



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 patterns. The current meta-analytic study aims at identifying normative developmental changes in parent-adolescent communication, as conceptualized within the parental monitoring framework, as entailing parental solicitation, control and knowledge, and adolescent's disclosure and secrecy. 31 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 (≤ 2 years, $d = -0.139$ vs. duration > 2 years, $d = -0.581$). Implications for programs aimed at promoting positive parent-adolescent communication, as well as new directions of future research, are discussed.

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

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

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30 At the threshold of the new millennium, these conceptual formulations were challenged by
31 the empirical studies of Stattin and Kerr (Kerr & Stattin, 2000; Stattin & Kerr, 2000). Thanks to their
32 seminal contribution, the focus of research on monitoring switched from parental monitoring
33 behaviors only, to the inclusion of adolescents' behavior as well, and from measuring parental
34 knowledge to including measures of the *process* through which parents come to know about their
35 children (i.e. the willingness of children themselves to disclose to their parents vs. gaining
36 information from soliciting or controlling information by parents). Specifically, the focus and thinking
37 about parental monitoring in developmental and clinical studies gradually shifted from an
38 unidirectional active role of parents in promoting well-being towards a more transactional and
39 dynamic view where adolescent's agency is a core component of the monitoring process (Keijsers,
40 2016; Meeus, 2016; Racz & McMahon, 2011; Smetana, 2008).

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53 In line with the assumption that parental knowledge is the product of a bidirectional process
54 taking place in the parent-adolescent dyad, there has been an increased attention on realignment of
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3 communication patterns with age (Branje, Finkenauer, & Meeus, 2008; Branje, Laursen, & Collins,
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5 2013; Smetana, 2008). Specifically, it has been suggested that developmental changes in
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7 communication patterns allows adolescents to develop towards an increased autonomy and
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9 independence, while remaining connected to their parents (Keijsers & Poulin, 2013; Van der Giessen
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11 et al., 2014). The main aim of the current meta-analytic study is to contribute to the empirical
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13 identification of normative developmental changes in the parent-adolescent relationship and, more
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15 specifically, the developmental changes in the communication processes related to monitoring. To
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17 describe these patterns is the key-objective of this meta-analysis. From an applied perspective,
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19 moreover, identifying these normative trends may provide some valuable input for parenting
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21 programs focused on the promotion of the parent-adolescent communication regarding leisure
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23 activities.
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25 26 27 28 ***Parental monitoring: A conceptual definition*** 29

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

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

30 31 32 33 34 ***Parental monitoring: A developmental perspective***

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36 Adolescence is a period of pronounced changes in the physical, social, and emotional domain (Lerner
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38 & Steinberg, 2009), and with these changes also patterns of communications are expected to
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40 change. Quite frequently, parents struggle with the questions regarding the normative patterns,
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42 such as what are age-appropriate levels of parental control, and is it age-normative for adolescents
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44 and young adults to keep secrets? This meta-analysis aims to provide some insights into normative
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46 patterns of change, by summarizing the existing empirical studies that may provide an answer to this
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48 question.

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51 Over the course of adolescence, the parent-child relationship has to be realigned in order to
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53 adjust to the increasing privacy and autonomy needs of adolescents (Collins, 1990; Collins & Laursen,
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55 2004; Petronio, 2002). These developmental forces not only affect the hierarchical distribution of
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3 power in the relationships, but also likely affect the monitoring and communication processes within
4 families (Branje et al., 2013; Smetana & Asquith, 1994). Due to adolescents' increasing tendencies to
5 spend time outside the parents' home (Larson & Richards, 1991), parents can decreasingly rely on
6 direct supervision (Dishion & McMahon, 1998), and need to rely on adolescent disclosure as a
7 source of knowledge (Stattin & Kerr, 2000). However, with adolescents' increased privacy needs
8 compared to children, adolescents may be less tempted to freely disclose and may in fact be more
9 tempted to keep secrets from their parents (Petronio, 2002). Furthermore, in light of adolescents'
10 increasing desire for autonomy, the legitimacy of parents' attempts to control the lives of
11 adolescents may decrease (Smetana, 1989; Smetana & Asquith, 1994). As such, we expected to find
12 that parental monitoring efforts and adolescent willingness to share information both decline over
13 the course of adolescence; resulting in a decrease in parental knowledge. Although some
14 longitudinal studies have tested these changes (Keijsers & Poulin, 2013; Masche, 2010), a meta-
15 analysis of the empirical findings from longitudinal studies regarding these changes is currently
16 lacking.

34 ***What moderates parent-child communication?***

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36 Apart from studying normative (or average) developmental changes, we were also interested in
37 examining heterogeneity, thereby focusing on two theoretical predictors, gender and country of
38 origin, and on three important elements of the study design, which are informant, age at
39 assessment, and duration of the longitudinal study. However, due to the limited number of
40 longitudinal studies conducted in non-Western Countries, and to the limited number of studies
41 reporting information on gender differences (see Table 1), we introduce gender and country of
42 origin as moderators only at a descriptive level and we statistically test as moderators informant, age
43 at assessment and duration of the study.

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45 ***Theoretical predictors.*** Though only a few studies reported relevant information for testing
46 the role of *gender* at a meta-analytic level, there are strong evidences suggesting that the normative

