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Social and Cognitive Factors Associated With Children's Secret-Keeping for a Parent

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This study examined children's secret-keeping for a parent and its relation to trust, theory of mind, secrecy endorsement, and executive functioning (EF). Children ($N = 107$) between 4 and 12 years of age participated in a procedure wherein parents broke a toy and asked children to promise secrecy. Responses to open-ended and direct questions were examined. Overall, secret-keeping increased with age and promising to keep the secret was related to fewer disclosures in open-ended questioning. Children who kept the secret in direct questioning exhibited greater trust and better parental ratings of EF than children who disclosed the secret. Findings highlight the importance of both social and cognitive factors in secret-keeping development.

Secrecy involves creating boundaries between information that one possesses and information that another possesses (e.g., Meares & Orlay, 1988; Piaget, 1929/1959). To keep a secret, one must understand that some information can be disclosed freely and publicly and other information must be set aside and not shared with anyone but the very person for whom the secret is kept. Secret-keeping may be a tremendous challenge for children for a number of reasons. First, keeping—or disclosing—secrets can have significant consequences for relationships that may be difficult for children to predict. For example, early school-aged children may not realize how disclosing a secret can negatively affect a friendship. Second, not all secrets are safe to keep and understanding the nuances between “good” and “bad” secrets may be difficult for younger children who have limited experiences with secrets. Third, keeping a secret requires keeping multiple pieces of information in mind at one time and ensuring one behaves in accordance with these rules. This may be very demanding for pre-

school and early school-aged children for whom these skills are developing. The current study examined three questions about the development of children's secret-keeping for a parent: (a) Does secret-keeping increase with age? (b) Are children able to keep secrets when asked open-ended questions and direct questions about the secret? and (c) What social and cognitive factors influence children's ability to keep a secret? Secret-keeping was examined in the context of the parent-child relationship because of the unique characteristics of this relationship—namely, that children form their first relationship with their parent(s), which serves as a model for children's behavior and later relationships. For example, maternal parenting style has been shown to predict children's disclosure of school events (Almas, Grusec, & Tackett, 2011).

The extant literature on children and secrecy can be divided into two broad categories: research that examines children's understanding of the concept of secrecy and research that examines children's actual secret-keeping behavior. The most common method used to investigate children's concept of secrets is by sharing vignettes about various secrets and asking questions that measure the children's understanding of the vignette and judgment of its characters' behavior. Overall, these studies suggest

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that children's understanding of secrets begins to develop at age 3 (e.g., Bok, 1983; Meares & Orlay, 1988) and, with age, children are more likely to say they would keep a secret for a peer (Piaget, 1932; Watson & Valtin, 1997b). Furthermore, these studies demonstrate that children's ability to distinguish between different types of secrets (e.g., Anagnostaki, Wright, & Bouchier-Sutton, 2012; Watson & Valtin, 1997a, 1997b) and reasons for keeping secrets (Last & Aharoni-Etzioni, 1995) become more sophisticated with age. Methods used to examine children's secret-keeping behavior typically involve a stranger (or parent in a few cases) committing a transgression and requesting secrecy, followed by an interview wherein the child is asked questions about the secret (e.g., Bottoms, Goodman, Schwartz-Kenney, & Thomas, 2002; Talwar, Lee, Bala, & Lindsay, 2004; Tye, Amato, Honts, Devitt, & Peters, 1999). The relation between age and children's secret-keeping behavior is somewhat inconsistent. Some studies report decreased secret-keeping with age (e.g., Pipe & Wilson, 1994) while other studies report no age effect at all (e.g., Bottoms et al., 2002; Talwar et al., 2004). However, these studies used children of different ages, making it difficult to examine the development of secret-keeping behavior across a range of ages.

Other factors that may affect children's secret-keeping behavior include promises and different kinds of interview questions. An emerging body of literature has examined the influence of various truth-promoting mechanisms (e.g., promising to tell the truth, taking an oath, truth induction) on children's reports. These studies reveal that children are more likely to tell the truth after promising to tell the truth (Talwar, Lee, Bala, & Lindsay, 2002; Talwar et al., 2004), being reassured about the consequences of truthfulness (e.g., Lyon & Dorado, 2008), and discussing the difference between truths and lies (e.g., London & Nunez, 2002). With respect to interview questions, research demonstrates that, relative to open-ended questions, yes-no and other direct questions elicit more disclosures of secrets (e.g., Bottoms et al., 2002; Pipe & Wilson, 1994); however, these same questions also increase the likelihood that children will allege an event occurred when in fact it did not (Quas, Davis, Goodman, & Myers, 2007). The present study extended the existing research on children's secret-keeping behavior by including a broad range of ages to explore age-related differences, asking children to promise to keep a secret at the time of the transgression, using open-ended and direct questions, and measuring the effects of trust, theory of

mind (ToM), endorsement of secret-keeping, and executive functioning (EF) on secret-keeping.

