnaire was completed in most cases by mothers (75.6%), and parents with Swiss (60%) or Italian (20%) nationality. In the majority of the families, at least one parent had a tertiary (applied) university degree (43%) or a post-secondary non-tertiary educational degree (41%). In 7% of the cases, the highest educational attainment among parents was lower secondary education.

Measures

All measures were translated from English into Italian. Independent back-translation was performed to assure linguistic validity.

Quality of parent-child relationship. Five items measured the quality of the parent-child relationship from the child perspective on a 5-point scale ranging from 1 "Never true" to 5 "Always true" (Venkatraman, Dishion, Kiesner, & Poulin, 2010). These items were: "I really enjoy being with my parents", "My parents and I get along really well", "There is a feeling of togetherness in my family", "My family members back each other up" and "The things we do together are fun and interesting". Higher values indicated better relationship quality ($M = 4.33$, $SD = .75$; $\alpha = .87$).

Perspective-taking. Four items were developed to measure parents' ability to take their child's perspective: "When we talk, my parent want to understand my side of things.", "When

we talk, my parents try to understand my point of view.”, “When we talk about important things, my parent just do not understand what I am going through.”, When we talk, it is hard for my parents to put themselves in my place.” Response options ranged from 1 “Never true” to 5 “Always true”. Two items were re-coded for further analyses so that higher values indicated better abilities in perspective taking ($M = 3.92$, $SD = .80$, $\alpha = .68$).

Self-disclosure. Three questions were used to measure children’s self-disclosure (Venkatraman et al., 2010). These were: “How often do you tell your parents how you are doing in school, without them asking?”, “How often do you spontaneously tell your parents, without them asking you, what do you do when you go out during the evening?”, “How often do you spontaneously tell your parents, without them asking you, about your friends and what you do together?”. Response options ranged from 1 “Never or almost never” to 5 “Always or almost always”. Thus, higher values indicated higher levels of self-disclosure ($M = 3.66$, $SD = 1.12$; $\alpha = .74$).

Secrecy. Two items were used to measure children’s secrecy behaviors (Venkatraman et al., 2010). Students were asked: “Do you keep secrets from your parents about what do you do during your free time?” and “Do you hide a lot from your parents about what do you do during nights and weekends?”. Response options ranged from 1 “Never or almost never” to 5 “Always or almost always”. The two questions were moderately related to each other (Pearson’s $r = .46$, $p < .001$), and higher values indicated higher levels of secrecy ($M = 1.55$, $SD = .85$).

Parental solicitation. Four items were used to measure parental solicitation from the child perspective (Venkatraman et al., 2010). These were: “During the past month, how often have your parents started a conversation with you about what you do during your free time?”, “How often do your parents ask you about things that happened during school?”, “How often do your parents ask you to talk about your friends and what you do together?”, and “How often do your parents ask you what you like to do or what you think about different things?”.

Response options ranged from 1 “Never or almost never” to 5 “Always or almost always”. Thus, higher values indicated higher levels of self-disclosure ($M = 3.31$, $SD = .99$; $\alpha = .80$).

Parental knowledge of screen time. This measure included estimates for the child’s time spent watching television, playing videogames, and surfing on the Internet representing three medium-specific screen activities across different platforms. Both parents and children were asked to indicate on a scale with nine-time interval how much time on a typical school day and on a weekend day the child spends watching television, playing videogames, and surfing on the Internet. The intervals were: 0 “never”, 1 “up to 0.5 hours”, 2 “between 0.5 and 1 hour”, 3 “between 1 and 1.5 hours”, 4 “between 1.5 and 2 hours”, 5 “between 2 and 3 hours”, 6, “between 3 and 4 hours”, 7 “between 4 and 5 hours”, and 8 “5 or more hours”. The midpoint of each interval was used as an approximate measure of screen time in hours. The interval 0 was assigned “0” and the interval 8 “5.5 hours”. The hours were averaged across the three media activities to obtain an overall measure of screen time. The absolute value of the difference between parent and child estimates were used as a measure of parental knowledge about their child’s screen time ($M = 2.41$; $SD = 1.62$). Additionally, information was extracted on the underestimation of children’s screen time by parents. To do so, absolute values were retained only for those cases where the difference between parent and child estimates was negative and different from zero ($n = 613$; $M = 2.84$; $SD = 1.94$).