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3 changes in parent-adolescent communication may very well vary between boys and girls. Empirical
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5 studies showed that girls often report more parental knowledge, adolescent disclosure, parental
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7 solicitation and parental control than boys do (Crouter & Head, 2002; Hamza & Willoughby, 2011;
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9 Kerr & Stattin, 2000; Stattin & Kerr, 2000), yet whether this also results in distinct developmental
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11 changes is unclear, as heterogeneity between empirical result may occur. For instance, even though
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13 one study found that the increase of secrecy throughout adolescence was faster for boys than for
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15 girls (Keijsers et al., 2010), another study found stable levels of secrecy for boys over the course of
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17 adolescence (Keijsers & Poulin, 2013).
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20 Because norms and expectations in terms of parent-adolescent communication rules and
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22 habits could vary across cultures, the moderating role of the *country of origin* should be considered.
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24 For example, the parent-child relationship quality and degree of communication may be different
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26 between in Asian cultures, where the family is considered central (Son & Choi, 2013), compared to
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28 Western countries. As such, it may be that parental control is not necessarily related to violation of
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30 children's sense of self as it might be in a European-American setting (Wang, Pomerantz, & Chen,
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32 2007). At the same time, some of the underlying processes may overlap. For instance, in a study
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34 involving Chinese and American adolescents (Qin & Pomerantz, 2013), the relation between youth's
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36 sense of responsibility and disclosure to parents were found in both cultures, despite cultural
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38 differences in the levels of independence from parents. Moreover, comparing the same cultural
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40 backgrounds, in another study (Wang et al., 2007) parental control predicted adolescents' enhanced
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42 academic functioning regardless of the cultural context.
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45 **Methodological predictors.** Whenever parent-child communication is studied, the eye of the
46
47 beholder, i.e. the *informant*, may be a crucial factor. Interestingly, previous studies have shown how
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49 parents and adolescents often disagree when it comes to parental monitoring (De Los Reyes,
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51 Goodman, Kliewer, & Reid-Quinones, 2010; Keijsers et al., 2010). These informant discrepancies
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53 should be acknowledged, since their presence makes it difficult to interpret the findings of many
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3 studies and to compare their results (De Los Reyes, Henry, Tolan, & Wakschlag, 2009; De Los Reyes
4 & Kazdin, 2009; Han et al., 2012; Pasch, Stigler, Perry, & Komro, 2010)

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7 The study designs also vary in terms of the time window under examination, which is the
8
9 *duration of the study*. The age of the first assessment in studies assessing monitoring longitudinally,
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11 for instance, ranges from middle-childhood (Glatz, Stattin, & Kerr, 2011; Keijsers, Loeber, Branje, &
12 Meeus, 2012) to late adolescence (Keijsers, Branje, et al., 2012; Van der Giessen et al., 2014).
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14 Moreover, whereas some studies only last 6 months (Stavrinides, Nikiforou, & Georgiou, 2015)
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16 others follow children up to 7 years (Keijsers & Poulin, 2013). We have therefore examined whether
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18 developmental changes are more likely to take place at specific ages or as a result of the duration of
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20 the study.
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25 **The current study**

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

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3 In order to conduct a structured review, we followed the PRISMA guidelines for systematic reviews
4 and meta-analyses (Moher, Liberati, Tetzlaff, Altman, & Group, 2009) as summarized in the flow-
5 chart reported in Figure 1.
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8 9 **Identification**

10 We identified potential relevant articles by searching in the SCOPUS, Web of Science and PsychInfo
11 scientific databases. The search was conducted in 2015, April 21st. First, we set the following
12 inclusion criteria: (1) the articles should cite Stattin and Kerr (2000) and/or Kerr and Stattin (2000)
13 papers as an indication that the relevant scales were assessed, and (2) they should contain in either
14 the title, abstract, or keywords at least one of the following keywords: disclos*; information manag*;
15 manag* of information; secre* or conceal*; parent* monitor* or parent* knowledge or parent*
16 monitor* knowledge; parent* solicitat* or parent* control* or parent* monitor* rule*or parent*
17 rule*. Citing Stattin and Kerr (2000), 347 papers in Psycinfo, 344 in Web of Science, and 329 in
18 Scopus were identified, whereas citing Kerr and Stattin (2000) we found 251 papers in PsychInfo,
19 291 in Web of Science, and 308 in Scopus.
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32 As a second identification step, we delimited the selection of papers to (1) empirical research
33 articles (in Scopus and Web of Science, we included "article" as a criterion, in PsycInfo we selected
34 only "peer-reviewed journals"), and (2) articles written in English. Citing Stattin and Kerr (2000), 322
35 papers were identified in PsychInfo, 323 in Web of Science, and 316 in Scopus, whereas citing Kerr
36 and Stattin (2000) we identified 157 papers in PsychInfo, 270 in Web of Science, and 263 in Scopus.
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43 Finally, we selected the ten journals in which authors had most often cited the articles of
44 Stattin and Kerr (2000) and Kerr & Stattin (2000). We manually screened the online platform of
45 these journals for identifying online papers that potentially could have met our search criteria but
46 that were not yet included in the scientific databases. No additional articles were identified.
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51 At the end of the identification phase, 1653 records were identified through these database
52 searches. Screening and evaluation of the eligibility of papers are summarized in Figure 1.
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11 **Screening**

12 All records were imported into Endnote Web. The duplicates were removed, first automatically -
13 leading to 882 articles - and then manually- leading to 468 ones. The selection phase based on
14 reading the title, keywords and abstract was done in accordance with the following hierarchical
15 criteria: (1) longitudinal studies (i.e., two or more repeated assessments); (2) adolescent sample (i.e.,
16 age range of participants ranging from 12 to 25 at the first wave of data collection); (3) community
17 samples (e.g., adolescents with special needs, such as HIV or diabetes were excluded); and (4)
18 empirical research article. The screening was done twice and in parallel by the golden standard rater,
19 Associate Professor and expert in the parental monitoring field (LK), and by a group of young
20 scholars (i.e. doctoral or post-doc level, FL, BEP, MC, OK, MR, AD). The inter-rater agreement
21 between the golden standard rater and the group, computed on the acceptance/rejection criterion,
22 was acceptable (Cohen's $K = 0.86 [0.81 - 0.91]$). Two post-doctoral researchers (FL and BEP) and the
23 golden rater (LK) recoded again independently all the articles for which an agreement was not
24 reached during the first screening phase. The inter-rater agreement at this point was 100%. This
25 resulted in 196 records selected for the eligibility phase.
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45 **Eligibility**