Trust and Secret-Keeping

Trust is often described as being paramount to the success of interpersonal relationships (e.g., Rotter, 1967, 1971). In order for an individual to be trustworthy, he or she must keep promises made to others, keep personal information confidential, and be honest. In other words, trustworthy individuals keep secrets. Research demonstrates that children begin to understand trustworthiness at an early age (e.g., Harris, 2007; Koenig, Clément, & Harris, 2004; Rotenberg, 1980). Indeed, children as young as 3 years of age were more likely to believe an individual who had provided reliable information previously than an individual who was unreliable in the past (Harris & Corriveau, 2011; Koenig & Harris, 2005a, 2005b).

Trust may play a role in children's endorsement of secrets. In their study with maltreated and non-maltreated children between 4 and 9 years of age, Lyon, Ahern, Malloy, and Quas (2010) asked whether a secret should or would be disclosed in scenarios that varied the person requesting the secret (i.e., instigator) and the person to whom the secret was disclosed (i.e., recipient). When asked whether they would endorse disclosure of parent and stranger transgressions to the police, maltreated children were less likely than nonmaltreated children to protect parents. Moreover, nonmaltreated but not maltreated children exhibited a tendency to endorse less disclosure against parent transgressors with age. Lyon et al. posited these findings may be explained by maltreated children's lack of trust in parental figures. The current study builds upon their suggestion by examining the role of children's trust in secret-keeping for a parent.

The relation between trust and secret-keeping behavior may be heightened in situations where a child is asked to keep a parent's secret. Rotenberg (1995) argued that the caregiver-parent relationship is built upon interactions that develop a child's understanding of trust beliefs, or the beliefs that others will follow through on their word, and that these beliefs shape children's behaviors. Indeed, greater trust beliefs are associated with several aspects of social and cognitive development like increased prosocial behavior (e.g., Doster & Chance, 1976; Rotenberg et al., 2005), peer relationships, and friendship (e.g., Betts, Rotenberg, & Trueman, 2009; Rotenberg et al., 2004). An example of this relation is in a study conducted by Corriveau et al. (2009)

that found that children between 4 and 5 years of age relied on information provided by their mother when asked to identify an unfamiliar object with ambiguous cues. Children's belief that their mother is reliable, in part based on previous interactions in which reliable information was provided, affected children's decision making. Applied to the current study, children whose parents have behaved reliably and honestly in the past may hold greater trust beliefs in their parents. These beliefs may, in turn, lead to more secret-keeping for their parents.

ToM and Secret-Keeping

Watson and Valtin (1997a, 1997b) read children vignettes about different types of secrets and asked questions about their understanding of the secrets. Based on children's responses, Watson and Valtin argued that increases in children's conceptualization of secrecy were marked by improvements in an appreciation of the roles that self and others play in keeping secrets. For example, young children (5- to 6-year-olds) did not demonstrate an understanding that keeping a secret may conflict with a desire to tell someone else about the secret (e.g., an adult or authority figure). However, older children (11- to 12-year-olds) reconcile these conflicts by evaluating the context surrounding the secret (e.g., some secrets may need to be disclosed to adults for safety while others may be kept to foster friendship). This requires ToM understanding, defined as the ability to consider others' mental states (e.g., Carlson & Moses, 2001; Sabbagh, Moses, & Shiverick, 2006). It should be noted that Watson and Valtin used stories to examine the role of ToM in children's understanding of secrets rather than their actual secret-keeping behavior. To our knowledge, there has been no research of this kind.

