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The development of parental monitoring during adolescence:

A meta-analysis

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Abstract

As adolescents grow up, one of the important developmental tasks is to individuate themselves and to become more autonomous from parents. This requires a realignment of the parent-adolescent communication. The current meta-analytic study aims at identifying developmental changes in parent-adolescent communication, conceptualized within the parental monitoring framework, as entailing parental solicitation, control and knowledge, and adolescent's disclosure and secrecy. Thirty-one longitudinal studies published between 2000 and 2015 were identified and included in the current meta-analysis. Informants, age at assessment and study duration were tested as moderators. Results showed a low to medium normative decline in parental control (Cohen's $d = -.395$, 95% CI $[-.541, -.249]$), knowledge ($d = -.245$, 95% CI $[-.331, -.160]$) and adolescence disclosure ($d = -.147$, 95% CI $[-.204, -.090]$), and an increase in adolescent's secrecy ($d = .194$, CI $[.031, .356]$). Parental solicitation decreased based on parents' ($d = -0.242$, 95% CI $[-0.376, -0.109]$) but not on adolescents' reports ($d = 0.038$, 95% CI $[-0.099, 0.175]$). Another significant moderator was the duration of the study, with studies longer than 2 years being able to detect a more pronounced change in parental control than studies lasting less than 2 years (≤ 2 years, $d = -0.139$ vs. duration > 2 years, $d = -0.581$). Limitations of the current knowledge and new direction of studies are discussed.

Key-words: Parental solicitation, parental control, parental knowledge, adolescent disclosure, adolescent secrecy, parental monitoring

When children mature, and enter high school, much of their daily lives take place outside the direct supervision of their parents. During this developmental phase, monitoring adolescents' activities allows parents to stay involved in their lives, without a need to be physically present. Parental monitoring, described as a set of parenting behaviors aimed at paying attention to and tracking of the adolescent's whereabouts, activities, adaptations, and friendships (Dishion & McMahon, 1998), has long been considered as one of the most important protective factors against adolescent problem behaviors. For instance, already in the 50's it was described that parents of antisocial children scored relatively low in tracking how their children spend their free time out of school (Glueck & Glueck, 1950); similarly, subsequent quantitative studies reported protective effects of parental monitoring against adolescents' delinquency and drug use (Patterson & Stouthamer-Loeber, 1984; Stouthamer-Loeber & Loeber, 1986). As such, adequate parental monitoring during adolescence became a key-element in theories on the development of adolescent delinquency (Gottfredson & Hirschi, 1990; Patterson & Dishion, 1985).

At the threshold of the new millennium, these conceptual formulations were challenged by the empirical studies of Stattin and Kerr (Kerr & Stattin, 2000; Stattin & Kerr, 2000). Thanks to their seminal contribution, the focus of research on monitoring switched from parental monitoring behaviors only, to the inclusion of adolescents' behavior as well, and from measuring parental knowledge to including measures of the process through which parents come to know about their children (i.e. the willingness of children themselves to disclose to their parents vs. gaining information from soliciting or controlling information by parents). Specifically, the focus and thinking about parental monitoring in developmental and clinical studies gradually shifted from an unidirectional active role of parents in promoting well-being towards a more transactional and dynamic view where adolescent's agency is a core component of the monitoring process (Keijsers, 2016; Meeus, 2016; Racz & McMahon, 2011; Smetana, 2008).

In line with the assumption that parental knowledge is the product of a bidirectional process taking place in the parent-adolescent dyad, there has been increased attention to realignment of

communication (Branje, Finkenauer, & Meeus, 2008; Branje, Laursen, & Collins, 2013; Smetana, 2008). Specifically, it has been suggested that developmental changes in communication allows adolescents to progress towards an increased autonomy and independence, while remaining connected to their parents (Keijsers & Poulin, 2013; Van der Giessen et al., 2014). The main aim of the current meta-analytic study is to contribute to the empirical identification of developmental changes in parent-child communication within the parental monitoring theoretical framework and, more specifically, to explore developmental changes in relation to parental control, solicitation and knowledge, and adolescence disclosure and secrecy (Kerr & Stattin, 2000; Stattin & Kerr, 2000). To describe how communication varies across ages in relation to these key-variables is the main aim of the current meta-analysis. Reviewing the literature in the parental monitoring framework, we also highlight limitations of the current knowledge, suggesting new directions of studies.

Parental monitoring: A conceptual definition

Over the last decades, it has become evident that the literature on parental monitoring needed to be conceptually refined, and several suggestions have been made how to better conceptualize the parenting behaviors involved and to operationalize the measurements. In fact, there is now a rather wide variety of parenting practices described in the literature that would fit under the umbrella term of parental monitoring (Dishion & McMahon, 1998). Parents can solicit information by asking their child to reveal the information (Stattin & Kerr, 2000) or rely on information they receive from knowledgeable others, such as neighbors or teachers (Waizenhofer, Buchanan, & Jackson-Newsom, 2004). Parents may also control their children, demanding that they inform them about their leisure time activities, friendships, and whereabouts (labeled parental control, Stattin & Kerr, 2000). Moreover, parents can try to influence the actual whereabouts, activities, adaptations, and friendships, for instance by contributing to structuring their children's leisure time activities (Fletcher, Steinberg, & Williams-Wheeler, 2004). In our meta-analysis we will report data on the two strategies that are mostly widely studied and were introduced by Stattin & Kerr (2000) – parental

solicitation and control, and to the final product to which these parenting practices contribute to, that is parental knowledge of out of home activities.

As carefully introduced by the work of Stattin and Kerr (2000), adolescents themselves also play an active role in managing the information their parents receive. That is, adolescent's disclosure regarding leisure time was identified as a strong predictor of how much parents know (Keijsers, Branje, Frijns, Finkenauer, & Meeus, 2010; Stattin & Kerr, 2000). Building further on this work, it became evident that distinguishing between disclosure and secrecy would potentially allow to add to our understanding of monitoring. Including secrecy in some studies, for instance, has helped to obtain a more in depth understanding of differences between parent-adolescent and peer-to-peer communication (Solís, Smetana, & Comer, 2015), and has indicated that adolescents' secrecy is a strong predictor of parental knowledge (Tilton-Weaver, 2014) and adolescents' delinquency and norm breaking (Keijsers, 2016). Moreover, also psychometrically, disclosure and secrecy are related, yet separate, factors (Lionetti, Keijsers, Dellagiulia, & Pastore, 2016). Therefore, both adolescent secrecy and disclosure will be examined in this meta-analysis.

Parental monitoring: A developmental perspective

Adolescence is a period of pronounced changes in the physical, social, and emotional domain (Lerner & Steinberg, 2009), and with these changes also patterns of communications are expected to change. Quite frequently, parents struggle with the questions regarding the normative patterns, such as what are age-appropriate levels of parental control, and is it age-normative for adolescents and young adults to keep secrets? Though each parent-child relationship is unique, and multiple variables (e.g. parenting style, personality traits) are likely to contribute to parent-child communication development, to investigate normative patterns of change within the parental monitoring framework may provide more information on how, and to what extent, on average the parent-child communication changes across years.