46 The full-text versions of these 196 articles were downloaded and again rated independently both by
47 the golden standard rater and the group of young scholars. Entire papers were screened on the
48 bases of the following three hierarchical criteria: (1) measures directly derived from Stattin and Kerr
49 (2000); (2) dataset based on community samples and sample age range between 12 to 25 years old;
50 (3) longitudinal data collection of the measures of interest. The inter-rater agreement was again high
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3 (Cohen's $K = .94$ [0.89 - 0.99]). Disagreements were discussed to reach a 100% agreement; 33 articles
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5 remained after this phase and are all reported in Table 1. Authors have been contacted up to three
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7 times to ask for missing information if the paper did not report values necessary for estimating
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9 developmental changes. All contacted authors but two provided data requested. Overall, 31 papers
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11 were eligible after this phase. Because some studies were (partially) based on the same longitudinal
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13 dataset, we included the studies based on the largest sample size and time span, and those which
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15 provided the more detailed information for estimating mean effect size and moderation effects in
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17 our meta-analysis (in Table 1 these articles are marked with an asterisk).
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26 **Coding**

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28 All eligible studies were coded following these criteria: availability of data for subgroups (e.g.
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30 gender, country), informant (i.e. parents or adolescents), adolescent's age at the first assessment (<
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32 14 years, ≥ 14 years), and duration of the study (i.e., time elapsed between the first and the last
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34 wave of data collection; < 2 years, ≥ 2 years). The variables country and gender were initially coded
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36 but then not taken into account for the subsequent moderation analyses due to the insufficient
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38 variability (country) and to the limited information available from published studies (gender).
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41 In the 31 papers considered for the analyses (Table 1), adolescent's mean age at the first
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43 assessment ranged from 11 (Glatz et al., 2011) to 16 years old (Van der Giessen et al., 2014).
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45 Because the duration of the study ranged between 0.25 and 7 years (see Table 1) the actual age
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47 range of adolescents in this study ranged from 11 to 20 years. All studies feature Western samples,
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49 with the exception of a contribution including Chinese adolescents (Cheung, Pomerantz, & Dong,
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51 2013).
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55 **Strategy of analysis**

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3 To summarize the developmental change in parent-adolescent communication (i.e., parental
4 knowledge, parental solicitation, parental control, adolescent disclosure, and adolescent secrecy)
5 over these 31 studies, we used meta-analysis. The effect size metric was standardized differences in
6 means (Cohen's d)¹ based on means, and standard deviations of the first and last wave of data
7 collected, as well as the estimates of the correlation between these measurement waves. For each
8 effect size estimate we computed the 95% confidence interval (CI). We used the Comprehensive
9 Meta-Analysis (CMA, version 2.2) program for this purpose (Borenstein, Rothstein, & Cohen, 2005).
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11 In order to respect the independency assumption across studies, in each study effect sizes from
12 different informants (i.e. parent and adolescent) were combined in a single effect size when the
13 informant variable was not tested as moderator.
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24 In terms of the analytical model, we used the random effects model, which gives the same
25 results as a fixed-model when applied to homogeneous studies (Cummings, 2012), but has additional
26 strengths. Specifically, the random effects model assumes that the different studies estimate
27 somewhat different values of the population parameter, thus allowing for greater generalizability to
28 other studies not included in this meta-analysis. When outliers (effects which differed substantially
29 from the other) were detected in the effect sizes distribution, a sensitivity analysis was conducted
30 which consisted of omitting the outlier to check whether the results differed substantially
31 (Borenstein, Hedges, Higgins Rothstein, 2009).
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41 We tested the distribution of the effect sizes with a homogeneity statistic, Cochran's Q.
42 When this statistic is significant, it indicates that the dispersion of the effect sizes is unlikely to be
43 due to sampling error. We conducted moderation analyses to account for the variability across
44 studies, by including informant (parents vs. adolescents), age at first assessment (< 14 years, ≥ 14
45 years), and duration of the study (< 2 years, ≥ 2 years) in the model. The limited variability did not
46 allow to statistically test the role of country. Similarly, because only a few studies reported the
47 association between the variables of interest and gender, it was not possible to test whether gender
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56 ¹ $d = \text{pre - posttest} \div (S_{\text{diff}} \div \sqrt{2(1 - r)})$
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3 influenced the mean level change. Categorical moderator analysis is akin to the analysis of variance
4 (ANOVA), with a within group variance, Q_w , and a between groups variance, Q_b . A significant Q_w
5 indicates that there is a heterogeneity within that group, while a significant Q_b indicates that the
6 effect sizes between compared groups are different (cfr Borenstein, Hedges, Higgins Rothstein,
7 2009).

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

12 13 14 15 16 17 18 19 20 21 22 **Results**

23 ***Parental control***

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25 Seventeen longitudinal studies examined developmental changes in parental control, which resulted
26 in effect sizes d ranging from -1.787 to .342 (Figure 2). Summarizing these effect sizes, there was a
27 small to medium decrease over time ($d = -.395$, 95% CI[.541, -.249]) (17 studies, total $N = 12,897$). The
28 fail-safe N was 5823, which exceeds Rosenthal (1979) threshold level of five times the number of
29 studies in the meta-analysis plus 10. We conducted a sensitivity analysis which consisted of
30 excluding outlier effect sizes of two studies, which incidentally had the longest duration (Keijsers &
31 Poulin, 2013; Van der Giessen et al., 2014). When the two outlier studies were removed, the
32 decrease in parental control remained statistically significant though the effect size was reduced ($d =$
33 $-.249$, 95% CI[-.387, -.111], 15 studies, total $n = 12,485$).

34
35 The homogeneity test indicated significant heterogeneity across the set of effect sizes (Q
36 (16) = 1040.079, $p < .001$). Subsequent moderation analyses revealed that the decrease reported by
37 adolescents and parents was comparable in effect size ($d = -0.414$, 95% CI [0.604, -0.225], 11 studies,
38 total $n = 8,808$ and $d = -0.365$, 95% CI, -0.568, -0.163, 10 studies, total $n = 3,384$, respectively; Q (1)
39 = 0.120, $p = .730$). Moreover, the decline was found independent of the age of the adolescent at the
40 first assessment: 14 years old or younger ($d = -.495$, 95% CI[-.721, -.270]) (8 studies, total $n = 6172$, vs
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3 older than 14 ($d = -.308$, 95% CI $[-.524, -.091]$, 9 studies, total $n = 6425$), $Q(1) = 1.379$, $p = .240$).

