



Do Parenting Practices and Child Disclosure Predict Parental Knowledge? A Meta-Analysis

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Received: 31 March 2019 / Accepted: 17 October 2019
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Abstract

Parental knowledge of a child's whereabouts, activities, and relationships is one of the most salient factors protecting adolescents against delinquency and misconduct. It is important to understand which strategies are the most effective. Little is known about the relative strength of associations between different parental strategies and parental knowledge, as well as the potential moderating factors of these associations. Seeking to clarify the effectiveness of various strategies in providing parents with knowledge about their adolescent (ages 10–18) offspring's activities and relationships, this meta-analytic review of 32 studies showed that children's disclosure was significantly better than any parental strategy except for parental warmth, which, along with behavioral control, seems to set the stage for the effectiveness of children's disclosure. Consistent with previous findings, psychological control was found to be the strategy with the lowest effect size. Further moderation analyses suggested that behavioral control had a better effect in Eastern than in Western cultures. Longitudinal studies were infrequent and displayed significantly lower effect sizes than one-time (correlational) studies for parental solicitation and children's disclosure. Parental warmth was the best long-acting strategy. The effect of behavioral control was higher for mothers than fathers, suggesting that behavioral control was better executed by mothers. These findings enhance our understanding of primary sources of parental knowledge of adolescents' activities and relationships. Implications for future research and design of interventions are also discussed.

Keywords Parental knowledge · Strategies · Meta-analysis

Introduction

Parental knowledge is conceptualized as parents' information about their child's whereabouts, activities, and relationships outside the home (Crouter and Head 2002).

Parental knowledge seems to be the most salient protective factor against offsprings' engagement in misconduct (Stattin and Kerr 2000). A substantial body of research has shown that higher levels of parental knowledge are associated with less antisocial and delinquent behavior among adolescents (Bendezú et al. 2016; Laible et al. 2019), lower levels of substance use (Barnes et al. 2000), better academic performance (Blocklin et al. 2011), and lower levels of internalizing problems, such as depression (Kerr and Stattin 2000). Previous work has identified several pathways to obtain this critical information, but there is not a strong synthesizing lens identifying which pathway is most effective in providing parents with knowledge about their children. Also uncertain is whether factors such as age or culture routinely moderate associations between strategies and parental knowledge. Using meta-analytic techniques, the current study sought to identify factors most consistently associated with parental knowledge and possible moderators of these associations.

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Supplementary information The online version of this article (<https://doi.org/10.1007/s10964-019-01154-4>) contains supplementary material, which is available to authorized users.

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Strategies to Obtain Parental Knowledge

Parents often adopt different strategies to know more about their adolescent's whereabouts and leisure activities. Some of them are parent-driven (e.g., parental solicitation and parental control); others are child-driven (e.g., children's disclosure). Stattin and Kerr (2000) argued that investigators often confounded parent- and child-driven strategies by using faulty measures of the construct, parental monitoring. They argued for more precise measures to examine the effects of each type of strategy on parental knowledge. Since 2000, numerous investigators have heeded Stattin and Kerr's advice, amassing sufficient evidence to allow for this systematic review of studies that address one child-driven strategy—children's disclosure—and/or one or more parent-driven strategies: parental warmth, parental solicitation, behavioral control, and psychological control.

Children's disclosure, parental solicitation, and behavioral control are the original three strategies proposed by Stattin and Kerr (2000), although they referred to behavioral control as "parental control." Children's disclosure is defined as a child's voluntary sharing of information with their parents about their whereabouts, activities, and companions. Several studies suggest that the information disclosed by children to parents is the most significant contributor to parental knowledge (Garthe et al. 2015; Willoughby and Hamza 2011), but these studies do not always consider parenting behaviors that might account for the effects of children's disclosure. Parental solicitation refers to parents' direct requests for information from their child or the child's friends. Behavioral control is a set of active strategies central to parent-driven processes. These strategies include setting expectations for a child's behavior, setting boundaries on the child's activities and associations, monitoring the child to assure that rules are followed, limiting what the child can do without informing the parent, and enforcing consequences for undesirable behavior. These strategies are enacted in a way that is not aggressive or psychologically controlling. They encompass what Stattin and Kerr regarded as the most prominent direct and indirect ways to obtain knowledge about an adolescent child's activities and relationships.

Other investigators have argued that it is important to consider an additional control strategy often employed by parents but ignored by Stattin and Kerr (2000): psychological control. It involves parental intrusion into their child's psychological and emotional world by using guilt induction, shaming, and love withdrawal to manipulate the child's thoughts, feelings, and aspirations. Psychological control is expected to inhibit children's disclosure because it arouses the child's fear that parents will react in a harmful and

intrusive way when confronted with norm-trespassing behaviors (Soenens et al. 2005). In previous literature, psychological control was considered an ineffective strategy to gain parental knowledge and conceptually different from behavioral control (Smetana and Daddis 2002).

Adolescents' and parents' behaviors related to parental knowledge should be considered within the context of the interpersonal environment that parents establish to guide parent-child interactions. This is most commonly captured by the construct of parental warmth, defined as the extent to which parents support their children with emotional nurturance and affectionate caregiving. An extensive body of literature has shown that a warm and supportive family climate (or a cohesive family relationship) sets the stage for open parental communication and hence is essential for a child's volitional disclosure (Gondoli et al. 2008). It can stimulate positive feelings and reduce children's psychological resistance toward active parental monitoring strategies like parental solicitation (Patrick et al. 2005). Although parental warmth is a thermostat-like indicator of relationship health, rather than a conscious strategy, it is the key for making other strategies effective. Hence, it is important to include in this study's analyses.

Potential Moderators

Researchers have explored numerous demographic characteristics that may moderate effects of parenting strategies on an adolescent child's disclosure. The first is a child's age. As children grow, they spend more time with their peers outside the family context. As direct supervision becomes more difficult, parents may rely more on children's voluntary disclosure as the primary information source about children's activities and companions (Stattin and Kerr 2000).

A second potential moderator is gender. Many studies have shown that girls disclose more to their parents (Keijsers et al. 2010) and report more parental solicitation and control than do boys (Kerr and Stattin 2000). Boys have been shown to be more likely than girls to engage in problem behaviors (Piotrowska et al. 2015) but less likely to disclose information to parents (Keijsers and Poulin 2013). Despite the importance of parental gender, most studies fail to distinguish between maternal and paternal knowledge and blur the identity of the parent by referring not to mothers and fathers, but generic "parents".

A third moderating factor is the number of parents in the household. Single parents know less about their offspring's whereabouts than adults in two-parent families (Pettit et al. 2001). Single parents often live under stressful circumstances such as limited incomes (Masarik and Conger 2017), which may distract them from keeping track of their adolescent effectively. Adolescents from single-parent families are often expected to have higher levels of autonomy, responsibility, and decision making, which conflict

with parental monitoring. Hence, parental solicitation and control become more difficult in single-parent than two-parent families (Shek et al. 2015).