Control variables. Control variables included the highest educational attainment among parents assessed in the parent questionnaire ranging from 1 “lower secondary education” to 5 “tertiary university education”, social desirability bias in child-report assessed with a 13-item version of the Children’s Social Desirability Short scale (Camerini & Schulz, 2018) in the student questionnaire ($M = 8.77$; $SD = 3.94$), and the presence of an adult at home after school assessed in the student questionnaire with a single item (“Usually, when you come back from school, is there an adult at home?”) and a binary response format coded as 0 “no” and 1 “yes”.

Data Analysis

Preliminary statistical analyses were performed in SPSS version 24 (IBM Corp, 2016), while the main analyses were conducted using the lavaan package (Rosseel, 2012) in R software (R Core Team, 2013). Since missing data were less than 5.2 per cent, and their distribution was completely at random, the expectation-maximization algorithm was used to impute missing data. Independent samples t-tests were performed to identify systematic differences in the distribution of gender and the presence of an adult at home when coming back from school between students without parent data ($n = 521$) and the analytical sample ($n = 854$). Due to the non-normal data distribution of the included variables, Mann-Whitney tests for independent samples were performed to test differences between 1) self-report data from the excluded and included student sample on all concepts of interest to this study, and 2) parent and child estimates of children's screen time in the analytical sample. Furthermore, given the nested structure of the data (students in schools), intra-class correlation coefficients were calculated for each variable in the model to evaluate whether multilevel analyses were required.

For the main analyses, the hypothesized model (Figure 1) was tested using structural equation modelling (SEM), combining the structural and the measurement model. The model was tested separately for the total difference in estimated children's screen time and underestimation of children's screen time by parents as the outcome. Highest educational attainment among parents as an indicator of socio-economic status, social desirability bias in child-report, and presence of an adult after school were entered as control variables. To deal with non-normality in the data, the Satorra-Bentler scaled test statistic (Satorra & Bentler, 1994) and robust standard errors were used. In the model specification, the factor loading of the first indicator of each latent variable was set to 1. The following goodness-of-fit indices were used to evaluate model-data correspondence: The Chi-square value, the Comparative Fit Index

(CFI), the Root Mean Square Error of Approximation (RMSEA), and the Standardized Root Mean Square Residual (SRMR). Given the large sample size for this study, the χ^2 value was not considered to be a good indicator of model fit. Byrne (2016) suggested to accept a model when the CFI is higher than .90 and close to .95, the RMSEA is .08 or less, and the SRMR is .05 or less. Finally, modifications indices and the matrix of standardized correlation residuals were inspected for potential improvement of model fit.

Results

Preliminary analyses and relationships among variables

The proportion of female students was significantly higher in the analytical sample compared to the student sample without parent data, $t(1363) = -3.47, p < .001$. No significant differences occurred for the presence of an adult at home after school, $t(1258) = .213, p = .830$. Non-parametric comparison tests revealed that students in the analytical sample reported significantly better quality of parent-child relationship ($p < .001$), better abilities of their parents in perspective taking ($p = .001$), higher self-disclosure ($p < .001$), and lower secrecy behaviors ($p = .022$) than students without parent data. No significant differences were evident for parental solicitation ($p = .075$) and propensity in social desirability responding ($p = .130$).

Non-parametric comparisons were also carried out to test the difference between parent- and children-report screen time, considering the compound score of television viewing, Internet use, and video gaming. As expected, there was a significant difference between the mean of the parent- and child-report overall children's screen time ($p = .036$). Additionally, when we considered the estimation of weekdays and weekend days separately, we also found a significant difference ($p < .001$), with parents reporting more discrepant estimates of children's screen time on weekend days compared to weekdays. Moreover, 613 parents (72%) underestimated the total screen time of their children.

Intra-class correlation coefficients (ICC) for all endogenous variables were as follows: self-disclosure (ICC = .02), parental solicitation (ICC = .00), secrecy (ICC = .01), parental knowledge in terms of absolute difference in estimated screen time by children (ICC = .01) and underestimation (ICC = .00). Given these low coefficients, the main analyses were carried out without multilevel considerations. Correlations are shown in *Table 1*, demonstrating the expected bivariate relationships among all variables in the model.