4 Results remained stable when the two outliers were removed. However, studies with longer
5 duration were able to detect stronger developmental declines in parental control (≤ 2 years, $d = -$
6 0.139 , 95% CI: $[-.374, .096]$) (7 studies, total $n = 3993$) versus duration > 2 years ($d = -0.581$, 95% CI: $-$
7 $.779, -.382$) (10 studies, total $n = 8199$), $Q(1) = 7.890$, $p = .005$.
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17 18 19 **Parental solicitation**

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21 Thirteen studies were identified that longitudinally assessed parental solicitation, indicating different
22 developmental changes ($d = -0.440$ to 0.089) (Figure 3). Summarizing the results, there was a small
23 decrease over time ($d = -0.082$, 95% CI $[-.163, -.000]$) (13 studies, total $N = 6659$). However, the fail-
24 safe N is 57; and therefore this finding fails to reach the Rosenthal (1979) of fail-safe $N > 5k + 10$.
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30 The homogeneity test indicated significant heterogeneity between studies ($Q(12) = 131.251$,
31 $p < .001$). Whereas parents reported a decrease in solicitation ($d = -0.242$, 95% CI $[-0.376, -0.109]$), 9
32 studies, $n = 2836$) adolescents did not observe developmental change ($d = 0.038$, 95% CI $[-0.099,$
33 $0.175]$, 8 studies, total $n = 3523$), a difference that was statistically significant ($Q(1) = 8.223$, $p =$
34 $.004$). The decrease was not moderated by age at assessment (respectively $d = -0.062$, 95% CI $[-0.158,$
35 $0.034]$, 9 studies, $n = 5801$ for adolescents 14 years old or younger, and $d = -0.134$, 95% CI $[-.289,$
36 $0.020]$, 4 studies, $n = 858$ for older ones; $Q(1) = .612$, $p = .434$), nor by the duration of the study
37 (respectively $d = -0.099$, 95% CI $[-0.210, 0.012]$, 8 studies, $n = 2175$ for a time interval ≤ 2 years, and
38 $d = -0.059$, 95% CI $[-.191, 0.073]$, 5 studies, $n = 4484$ for a time interval > 2 years; $Q(1) = .208$, $p =$
39 $.648$).
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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% 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 4 studies per group (Fu et al., 2011). Whether the adolescent ($d = -0.259$, 95% CI [-0.383, -0.134], 6 studies, total $n = 2078$) or parents reported on knowledge ($d = -0.303$, 95% CI [-0.425, -0.182], 6 studies, total $n = 3113$ respectively) resulted in similar developmental ($Q(1) = 0.257$, $p = .612$). 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 disclosure ($d = -0.173$, 95% CI [-0.270, -0.076], 7 studies, total $n = 2310$) did not

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3 explain the heterogeneity ($Q(1) = 0.113, p = .737$). Neither did comparing adolescent first
4 assessment at ≤ 14 years ($d = -0.166, 95\% \text{ CI}: [-.232, -.100]$) (9 studies, total $n = 5269$) vs >14 years ($d = -$
5 $0.132, 95\% \text{ CI}[-.225, -.039]$, 5 studies, total $n = 3819$) explain the heterogeneity in the effect sizes (Q
6 $(1) = 0.354, p = .552$). Finally, comparing adolescent disclosure assessments interval ≤ 2 years, ($d = -$
7 $0.098, 95\% \text{ CI}[-.191, -.005]$, 6 studies, total $n = 1616$) vs more than 2 years ($d = -0.178, 95\% \text{ CI}[-.252, -$
8 $.104]$, 9 studies, total $n = 7791$), resulted in a similar effect size for the developmental decline in
9 disclosure ($Q(1) = 1.732, p = .188$).

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21 22 23 24 **Adolescent secrecy**

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26 In the 6 studies on secrecy, the developmental change in secrecy ranged from $d = -0.076$ to $d = 0.591$
27 (Figure 6). Summarizing these results, we found a statistically significant small to medium increase
28 over time ($d = .194, 95\% \text{ CI} [.031, .356]$, 6 studies, total $N = 4,368$). The fail-safe number is 160. With 6
29 studies included in this meta-analysis, this exceeds Rosenthal (1979) threshold of 40 ($N > 5k + 10$).
30 Even though the homogeneity test indicated that there was statistically significant heterogeneity
31 across the studies in terms of the effect sizes: $Q(8) = 131.047, p < .001$ this analysis did not meet the
32 criterion of at least 4 studies for each category to be compared. Therefore moderation analyses
33 could not be conducted.

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46 47 48 49 **Discussion**

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51 As adolescents grow up, one of the important developmental tasks is to individuate themselves and
52 becoming more autonomous from parents. As such, they increasingly spend their leisure time out-
53 side, in activities which are not supervised by parents, and of which often parents are unaware of (R.
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3 W. Larson, Richards, Moneta, Holmbeck, & Duckett, 1996; Stattin & Kerr, 2000). At the same time,
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5 parents are faced with the challenging task of monitoring these activities, while at the same time
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7 facilitating and supporting their children's needs of reaching an increased autonomy, and
8
9 maintaining connectedness. In order to realign their relationship, both the parent and the
10
11 adolescent thus have to renegotiate the communication processes that involve expecting and
12
13 sharing information regarding leisure time activities (Branje, Laursen, & Collins, 2012; Keijsers &
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15 Poulin, 2013).