Fourth, cultural norms and values could affect a child's and/or parent's behavior. Chang (2007) found that Asian American parents tended to be more authoritarian than their Caucasian counterparts. In European American culture, children are expected to be more independent and autonomous. It seems reasonable to suggest that parents of Asian descent are more likely to track their offspring's behavior and companions via active surveillance.

In addition to effects of these moderating variables, there is some question about the source of data. Parental knowledge can be measured using a multimethod, multiple-reporter approach. Studies indicate that reports from parents and children are only moderately correlated (Pettit et al. 2001; Stattin and Kerr 2000). The effect of data source on strength of associations between parenting behavior and parental knowledge deserves closer scrutiny.

Current Study

Through examination of relevant published research over the past 20 years, this meta-analysis aimed to determine the strength and consistency with which one child behavior (voluntary disclosure of information) and four parenting behaviors (parental solicitation, parental warmth, behavioral control, and psychological control) contribute to parents' knowledge of their adolescent's activities or associates. The data source (child or parent report) was also considered. The effect of each of the 5 strategies on parental knowledge was examined separately. Then, moderation, meta-regression, and publication bias analyses were conducted for the five meta-analyses.

Method

Literature Search and Inclusion Criteria

Three search strategies were used to systematically collect empirical studies on the relationships among parental warmth, psychological control, behavioral control, parental solicitation, children's disclosure and parental knowledge. First, PsycInfo, PsycArticles, ERIC, Google Scholar, ProQuest Dissertations and Theses, and Web of Knowledge databases were searched for articles published from 2000 through 2019. The starting date marked the year in which Stattin and Kerr (2000) published a landmark study indicating that most previous research had measured parental monitoring inaccurately and that adolescents' voluntary disclosure, not parenting efforts, was

the primary source of parents' awareness of their adolescent's activities. The following keywords were used: *parental monitoring, parental solicitation, child disclosure, psychological control, behavioral control, self-disclosure, parental knowledge, communication, parenting, information, parent-adolescent, parent-child, children, and adolescents*. Second, the reference lists of the included studies were searched manually. Third, the in-press or online-first article abstract in the following journals were searched manually: *Child Development, Developmental Psychology, Journal of Adolescence, Journal of Child and Family Studies, Journal of Family Psychology, Journal of Research on Adolescence, Journal of Youth and Adolescence*. Together, these searching methods resulted in 154 relevant studies.

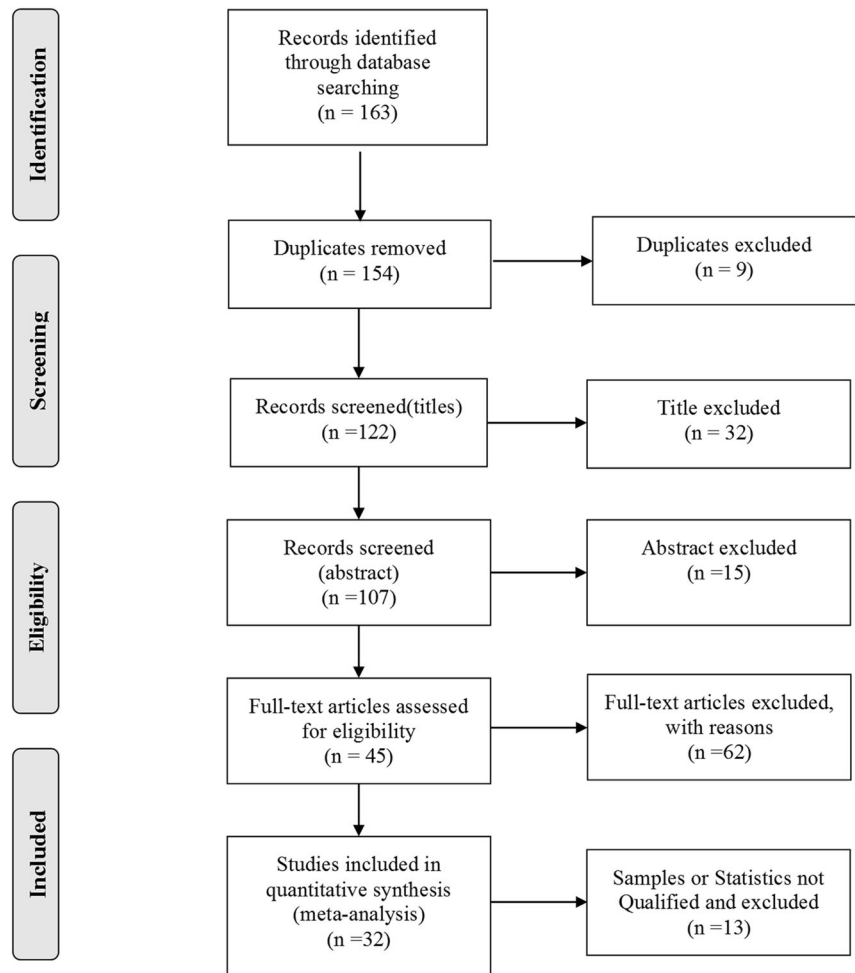
These studies were further screened by the following criteria: (a) the study was published in English; (b) the average age of the sample was between 10 and 18 (many youths older than 18 no longer live at home, which constitutes a different context for parenting); (c) the study had to provide sufficient statistics convertible to effect sizes; (d) the study included at least one measure of the five parental knowledge sources, that is, children's disclosure, parental solicitation, behavioral control, psychological control, and parental warmth. For relevant studies that lacked statistical information needed to calculate effect sizes, authors were contacted and asked to provide the missing data.

Of the 154 relevant studies identified in the initial searches, 32 were excluded after checking the title and 15 were ruled out after checking the abstract. Closer examination of the contents of the 94 remaining articles led to elimination of 62 studies. Seven investigations had samples with average ages outside the specified age range for the meta-analysis; 37 did not include measures necessary to calculate associations between parental strategies and parental knowledge; 12 featured faulty measures (scales with inadequate reliability— $\alpha < 0.70$ —or insufficient information about derivation and validity); and 6 did not to report sufficient statistics required to compute effect sizes (authors of these studies failed to respond to requests for the needed information). This left 32 studies that could be included in meta-analyses. Figure 1 presents a flowchart of the study selection process.

Coding Scheme

A coding manual that specified the coding categories and possible codes to be used for each study was developed. Following the coding manual, the first author and a doctoral student coded all information contained in the 32 studies. The coders achieved 95% agreement on their codes. Disagreements were resolved through mutual discussion.