<< Table 1 about here >>

Primary analyses testing the hypothesized model

The hypothesized model in Figure 1 was tested with the absolute value of parental knowledge on the total sample ($n = 854$), i.e., the lack of parental knowledge represented by the discrepancy between parent- and child-report total screen time, as the outcome variable (Model 1). Highest educational attainment among parents, the presence of an adult at home after school, and social desirability were added as control variables. The inclusion of these variable resulted in a not-acceptable model fit ($\chi^2 (197) = 856.24, p < .0001$, CFI = .87, SRMR = .07, RMSEA = .068, 90% CI [.063, .073]). Since social desirability ($\beta = -.046, p = .19$) and the presence of an adult at home after school ($\beta = .013, p = .73$) were not significantly related to parental knowledge, while parental education was a significant predictor ($\beta = -.12, p < .001$), the model was re-tested after the exclusion of the non-significant control variables. The final model (Figure 2) showed a good fit of the data with $\chi^2 (159) = 462.22, p < .0001$, CFI = .93, SRMR = .04, and RMSEA = .05, 90% CI [.047, .058]. Table 2 represents the factor loadings of the latent constructs included in Model 1. Examination of path coefficients yielded evidence for the hypothesized paths.

<< Table 2 about here >>

<<Figure 2 about here>>

Self-disclosure was significantly negatively related to the discrepancy in screen time estimates ($\beta = -.24, p = .001$), indicating that increased self-disclosure led to better parental knowledge about children's screen time. Likewise, secrecy behaviors were significantly positively related to worse parental knowledge of children's screen time ($\beta = .11, p = .031$). Among the two, self-disclosure was more strongly related to the final outcome variable. Parental solicitation was not significantly related to parental knowledge ($\beta = .017, p = .81$). Furthermore, self-disclosure and parental solicitation were positively correlated with each other ($r = .69, p < .001$). Among the theoretically derived predictors of the different aspects of parent-child communication, parents' ability in perspective-taking as perceived by their children was a significant positive predictor of self-disclosure ($\beta = .45, p < .001$) and parental solicitation ($\beta = .34, p < .001$), while it was a significant and negative predictor of secrecy ($\beta = -.31, p = .001$). Perceived quality of the parent-child relationship was significantly positively related to parental solicitation ($\beta = .14, p = .026$) but not to the other two concepts describing the parent-child communication (self-disclosure: $\beta = .12, p = .08$; secrecy: $\beta = -.031, p = .71$). Moreover, the indirect path from perspective-taking to parental knowledge through children's self-disclosure was significant and negative ($\beta = -.11, p = .004$), while the other indirect paths were not. The total effect from parental perspective taking through secrecy and self-disclosure was negative and significant ($\beta = -.14, p < .001$). Additionally, the highest educational level among both parents was significantly negatively ($\beta = -.12, p < .001$) associated with the difference in parent and child estimates of children's screen time.

Since preliminary analyses revealed a significant difference in estimated screen time for weekend days and weekdays, we ran two other models, one for the discrepancy in weekend days (Model 1a) and another one for the discrepancy in weekdays (Model 1b). Goodness of fit

indices remained good in both models (Model 1a: $\chi^2 (159) = 464.74, p < .001$; CFI = .935, RMSEA = .052, SRMR = .045; Model 1b: $\chi^2 (159) = 451.533, p < .001$, CFI = .937, RMSEA = .051, SRMR = .044), and the direction and the significance of all paths remained the same, except for the path from secrecy to parental knowledge, which was significant only in Model 1b for weekdays estimates ($\beta = .117, p = .034$).

On a subsample ($n = 613$), including only dyads in which parents underestimated their children's screen time, we also tested the hypothesized model with parental underestimation of their child's screen time as the outcome variable (Model 2). The model was first tested controlling for parental education level, presence of an adult at home after school, and social desirability, resulting in a poor model fit ($\chi^2 (197) = 682.354, p < .0001$, CFI = .859, SRMR = .072, RMSEA = .069, 90% CI [.063, .075]). Social desirability ($\beta = -.072, p = .084$) and the presence of an adult at home after school ($\beta = -.054, p = .23$) were not significantly related to parental underestimation of children's screen time, while parental education level was a significant predictor ($\beta = -.083, p = .023$). The model was re-tested after the exclusion of non-significant control variables. The final model (Figure 3) showed good fit of the data with $\chi^2 (159) = 389.68, p < .0001$, CFI = .93, SRMR = .048 and RMSEA = .05, 90% CI [.047, .060]. Examination of path coefficients yielded evidence for the hypothesized paths mirroring findings from Model 1. However, in addition, perceived quality of the parent-child relationship was a significant positive predictor of self-disclosure ($\beta = .18, p = .019$). The indirect path from perspective taking through children's self-disclosure was significant ($\beta = -.22, p = .005$) as well as the indirect path from perspective taking through secrecy ($\beta = -.052, p = .027$). The total effect, considering both perspective taking and relationship quality through secrecy and self-disclosure, was negative and significant ($\beta = -.21, p < .001$). Finally, it should be noted that also in this model highest educational attainment among parents was significantly ($\beta = -.088, p = .015$) associated with parents' underestimation of children's screen time.