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17 We used a meta-analytic approach to describe the normative developmental changes and
18
19 summarize the empirical literature on developmental changes in parent-adolescent communication
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21 regarding leisure activities in community samples. Specifically, we included in the analysis all
22
23 longitudinal studies published between 2000 and 2015 on adolescent's disclosure and secrecy,
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25 control, knowledge and solicitation, in community samples. This resulted in the inclusion of 31
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27 studies, on which mean developmental changes and moderations effects were estimated.
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32 ***Developmental changes in parent-child communication***

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34 In line with our expectations, and with the assumption that children experience an increased need of
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36 independence and of individuation when moving from middle childhood to adolescence, results
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38 showed a normative decline in adolescence disclosure, parental control, knowledge and solicitation,
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40 and an increase in the degree of adolescent's secrecy. The most pronounced developmental changes
41
42 were found for parental control ($d = -.395$), followed by parental knowledge ($d = -.245$) and
43
44 solicitation (based on parents' reports, $d = -0.242$) and adolescent secrecy ($d = .194$) and disclosure
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46 ($d = -.147$).
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49 These results suggest that parents seem to acknowledge early adolescent needs of privacy
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51 particularly by decreasing efforts of controlling access to information regarding leisure time (i.e.,
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53 demanding that adolescent tell them where they go, with whom, etc), and fit nicely with studies that
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55 apply a social domain perspectives on parent-child relationships, which indicate that parents
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3 themselves consider that parental authority becomes less legitimate (Smetana, Crean, & Campione-
4 Barr, 2005). Interestingly, whereas parents reported a decrease in solicitation ($d = -0.242$) no such
5 developmental change was observed in adolescents' reports ($d = 0.038$), a significant moderation
6 effect in our meta-analytic study. Adolescents and parents seem to see the same world through
7 different lenses. One potential explanation can be found in the impact that solicitation has. As the
8 legitimacy of parental involvement in personal and multifaceted domains decreases during
9 adolescence (Smetana et al., 2005), the potentially negative impact of parents asking questions may
10 increase, for instance, if parental attempts to be involved are perceived as a violation of adolescents'
11 privacy (Hawk, Hale, Raaijmakers, & Meeus, 2008). To consider this mismatch in the parent and in
12 the adolescent perspective, currently supported with a meta-analytic finding, may have important
13 implications for parenting programs and adolescents' intervention programs aimed at promoting a
14 positive communication between the two.
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28 At the same time, adolescent themselves are not passive recipients of parenting, but
29 through managing the information their parents get (Keijsers & Laird, 2010; Marshall, Tilton-Weaver,
30 & Bosdet, 2005), they may play an active role in shaping and changing the communication process.
31 Indeed, whereas adolescents decreased their disclosure, their secrecy increased over the course of
32 adolescence. There are several potential explanations of these findings. One group of explanations
33 suggests that adolescents may strategically use information management, such as lying, disclosing
34 only partial truths, or keeping secrets in order to establish their autonomous self (Finkenauer, Frijns,
35 Engels, & Kerkhof, 2005; Keijsers et al., 2010) to assert power or manipulate parents (Kerr, Stattin,
36 Biesecker, & Ferrer-Wreder, 2003), or avoid disapproval (Marshall et al., 2005). At the same time, as
37 children grow up an increasing amount of aspects of their lives become private or personal, and
38 rather than being an active strategy, disclosure may also decline because there is no longer an
39 obligation to disclosure such information to parents (Smetana et al., 2006) or because the
40 opportunities to talk decrease. Finally, changes in parental monitoring efforts, specifically their
41 solicitation attempts, or changes in the relationship quality may affect adolescent's willingness to
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3 disclose and form a driving force behind these developmental changes in disclosure (Keijsers et al.,
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5 2016).

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7 Lastly, this meta-analytical study indicated a decline in parental knowledge ($d = -.245$). One
8
9 likely explanation, is that this decline is the result of the developmental changes in adolescent
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11 disclosure and monitoring practices (Keijsers et al., 2016). This decline in parental knowledge may
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13 have important implications for child well-being, as it is only through being informed that parents
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15 can be the source of support and guidance that a developing adolescent needs. Parental knowledge
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17 has been frequently linked to adolescent delinquency and norm breaking in the monitoring
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19 literature. However, also when it comes to internalizing problems, and other mental health
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21 problems, parents are often not well-informed, and there is a concerning long delay between the
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23 first display of symptoms, and receiving actual treatment (Raven, Jörg, Visser, Oldehinkel, &
24
25 Schoevers, 2017). Future research is thus needed to understand what the driving forces are behind
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27 these developmental declines in parent-child communication, and how they may impact the health
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29 and well-being of adolescents.
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34 **Limitations and future directions**