Research on children's lie-telling provides some evidence to suggest that ToM understanding may be related to children's behavior (e.g., Carlson, Moses, & Hix, 1998; Talwar, Gordon, & Lee, 2007). These studies have demonstrated that children's lie-telling behavior is related to children's first-order false belief understanding (e.g., Polak & Harris, 1999; Talwar & Lee, 2008), which supports the hypothesis that lie-telling requires creating a false belief in the mind of another person. These studies have also demonstrated that children's successful maintenance of lies through follow-up questioning is related to second-order false belief understanding (e.g., Talwar et al., 2007; Talwar & Lee, 2008), which supports the hypothesis that maintaining a lie requires a child to understand another's beliefs

and what another may deduce from information the child reveals. These hypotheses can be applied to the context of secret-keeping as well. Successfully keeping a secret requires that a child understand the information known by others and what information may reveal the secret. Thus, better ToM understanding should correspond to more secret-keeping behavior.

EF and Secret-Keeping

Executive functioning, an umbrella term used to describe several related cognitive skills like self-regulation, planning, cognitive flexibility, inhibition, and working memory (e.g., Carlson, 2005; Davidson, Amso, Anderson, & Diamond, 2006; Zelazo & Muller, 2002), may also be related to secret-keeping. Secret-keeping involves the simultaneous awareness of what information needs to be concealed and what information can be disclosed without arousing suspicion. This is, in effect, EF. Specifically, secret-keeping may require the use of at least two executive functions: working memory and inhibitory control. To keep a secret, children must hold in mind multiple pieces of information at one time (i.e., working memory) and suppress secret-revealing thoughts, behaviors, and actions from those who are not privy to the secret (i.e., inhibitory control). Secret-keeping may be difficult for children with poor working memory or inhibitory control.

Recent research provides support for the role of inhibitory control in secret-keeping. Rotenberg, Michalik, Eisenberg, and Betts (2008) examined peer-reported trustworthiness, inhibitory control, and preschool adjustment in 4- to 6-year-old children. Teachers provided ratings of inhibitory control and preschool adjustment and children provided ratings of trustworthiness by responding to questions about how often their classmates kept promises and secrets. They found that the relation between inhibitory control and preschool adjustment was mediated by peer-reported trustworthiness. Betts and Rotenberg (2007) conducted a similar study and found that children's peer-reported trustworthiness also mediated the relation between inhibitory control and teachers' ratings of a child's school adjustment. Rotenberg and colleagues argued that these findings support the notion that inhibitory control contributes to children's trustworthiness in ways similar to those described earlier. The act of secret-keeping requires that a child suppress responses that reveal the secret and behave in accordance with the secret. In both of these studies, teachers rated children's

inhibitory control. The current study extends this literature by using parental ratings of executive functions, as parents have the ability to evaluate their child's behavior in a greater number of contexts than teachers.

The Current Study

In the current study, using methods similar to those in previous studies (e.g., Bottoms et al., 2002; Talwar et al., 2004), secret-keeping in children 4–12 years of age was examined. This age range was selected to capture the breadth of children's performance on measures of social and cognitive factors that may affect their secret-keeping. Children witnessed their parents commit a transgression (i.e., break a toy) and were then asked to promise to keep the broken toy a secret. Later, children responded to an open-ended question about what they did with their parent and direct questions about the broken toy, and completed tasks that measured their trust beliefs, ToM, and secrecy endorsement. Parents rated their child's EF in another room while their child was completing the interview. Overall, we expected to find that more children would keep the secret in response to the open-ended question than subsequent repeated direct questions about the toy. For social and cognitive factors, we expected children's trust, ToM, secrecy endorsement, and EF to predict children's secret-keeping such that secret-keeping would increase with scores for each of these factors. Given that children's performance on the social and cognitive measures increases with age, and that we expected these measures would be related to secret-keeping, we expected to see increased secret-keeping with age as well.

Method

Participants

Children ($N = 107$; 51 boys) between 4 and 12 years of age ($M_{\text{age}} = 8.32$ years, $SD = 2.49$ years) from an urban center in Ontario, Canada participated. Families responded to a mail-out that briefly described the research. According to a brief income and education questionnaire completed by parents, household income was less than \$50,000 for 14% of families, between \$50,000 and \$80,000 for 25% of families, and more than \$80,000 for 47% of families. The highest level of education achieved in the household was high school or some postsecondary education (e.g., technical or vocational school, com-

munity college) for 23% of families; a postsecondary diploma, certificate, or degree for 49% of families; and a postgraduate degree for 25% of families. Fifteen parents did not respond to the household income question and three parents did not provide educational information. Parents completed a detailed informed consent procedure, described in more detail next, and children provided verbal assent prior to completing any of the activities.