Over the course of adolescence, the parent-child relationship has to be realigned in order to adjust to the increasing privacy and autonomy needs of adolescents (Collins, 1990; Collins & Laursen, 2004; Petronio, 2002). These developmental forces not only affect the hierarchical distribution of power in the relationships, but also likely affect the monitoring and communication processes within families (Branje et al., 2013; Smetana & Asquith, 1994). Due to adolescents' increasing tendencies to spend time outside the parents' home (Larson & Richards, 1991), parents can decreasingly rely on direct supervision (Dishion & McMahon, 1998), and need to rely on adolescent's disclosure as a source of knowledge (Stattin & Kerr, 2000). However, compared to children, adolescents may be more tempted to keep secrets from their parents as a result of an increased need of privacy (Petronio, 2002). Similarly, adolescents may share less with their parents to preserve their autonomy and achieve a greater differentiation (Branje, Laursen, & Collins, 2012). Furthermore, the legitimacy of parents' attempts to control the lives of adolescents may decrease (Smetana, 1989; Smetana & Asquith, 1994). As such, we expected to find that parental monitoring efforts and adolescent willingness to share information both decline over the course of adolescence; resulting in a decrease in parental knowledge. Although some longitudinal studies have tested these changes (Keijsers & Poulin, 2013; Masche, 2010), a meta-analysis of the empirical findings from longitudinal studies regarding these changes is currently lacking.

What moderates parent-child communication?

Apart from studying normative (or average) developmental changes, we were also interested in examining heterogeneity, thereby focusing on two theoretical predictors, gender and country of origin, and on three important elements of the study design, which are informant, age at assessment, and duration of the longitudinal study. However, due to the limited number of longitudinal studies conducted in non-Western Countries, and to the limited number of studies reporting information on gender differences (see Table 1), we introduce gender and country of

origin as moderators only at a descriptive level and we statistically test as moderators informant, age at assessment and duration of the study.

Theoretical predictors. Though only a few studies reported relevant information for testing the role of gender at a meta-analytic level, there are strong evidences suggesting that the normative changes in parent-adolescent communication may very well vary between boys and girls. Empirical studies showed that girls often report more parental knowledge, adolescent's disclosure, parental solicitation and parental control than boys do (Crouter & Head, 2002; Hamza & Willoughby, 2011; Kerr & Stattin, 2000; Stattin & Kerr, 2000), yet whether this also results in distinct developmental changes is unclear, as heterogeneity between empirical result may occur. For instance, even though one study found that the increase of secrecy throughout adolescence was faster for boys than for girls (Keijsers et al., 2010), another study found stable levels of secrecy for boys over the course of adolescence at a within level of analysis (Keijsers & Poulin, 2013).

Because norms and expectations in terms of parent-adolescent communication rules and habits could vary across cultures, the moderating role of the country of origin should be considered. For example, the parent-child relationship quality and degree of communication may be different in Asian cultures, where the family is considered central (Son & Choi, 2013), compared to Western countries. As such, it may be that parental control is not necessarily related to violation of children's sense of self as it might be in a European-American setting (Wang, Pomerantz, & Chen, 2007). At the same time, some of the underlying processes may overlap. For instance, in a study involving Chinese and American adolescents (Qin & Pomerantz, 2013), the relation between youth's sense of responsibility and disclosure to parents were found in both cultures, despite cultural differences in the levels of independence from parents have been reported in the literature, with American adolescents more strongly marked by need of establishing independence from parents (Collins & Steinberg, 2006) compared to Chinese adolescents (Pomerantz, Qin, Wang, & Chen, 2011). Moreover, comparing the same cultural backgrounds, in another study (Wang et al., 2007) parental control predicted adolescents' enhanced academic functioning regardless of the cultural context.

Methodological predictors. The psychological assessment of children and parents, when it comes to adolescence, often involves the employment of multiple informants; however, informants often disagree. For example, reports of behavioral problems, psychiatric symptoms and even of benefits after intervention programs have been found to significantly diverge between parents and children (Achenbach, 2006; Weisz, McCarty, & Valeri, 2006; Yungstrom, Findling, & Calabrese, 2003; De Los Reyes, Goodman, Kliewer, & Reid-Quinones, 2008). Whenever parent-child communication is studied, the eye of the beholder, i.e. the informant, may be a crucial factor too. Interestingly, previous studies have shown low levels of agreement between parents and children's report of parental monitoring (De Los Reyes, Goodman, Kliewer, & Reid-Quinones, 2010; Keijsers et al., 2010). When different reports about the same behavior differ depending on the informant, it could be difficult for policy-makers and researchers to interpret research findings, for example, to understand what causes that behavior, what are its consequences and how it develops over time (De Los Reyes, Henry, Tolan, & Wakschlag, 2009; De Los Reyes & Kazdin, 2009; Han et al., 2012; Pasch, Stigler, Perry, & Komro, 2010). Although there is no conclusive way for determining the best informant, by acknowledging differences among informants, results among studies could be compared and results interpreted taking into account differences among individuals.

The study designs also vary in terms of the time window under examination, which is the duration of the study. The age of the first assessment in studies assessing monitoring longitudinally, for instance, ranges from middle-childhood (Glatz, Stattin, & Kerr, 2011; Keijsers, Loeber, Branje, & Meeus, 2012) to late adolescence (Keijsers, Branje, et al., 2012; Van der Giessen et al., 2014). Moreover, whereas some studies only last 6 months (Stavrinides, Nikiforou, & Georgiou, 2015) others follow children up to 7 years (Keijsers & Poulin, 2013). We have therefore examined whether developmental changes are more likely to take place at specific ages or as a result of the duration of the study.

The current study

The current study aimed at identifying normative trends in parental monitoring considering all studies published between 2000 to 2015 in which the scales proposed by Stattin and Kerr (2000), named parental control, solicitation and knowledge, and adolescent's disclosure have been used. Moreover, following more recent insights in the psychometric properties of the disclosure scale (e.g., Frijns et al, 2010; Lionetti et al, 2016), we also included studies that computed adolescent secrecy, based on a subset of items from the disclosure scale. First, we aimed at providing information on average changes in parental control, solicitation and knowledge, and adolescent's disclosure and adolescent secrecy, to obtain information on age-normative development during adolescence. In doing this, we have focused exclusively on longitudinal studies to avoid confusion between cohort and age effects. Second, we examined two theoretical (i.e., gender and country of origin) and three methodological moderators (i.e., informant, age at assessment and duration of the study).

Method

In order to conduct a structured review, we followed the PRISMA guidelines for systematic reviews and meta-analyses (Moher, Liberati, Tetzlaff, Altman, & Group, 2009) as summarized in the flow-chart reported in Figure 1.

Identification

We identified potential relevant articles by searching in the SCOPUS, Web of Science and PsychInfo scientific databases. The search was conducted in 2015, April 21st. First, we set the following inclusion criteria: (1) the articles should cite Stattin and Kerr (2000) and/or Kerr and Stattin (2000) papers as an indication that the relevant scales were assessed, and (2) they should contain in either the title, abstract, or keywords at least one of the following keywords: disclos*; information manag*; manag* of information; secre* or conceal*; parent* monitor* or parent* knowledge or parent* monitor* knowledge; parent* solicitat* or parent* control* or parent* monitor* rule* or parent* rule*. Citing Stattin and Kerr (2000), 347 papers in Psycinfo, 344 in Web of Science, and 329 in Scopus were

identified, whereas citing Kerr and Stattin (2000) we found 251 papers in PsychInfo, 291 in Web of Science, and 308 in Scopus.