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36 Even though this is, to the best of our knowledge, the first meta-analytical summary of the empirical
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38 literature on parent-child communication, it is not without limitations. First, it has to be
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40 acknowledged that overall the number of longitudinal studies included in the meta-analysis, and
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42 currently available in this field, is limited, and this may have downplayed the opportunity of
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44 detecting more significant moderating effects. Second, only a few papers explored the role of
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46 candidate moderating variables (e.g. gender and country), preventing a more extended analysis of
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48 other potentially relevant variables beside demographic ones. Beside sociodemographic variables,
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50 the research in this field has not yet extended the focus of the analysis on other relevant moderating
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52 variables, for instance, pertaining to personality and temperamental differences in children and
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54 parents (Pluess et al., 2017) which could partially moderate the impact that each member of the
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3 dyad has on the other. These moderating mechanisms, extensively explored in parent-infant
4 interaction studies (Slagt, Dubas, Dekovic, & van Aken, 2016), have still to be integrated in the
5 parental monitoring framework.
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9 Notwithstanding these limitations, our meta-analysis adds to the existing literature on
10 developmental changes in parent – child relationships in three ways. First, our results provide
11 further support to the hypothesized decline in the flow of the parent-child communication as a
12 normative and developmental process. This decline, consistently reported across all scales, support
13 the idea that knowledge, solicitation and control, and secrecy and disclosure, reflect a broader and
14 cohesive parent-child communication process. At the same time, the most pronounced changes
15 were a developmental decline in parental control and parental knowledge and a developmental
16 increase in adolescent secrecy. Second, the current meta-analysis suggests that parental and
17 adolescent perception of developmental changes in communication processes may differ from each
18 other, with parents reporting a decrease in their level of solicitation, which adolescents do not
19 perceive. This suggests that differences in the parent and adolescent perception is a normative
20 developmental aspect and should be considered by practitioners and clinicians working for the
21 improvement of the parent-child communication quality. Third, the high heterogeneity in study
22 results emerged at a meta-analytical level clearly call for a more in depth exploration of putative
23 moderation mechanisms, yet to be identified, able to better explain individual differences in
24 developmental changes in parent-child communication regarding adolescent leisure activities.
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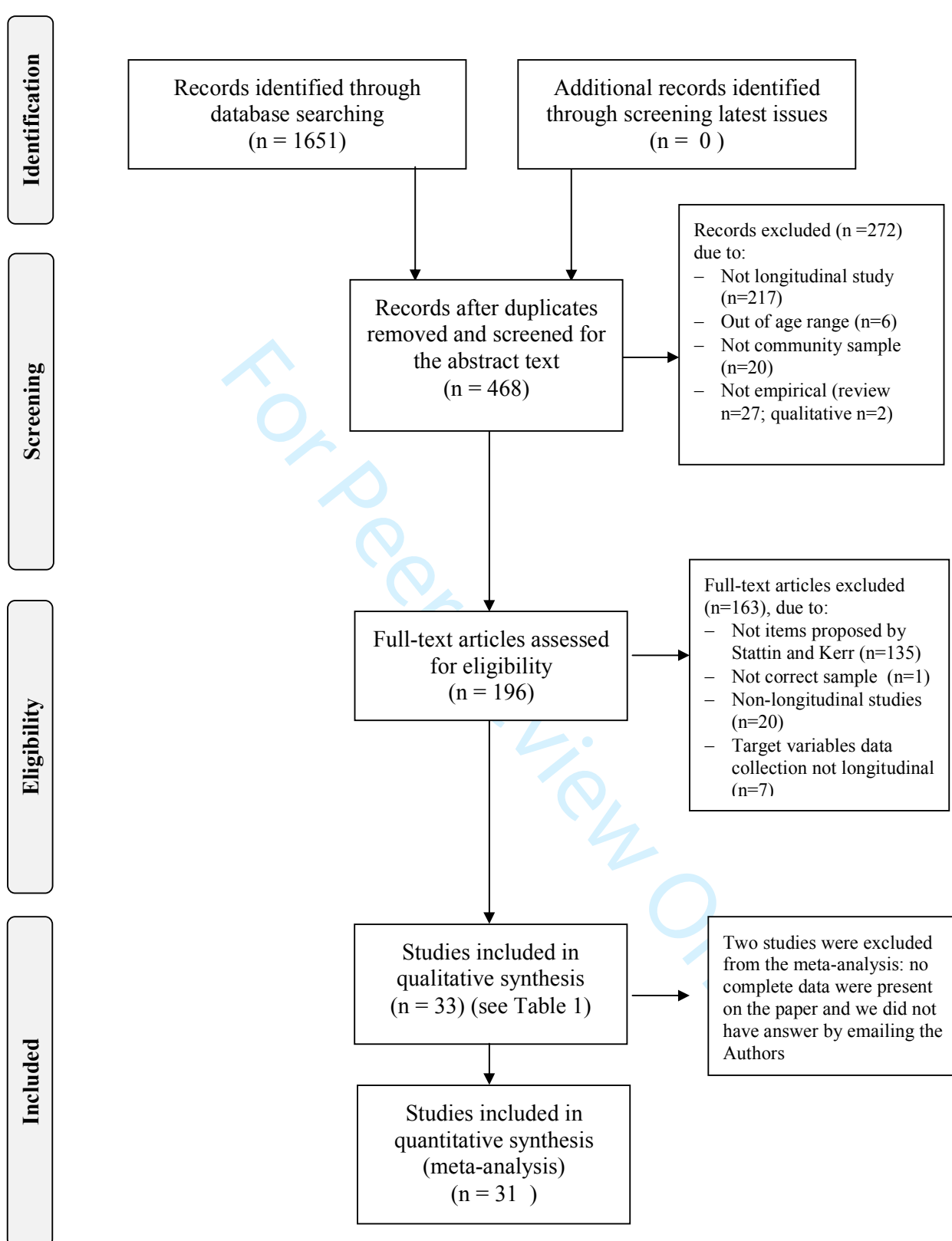
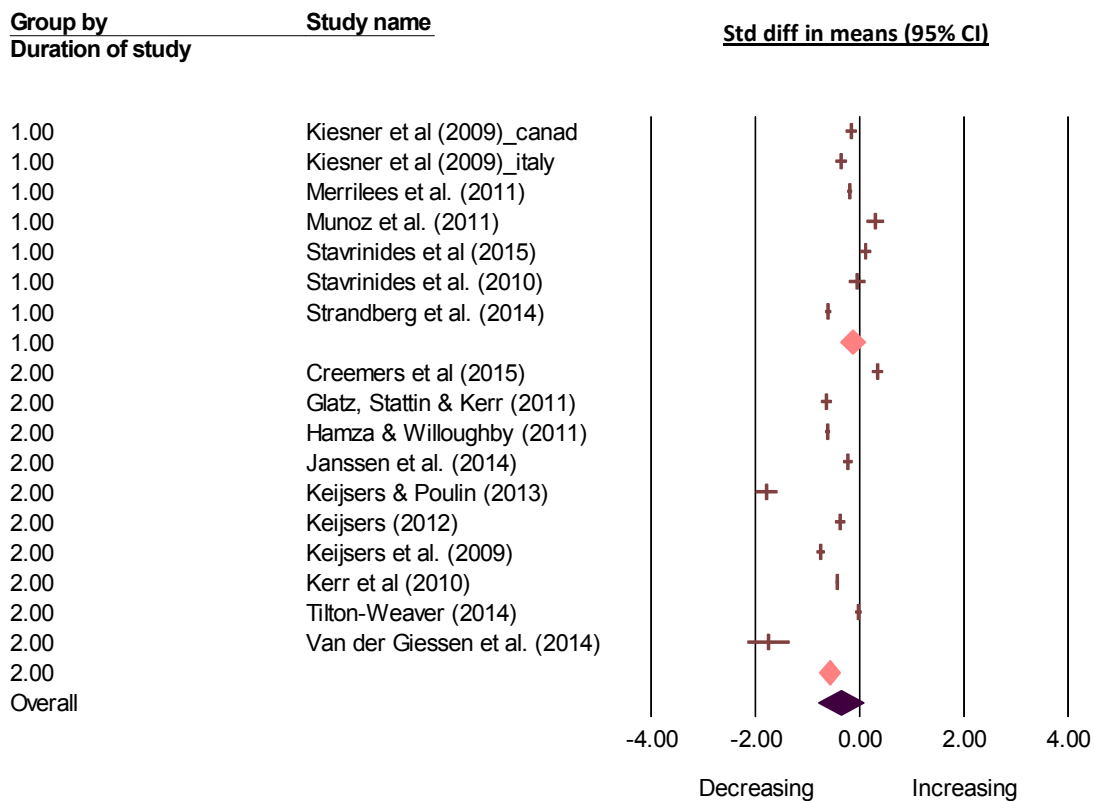