Procedure

Parents and children visited our laboratory on campus to participate in the study and were greeted by two experimenters. While the child and Experimenter 1 became acquainted in the waiting room, Experimenter 2 brought parents into the testing room for the detailed informed consent procedure. Parents were informed of their role as confederate and given the opportunity to ask questions and withdraw from the study. No parents withdrew at this time. Parents were also shown the location of four hidden cameras that recorded the session.

After completing informed consent, Experimenter 1 brought the parent and child into the testing room where they were seated at a table and informed they would play some games. Before beginning, Experimenter 1 said she had papers to retrieve in another room. Parents were instructed during the informed consent procedure to play with some of the toys in the room at this time and then to break the toy on the top shelf of a bookcase. The toy, "Wobblyball," was a series of magnet balls and rings built in a tower that, if poked, collapsed and appeared broken. After breaking the toy, parents acted surprised, pointed to the "DO NOT TOUCH" sign positioned behind the "Wobblyball," and made it clear to their child that they should not have touched the toy. Parents then said: "Do not tell her I broke it" and asked, "Can you promise that you will not tell her I broke it?" Approximately two thirds of children agreed to promise to keep the secret (66%; $n = 71$; 34 boys; $M_{\text{age}} = 8.16$ years, $SD = 2.36$ years).

Once the child had either promised or not promised to keep the secret, Experimenter 1 returned to the room to complete the first interview (parents were asked to complete questionnaires in another room). The interview began with an open-ended question (i.e., "Tell me everything you did with your mom or dad") and three nondirective prompts (e.g., "What else can you remember?") to exhaust the child's recall. Following the open-ended ques-

tions, the experimenter told the child that the first game would be "Wobblyball." Looking at the bookcase, she feigned surprise to see the broken toy and said, "I wonder how it broke. You could not have broken the toy because it is too high to reach." This statement assured the child that they were not implicated in the transgression, an important factor contributing to their rate of secret-keeping (Talwar et al., 2004). The experimenter then asked a direct question about the broken toy ("What happened to the 'Wobblyball?") and three follow-up questions ("Did your mom or dad break it?" "Did someone else come into the room and break it?" and "Did your mom or dad ask you not to tell me that she or he broke the toy?").

Once the first interview was completed, Experimenter 2 interrupted the session and informed Experimenter 1 that she had an important phone call. Experimenter 1 left the room, ostensibly to take her phone call, and Experimenter 2 proceeded to ask the child the same direct questions about the broken toy for a second time. Interview questions were repeated as a measure of children's ability to keep a secret in response to repeated questioning. All children were asked both sets of interview questions, even if they had disclosed the secret during open-ended questioning. Children completed three social and cognitive measures after responding to the interview questions: a trust questionnaire, four ToM stories and three stories about secrets (see next for more detail).

All children were debriefed in an age-appropriate manner following completion of the interviews. Children were shown the hidden cameras, learned about the deception in the study, and reassured by the researchers and their parents that their behavior was natural and appropriate. Researchers provided a relaxed atmosphere in which to discuss moral issues with the children and their parents. Parents often appreciated this portion of the experience as it provided them with a unique opportunity to discuss moral and social issues (e.g., lying, secrecy, honesty) with their children. The university's Office of Research Ethics approved the procedure.

Measures

Trust

Children answered a subset of questions from the Early Childhood Generalized Trust Belief Scale (ECGTBS; Betts et al., 2009) or the Childhood Generalized Trust Belief Scale (CGTBS; Rotenberg

et al., 2005) to measure children's trust beliefs. Both scales were designed to measure children's trust beliefs in the people with whom they typically share relationships (i.e., mothers, fathers, teachers, and peers). Questions on each of these scales are based on Rotenberg's (1994) Bases, Domains, and Targets (BDT) framework for children's trust beliefs, which includes the following three bases of trust: reliability, emotional, and honesty. Two questions each for reliability (e.g., "Your mother said she would buy you a toy that you like. Do you think your mother will buy a toy that you like?"), emotional (e.g., "You told your mother you got a gift for a friend. You asked your mother not to tell anybody about the gift as a surprise. Do you think your mother will tell anybody about the gift?"), and honesty (e.g., "Your mother said she was too tired and cannot go shopping with you. Do you think your mother was too tired?") were selected so that measurement of each underlying factor of trust did not rely on a single item. Younger children (4- to 8-year-olds) responded to items drawn from the ECGTBS and older children (9- to 12-year-olds) responded to items drawn from CGTBS. The items were similar for all children, except that the language was simplified and more age appropriate for the younger children. For example, older children responded to a scenario about cleaning their room and bedtime, and younger children responded to a scenario about eating dinner and going out to play. Children provided their responses on 5-point Likert scales where higher scores reflected greater trust beliefs. Both scales have demonstrated low to moderate internal consistency (α s = .72-.79; Betts et al., 2009; Rotenberg et al., 2005).