As a second identification step, we delimited the selection of papers to (1) empirical research articles (in Scopus and Web of Science, we included "article" as a criterion, in PsychInfo we selected only "peer-reviewed journals"), and (2) articles written in English. Citing Stattin and Kerr (2000), 322 papers were identified in PsychInfo, 323 in Web of Science, and 316 in Scopus, whereas citing Kerr and Stattin (2000) we identified 157 papers in PsychInfo, 270 in Web of Science, and 263 in Scopus.

Finally, we selected the ten journals in which authors had most often cited the articles of Stattin and Kerr (2000) and Kerr & Stattin (2000). We manually screened the online platform of these journals for identifying online papers that potentially could have met our search criteria but that were not yet included in the scientific databases. No additional articles were identified.

At the end of the identification phase, 1651 records were identified through these database searches. Screening and evaluation of the eligibility of papers are summarized in Figure 1.

FIGURE 1 AROUND HERE

Screening

All records were imported into Endnote Web. The duplicates were removed, first automatically - leading to 882 articles - and then manually- leading to 468 ones. The selection phase based on reading the title, keywords and abstract was done in accordance with the following hierarchical criteria: (1) longitudinal studies (i.e., two or more repeated assessments); (2) adolescent sample (i.e., age range of participants ranging from 12 to 25 at the first wave of data collection); (3) community samples (e.g., adolescents with special needs, such as HIV or diabetes were excluded); and (4) empirical research article. The screening was done twice and in parallel by the golden standard rater, Associate Professor and expert in the parental monitoring field (LK), and by a group of young scholars (i.e. doctoral or post-doc level, FL, BEP, MC, OK, MR, AD). The inter-rater agreement between the golden standard rater

and the group, computed on the acceptance/rejection criterion, was acceptable (Cohen's $K = 0.86$ [0.81 - 0.91]). Two post-doctoral researchers (FL and BEP) and the golden rater (LK) recoded again independently all the articles for which an agreement was not reached during the first screening phase. The inter-rater agreement at this point was 100%. This resulted in 196 records selected for the eligibility phase.

Eligibility

The full-text versions of these 196 articles were downloaded and again rated independently both by the golden standard rater and the group of young scholars. Entire papers were screened on the bases of the following three hierarchical criteria: (1) measures directly derived from Stattin and Kerr (2000); (2) dataset based on community samples and sample age range between 12 to 25 years old; (3) longitudinal data collection of the measures of interest. The inter-rater agreement was again high (Cohen's $K = .94$ [0.89 - 0.99]). Disagreements were discussed to reach a 100% agreement; 33 articles remained after this phase and are all reported in Table 1. Authors have been contacted up to three times to ask for missing information if the paper did not report values necessary for estimating developmental changes. All contacted authors but two provided data requested. Overall, 31 papers were eligible after this phase. Because some studies were (partially) based on the same longitudinal dataset, we included the studies based on the largest sample size and time span, and those which provided the more detailed information for estimating mean effect size and moderation effects in our meta-analysis (in Table 1 these articles are marked with an asterisk).

TABLE 1 AROUND HERE

Coding

All eligible studies were coded following these criteria: availability of data for subgroups (i.e. gender, country), informant (i.e. parents or adolescents), adolescent's age at the first assessment (< 14 years,

≥ 14 years), and duration of the study (i.e., time elapsed between the first and the last wave of data collection; < 2 years, ≥ 2 years). The variables country and gender were initially coded but then not taken into account for the subsequent moderation analyses due to the insufficient variability (country) and to the limited information available from published studies (gender).

In the 31 papers considered for the analyses (Table 1), adolescent's mean age at the first assessment ranged from 11 (Glatz et al., 2011) to 16 years old (Van der Giessen et al., 2014). Because the duration of the study ranged between 0.25 and 7 years (see Table 1) the actual age range of adolescents in this study ranged from 11 to 20 years. All studies feature Western samples, with the exception of a contribution including Chinese adolescents (Cheung, Pomerantz, & Dong, 2013).

Strategy of analysis

To summarize the developmental change in parent-adolescent communication (i.e., parental knowledge, parental solicitation, parental control, adolescent's disclosure, and adolescent secrecy) over these 31 studies, we used meta-analysis. The effect size metric was standardized differences in means (Cohen's d)¹ based on means, and standard deviations of the first and last wave of data collected, as well as the estimates of the correlation between these measurement waves. For each effect size estimate we computed the 95% confidence interval (CI). We used the Comprehensive Meta-Analysis (CMA, version 2.2) program for this purpose (Borenstein, Rothstein, & Cohen, 2005). In order to respect the independency assumption across studies, in each study effect sizes from different informants (i.e. parent and adolescent) were combined in a single effect size when the informant variable was not tested as moderator.

In terms of the analytical model, we used the random effects model, which gives the same results as a fixed-model when applied to homogeneous studies, but has additional strengths (Borenstein, Hedges, & Higgins Rothstein, 2009). Specifically, the random effects model assumes that the different studies estimate somewhat different values of the population parameter, thus allowing

¹ $d = \text{pre - posttest} \div (S_{\text{diff}} \div \sqrt{2(1 - r)})$

for greater generalizability to other studies not included in this meta-analysis. When outliers (effects which differed substantially from the other) were detected in the effect sizes distribution, a sensitivity analysis was conducted which consisted of omitting the outlier to check whether the results differed substantially (Borenstein et al., 2009).

We tested the distribution of the effect sizes with a homogeneity statistic, Cochran's Q. When this statistic is significant, it indicates that the dispersion of the effect sizes is unlikely to be due to sampling error. We conducted moderation analyses to account for the variability across studies, by including informant (parents vs. adolescents), age at first assessment (< 14 years, \geq 14 years), and duration of the study (< 2 years, \geq 2 years) in the model. The limited variability did not allow to statistically test the role of country. Similarly, because only a few studies reported the association between the variables of interest and gender, it was not possible to test whether gender influenced the mean level change. Categorical moderator analysis is akin to the analysis of variance (ANOVA), with a within group variance, Q_w , and a between groups variance, Q_b . A significant Q_w indicates that there is a heterogeneity within that group, while a significant Q_b indicates that the effect sizes between compared groups are different (cfr Borenstein, Hedges, & Higgins Rothstein, 2009).

To account for publication bias, we calculated the fail-safe N (Rosenthal, 1979), which is the minimum number of studies with null results needed to reduce the meta-analysis results to non-significance.

Results

Parental control

Seventeen longitudinal studies examined developmental changes in parental control, which resulted in effect sizes d ranging from -1.787 to .342 (Figure 2). Summarizing these effect sizes, there was a small to medium decrease over time ($d = -.395$, 95% CI [-.541, -.249]) (17 studies, total $N = 12,897$). The fail-safe N was 5823, which exceeds Rosenthal (1979) threshold level of five times the number of studies in the meta-analysis plus 10. We conducted a sensitivity analysis which consisted of

excluding outlier effect sizes of two studies, which incidentally had the longest duration (Keijsers & Poulin, 2013; Van der Giessen et al., 2014). When the two outlier studies were removed, the decrease in parental control remained statistically significant though the effect size was reduced ($d = -.249$, 95% CI $[-.387, -.111]$, 15 studies, total $n = 12,485$).