Fig. 1 Flowchart describing identification and screening of studies



Studies that met the inclusion criteria were coded for sample characteristics (country, proportion of participants who were female, average age of sample, sample size), parental knowledge types (whether the measure assessed maternal, paternal, or parental knowledge—a rating of parents’ knowledge in general, usually made by adolescents), and knowledge source(s): parental warmth, parental solicitation, behavioral control, psychological control, and children’s disclosure (see Table A1 in Appendix A). More than half of studies measured parental knowledge by adopting Kerr and Stattin’s scale (2000; e.g., “Do your parents know what you do during your free time?”). The average age and the educational level(s) (elementary, middle, or high school) of the sample were coded. Because child and parent reports of the scope of parental knowledge are markedly different (Dotterer and Day 2018), the source of this variable in each study was noted (child vs. parent report).

Multiple Dependent Effect Sizes

If a study reported effect sizes for more than one construct (e.g. the correlations between parental knowledge and both

behavioral control and parental warmth), separate analyses were conducted. Some studies reported multiple similar effects using the same sample—for example, obtaining data on the same measures from both parent and child. In these cases, a single effect size was created by aggregating the multiple correlation coefficients into a single coefficient (Hunter and Schmidt 2015). All the dependent effect sizes were aggregated before meta-analysis.

Computation of Effect Sizes

To get a conservative estimate, all analyzed effects were attenuated and not corrected for artifacts. The meta-analyses were conducted using effect sizes that were transformed to Fisher’s Z , using study weights with $\omega = n - 3$ (Lipsey and Wilson 2001). Effect sizes were then transformed back into correlations when reporting results of analyses for ease of interpretation. All analyses were completed in Comprehensive Meta-Analysis version 3 (Borenstein et al. 2014).

Significance tests and moderator analyses were performed using random effects models, as this approach is most widely applicable and conservative (Borenstein et al. 2011). Random

effects models allow for the possibility that there are random differences between studies that are associated with variations in procedures, measures, and settings that go beyond subject-level sampling error and thus point to different study populations (Lipsey and Wilson 2001). One critical issue for meta-analysis is how much variance in the effect sizes analyzed stems from true effect differences. To test the heterogeneity, the I^2 statistics of the overall and specific sets of effect sizes were computed (Borenstein et al. 2011).

Publication Bias Analysis

Publication bias and p -hacking are two main sources of bias in meta-analysis. Publication bias refers to the fact that studies with statistically significant findings are more likely to be published by journals. P -hacking is the inclination of researchers to selectively report statistically significant, larger effects in the writing process, which serves to overstate the true effect size. Following the standard practice for testing publication bias or p -hacking in meta-analysis, the following methods were applied:

(a) Check the asymmetry of contour-enhanced funnel plots to examine publication bias (Peters et al. 2008). If asymmetry exists in the gray areas of the funnel plot, that will imply possible publication bias. Conversely, if the supposed missing studies are in areas of higher statistical significance, this would suggest that the asymmetry is more likely due to factors other than publication bias, such as variable study quality.

(b) Apply the p -curve method to detect p -hacking (Simonsohn et al. 2014a, 2014b). P -curve is a novel technique for detecting small effect selection bias. By plotting the distribution of statistically significant p values, it is possible to rule out selective reporting as an explanation. P -curve analyses were conducted to confirm that the above findings have evidential value and are not a result of p -hacking or publication bias. These analyses were conducted with applications from www.p-curve.com.

(c) Apply p -uniform analysis to test publication bias (van Assen et al. 2015). The p -uniform method assumes that, conditional on the true effect sizes, the distribution of the p -value is uniform. It is a power-based test and adjustment for bias and only makes use of the statistically significant results. It also provides a publication bias test by comparing the adjusted effect size and the naïve meta-analytic estimate.

Follow-Up Analysis

Parents engage in specific parenting behaviors within the context of more general relationship features—especially, parental warmth. Parental warmth may enhance the effects of parental solicitation and behavioral control and encourage children's disclosure. However, it is still unclear how

these parental strategies interact with each other. To clarify the interrelationships among effective strategies (all strategies except for psychological control) and parental knowledge, a series of follow-up analyses was conducted. Mini meta-analyses among positive strategies were conducted to establish a correlation matrix. With this matrix, two methods were used to explore the interrelationships among positive parenting strategies and parental knowledge: structural equation modeling (SEM) and social network analysis (SNA). SEM is a supervised method with the conceptual model designed in advance, whereas SNA allows for exploring the data unsupervised. SEM was used to test the hypothesized relationship; SNA was employed to further confirm the findings from SEM. The initial SEM model was set up and modified in Mplus 7. The harmonic mean of all cells in the matrix was used as the sample size for SEM analysis. The SEM model was considered to have a good fit if CFI and TLI values exceeded 0.95, and RMSEA and SRMR were lower than 0.08 and 0.06, respectively (Hu and Bentler 1999).

The association network was also computed, in which each edge represented the zero-order correlation between two variables. Thicker edges between variables represent stronger correlations. This network is not directed. The *qgraph* package implements Fruchterman and Reingold's (1991) algorithm, which positions nodes with stronger correlations near the center of the network and those with weaker correlations near the periphery of the network. To make the interconnected networks simple, an association network was computed whereby only edges depicting internode correlations of at least $r = 0.30$ appeared in the graph. Correlations between symptoms having magnitudes less than 0.30 were suppressed to make the strongest connection clearer (McNally et al. 2014). The R package, *qgraph* (Epskamp et al. 2012), was used to perform the network analysis.

Outline of the Analyses Steps

First, meta-analyses between the five strategies and parental knowledge were conducted. Then, a series of moderation analyses was conducted to distinguish the effects between parental strategies and parental knowledge under different situations. Third, a mediation analysis proposing children's disclosure as the most important mediator was conducted. Finally, publication bias was tested.

Results

Sample Characteristics

Seventy-six effect sizes for parental knowledge and its predictors were identified, encompassing data from 9

countries or areas (U. S., Canada, U.K., Sweden, Belgium, the Netherlands, South Korea, China, and Hong Kong). Sixty-one percent of study participants were from the U.S. The studies examined included 17 independent effect sizes between behavioral control and parental knowledge, from 23,290 adolescents; 6 independent effect sizes between psychological control and parental knowledge, from 4,233 adolescents; 25 independent effect sizes between children's disclosure and parental knowledge, from 26,868 adolescents; 16 independent effect sizes between parental solicitation and parental knowledge, from 17,848 adolescents; and 7 independent effect sizes between parental warmth and parental knowledge, from 11,804 adolescents. The average age of the sample in studies examined ranged from 10 to 17. The female proportion of the sample ranged from 0 to 1. The most frequently used scales measuring parental strategies or parental knowledge were developed by Kerr and Stattin (2000). In most cases, however, investigators employed novel measures that were unique to their study.