<<Figure 3 about here>>

Gender differences in the hypothesized model

To test whether the hypothesized paths for Model 1 and Model 2 differed for males and females, a multi-group analysis was carried out constraining the paths for the measurement and structural model by gender. Five nested models were tested: configural invariance, weak invariance, strong invariance, strict invariance, and means invariance. For the evaluation of the models, the $\Delta\chi^2$ -statistic was applied and, since its value depends on the sample size (Brannick, 1995; Kelloway, 1995), ΔCFI paired with $\Delta RMSEA$ were also evaluated. A combination of ΔCFI values smaller than or equal to .01 and $\Delta RMSEA$ values smaller than .015 was considered evidence of invariance (Chen, 2008; Cheung & Rensvold, 2002). Table 3 shows the results of the multi-group comparison. For both outcomes, the absolute discrepancy in parent and child estimates of children's screen time and parents' underestimation, full invariance by gender was obtained. In other words, the established associations between the parent-child relationship in terms of perceived relationship quality and parents' ability in perspective-taking, the parent-child communication, and parental knowledge about children's screen time did not differ by children's gender.

<< Table 3 about here >>

Discussion

The transition from childhood to adolescence makes parental knowledge about children's activities and screen time increasingly harder (Keijsers & Poulin, 2013). Parental knowledge can stem from different sources, including parental solicitation and children's

disclosure of information (Kerr & Stattin, 2000; Stattin, Kerr, & Burk, 2010). In the present study, we aimed at examining the role of self-disclosure, parental solicitation, and secrecy behaviors as direct indicators of parental knowledge of children's screen time. Besides, we aimed to investigate how these indicators are, in turn, related to the perceived quality of the parent-child relationship and parents' ability in perspective-taking. According to our findings, self-disclosure was the most important variable associated with parental knowledge, i.e. the more children disclosed information about themselves and on their initiative, the smaller the discrepancy was in parent and child estimates of children's screen time. This result was found for both weekdays and weekend days as well as for a general day. Comparing overall discrepancy with parents' underestimation of children's screen time, we saw that self-disclosure particularly decreased parents' underestimation of children's screen time. Our finding is in line with previous research looking at parental knowledge of what adolescents do during their free time, where they are, and whom they are with (Crouter & Head, 2002; Kerr & Stattin, 2000; Smetana & Metzger, 2008; Stattin & Kerr, 2000). It underlines the importance of children voluntarily talking about their whereabouts, which is facilitated by a warmer family climate in terms of better parental perspective-taking and good quality of parent-child relations. This result corroborates findings from other studies reporting how family climate (Fletcher, Steinberg, & Williams-Wheeler, 2004; Kerr et al., 1999; Smetana & Metzger, 2008), parental trust (Kerr, Stattin, & Trost, 1999; Rotenberg, 2010; Smetana & Metzger, 2008), and parental responsiveness (Smetana & Metzger, 2008; Soenens et al., 2006) enhance children's disposition to share information with their parents. In a similar way, an autonomy-supportive parenting style, i.e. with high levels of perspective taking, gives children guidance and allows them to make their own choices. A supporting parent enhances children's autonomy, respects their feelings, and resonates with them about rules and behaviors. In this vein, restrictive and active mediation have been found to be effective only when occurring in an autonomy-supportive

environment (Valkenburg, Piotrowski, Hermanns, De Leeuw, 2013), since parental rules are more effective when they encourage children's autonomy and consider children's perspective. Moreover, our results complement previous qualitative research on parental behaviors related to adolescents' self-disclosure (Tokić & Pećnik, 2011), demonstrating that parents' ability in perspective-taking and recognition of adolescents' cognitive and emotional state are associated with children's availability to talk about themselves.