The homogeneity test indicated significant heterogeneity across the set of effect sizes ($Q(16) = 1040.079$, $p < .001$). Subsequent moderation analyses revealed that the decrease reported by adolescents and parents was comparable in effect size ($d = -0.414$, 95% CI $[0.604, -0.225]$, 11 studies, total $n = 8,808$ and $d = -0.365$, 95% CI $[-0.568, -0.163]$, 10 studies, total $n = 3,384$, respectively; $Q(1) = 0.120$, $p = .730$). Moreover, the decline was found independent of the age of the adolescent at the first assessment: 14 years old or younger ($d = -.495$, 95% CI $[-.721, -.270]$) (8 studies, total $n = 6172$, vs older than 14 ($d = -.308$, 95% CI $[-.524, -.091]$), 9 studies, total $n = 6425$), $Q(1) = 1.379$, $p = .240$). Results remained stable when the two outliers were removed. However, studies with longer duration were able to detect stronger developmental declines in parental control (≤ 2 years, $d = -0.139$, 95% CI: $[-.374, .096]$) (7 studies, total $n = 3993$) versus duration > 2 years ($d = -0.581$, 95% CI: $[-.779, -.382]$) (10 studies, total $n = 8199$), $Q(1) = 7.890$, $p = .005$).

FIGURE 2 AROUND HERE

Parental solicitation

Thirteen studies were identified that longitudinally assessed parental solicitation, indicating different developmental changes ($d = -0.440$ to 0.089) (Figure 3). Summarizing the results, there was a small decrease over time ($d = -0.082$, 95% CI $[-.163, -.000]$) (13 studies, total $N = 6659$). However, the fail-safe N is 57; and therefore, this finding fails to reach the Rosenthal (1979) of fail-safe $N > 5k + 10$.

The homogeneity test indicated significant heterogeneity between studies ($Q(12) = 131.251$, $p < .001$). Whereas parents reported a decrease in solicitation ($d = -0.242$, 95% CI $[-0.376, -0.109]$), 9 studies, $n = 2836$, adolescents did not ($d = 0.038$, 95% CI $[-0.099, 0.175]$), 8 studies, total $n = 3523$), a

difference that was statistically significant ($Q(1) = 8.223, p = .004$). The decrease was not moderated by age at assessment (respectively $d = -0.062, 95\% \text{ CI}[-0.158, 0.034]$, 9 studies, $n = 5801$ for adolescents 14 years old or younger, and $d = -0.134, 95\% \text{ CI}[-.289, 0.020]$, 4 studies, $n = 858$ for older ones; $Q(1) = .612, p = .434$), nor by the duration of the study (respectively $d = -0.099, 95\% \text{ CI}[-0.210, 0.012]$, 8 studies, $n = 2175$ for a time interval ≤ 2 years, and $d = -0.059, 95\% \text{ CI}[-.191, 0.073]$, 5 studies, $n = 4484$ for a time interval > 2 years; $Q(1) = .208, p = .648$).

FIGURE 3 AROUND HERE

Parental knowledge

Nine studies examined developmental changes in parental knowledge, and these revealed different effect sizes ranging from $d = -.714$ to $d = .190$ (Figure 4). Overall, knowledge decreased significantly over time ($d = -.245, 95\% \text{ CI}[-.331, -.160]$, 9 studies, total $N = 5510$). The fail-safe N is 807; this exceeds Rosenthal (1979) threshold level of five times the number of studies in the meta-analysis plus 10.

There was significant heterogeneity in these effect sizes ($Q(8) = 87.045, p < .001$). In subsequent moderation analyses, only the role of informants could be tested with at least four studies per group (Fu et al., 2011). Whether the adolescent ($d = -0.259, 95\% \text{ CI}[-0.383, -0.134]$, 6 studies, total $n = 2078$) or parents reported on knowledge ($d = -0.303, 95\% \text{ CI}[-0.425, -0.182]$, 6 studies, total $n = 3113$ respectively), results were not statistically different ($Q(1) = 0.257, p = .612$). Hence, other moderators, that have yet to be identified, are most likely responsible of such variability.

FIGURE 4 AROUND HERE

Adolescent Disclosure

The distribution of effect sizes of developmental change of disclosure ranged from -0.569 to 0.009 (negative values indicating declines; Figure 5). Over the studies, a small decrease was found ($d = -.147$, 95% CI [-.204, -.090], 15 studies, total $N=9707$). The fail-safe number, which is the minimum number of additional studies with null results, needed to overturn this significant result, is 670. With 15 studies included in this meta-analysis, this exceeds Rosenthal (1979) threshold of 85 (i.e., five times the number of studies in the meta-analysis plus 10: fail-safe $N > 5k + 10$).

The homogeneity test indicated that there was statistically significant heterogeneity across the set of effect sizes: $Q(14) = 107.984$, $p < .001$, indicating a need to test for potential moderators. Comparing adolescent ($d = -0.152$, 95% CI [-0.229, -0.076], 12 studies, total $n=7097$) vs the parents report on adolescent's disclosure ($d = -0.173$, 95% CI [-0.270, -0.076], 7 studies, total $n=2310$) did not explain the heterogeneity ($Q(1) = 0.113$, $p = .737$). Neither did comparing adolescent first assessment at ≤ 14 years ($d = -0.166$, 95% CI [-.232, -.100] (9 studies, total $n=5269$) vs >14 years ($d = -0.132$, 95% CI [-.225, -.039], 5 studies, total $n=3819$) explain the heterogeneity in the effect sizes ($Q(1) = 0.354$, $p = .552$). Finally, comparing adolescent's disclosure assessments interval ≤ 2 years, ($d = -0.098$, 95% CI [-.191, -.005], 6 studies, total $n = 1616$) vs more than 2 years ($d = -0.178$, 95% CI [-.252, -.104], 9 studies, total $n = 7791$), resulted in a similar effect size for the developmental decline in disclosure ($Q(1) = 1.732$, $p = .188$).

FIGURE 5 AROUND HERE

Adolescent secrecy

In the 6 studies on secrecy, the developmental change in secrecy ranged from $d = -0.076$ to $d = 0.591$ (Figure 6). Summarizing these results, we found a statistically significant small to medium increase over time ($d = .194$, 95% CI [.031, .356], 6 studies, total $N = 4,368$). The fail-safe number is 160. With 6 studies included in this meta-analysis, this exceeds Rosenthal (1979) threshold of 40 ($N > 5k + 10$). Even though the homogeneity test indicated that there was statistically significant heterogeneity

across the studies in terms of the effect sizes: $Q(8) = 131.047, p < .001$ this analysis did not meet the criterion of at least 4 studies for each category to be compared. Therefore, moderation analyses could not be conducted.