Meta-Analysis of Parental Strategies to Obtain Parental Knowledge

A random-effects model was used because of the high heterogeneity among studies ($I^2 > 90\%$; see Table 1). The association between psychological control and parental knowledge was the lowest, $r = -0.212$, $p < 0.001$, with the 95% confidence interval (C.I.) ranging from -0.288 to -0.133 . The effect size of children's disclosure was the highest, $r = 0.523$, $p < 0.001$. Effect sizes for the other sources of knowledge were fairly similar: $r = 0.416$ for parental warmth, $r = 0.376$ for behavioral control, and $r =$

0.339 for parental solicitation ($p < 0.001$ for all). Q statistics for each source of parental knowledge were supplemented by calculating the standard deviation between study effects- τ . Q statistics analyses suggested that the effect sizes between the five sources of parental knowledge differed significantly ($Q_{between} = 215.684$, $p < 0.001$).

To identify which effect sizes differed from each other, multiple pairwise comparisons between every two effects were conducted. The results showed that the effect size for associations between parental knowledge and children's disclosure was significantly higher than the effect sizes for associations between parental knowledge and parental solicitation ($Q_{between} = 18.129$, $p < 0.001$; corrected by Bonferroni, requiring $p < 0.005$ to be significant), behavioral control ($Q_{between} = 9.644$, $p < 0.01$), and psychological control ($Q_{between} = 190.899$, $p < 0.001$). The effect size of associations between parental warmth and parental knowledge was significantly higher than that between psychological control and parental knowledge ($Q_{between} = 102.738$, $p < 0.001$). The effect size of associations between parental solicitation and knowledge was higher than that for associations between psychological control and knowledge ($Q_{between} = 107.288$, $p < 0.001$). All other differences were not significant ($p > 0.005$).

Moderating Effects

Adolescent's gender and family structure

To test for possible moderating effects of the gender distribution of the sample or family structure, the average proportion of sample members who were female and the

Table 1 Differences between studies of Eastern and Western cultural samples in effects of each knowledge source on parental knowledge

Sources	<i>k</i>	<i>N</i>	ρ	95% C. I.	<i>Q</i>	I^2	τ
Children's disclosure	24	26,868	0.523***	[0.461, 0.580]	988.860	97.674	0.197
Eastern	3	9318	0.510***	[0.466, 0.550]	15.450	87.055	0.047
Western	21	17,550	0.525***	[0.445, 0.597]	943.906	97.881	0.240
Behavioral control	17	23,290	0.376***	[0.297, 0.449]	720.928	97.781	0.182
Eastern	2	5908	0.584***	[0.061, 0.609]	82.226	98.784	0.167
Western	15	17,382	0.344***	[0.276, 0.408]	330.605	95.765	0.142
Psychological control	6	4233	-0.212***	[-0.288, -0.133]	22.247	77.525	0.084
Eastern	1	2559	-0.180***	[-0.217, -0.142]	0	0	0
Western	5	1673	-0.218***	[-0.321, -0.110]	4.350	54.028	0.053
Parental solicitation	16	17,848	0.339***	[0.275, 0.400]	321.257	95.331	0.138
Parental warmth	7	11,804	0.416***	[0.332, 0.494]	153.808	96.099	0.126
Eastern	2	5969	0.359***	[0.261, 0.451]	18.481	94.589	0.077
Western	6	5835	0.432***	[0.324, 0.529]	93.271	94.639	0.149

k = number of effect sizes, *p* = significance level, *Q* = weighted sum of squared differences between individual study effects and the pooled effect across studies, I^2 = percentage of variation across studies that is due to heterogeneity rather than chance, τ = the estimated standard deviation of underlying effects across studies

*** $p < 0.001$

average proportion from single-parent households were used as continuous predictors for the relationship between knowledge contributors and parental knowledge. No meta-regression results were significant.

Culture

Although studies involved youths from 9 different countries, there were not sufficient numbers of studies from specific countries to allow for a nation-by-nation comparison of effects. Instead, based on Suh et al. (1998) guidelines, the results of studies from China, Hong Kong, and South Korea were combined as representatives of Eastern culture, and compared to findings from the other nations as representatives of Western culture. The tests of these cultural differences were only significant for behavioral control (see Table 1; $Q_{between} = 6.122$, $p < 0.05$). The association between behavioral control and parental knowledge was much stronger among youths in Eastern culture.

Age or educational level

Average age of the sample did not significantly moderate associations between parental knowledge and any of the knowledge sources. A further check of developmental differences involved comparisons of samples from different

educational levels (elementary, middle, and high school). Only those studies collecting samples from a single educational level were used for this analysis: 9 involving elementary school youths, 13 with middle school students, and 5 featuring high school students. In all three educational levels, significant differences among the effects of five knowledge predictors were found ($Q_{between} = 61.866$ for elementary school, $p < 0.001$; $Q_{between} = 95.097$ for middle school, $p < 0.001$; $Q_{between} = 457.701$ for high school, $p < 0.001$); see Table 2. Because sample sizes in these separate analyses are very limited, results were not reliable and were reported here only for reference.

One-time versus longitudinal designs

Although most studies relied on correlational data (all information collected at one time point), 6 investigations featured longitudinal analyses, which provide stronger evidence of effects of children's disclosure or parenting strategies on parental knowledge. There were significant numbers of studies to compare effect sizes across study designs for children's disclosure, parental solicitation, and behavioral control. The longitudinal effects were significantly lower than effects in correlational studies for parental solicitation ($Q_{between} = 4.822$, $p < 0.05$) and children's disclosure ($Q_{between} = 6.590$, $p < 0.01$); see Table 3.

Table 2 Differences among educational levels in effects of each knowledge source on parental knowledge

Educational level	<i>k</i>	N	<i>P</i>	95% C.I.	<i>Q</i>	<i>I</i> ²	τ
Elementary School							
Children's disclosure	5	5263	0.424***	[0.210, 0.600]	244.752	98.366	0.269
Behavioral control	2	1019	0.260***	[-0.156, 0.597]	17.285	98.666	0.225
Psychological control	1	500	-0.210*	[-0.292, -0.125]	0.000	0.000	0.000
Parental solicitation	4	1942	0.318***	[0.186, 0.439]	25.421	88.199	0.133
Parental warmth	2	3084	0.275***	[-0.022, 0.528]	21.216	95.287	0.215
Middle School							
Children's disclosure	11	16,246	0.527***	[0.461, 0.587]	298.591	96.651	0.143
Behavioral control	10	14,571	0.361***	[0.237, 0.474]	603.504	98.509	0.218
Psychological control	3	2846	-0.128*	[-0.239, -0.014]	5.318	62.393	0.080
Parental solicitation	7	8183	0.311***	[0.185, 0.428]	218.174	97.250	0.179
Parental warmth	1	3125	0.310***	[0.278, 0.341]	0.000	0.000	0.000
High School							
Children's disclosure	4	1127	0.591***	[0.439, 0.710]	27.869	89.235	0.198
Behavioral control	3	3454	0.422***	[0.265, 0.558]	33.795	94.082	0.151
Psychological control	2	886	-0.317***	[-0.375, -0.256]	0.170	0.000	0.000
Parental solicitation	1	2568	0.450***	[0.419, 0.480]	0.000	0.000	0.000
Parental warmth	3	3454	0.485***	[0.352, 0.599]	27.293	92.672	0.135

k = number of effect sizes, *p* = significance level, *Q* = weighted sum of squared differences between individual study effects and the pooled effect across studies, *I*² = percentage of variation across studies that is due to heterogeneity rather than chance, τ = the estimated standard deviation of underlying effects across studies