During puberty, activities outside parental supervision and secrecy behaviors tend to increase (Keijsers et al., 2008), especially in difficult parent-child relationships and situations of negative parental reactions to disclosed information (Finkenauer, Engels, & Meeus, 2002; Tilton-Weaver et al., 2010). In the present study, we found that secrecy reduced parental knowledge about children's whereabouts, such as the time they spent with screen media. This was particularly evident when considering parents' underestimation of children's screen time. Moreover, we only found parental perspective-taking to be significantly and negatively related to secrecy, which means that parents who were able to put themselves in their children's shoes encountered less often situations where children hide information. At the same time, it may also be that secrecy behaviors in children result in a maladaptive parent-child relationship and less empathy by parents. In this view, secrecy may prompt aversive reactions in parents, which subsequently lead to even more secrecy and other problems in child conduct (Lytton, 1990). The cross-sectional nature of our data did not allow us to test these reciprocal relationships, which require multiple waves from the same cohort.

We did not find a significant effect of parental solicitation on parental knowledge, meaning that parents' attempts to get information from their children do not improve their knowledge. Similar results have been reported in previous research on parental knowledge about adolescents' daily activities and delinquencies (Keijsers et al., 2010; Kerr & Stattin, 2000; Kerr, Stattin, & Burk, 2010; Stattin & Kerr, 2000). However, since parental solicitation was

positively correlated with children's self-disclosure, parents may encourage their child to open up about their whereabouts, thus promoting disclosure. Indeed, how much solicitation practices are perceived as intrusive or effective may depend on the degree to which they are perpetuated as supportive of the autonomy of the child. Hence, such parental solicitation can be also perceived in a positive way if it reflects parents' interest in the child's life instead of an intrusion of privacy. For example, when a parent starts a conversation, asking direct questions, and the child perceives it as a gesture of caring and interest towards him/her, it increases the willingness to share information and relational closeness (Baudat, Van Petegem, Antonietti, & Zimmermann, 2020). In other words, in an autonomy-supportive context, the child decides to disclose information, after the parent solicits it, because he/she wants to, and not because he/she feels pressured to do so (Wuyts, Soenens, Vansteenkiste, & Van Petegem, 2018).

Thus, the results discussed so far emphasize that every parental monitoring practice related to media use starts with a good dialogue on what is happening, especially in the case of privatized media use (Byrne et al., 2014). Facilitation of self-disclosure presents the best means to obtain a better knowledge of children's screen time to eventually apply different parental monitoring strategies such as actively talking with children about the benefits and adverse outcomes of increased screen time overall and with regards to specific contents and functionalities.

Among our controls variables, i.e. social desirability bias in child-report, presence of an adult at home after school, and parental education, only the latter showed to be significantly and positively related to parental knowledge, i.e. better-educated parents were better informed about their children's screen time. This result can be explained by the fact that better educated are also better aware of the potential adverse outcomes related to excessive screen time and, therefore, use a variety of strategies including good parent-child communication and parental regulation strategies to obtain information and control the media use of their children

(Livingstone, 2007; Totland et al., 2013). Another explanation may be that better-educated parents also tend to have more financial resources to offer their children supervised extracurricular activities such as sports, music, creative play, reading time (Davis-Kean, 2005), and thereby have a better idea of how children spend the rest of their daily leisure time with screen media. Furthermore, we assumed that the presence of an adult at home after school might affect discrepancies between estimates of screen time, considering that, in the context of Italian-speaking Switzerland, this adult is in most cases the mother. However, we did not find an effect for this control variable. We also expected a social desirability bias in child-reported estimates of screen-time, i.e. children with a higher tendency to provide socially desirable answers would report less socially undesirable screen time, and this would alter the discrepancy between child- and parent-report. But we could rule out the effect of such a systematic bias in self-report.

Finally, we aimed to explore gender differences by testing for gender invariance in both our model with the absolute discrepancy between parent- and child-report screen time and parental underestimation of children's screen time. We found no significant differences in the effects for males and females. Hence, despite some literature suggesting that girls have a higher propensity to disclose information to their parents (Papini et al., 1990), the invariance of the two models confirms that the associations between parent-child relationship, communication, and parental knowledge of children's screen time do not differ by gender.