Figure 1: Flow-chart of studies identification, screening, eligibility and inclusion



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

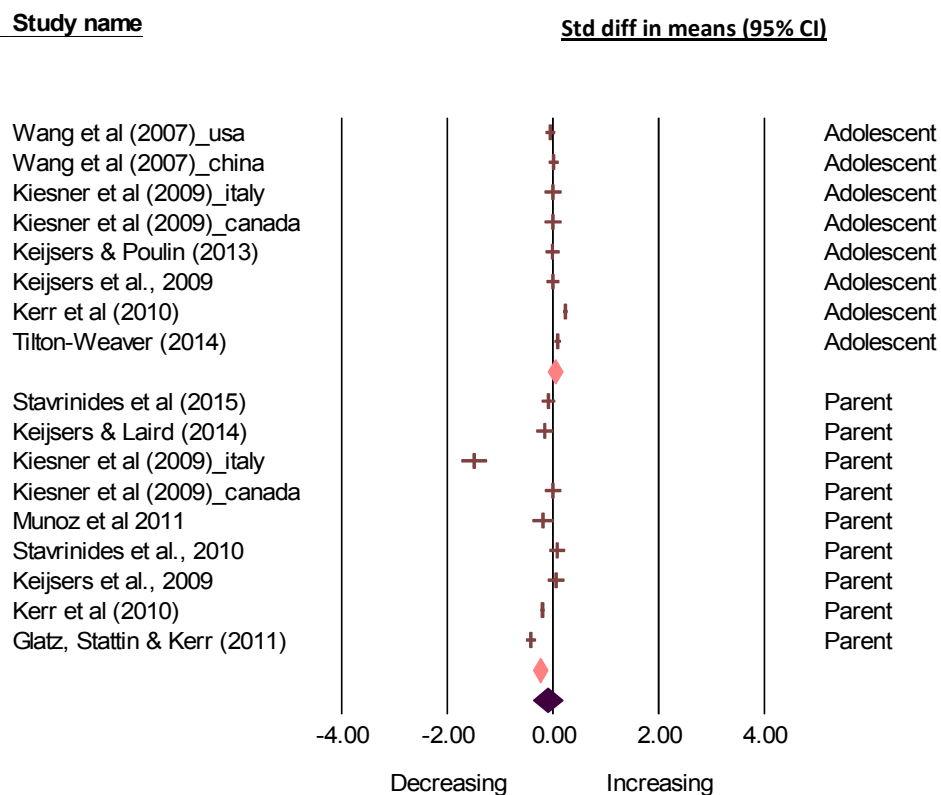
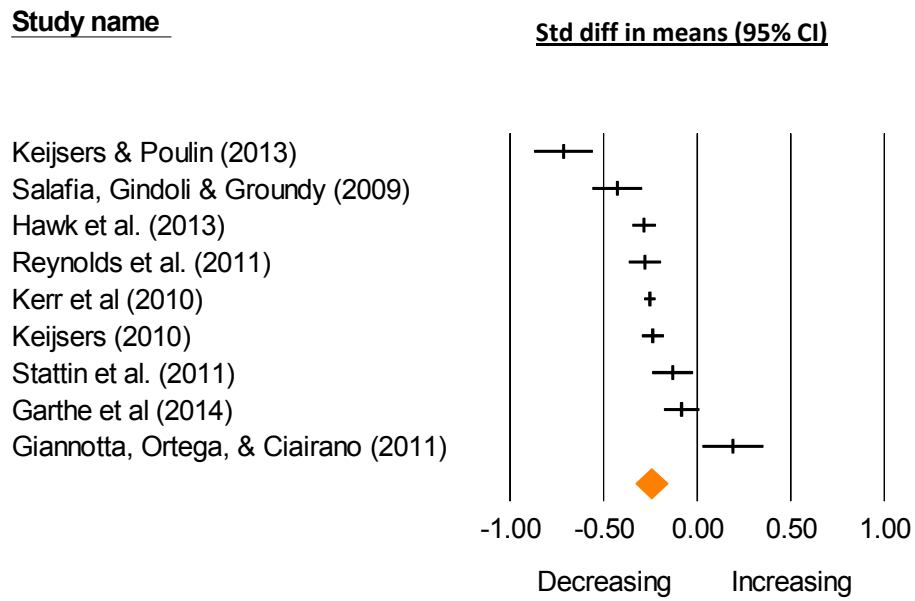


Figure 3. Effect size distribution of parental solicitation with informants (adolescent vs parent) as a moderator.