* $p < 0.05$; *** $p < 0.001$

Table 3 Differences by study design in effects of knowledge sources on parental knowledge

Knowledge source	<i>k</i>	N	ρ	95% C. I.	<i>Q</i>	I^2	τ
Children's disclosure							
Correlational	20	21,470	0.567***	[0.517, 0.613]	478.042	96.025	0.154
Longitudinal	8	11,472	0.415***	[0.295, 0.521]	358.736	98.049	0.194
Behavioral control							
Correlational	15	21,072	0.396***	[0.321, 0.465]	520.629	97.311	0.164
Longitudinal	5	5448	0.306***	[0.129, 0.465]	188.070	97.873	0.210
Parental solicitation							
Correlational	14	15,630	0.389***	[0.355, 0.422]	55.081	81.508	0.065
Longitudinal	4	4168	0.198**	[0.061, 0.329]	58.104	94.837	0.138
Parental warmth							
Correlational	6	8679	0.467***	[0.362, 0.561]	154.219	96.758	0.153
Longitudinal	1	3125	0.441***	[0.215, 0.623]	101.282	99.013	0.184

k = number of effect sizes, *p* = significance level, *Q* = weighted sum of squared differences between individual study effects and the pooled effect across studies, I^2 = percentage of variation across studies that is due to heterogeneity rather than chance, τ = the estimated standard deviation of underlying effects across studies

p* < 0.01; *p* < 0.001

Additional analyses compared the magnitude of effects across four parenting strategies (all but psychological control) within each study design. Effect sizes differed significantly among correlational studies ($Q_{between} = 267.012$, $p < 0.001$) but not among longitudinal studies. Further pairwise analyses of correlational data suggested that the effect of behavioral control was significantly lower than children's disclosure ($Q_{between} = 15.711$, $p < 0.001$; corrected by Bonferroni, requiring $p < 0.008$ to be significant). All other effects were not significant.

Reporter effects

A final set of moderator analyses compared the strength of associations between knowledge source and parental knowledge when adolescents versus parents were the reporters. Comparing studies with different reporters of parental strategies, the moderation test was only significant for behavioral control ($Q_{between} = 9.685$, $p < 0.001$); see Table 4. The average effect was higher when adolescents, versus parents, were the source of ratings of parental strategies. In cases in which there were different reporters of parental knowledge level, the effects between behavioral control ($Q_{between} = 11.707$, $p < 0.001$), psychological control ($Q_{between} = 8.904$, $p < 0.01$) and parental knowledge were significantly lower for parent-reported effects; see Table 5. The other two moderation tests were not significant.

Publication Bias Analysis

In funnel plot analyses, the points that fell into the gray area were asymmetrical, indicating publication bias may exist (see Fig. 2). All *p*-uniform publication tests were not

significant. *P*-curve analyses were conducted to confirm that the above findings have evidential value and are not a result of *p*-hacking or publication bias. According to Simonsohn et al. (2014a), when the population effect is significant, *p* curves will be right skewed; when the effects do not exist, *p* curves will be flattened. When the effects are the result of *p* hacking, *p* curves will be left skewed. *P*-curves were plotted to evaluate the evidential value of research findings on each of the five correlates of parental knowledge. All *p*-curves showed a shape that is right skewed and not flatter than 33%, suggesting that the data for all meta-analyses have evidential value and that *p*-hacking is unlikely to have occurred (see Fig. 3).

Follow-Up Analyses

Follow up analyses served to clarify relationships among the parental strategies and children's disclosure. First, the random effects were calculated to construct the correlation matrix (Table 6). The resulting information was used for SEM analysis in *Mplus 7* (Muthén and Muthén 2012). As mentioned in the Method section, the harmonic mean sample size was used to compute standard errors (Viswesvaran and Ones 1995). Figure 4a reveals the findings for the relationship between positive strategies and parental knowledge. The final model's fit was promising, $\chi^2(1) = 11.487$, $p < 0.001$, $RMSEA = 0.041$, $CFI = 0.999$, $TLI = 0.988$, $SRMR = 0.008$. Generally, 34.9% of the variance of parental knowledge, 43.7% of the variance of children's disclosure, and 24.8% of the variance of parental solicitation can be explained by the model. Specifically, among all the direct effects, the path from children's disclosure to parental knowledge was found to be the strongest ($\beta =$

Table 4 Differences in effects of knowledge source on parental knowledge when child vs. parent reports on knowledge source

Knowledge source Reporter	<i>k</i>	N	ρ	95% C. I.	<i>Q</i>	I^2	τ
Children's disclosure							
Children	14	21,304	0.568***	[0.512, 0.619]	392.755	96.690	0.143
Parents	8	5504	0.445***	[0.271, 0.591]	391.713	98.213	0.287
Behavioral control							
Children	13	22,261	0.452***	[0.381, 0.518]	483.337	97.517	0.154
Parents	5	3588	0.215***	[0.072, 0.349]	75.786	94.722	0.161
Parental solicitation							
Children	11	14,645	0.339***	[0.275, 0.400]	171.153	94.157	0.113
Parents	5	3203	0.347***	[0.148, 0.519]	141.109	97.165	0.239

k = number of effect sizes, *p* = significance level, *Q* = weighted sum of squared differences between individual study effects and the pooled effect across studies, I^2 = percentage of variation across studies that is due to heterogeneity rather than chance, τ = the estimated standard deviation of underlying effects across studies

****p* < 0.001

Table 5 Differences in effects of knowledge source on parental knowledge when child vs. parent reports of parental knowledge

Knowledge source Reporter	<i>k</i>	N	ρ	95% C. I.	<i>Q</i>	I^2	τ
Children's disclosure							
Children	14	21,454	0.550***	[0.475, 0.617]	700.115	98.143	0.190
Parents	8	4950	0.479***	[0.345, 0.594]	227.046	96.917	0.229
Behavioral control							
Children	12	22,155	0.474***	[0.403, 0.538]	459.567	97.799	0.155
Parents	5	2835	0.215*	[0.072, 0.349]	75.786	94.722	0.161
Psychological control							
Children	6	6597	-0.234***	[-0.280, -0.186]	14.377	65.223	0.046
Parents	1	194	-0.009	[-0.150, 0.132]	0	0	0
Parental solicitation							
Children	8	13,541	0.361***	[0.289, 0.428]	150.941	95.362	0.112
Parents	7	4201	0.342***	[0.202, 0.469]	145.380	95.873	0.201

k = number of effect sizes, *p* = significance level, *Q* = weighted sum of squared differences between individual study effects and the pooled effect across studies, I^2 = percentage of variation across studies that is due to heterogeneity rather than chance, τ = the estimated standard deviation of underlying effects across studies

p* < 0.05; **p* < 0.001

0.318, *p* < 0.001). Behavioral control ($\beta = 0.246$, *p* < 0.001) and parental warmth ($\beta = 0.216$, *p* < 0.001) contributed equally to parental knowledge. Although the path from parental solicitation to knowledge was significant when added into the model (dashed line in Fig. 1a), it was weak ($\beta = 0.099$, *p* < 0.05) and the overall model fit improved only slightly (all the model fit statistics were the same). Hence, it was excluded. Indirect effects also were assessed in the final model. They suggested two significant pathways: parental warmth → children's disclosure → parental knowledge, $\beta = 0.177$, *p* < 0.001; behavioral control → children's disclosure → parental knowledge, $\beta = 0.106$, *p* < 0.001.