Limitations and future directions

Our study is not without limitations. We used cross-sectional data, henceforth, we cannot assume causality, which would require longitudinal data for all concepts under investigation. Furthermore, both parents' and children's estimates of screen time may be biased by limitations in recall (Boase & Ling, 2013). A time-use diary or ecological momentary assessments (Shiffman, Stone, & Hufford, 2008) may aid recall by shortening the time lag

between activity and assessment and providing anchors (i.e., time slots) to help recalling the duration of different (scattered) media activities throughout the day. In addition, objective trace data would further improve the reliability of screen time measures. During the last years, dedicated apps have been developed and used to objectively measure behavior, especially through smartphones (Ryding & Kuss, 2020). Concerning the assessment of parental knowledge of children's screen time, we did not include information about smartphone screen time but asked for Internet use in general. However, since the smartphone becomes more and more ubiquitous in children's and adolescents' lives (Süss et al., 2018), its consideration would have provided a more holistic picture of children's screen time. Future research should also try to replicate our model by considering not only parental knowledge about the overall quantity of children's screen time but also the quality, i.e. how much time children spend with specific contents and functionalities. In this regard, a comparison of parents' knowledge about – in their eyes – good-quality screen time compared to bad-quality screen time would be most interesting as it introduces a more refined discussion on perceptions and attitudes towards screen media in children's lives. In addition, our analytical sub-sample from a bigger student sample consists of parent-child dyads with more engaged parents who have a better relationship and communication with their children as reported from the child's perspective. This limitation is frequent in surveys that rely on the voluntary participation of parents and students where data collection from students in school settings guarantee higher response rates compared to mail-based data collection from parents. Finally, we relied on two indicators to measure parent-child relationship, i.e. quality of the parent-child relationship and parents' ability in perspective-taking. However, the inclusion of other indicators, such as trust and parental responsiveness, can add valuable information on the family context that shapes the communication between parents and children, and, in turn, parental knowledge of children's media use. Particularly, trust between parents and adolescents emerges thanks to the communication between family

members (Rotter, 1967). Trust is a fundamental reciprocal process, in which one partner's attribution of trustworthy intentions and behaviors to the other is normally reciprocated (Rotenberg, 2010; Betts et al., 2014). Parents and children, establishing a common social history comprising fulfilment of promises, refrain from causing emotional harm, act honestly, and eventually build a mutual sense of trust (Rotenberg, 2010). Trust represents the building blocks of a relationship (Petrocchi et al., 2020) and may facilitates self-disclosure because adolescents, who trust their parents, may feel comfortable to disclose to them personal confidence, concerns, and share with them their personal feelings. Therefore, self-disclosure may emerge in a context of a trustworthy relation and might be associated with parental estimation of adolescents' screen time.

Conclusion

In sum, the results of this study underline the importance of children's self-disclosure as a dimension of good parent-child communication associated with parental knowledge of children's screen time. On the other hand, the parental solicitation to obtain information on children's activities does not increase better knowledge of screen time as a popular leisure-time activity. Moreover, children's self-disclosure is facilitated by a good parent-child relationship, especially in terms of parents' ability in taking the perspective of their children and understanding their side of things.

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Acknowledgements

We wish to thank the regional education administration of Canton Ticino and the participating schools for their collaboration during data collection. This research was in part funded by the Swiss National Science Foundation (Grant no. 175874).

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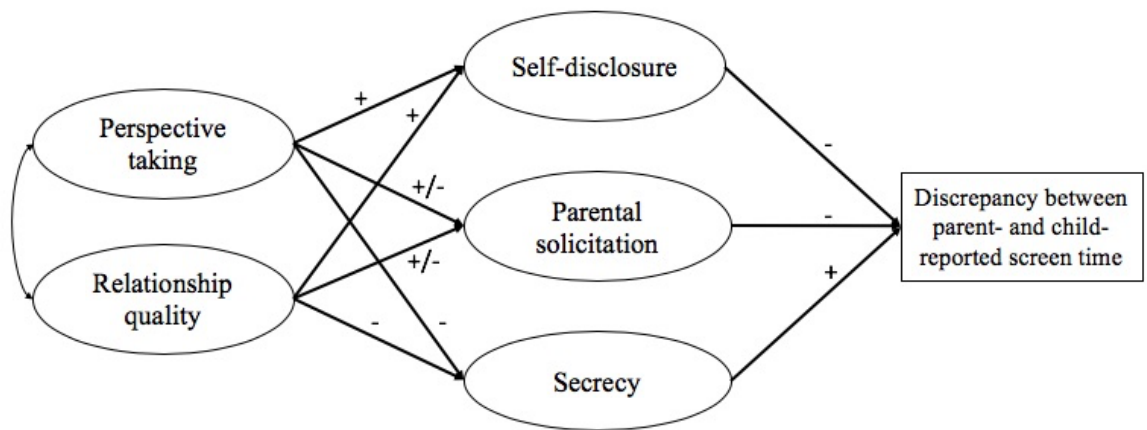


Figure 1. Theoretical model with hypothesized relationships. Latent variables are measured with child-report. The discrepancy in children's screen time is measured with an index representing the absolute difference between parent- and child-report.