FIGURE 6 AROUND HERE

Discussion

As adolescents grow up, one of the important developmental tasks is to individuate themselves and becoming more autonomous from parents. As such, they increasingly spend their leisure time outside, in activities which are not supervised by parents, and of which often parents are unaware. (Larson, Richards, Moneta, Holmbeck, & Duckett, 1996; Stattin & Kerr, 2000). At the same time, parents are faced with the challenging task of monitoring these activities, while at the same time facilitating and supporting their children's needs of reaching an increased autonomy, and maintaining connectedness. In order to realign their relationship, both the parent and the adolescent thus have to renegotiate the communication processes that involve expecting and sharing information regarding leisure time activities (Branje, Laursen, & Collins, 2012; Keijsers & Poulin, 2013).

We used a meta-analytic approach to describe the normative developmental changes and summarize the empirical literature on developmental changes in parent-adolescent communication regarding leisure activities in community samples. Specifically, we included in the analysis all longitudinal studies published between 2000 and 2015 on adolescent's disclosure and secrecy, control, knowledge and solicitation, in community samples. This resulted in the inclusion of 31 studies, on which mean developmental changes and moderation effects were estimated.

Developmental changes in parent-child communication

In line with our expectations, and with the assumption that children experience an increased need of independence and of individuation when moving from middle childhood to adolescence, results showed a normative decline in adolescent's disclosure, parental control, knowledge and solicitation, and an increase in the degree of adolescent's secrecy. The most pronounced developmental changes were found for parental control ($d = -.395$), followed by parental knowledge ($d = -.245$) and solicitation (based on parents' reports, $d = -0.242$) and adolescent secrecy ($d = .194$) and disclosure ($d = -.147$).

These results suggest that parents seem to acknowledge early adolescent needs of privacy particularly by decreasing efforts of controlling access to information regarding leisure time (i.e., demanding that adolescent tell them where they go, with whom, etc.), and fit nicely with studies that apply a social domain perspective on parent-child relationships, which indicate that parents themselves consider that parental authority becomes less legitimate (Smetana, Crean, & Campione-Barr, 2005). Interestingly, whereas parents reported a decrease in solicitation ($d = -0.242$) no such developmental change was observed in adolescents' reports ($d = 0.038$), a significant moderation effect in our meta-analytic study. Adolescents and parents seem to see the same world through different lenses. One potential explanation can be found in the impact that solicitation has. As the legitimacy of parental involvement in personal and multifaceted domains decreases during adolescence (Smetana et al., 2005), the potentially negative impact of parents asking questions may increase, for instance, if parental attempts to be involved are perceived as a violation of adolescents' privacy (Hawk, Hale, Raaijmakers, & Meeus, 2008). To consider this mismatch in the parent and in the adolescent perspective, currently supported with a meta-analytic finding, may have important implications for parenting programs and adolescents' intervention programs aimed at promoting a positive communication between the two.

At the same time, adolescent themselves are not passive recipients of parenting, but through managing the information their parents get (Keijsers & Laird, 2010; Marshall, Tilton-Weaver, & Bosdet, 2005), they may play an active role in shaping and changing the communication process.

Indeed, whereas adolescents decreased their disclosure, their secrecy increased over the course of adolescence. There are several potential explanations of these findings. One group of explanations suggests that adolescents may strategically use information management, such as lying, disclosing only partial truths, or keeping secrets in order to establish their autonomous self (Finkenauer, Frijns, Engels, & Kerkhof, 2005; Keijsers et al., 2010) to assert power or manipulate parents (Kerr, Stattin, Biesecker, & Ferrer-Wreder, 2003), or avoid disapproval (Marshall et al., 2005). At the same time, as children grow up an increasing amount of aspects of their lives become private or personal, and rather than being an active strategy, disclosure may also decline because there is no longer an obligation to disclose such information to parents (Smetana, Metzger, Gettman & Campione-Barr, 2006), because adolescents express a greater desire for individuation and independence or because the opportunities to talk decrease, for example, as the result of an increase in time spent with friends in out of home activities.

Finally, changes in parental monitoring efforts, specifically their solicitation attempts, or changes in the relationship quality may affect adolescent's willingness to disclose and form a driving force behind these developmental changes in disclosure (Keijsers et al., 2016).

Lastly, this meta-analytical study indicated a decline in parental knowledge ($d = -.245$). One likely explanation, is that this decline is the result of the developmental changes in adolescent's disclosure and monitoring practices (Keijsers et al., 2016). This decline in parental knowledge may have important implications for child well-being, as it is only through being informed that parents can be the source of support and guidance that a developing adolescent needs. Parental knowledge has been frequently linked to adolescent delinquency and norm breaking in the monitoring literature. However, also when it comes to internalizing problems, and other mental health problems, parents are often not well-informed, and there is a concerning long delay between the first display of symptoms, and receiving actual treatment (Raven, Jörg, Visser, Oldehinkel, & Schoevers, 2017). Future research is thus needed to understand what the driving forces are behind

these developmental declines in parent-child communication, and how they may impact the health and well-being of adolescents.

Limitations and future directions

Even though this is, to the best of our knowledge, the first meta-analytical summary of the empirical literature on parent-child communication, it is not without limitations. First, it has to be acknowledged that overall the number of longitudinal studies included in the meta-analysis, and currently available in this field, is limited, and this may have downplayed the opportunity of detecting more significant moderating effects. Second, only a few papers explored the role of candidate moderating variables (e.g. informant's gender, distinction between mother and father, and country), preventing a more extended analysis of other potentially relevant variables beside demographic ones. Beside sociodemographic variables, the research in this field has not yet extended the focus of the analysis on other relevant moderating variables, for instance, pertaining to personality and temperamental differences in children and parents (Pluess et al., 2017) which could partially moderate the impact that each member of the dyad has on the other. These moderating mechanisms, extensively explored in parent-infant interaction studies (Slagt, Dubas, Dekovic, & van Aken, 2016), have still to be integrated in the parental monitoring framework. Lastly, it has to be acknowledged that meta-analytic information on changes in parent-child communication across time does not inform on motivation behind such changes, and does not allow to identify mediation mechanisms responsible for this process. Other candidate variables, as parenting style, could be more extensively explored. For example, studies reported that parenting styles dimension may partially influence the degree to which adolescents disclose information about their everyday life activities, with high parental responsiveness and behavioral control, and low psychological control, reported to create a family climate in which adolescents are more prone to speak about their whereabouts (Soenens, Vansteenkiste, Luyckx, & Goossens, 2006), suggesting that taking into

account other parenting variables may help in better understanding changes in communication across time.

Notwithstanding these limitations, which suggest at the same time new directions for future studies, our meta-analysis adds to the existing literature on developmental changes in parent – child relationships in three ways. First, our results provide further support to the hypothesized decline in the flow of the parent-child communication as a normative and developmental process. This decline, consistently reported across all scales, support the idea that knowledge, solicitation and control, and secrecy and disclosure, reflect a broader and cohesive parent-child communication process. At the same time, the most pronounced changes were a developmental decline in parental control and parental knowledge and a developmental increase in adolescent secrecy. Second, the current meta-analysis suggests that parental and adolescent perception of developmental changes in communication processes may differ from each other, with parents reporting a decrease in their level of solicitation, which adolescents do not perceive. This suggests that differences in the parent and adolescent perception is a normative developmental aspect and should be considered by practitioners and clinicians working for the improvement of the parent-child communication quality. Third, the high heterogeneity in study results emerged at a meta-analytical level clearly call for a more in depth exploration of putative moderation mechanisms, yet to be identified, able to better explain individual differences in developmental changes in parent-child communication regarding adolescent leisure activities.