The network analysis implemented in *qgraph* demonstrated a similar finding (see Fig. 4b). The centrality statistic

of children's disclosure was the largest for all three indicators (*degree* = 1.898, *closeness* = 0.115, *betweenness* = 4), suggesting that it was located in the most central position in the network. Although parental warmth was on the edge of the network (*degree* = 1.275, *closeness* = 0.078, *betweenness* = 0), it was a strong correlate of parental knowledge and children's disclosure and formed a cluster. The edges among these three variables were obviously thicker.

Discussion

Parental knowledge about their adolescent child's activities, whereabouts, and relationships can facilitate positive

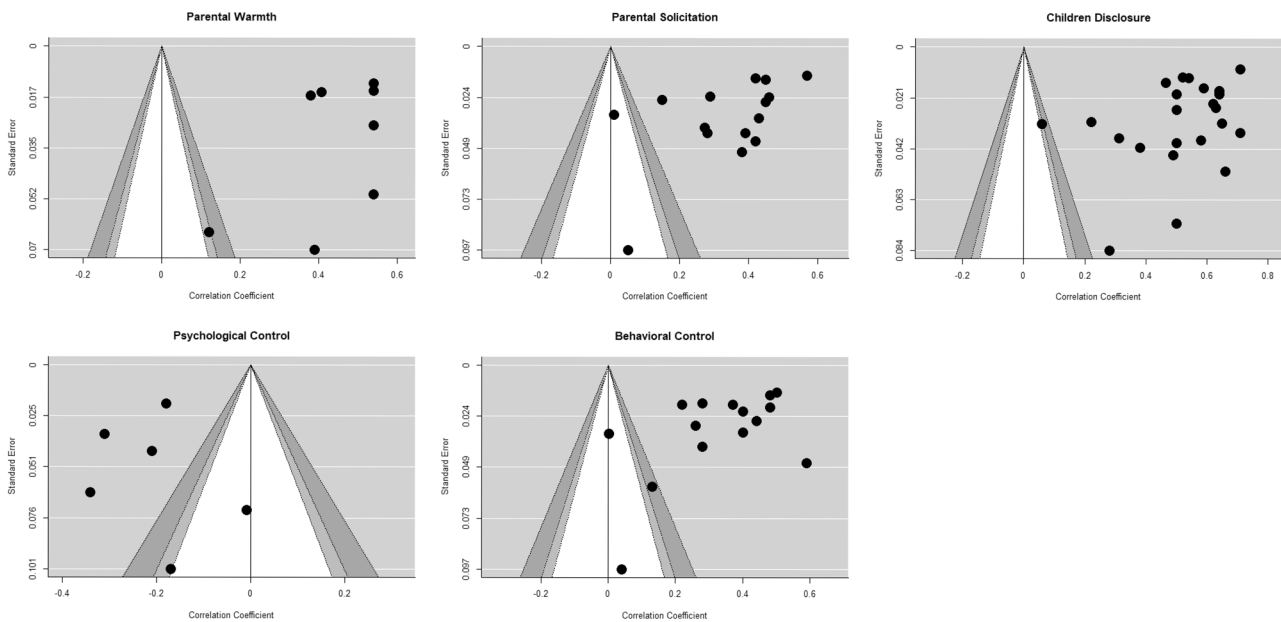


Fig. 2 Funnel plot of the effect sizes between parenting strategies and parental knowledge. The significance level of the effects in the white triangle area are greater than $p = 0.1$ and the three gray areas from

inside to outside respectively represent effects between $p = 0.1$ and $p = 0.05$, effects between $p = 0.05$ and $p = 0.01$, and effects smaller than $p = 0.01$ (the outside wide gray area)

interactions between children and parents and have a long-lasting influence on adolescents' developmental outcomes. Because of the critical role of parental knowledge in preventing both externalizing and internalizing problems (Racz and McMahon 2011), it is important to know which strategies for obtaining knowledge are the most effective and what factors can moderate the effects of these strategies. To date, a comprehensive review comparing the effects of different strategies and exploring moderators is still missing. This meta-analysis provides a systematic review of research over the past two decades of the effects of several strategies for parents to obtain knowledge about their adolescent child's activities. By examining findings from 32 studies, three primary issues important to understanding the association of parental strategies and parental knowledge were addressed. The first concerned the most effective way for parents to gain knowledge about their children. Consistent with Stattin and Kerr's (2000) results, analyses suggested that children's disclosure was the strongest predictor of parental knowledge. Traditionally, voluntary disclosure of information by the child has been assumed to be the driver of parental knowledge. However, both SEM and SNA findings indicated that children's disclosure is an endogenous variable deeply affected by parental warmth and behavioral control. Strictly speaking, children's disclosure should not be defined as the driver of parental knowledge but the most critical mediator. Although spontaneous disclosure of personal information to parents is the strongest correlate of parental knowledge, it appears to be precipitated by adolescents' sense of a positive, warm

relationship with a parent. Collectively, parental warmth and behavioral control explained almost half the variance in children's disclosure, suggesting that an adolescent's voluntary personal disclosure usually happens in the context of a parent-led, warm family environment.

A second issue involved factors that could moderate the relationship between strategies and parental knowledge. Among these moderators, the adolescent's age appeared to be an especially strong concern. However, the meta-regression analyses showed that age was not a significant moderator. We also calculated the effect sizes for analyses of adolescents at different educational levels. Although subgroup analyses showed some comparisons were significant, these results were based on a small sample and may not be stable. Closer consideration of possible developmental differences is warranted. Neither the adolescent's gender nor family structure (single- versus multi-parent household) moderated the main effects discerned in analyses.

The association between behavioral control and parental knowledge was much stronger in Eastern cultures. Behavioral control, characterized by imposing rules and restrictions, may violate Western adolescents' sense of self and feelings of autonomy. Such feelings may not be as concerning to youths in Asian cultures, where collectivist orientations prioritize group cohesiveness over individuality (Markus and Kitayama 1991). Psychological control was a consistently ineffective strategy for gaining knowledge about adolescent children's activities, regardless of cultural background.