Theory of Mind

Children's ToM understanding was measured using two unexpected location first-order false belief stories (Wimmer & Perner, 1983) and two unexpected location second-order false belief stories. The two unexpected first-order false belief stories were the oft-cited stories about (a) Max and his chocolate bar and (b) Sally and her ball. For example, the story about Max begins when he puts his chocolate bar in the cupboard before going out to play. While he is outside Max's mother moves his chocolate bar to the drawer. Children were asked reality (e.g., "Where is the chocolate now?") and memory (e.g., "Where did Max put his chocolate at the beginning?") questions to check their comprehension. At the end of each story, children

were asked a test question about where the main character would look for the object. Children received 1 point for every correct response to create a first-order false belief score 1 of 2.

Two unexpected location second-order false belief stories were adapted from Astington, Pelletier, and Homer (2002). One of the stories was about John and his sister Mary. It began with John putting a crayon in his desk and leaving the room where he and his sister Mary were playing. Mary moves the crayon from the desk and puts it in the basket, but John sees her do this because he is peeking around the corner. Children were asked two target questions: "Does Mary think that John can see her?" and "Where does Mary think John will look for the crayon when he comes back into the room?" Children were also asked two control questions (e.g., "Can John see Mary?" and "Where does John think the crayon is?") to check comprehension. The second story involved Jenny discovering the birthday present her mother had hidden for her, and children were asked two similar target and control questions. Children received 1 point for answering each target question correctly to create a second-order false belief score 1 of 4. Individually, Hughes et al. (2000) found fair to moderate reliability (κ coefficients = .48–.72) and, in aggregate, good to substantial internal consistency (Cronbach's α s = .60–.82) for tasks measuring first-order and second-order false beliefs.

Secrecy Endorsement

Children read three stories about secrets based on those developed by Watson and Valtin (1997a, 1997b). Each story involved one of the characters sharing a secret with the other, who then disclosed the secret to the mother character. For example, in the guilty secret story, Susan confesses to Cathy that she stole money from her mother's purse to buy ice cream. Cathy then tells her mother that Susan stole money. The innocent story involved a secret about a birthday present, and the dangerous story involved a secret about lighting a fire. After each story, children were asked three control questions to check their understanding of the story's events (e.g., "Who stole the money?"). If a child answered a control question incorrectly, the experimenter corrected the child to ensure that each child understood key parts of the story. The majority of children (91.2%) provided accurate responses to at least seven of the nine control questions. However, a three-way (age: 4- to 6-year-olds, 7- to 9-year-olds, 10- to 12-year-olds)

analysis of variance revealed a significant effect of age on the number of correct responses, $F(2, 99) = 8.45, p < .01$, partial $\eta^2 = .15$. Tukey's honestly significant difference (HSD) post hoc comparisons revealed that the youngest children (4- to 6-year-olds) answered fewer control questions correctly than the older children. Approximately 53% of 4- to 6-year-olds responded to all the control questions correctly compared to 78% of 7- to 9-year-olds and 89% of 10- to 12-year-olds. Children were also asked one question measuring whether it was all right for the character to disclose the secret, and one question that asked what the child would have done in the same situation. Children's responses to these questions fell into three categories: responses that endorsed secret-telling, responses that endorsed secret-keeping, and "don't know" responses. Responses that endorsed secret-telling were assigned a score of 1 and responses that endorsed secret-keeping were assigned a score of 2. "Don't know" responses were assigned a score of 0. Scores for each response were summed, for a possible total of 12, so that higher scores reflected greater support for secret-keeping.