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Table 1 Studies included in the meta-analysis. Country, measures used, presence of subsamples, type of informant, time span covered by the data collection and adolescents mean age are reported for each study.

	References	Name of the Study or Country	Overlapping Dataset	Measure	Subsample	Informant ¹	Time Span (in years)	Adolescents Mean Age (1st Assess.)
1	(Boislard & Poulin, 2011)	Canada	(Kiesner, Dishion, Poulin, & Pastore, 2009) (Keijsers & Poulin, 2013)	Disclosure Parental Control	Urban	AP	---	---
2	(Cheung, Pomerantz, & Dong, 2013)	USA - CHINA	---	Disclosure	USA Chinese	AP	2	12.78 12.69
3	(Creemers et al., 2015)	The Netherlands - RADAR	---	Parental Control	n.a.	AP	2	14
4	(Garthe, Sullivan, & Kliewer, 2015)	USA	---	Disclosure Parental Knowledge	n.a.	AP Composite measure: caregiver and adolescent	1	missing
5	(Giannotta, Ortega, & Ciairano, 2011)	Italy	---	Parental Knowledge	n.a.	AP	3	11.14
6	(Glatz, Stattin, & Kerr, 2011)	Sweden	---	Parental Control Parental Solicitation	n.a.	PA	4	11
7	(Hamza & Willoughby, 2011) *	Canada (Ontario)	(Willoughby & Hamza, 2011)	Disclosure Parental Control	Female Male	AP	3	14
8	(Hawk, Hale, Raaijmakers, & Meeus, 2008)	The Netherlands - CONAMORE	(Keijsers, Frijns, Branje, & Meeus, 2009)	Parental Control Parental Solicitation	Male Female n.a.	AP	---	---

	References	Name of the Study or Country	Overlapping Dataset	Measure	Subsample	Informant ¹	Time Span (in years)	Adolescents Mean Age (1st Assess.)
9	(Hawk et al., 2013)	The Netherlands - RADAR	---	Parental Knowledge Secrecy	n.a.	MA FA AM MA AF FA	2	13
10	(Janssen, Dekovi, & Bruinsma, 2014)	SPAN	---	Parental Control	n.a.	AP	2	14.3
11	(Keijsers & Laird, 2014)	USA	---	Disclosure Secrecy Parental Solicitation	n.a. n.a.	AM MA	1	12.4
12	(Keijsers & Poulin, 2013) *	Canada	(Boislard P & Poulin, 2011) (Poulin & Denault, 2012) ---	Disclosure Parental Control Parental Knowledge Parental Solicitation Secrecy	n.a.	AP	7	12.38
13	(Keijsers et al., 2009) *	The Netherlands - CONAMORE	(Keijsers, Branje, VanderValk, & Meeus, 2010) --- (Keijsers, Branje, VanderValk, et al., 2010) ---	Disclosure Parental Solicitation Parental Control Parental Control Disclosure	n.a. n.a.	MA FA	2	13.2

References	Name of the Study or Country	Overlapping Dataset	Measure	Subsample	Informant ¹	Time Span (in years)	Adolescents Mean Age (1st Assess.)
			Parental Solicitation Disclosure				
		(Keijsers, Branje, VanderValk, et al., 2010)	Parental Solicitation	n.a.	AP	3	
		(Hawk et al., 2008)	Parental Control				
14	(Keijsers, Branje, Frijns, Finkenauer, & Meeus, 2010)	The Netherlands - CONAMORE	Secrecy	Male Female	AP	3	13.2
			Disclosure Parental Control Parental Solicitation	n.a.	MA FA AP	---	---
15	(Keijsers, Branje, VanderValk, et al., 2010)	The Netherlands - CONAMORE	Parental Knowledge	Male Female Male Female Male Female	MA FA AP	1	14.2
16	(Keijsers et al., 2012)	The Netherlands - RADAR	Parental Control	n.a.	MA FA	---	---
		(Van der Giessen et al., 2014)				2	13
17	(Kerr, Stattin, & Burk, 2010) *	Sweden	Disclosure Parental Knowledge Parental Control Parental Solicitation	n.a.	PA	2	13.51

References	Name of the Study or Country	Overlapping Dataset	Measure	Subsample	Informant ¹	Time Span (in years)	Adolescents Mean Age (1st Assess.)
		(Tilton-Weaver et al., 2010)	Disclosure Parental Knowledge				
		---	Parental Control Parental Solicitation	n.a.	AP		
18	(Kiesner et al., 2009) *	Italy - Canada	Parental Solicitation	Italian	AP PA	1	14.11
				Canadian	AP PA		14.55
			Disclosure Parental Control	Italian	AP PA		14.11
		(Boislard P & Poulin, 2011)		Canadian	AP PA		14.55
19	(Masche, 2010) **	---	---	---	---	---	---
20	(Merrilees et al., 2011)	Ireland	Parental Control	n.a.	AM MA	1	13.61
21	(Muñoz, Pakalniskiene, & Frick, 2011)	USA	Parental Control Parental Solicitation	n.a.	MA	1	14.5
22	(Poulin & Denault, 2012)	Canada	(Keijsers & Poulin, 2013) Parental Knowledge	n.a.	AP	---	---
23	(Reynolds, MacPherson, Matusiewicz, Schreiber, & Lejuez, 2011)	USA	Parental Knowledge	n.a.	AP MA	1	11.03
24	(Salafia, Gondoli, & Grundy, 2009)	USA	Disclosure Parental Knowledge	n.a.	AM MA	3	11.65

	References	Name of the Study or Country	Overlapping Dataset	Measure	Subsample	Informant ¹	Time Span (in years)	Adolescents Mean Age (1st Assess.)
25	(Stattin et al., 2011)	Sweden	(Kerr et al., 2010) --- (Kerr et al., 2010)	Disclosure Parental Knowledge	n.a.	AP MA AP	--- 2 ---	--- 13.89 ---
26	(Stavrinides, Georgiou, & Demetriou, 2010)	Cyprus	---	Disclosure Parental Control Parental Solicitation	n.a.	MA	0.25	15.07
27	(Stavrinides, Nikiforou, & Georgiou, 2015)	Cyprus	---	Disclosure Parental Control Parental Solicitation	n.a.	MA	0.5	13.5
28	(Strandberg, Bodin, & Romelsjö, 2014)	Sweden	---	Parental Control	Male Female	AP	1.5	14
29	(Tilton-Weaver, 2014)	Sweden	---	Disclosure Parental Control Parental Solicitation Secrecy	n.a.	AP	2	13.72
30	(Tilton-Weaver et al., 2010)	Sweden	(Kerr et al., 2010) ---	Disclosure Parental Control Secrecy	n.a.	AP	--- 3	--- 15.04
31	(Van der Giessen et al., 2014) *	The Netherlands - RADAR	(Keijsers et al., 2012)	Disclosure Parental Control	n.a.	MA	5	16.05
32	(van der Zwaluw et al., 2010) **	---	---	---	---	---	---	---
33	(Willoughby & Hamza, 2011)	Canada (Ontario)	(Hamza & Willoughby, 2011)	Disclosure Parental Control	Male Female	AP	---	---

Note: *reference used in analyses when datasets overlap (data about time-span covered by the assessment and Adolescents mean age are reported only for the study used as reference).** Data not available from the paper and upon the request from the authors;

¹ PA=Parents to Adolescent; MA= Mother to Adolescent; FA= Father to Adolescent; AM=Adolescent to Mother; AF=Adolescent to Father; AP=Adolescent to Parents. In the Measure column, When Disclosure is reported without the variable Secrecy in correspondence of a specific study, the original scale of Stattin and Kerr (2000) with 5 items was used. When both Disclosure and Secrecy are listed, two of the items of the original scale were attributed to Secrecy and three to Disclosure.