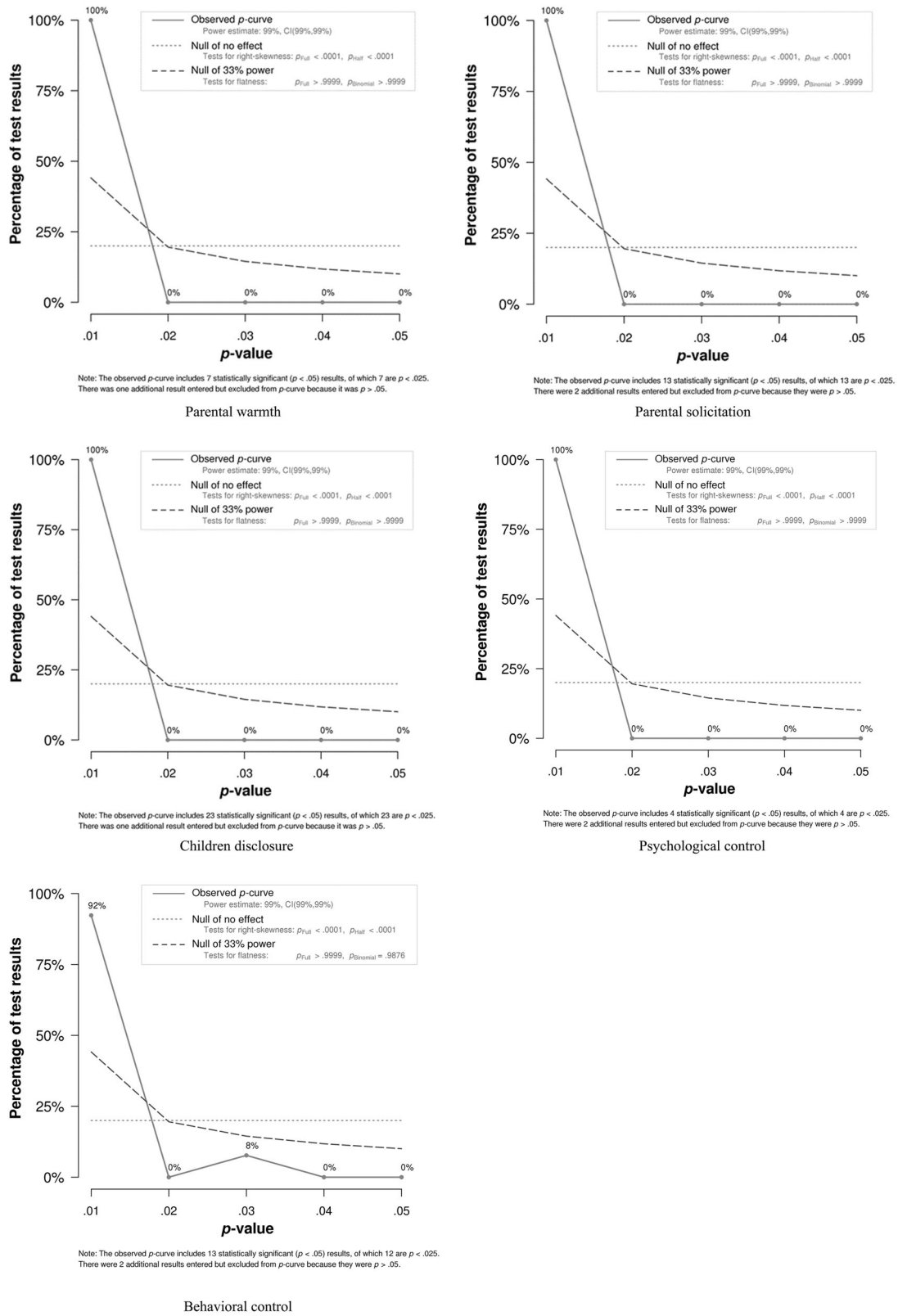


Fig. 3 P-curves for the five meta-analyses of parenting strategies and parental knowledge

Table 6 Meta-analytic inter-correlations between positive parental strategies and parental knowledge

Variable	1	2	3	4	5
1. Child-disclosure	–				
2. Parental warmth	0.572* (3, 6942)	–			
3. Parental solicitation	0.437*** (14, 11,501)	0.240*** (1, 2568)	–		
4. Behavioral control	0.359*** (12, 7876)	0.050* (1, 2568)	0.380*** (6, 4305)	–	
5. Parental knowledge	0.523*** (24, 26,868)	0.416*** (7, 11,804)	0.339*** (16, 17,848)	0.376*** (15, 23,290)	–

The number of independent samples (k) and cumulative sample sizes (N), respectively, are provided in parentheses

* $p < 0.05$; *** $p < 0.001$

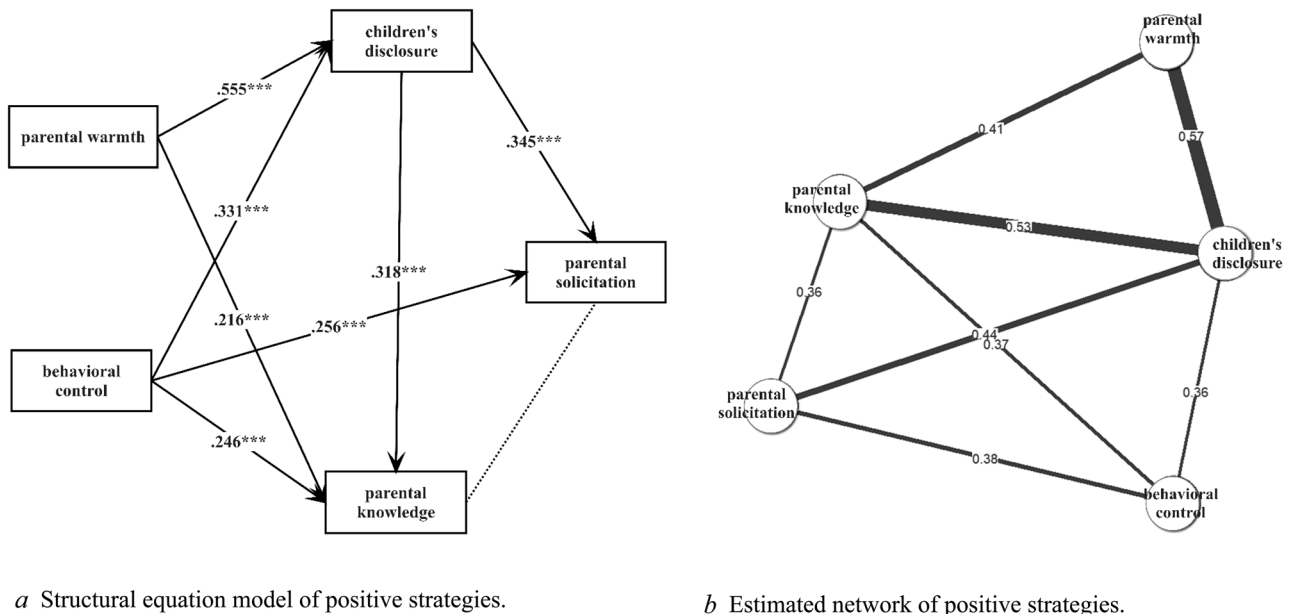


Fig. 4 Interrelationship between positive strategies and parental knowledge. The dashed line in **a** refers to weak correlation. All coefficients in **a** were standardized

Mothers and fathers may acquire knowledge most effectively through different routes (Waizenhofer et al. 2004). Mothers are usually more knowledgeable and more likely than fathers to gain information by active supervision or voluntary disclosure from their children. Attempts to examine this difference in the meta-analysis were stymied by the lack of sufficient data to make reliable inferences. Future studies should consider effects of each parent separately, rather than presuming that parents act as a unit.