Random effect model

Figure 4. Effect size distribution of parental knowledge

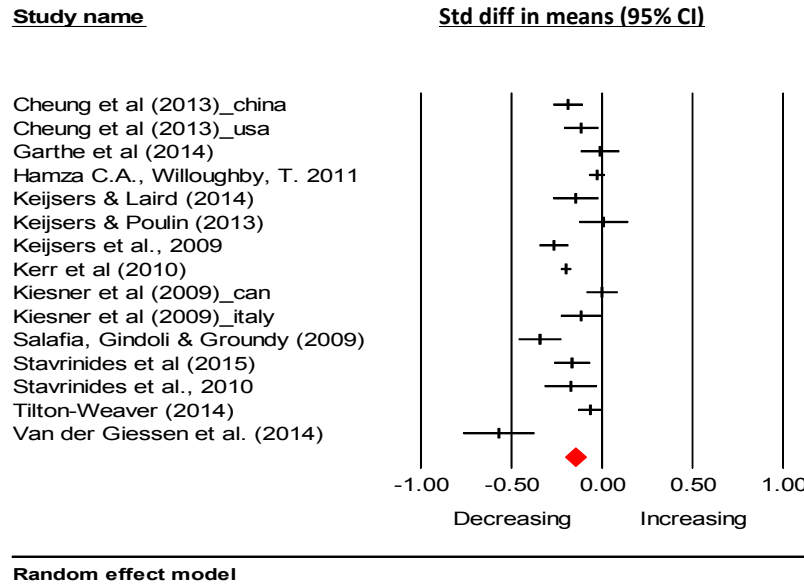


Figure 5. Effect size distribution of adolescent disclosure

PARENTAL MONITORING: A META-ANALYSIS

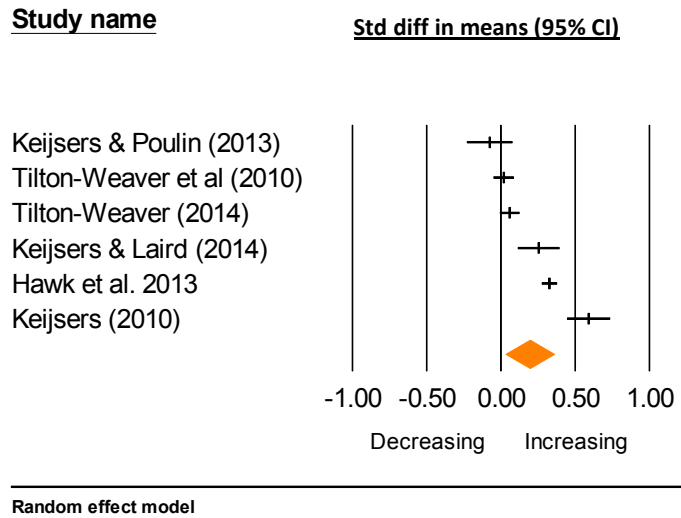


Figure 6. Effect size distribution of adolescent secrecy

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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.

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References	Name of the Study or Country	Overlapping Dataset	Measure	Subsample	Informant ¹	Time Span (in years)	Adolescents Mean Age (1st Assess.)
1 (Boislard P & Poulin, 2011)	Canada	(Kiesner, Dishion, Poulin, & Pastore, 2009) (Keijsers & Poulin, 2013)	Disclosure Parental Control	Urban Suburban	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	---	---
9 (Hawk et al., 2013)	The Netherlands - RADAR	---	Parental Knowledge Secrecy	n.a.	MA FA AM MA AF	2	13

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1									
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6	10	(Janssen, Dekovi , & Bruinsma, 2014)	SPAN	---	Parental Control	n.a.	AP	2	14.3
7									
8	11	(Keijsers & Laird, 2014)	USA	---	Disclosure Secrecy	n.a.	AM	1	12.4
9									
10					Parental Solicitation	n.a.	MA		
11									
12									
13				(Boislard P & Poulin, 2011)	Disclosure Parental Control				
14									
15	12	(Keijsers & Poulin, 2013) *	Canada	(Poulin & Denault, 2012)	Parental Knowledge	n.a.	AP	7	12.38
16									
17					Parental Solicitation				
18					Secrecy				
19									
20									
21				(Keijsers, Branje, VanderValk, & Meeus, 2010)	Disclosure	n.a.	MA		
22									
23					Parental Solicitation				
24					Parental Control			2	
25									
26	13	(Keijsers et al., 2009) *	The Netherlands - CONAMORE	(Keijsers, Branje, VanderValk, et al., 2010)	Parental Control	n.a.	FA		13.2
27									
28					Disclosure Parental Solicitation				
29									
30					Disclosure				
31									
32									
33				(Keijsers, Branje, VanderValk, et al., 2010)	Parental Solicitation	n.a.	AP	3	
34									
35				(Hawk et al., 2008)	Parental Control				
36	14	(Keijsers, Branje, Frijns, Finkenauer, & Meeus, 2010)	The Netherlands - CONAMORE	---	Secrecy	Male Female	AP	3	13.2
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PARENTAL MONITORING: A META-ANALYSIS

15	(Keijsers, Branje, VanderValk, et al., 2010)	The Netherlands - CONAMORE	(Keijsers et al., 2009)	Disclosure Parental Control Parental Solicitation	n.a.	MA FA AP	---	---
					Male Female	MA		
			---	Parental Knowledge	Male Female	FA	1	14.2
					Male Female	AP		
16	(Keijsers et al., 2012)	The Netherlands - RADAR	(Van der Giessen et al., 2014)	Parental Control	n.a.	MA FA	---	---
			---				2	13
17	(Kerr, Stattin, & Burk, 2010) *	Sweden	(Stattin, Persson, Burk, & Kerr, 2011)	Disclosure Parental Knowledge Parental Control Parental Solicitation	n.a.	PA	2	13.51
			(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 Canadian	AP PA AP PA	1	14.11 14.55
			(Boislard P & Poulin, 2011)	Disclosure Parental Control	Italian Canadian	AP PA		14.11 14.55

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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	
25	(Stattin et al., 2011)	Sweden	(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	n.a.	AP	2	13.72	

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				Secrecy					
30	(Tilton-Weaver et al., 2010)	Sweden	(Kerr et al., 2010)	Disclosure Parental Control	n.a.	AP	---	---	
			---	Secrecy			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;

¹PA=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*.