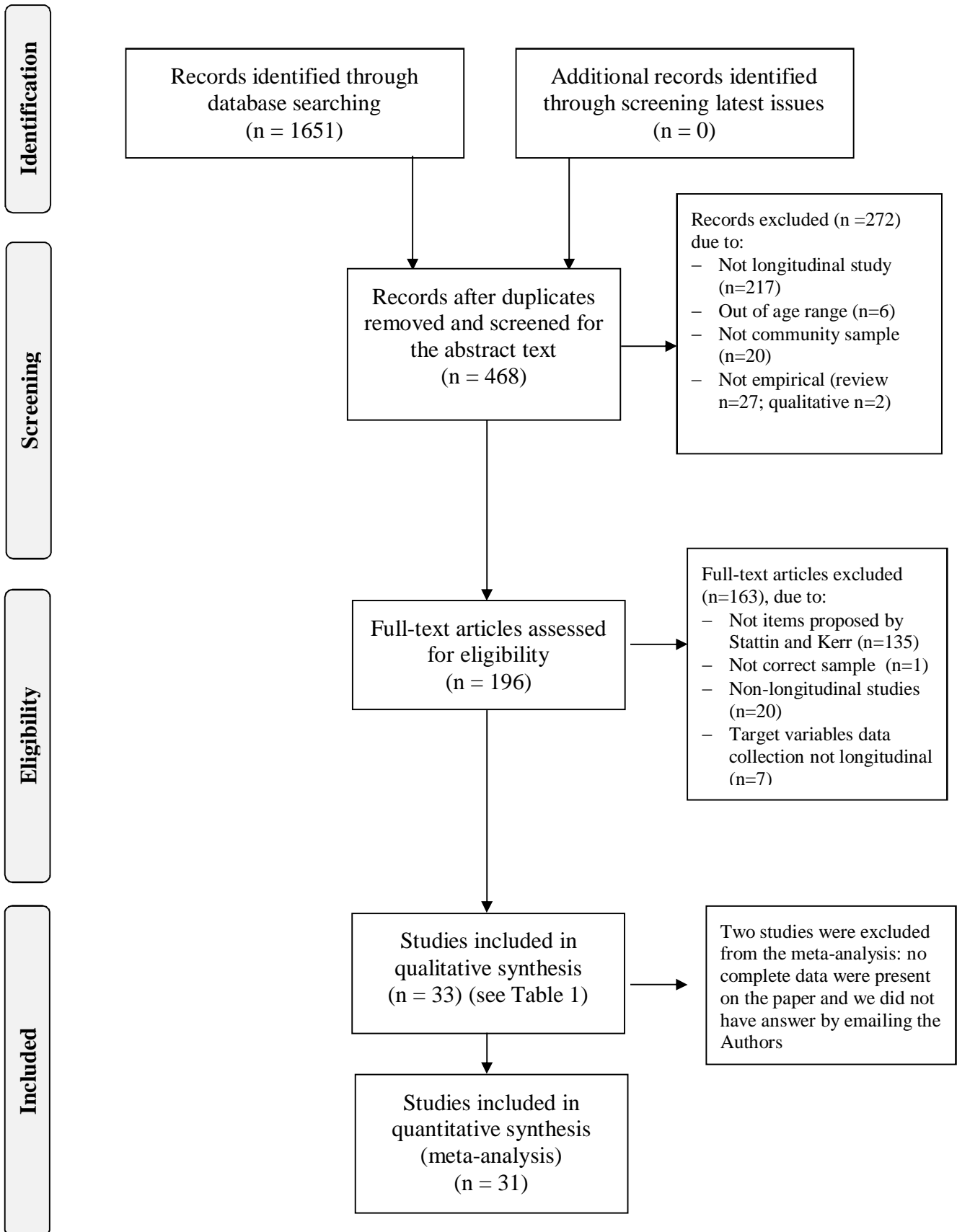
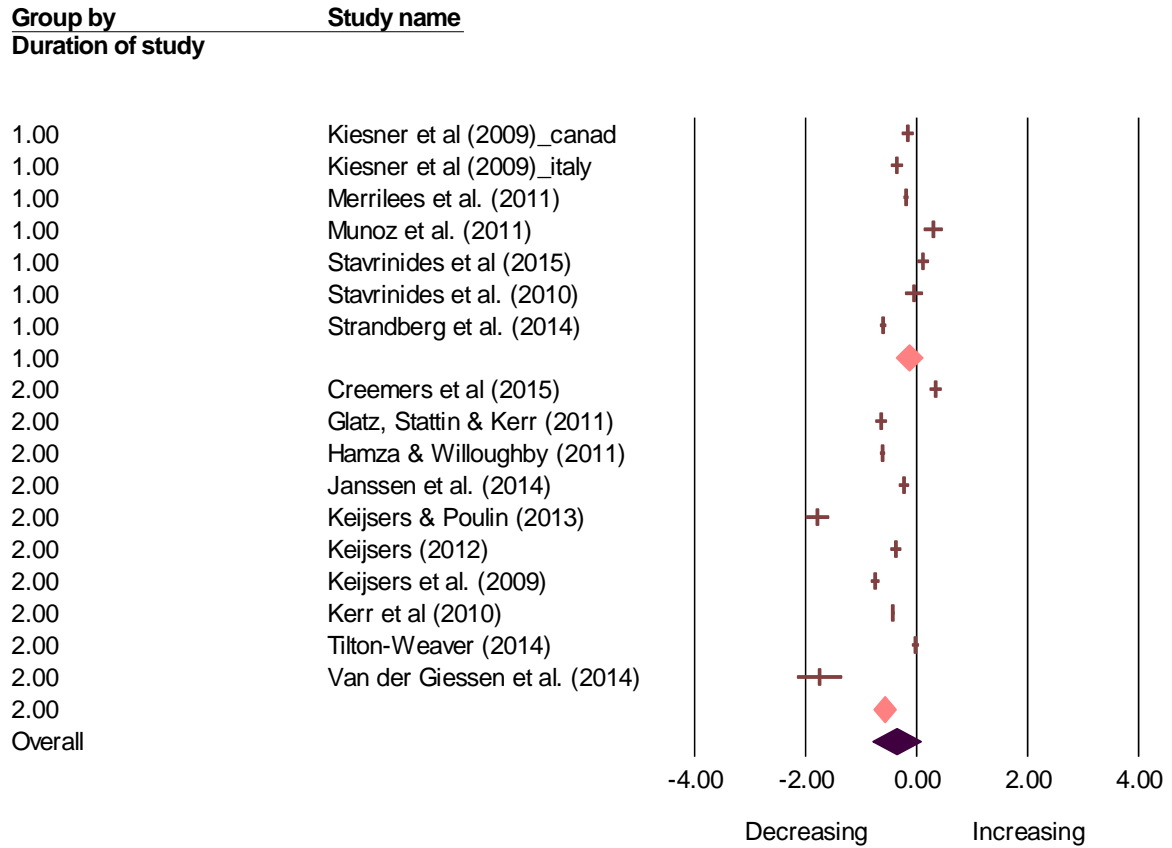