A third issue concerns research methodology. In interpreting study findings, it is important to differentiate longitudinal studies, which allow for more confident assertions about causal relations among variables, from those with a single data collection point. In analyses for this study, all the longitudinal studies reported lower effects than correlational designs—but many of these effects were statistically significant. The effect of behavioral control was significantly lower than parental warmth, suggesting that

parental warmth was a better long-term strategy. Children's disclosure had a stronger association with parental knowledge than behavioral control did in one-time studies. Taken together, these findings highlight the importance of parents' active attempts (parental warmth) and passive attempts (relying on children's disclosure) in promoting parental knowledge.

Theoretical and Methodological Issues

Stattin and Kerr (2000) concluded that parental knowledge is a product of the actions of parents, who may actively seek such knowledge, as well as adolescents, who may willingly provide it. This meta-analysis provides a more complex and nuanced picture of the knowledge gaining process. Whereas children's disclosure was the most powerful predictor of parental knowledge, this seemingly passive parenting approach appeared to be prompted by more active efforts of parents

to create a warm parent-child relationship. Parental warmth seems to provide the basis for high-quality children's disclosure. Behavioral control was another antecedent of children's disclosure. If children's disclosure is considered the gateway to parental knowledge, parental warmth and behavioral control appear to be the keys that unlock the gate. These findings encourage a different conceptual approach than was observed in most studies included in the meta-analysis. To adequately capture the dynamics of parental knowledge, investigators need to consider developmental cascades linking parent and child behavior over a more extended time period than even most longitudinal investigations have encompassed.

In contrast to parental warmth and behavioral control, analyses demonstrated that parental solicitation was not a fundamental source of parental knowledge. Both direct and indirect links between parental solicitation and parental knowledge were weak. In longitudinal studies, the effect of parental solicitation was lower than any other strategy. These findings suggest that active solicitation of adolescents' personal information is more likely to be perceived as a privacy violation or intrusion by young people (Hawk et al. 2013). It is also possible, however, that measures of children's disclosure include both voluntary sharing of information and sharing in response to parental solicitation. High correlations between the two measures could indicate that the role of solicitation is muted by inclusion of a measure of children's disclosure.

Reporter effects constitute a methodological concern. Correlations between behavioral control or psychological control and parental knowledge were significantly higher when based on adolescents' reports than parents' reports. Adolescents and parents disagree about the scope of parental knowledge (Dotterer and Day 2018). A multimethod, multiple-reporter approach to measuring parental knowledge seems highly advisable.

Strengths, Limitations, and Future Directions

This meta-analysis revealed several limitations in the research literature. First, the number of studies that qualified for analysis is still small. Some important issues, such as differences in parenting practices and knowledge obtained by mothers versus fathers, have barely been considered. Second, most studies have relied on a single reporter, usually the child. Evidence from multiple reporters would increase confidence in the reliability of findings. Third, less than one-fourth the studies involved multiple time points, which are essential to make credible inferences about the causal ordering of effects. Fourth, many studies lack uniformity in measurement of central constructs (e.g. parental solicitation). If investigators could settle on a standard set of

measures for these constructs, it would aid in identifying consistent patterns of association between parental knowledge about adolescents' activities and relationships and the strategies employed to obtain such knowledge—as well as factors that moderate these general patterns. Finally, potentially important parenting strategies remain unexamined—*noticing and listening*, for example. Observing and attending to relevant details of adolescent offspring (i.e. their tone of voice or a sudden change in routine behavior) can reveal important information. Future studies should include consideration of these subtler forms of information gathering.

Despite these limitations, the meta-analysis has several strengths. The study compared findings from one-time (correlational) and longitudinal studies to get a better sense of causal directions and the relative strength of various parenting approaches. The study assessed consistencies and differences across various segments of the adolescent age range and various cultures to spur the way for closer examination of important moderating factors. The analyses suggested a more complex model that linked parenting precursors to child behaviors as a potential correction to the over-emphasis on children's disclosure as the monolithic factor accounting for parental knowledge.

Conclusion

Parents' efforts to seek knowledge about their adolescent child's whereabouts, activities, and relationships are important in protecting children against delinquent or antisocial behaviors and fostering healthy development. A series of parental strategies like behavioral control has been studied frequently in the past two decades. To date, however, there has not been a comprehensive effort to identify which strategy or combination of strategies can help parents get the most knowledge about their adolescent offspring. The current study found that a cohesive, warm parent-child relationship was the basis that gives rise to parental knowledge. Not only is a warm, supportive relationship likely to motivate the parent to stay informed, but it creates a context in which an adolescent can freely disclose information to the parent and parents can confidently set rules for their child. Analyses also confirmed that children's disclosure remains the strongest predictor of parental knowledge throughout the early adolescent and teenage years. Although further research is needed, it appears as if parental warmth provides the foundation for effective parenting strategies, such as behavioral control, and promotes a child's willingness to share information with parents. Working in concert, these three factors appear to form the most effective strategy for parents to obtain knowledge about the activities and relationships of

adolescent children. These findings are promising for parents, educators, and practitioners who plan interventions to promote child development or to prevent antisocial behaviors or substance use. The findings also provide direction for future research that can yield a more comprehensive understanding of how parent and child behaviors over time contribute to the knowledge that parents have of their offspring's behavior.

Authors' Contributions L.D. and B.B. conceived of the study and its design, participated in data collection, conducted statistical analyses, provided interpretation of the data, and contributed to the writing of this manuscript; C.D. contributed to the data collection and coding of the article; B.B. is co-first and corresponding author of the article with equal contribution to the study. All authors read and approved the final version of this article.

Funding This study was supported by the MOE Project of Key Research Institute of Humanities and Social Sciences in universities (16JJD860008).

Data Sharing and Declaration All data generated or analyzed during this study are included in this published article (and its supplementary information files).

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Approval Because the research is a literature review and did not involve collection of data from human research participants, it was classified as exempt and did not require further approval of an ethical committee was not necessary.

Informed Consent This research is a meta-analysis (secondary data analysis); it did not involve informed consent of human research participants.

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