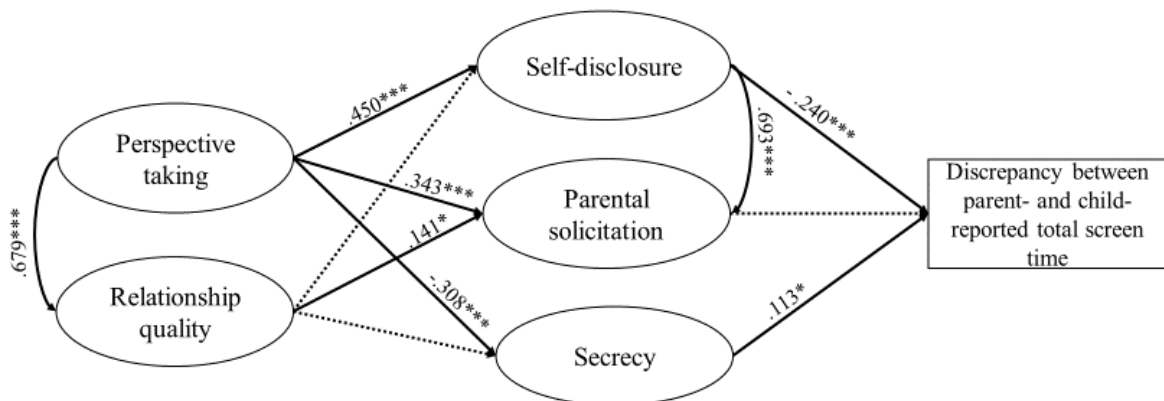


Figure 2. Final model (Model 1) with *absolute difference in parent- and child-report total screen time*; $N = 854$. Control variable: parental education. Only standardized path coefficients of structural model are shown; dashed arrows denote non-significant paths; all other paths denote significant relationships at $* = p < .05$, $** = p < .01$, $*** = p < .001$; correlation between endogenous variables represent correlation between disturbance terms.

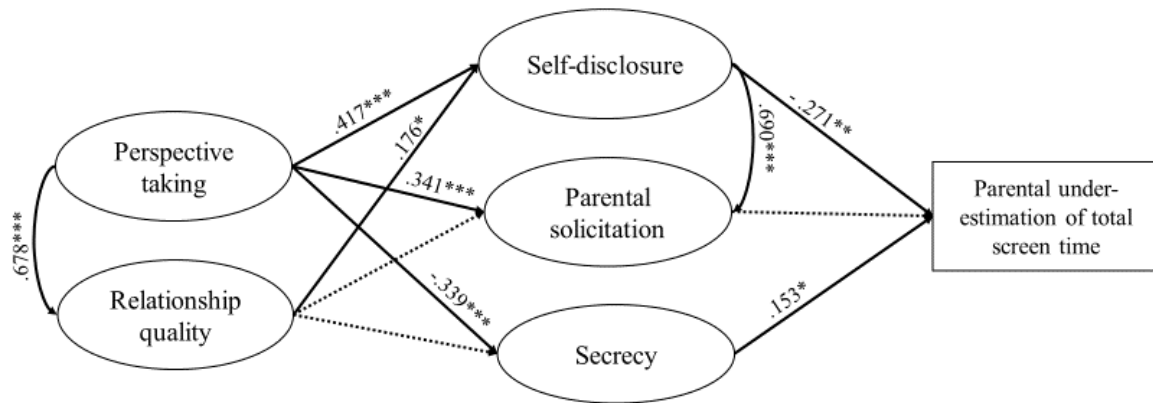


Figure 3. Final model (Model 2) with parents' underestimation of children's screen time; $n = 613$. Control variable: parental education. Only standardized path coefficients of structural model are shown; dashed arrows denote non-significant paths; all other paths denote significant relationships at $* = p < .05$, $** = p < .01$, $*** = p < .001$; correlation between endogenous variables represent correlation between disturbance terms.

Table 1. Means, standard deviations, and correlations between main variables and control variables.