Figure 2. Effect size distribution of parental control with duration of study (1=less than 2 years; 2=two or more years) as a moderator



Random effect model

Figure 2. Effect size distribution of parental control with duration of study (1=less than 2 years; 2=two or more years) as a moderator

Study name

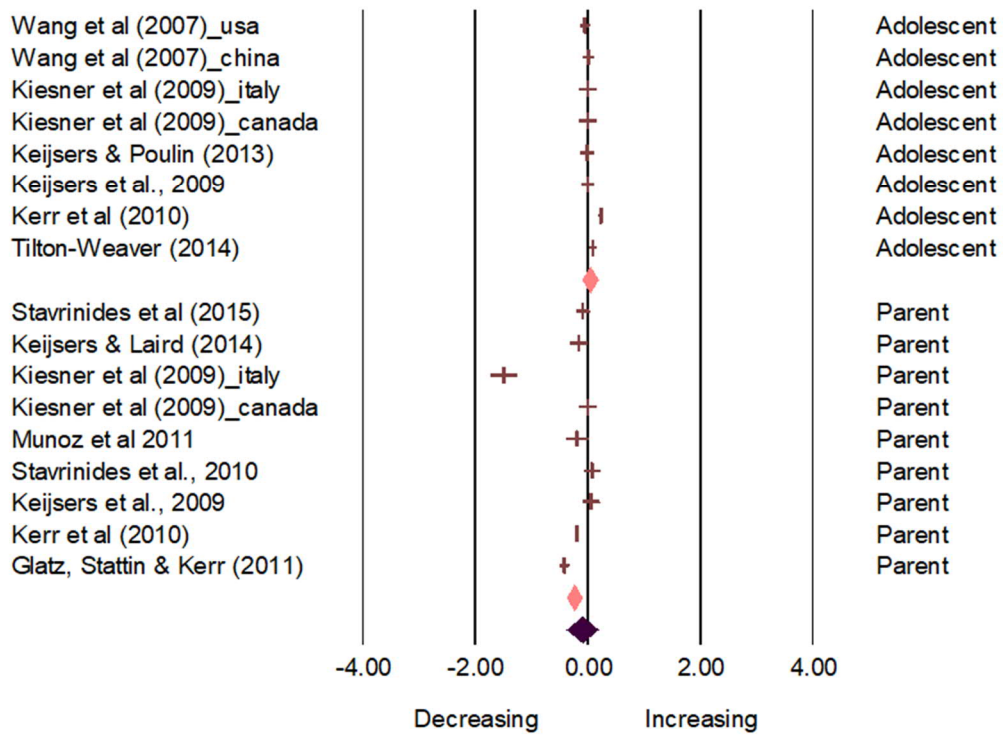
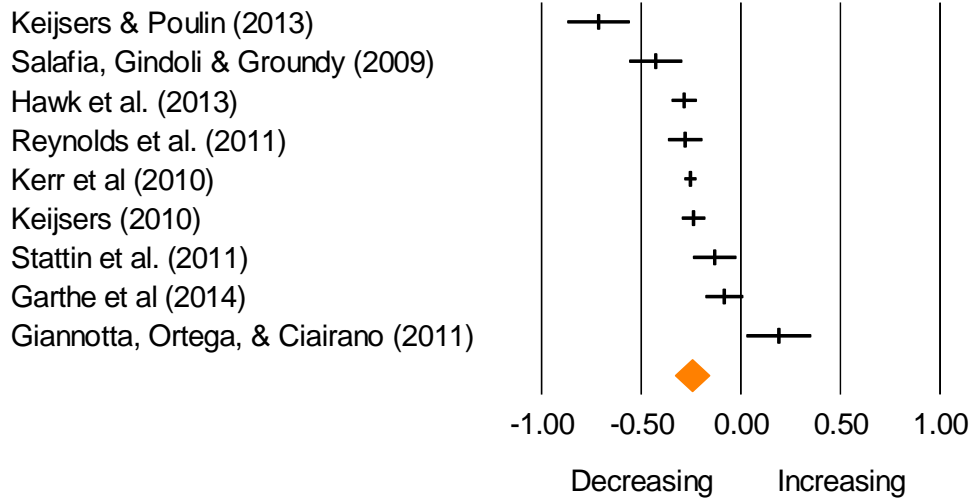


Figure 3. Effect size distribution of parental solicitation with informants (adolescent vs parent) as a moderator.

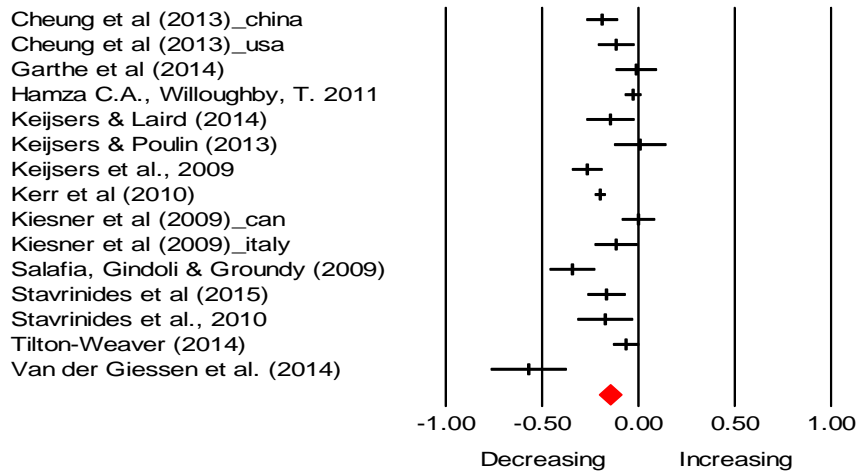
Study name



Random effect model

Figure 4. Effect size distribution of parental knowledge

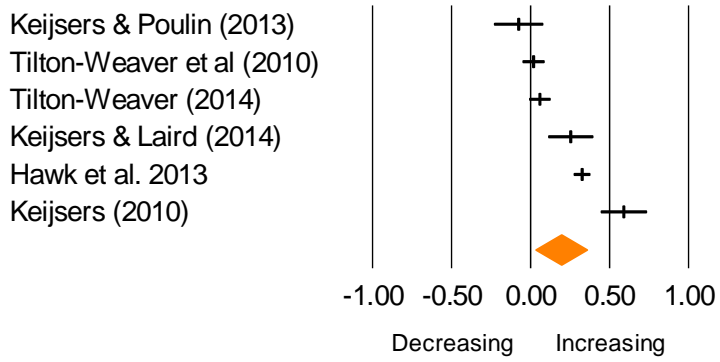
Study name



Random effect model

Figure 5. Effect size distribution of adolescent disclosure

Study name



Random effect model

Figure 6. Effect size distribution of adolescent secrecy