Behavior Rating Inventory of Executive Function

EF was measured using the Behavior Rating Inventory of Executive Function (BRIEF)–Preschool Version (BRIEF-P; Gioia, Espy, & Isquith, 2002) for 4-year-olds and the BRIEF (Gioia, Isquith, Guy, & Kenworthy, 2000) for 5- to 12-year-olds. Both scales measure parental ratings of several aspects of their children's EF, including inhibitory control, shifting, emotional control, and working memory. Each item presents the parent with a behavior (e.g., overreacts to small problems) and parents are to respond "never," "sometimes," or "often" to indicate whether their child engaged in the behavior in the past 6 months. Responses to items on all scales were then summed to create a global executive composite (GEC) score for each child. Raw scores were converted to T scores normed for gender and age so that the contribution of EF to secret-keeping, over and above age, could be examined. The pattern of results was the same when raw scores were used. Standardized z scores were used so that scores for 4- and 5- to 12-year-olds could be included in the same analysis. Higher GEC scores reflected poorer EF. Both the BRIEF and BRIEF-P have high internal consistency (α s = .80–.90s) and test-retest reliability (r s = .80–.90s; Gioia et al., 2002; Gioia et al., 2000).

Results

Children's responses to the open-ended and direct interview questions were analyzed separately. Descriptive analyses for each question are presented first (see Table 1 for the number of children who kept the secret in response to each interview question, separated by child's age and promise), followed by a series of hierarchical logistic regression analyses to examine the social and cognitive factors that predicted children's secret-keeping behavior.

Open-Ended Question

When asked, "Tell me everything you did with your mom or dad," 82.2% of children ($N = 88$) kept the secret. Hierarchical logistic regression analyses were conducted on children's responses to the open-ended interview question as a measure of children's spontaneous disclosures. Children's secret-keeping behavior (secret-keeper or secret-teller) was the dependent variable, child's age (continuous variable) and promise (promise, no promise) were entered in the first step (the first model), children's trust beliefs scores (continuous) were entered in the second step (the second model), children's ToM and Secrecy Endorsement scores were entered in the third step (the third model), and BRIEF GEC scores were entered in the fourth step (the fourth model). Preliminary analyses revealed no significant effects for sex of child, parental education, or parental income and so these variables were not included in the hierarchical logistic regression analyses. The order in which predictors were included in the model was determined by their relevance to the

overall objective of the current study and the method of measuring each predictor. For example, measures of the child (i.e., age) and the child's behavior (i.e., promise) or performance (i.e., trust beliefs) were entered prior to parental ratings (i.e., BRIEF GEC scores). Furthermore, Block chi-square tests were used to determine significance at each step, which requires that each predictor increase the variability accounted for substantially in order to justify its inclusion in the model. See Table 2 for correlations among variables and Table 3 for odds ratios and 95% confidence intervals for regression results.

The first model was significant, $\chi^2(2, N = 93) = 18.43, p < .01$. Age ($\beta = .03$, Wald = 6.69) was a significant predictor such that for every 1-month increase in age, children were 1.03 times more likely to keep the secret. Promise ($\beta = 2.36$, Wald = 10.73) was also a significant predictor of children's secret-keeping when asked an open-ended question. Relative to children who did not promise to keep the secret, children who promised were 10½ times more likely to keep the secret. The second model, $\chi^2(1, N = 93) = 1.25, ns$; third model, $\chi^2(1, N = 93) = 1.72, ns$; and fourth model, $\chi^2(1, N = 93) = 0.44, ns$, were nonsignificant.

Direct Questions (First Interview)

For each set of analyses conducted on children's responses to the direct questions, children who had previously disclosed the secret were excluded. Of the 88 children who kept the secret in response to the open-ended question, 64.8% (57) of children kept the secret when asked, "What happened to the

Table 1

Percentage (Number) of Children Who Kept the Secret When Responding to Each Type of Interview Question, Separated by Child's Age and Promise

Question	4- to 6-year-olds		7- to 9-year-olds		10- to 12-year-olds	
	Promise	No promise	Promise	No promise	Promise	No promise
First interview						
Tell me everything you did	88.9 (24/27)	54.5 (6/11)	88.9 (24/27)	57.1 (4/7)	100 (17/17)	91.7 (11/12)
What happened to the "Wobblyball?"	62.5 (15/24)	33.3 (2/6)	62.5 (15/24)	75.0 (3/4)	76.5 (13/17)	63.6 (7/11)
Did someone else come in and break it?	80.0 (12/15)	50.0 (1/2)	100 (15/15)	100 (3/3)	92.3 (12/13)	100 (7/7)
Did your mom or dad break it?	83.3 (10/12)	0 (0/1)	66.7 (10/15)	66.7 (2/3)	75.0 (9/12)	85.7 (6/7)
Did she or he ask you not to tell me?	80.0 (8/10)	—	80.0 (8/10)	100 (2/2)	100 (9/9)	83.3 (5/6)
Second interview						
What happened to the "Wobblyball?"	100 (8/8)	—	100 (8/8)	50.0 (1/2)	100 (9/9)	100 (5/5)
Did someone else come in and break it?	100 (8/8)	—	100 (8/8)	100 (1/1)	100 (9/9)	100 (5/5)
Did your mom or dad break it?	100 (8/8)	—	100 (8/8)	100 (1/1)	100 (9/9)	100 (5/5)
Did she or he ask you not to tell me?	100 (8/8)	—	100 (8/8)	100 (1/1)	100 (9/9)	100 (5/5)