Main Variables	M (SD)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Perspective-taking	3.92 (0.80)	.50***	.36***	-.22***	.31***	.05	.07*	.23***	-.20***	-.19***
Quality of parent-child relationship (2)	4.33 (0.75)		.35***	-.18***	.32***	-.007	.07*	.26***	-.16***	-.27***
Self-disclosure (3)	3.66 (1.12)			-.17***	.57***	-.02	.04	.29***	-.21***	-.24***
Secrecy (4)	1.55 (0.85)				-.005	-.03	-.03	-.24***	.12***	.16***
Parental solicitation (5)	3.31 (0.99)					.004	.02	.19***	-.15***	-.21***
Control: Highest educational attainment among parents (6) ¹	-						.07*	.004	-.07	-.03
Control: Presence of an adult at home after school (7) ²	-							.09*	.003	-.06
Control: Social desirability (8)	8.77 (3.94)								-.13***	-.17***
Parental knowledge (absolute difference in estimation) (9)	2.41 (1.62)									.83***
Parental knowledge (underestimation) (10)	2.84 (1.94)									

Note: 263 < df < 852; * $p < .05$; ** $p < .01$; *** $p < .001$; correlation coefficients are Pearson's r except for ¹ Spearman's rho and ² Kendall's tau-b.

Table 2. Results of factor loadings of the latent constructs included in Model 1

Latent Factor	Indicator	B	se	Z	β	p
Secrecy	item1	1.000	0.000	na	.697	na
Secrecy	item2	0.710	0.157	4.515	.652	***
Self-disclosure	item1	1.000	0.000	na	.681	na
Self-disclosure	item2	1.117	0.072	15.607	.622	***
Self-disclosure	item3	1.218	0.067	18.166	.793	***
Parental solicitation	item1	1.000	0.000	na	.618	na
Parental solicitation	item2	0.815	0.057	14.217	.635	***
Parental solicitation	item3	1.194	0.063	18.847	.789	***
Parental solicitation	item4	1.172	0.063	18.547	.789	***
Perspective taking	item1	1.000	0.000	na	.676	na
Perspective taking	item2	0.952	0.095	10.010	.479	***
Perspective taking	item3	1.124	0.099	11.314	.598	***
Perspective taking	item4	1.174	0.096	12.192	.603	***
Quality of parent-child relationship	item1	1.000	0.000	na	.688	na
Quality of parent-child relationship	item2	1.198	0.053	22.419	.777	***
Quality of parent-child relationship	item3	1.489	0.088	16.909	.819	***
Quality of parent-child relationship	item4	1.513	0.107	14.099	.746	***
Quality of parent-child relationship	item5	1.254	0.076	16.526	.709	***

Note: B = unstandardized estimate; se = standard errors; Z = z-value; β = standardized coefficient; *** $p < .001$; na = not applicable.

Table 3. Measurement invariance for the model with parental knowledge and the model with underestimation as outcome variables.

	Model compared	χ^2	df	$\Delta\chi^2$	Δdf	CFI	ΔCFI	RMSEA	$\Delta RMSEA$
A - configural invariance ¹		756.88	318			.923		.057	
		<i>678.96</i>				<i>.911</i>		<i>.061</i>	
B - weak invariance ²	B vs A	776.16	341	19.28	23	.924	.001	.055	.002
		<i>698.18</i>		<i>19.22</i>		<i>.912</i>	<i>.001</i>	<i>.058</i>	<i>.003</i>
C - strong invariance ³	C vs B	802.31	355	26.14*	14	.922	.002	.054	.001
		<i>730.69</i>		<i>32.52**</i>		<i>.908</i>	<i>.004</i>	<i>.059</i>	<i>.001</i>
D - strict invariance ⁴	D vs C	876.30	374	73.10***	19	.912	.01	.056	.002
		<i>786.64</i>		<i>55.95***</i>		<i>.898</i>	<i>.01</i>	<i>.060</i>	<i>.001</i>
E - means invariance ⁵	E vs D	915.78	379	39.47***	5	.906	.006	.058	.002
		<i>803.19</i>		<i>16.55**</i>		<i>.896</i>	<i>.002</i>	<i>.060</i>	<i>.000</i>

Note: Results in plain text refer to models with total discrepancy of estimated screen time as the outcome variable (Model 1). Results in Italics refer to models with underestimation (Model 2). Constrains as follows: ¹ factor structure, ² factor loadings, ³ factor loadings and intercepts, ⁴ factor loadings, intercepts, and residuals, ⁵ factor loadings, intercepts, residuals, and means. * $p < .05$; ** $p < .01$; *** $p < .001$;