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Table 2
Correlations Among Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Age	—												
2. Promise	-.10	—	.03	-.10	-.08	.03	.05	.07	.05	-.02	.09	.36**	.19
3. Trust	.34**	.02	—	.06	.01	-.16	-.13	-.05	-.19	-.08	-.04	-.10	.20
4. ToM	.51**	-.09	.31**	—	.23	-.31**	-.17	-.26*	-.30**	-.14	-.27*	-.17	-.07
5. Endorse	.03	-.07	.01	.17	—	-.04	-.05	-.12	-.07	-.02	-.03	-.07	-.07
6. GEC	-.02	-.01	-.21*	-.28**	-.05	—	.51**	.76**	.86**	.69**	.80**	.06	-.23*
7. I	-.54**	.07	-.38**	-.42**	-.04	.43**	—	.42**	.66**	.20	.24*	.15	-.15
8. S	-.07	.06	-.14	-.27**	-.14	.75**	.40**	—	.59**	.55**	.54**	-.03	-.18
9. WM	-.23*	.05	-.36**	-.39**	-.04	.82**	.67**	.57**	—	.47**	.67**	.11	-.17
10. EC	.05	-.06	-.02	-.09	-.04	.66**	.14	.53**	.39**	—	.38**	-.04	-.22*
11. PO	.28**	.04	-.05	-.08	-.02	.76**	.05	.48**	.57**	.34**	—	.18	-.10
12. Open	.14	.28*	-.01	-.07	.01	-.01	.06	-.05	-.02	-.02	.14	—	.23*
13. Direct	.21*	.16	.25**	.03	.01	-.26**	-.25**	-.22*	-.24*	-.23*	-.06	.30**	—

Note. Variables include (1) child's age in months, (2) whether the child promised, (3) child's trust belief scores, (4) child's ToM scores, (5) child's secrecy endorsement scores, (6) BRIEF GEC, (7) inhibit, (8) shift, (9) working memory, (10) emotion control, (11) plan or organize scores, (12) secret-keeping in response to open-ended questions, and (13) secret-keeping in response to direct questions. Bivariate correlations are included below the diagonal and partial correlations, controlling for age, are included above the diagonal ($dfs = 87-107$). ToM = theory of mind; GEC = global executive composite; I = inhibit; S = shift; WM = working memory; EC = emotion control; PO = plan or organize scores; BRIEF = Behavior Rating Inventory of Executive Function.

* $p < .05$. ** $p < .01$.

Table 3

OR and 95% CI for Hierarchical Logistic Regression Analyses Predicting Children's Secret-Keeping for a Parent in Response to Open-Ended Questions and Direct Questions

Predictor variable	Model 1		Model 2		Model 3		Model 4	
	OR	CI	OR	CI	OR	CI	OR	CI
Open-ended questions								
Age	1.03**	[1.01, 1.06]	1.04**	[1.01, 10.7]	1.05**	[1.02, 1.08]	1.05**	[1.02, 1.09]
Promise	10.58**	[2.58, 43.42]	10.97**	[2.58, 46.72]	11.05**	[2.48, 49.17]	12.31**	[2.57, 58.98]
Trust			0.66	[0.31, 1.41]	0.70	[0.32, 1.55]	0.66	[0.29, 1.50]
ToM					0.49	[0.15, 1.59]	0.42	[0.12, 1.49]
Secrecy endorsement					1.05	[0.53, 2.05]	1.09	[0.56, 2.26]
BRIEF GEC							0.76	[0.35, 1.68]
Direct questions								
Age	1.02**	[1.01, 1.04]	1.02	[1.00, 1.03]	1.02	[1.00, 1.04]	1.02*	[1.00, 1.04]
Promise	2.82	[0.94, 8.45]	3.19*	[1.02, 9.96]	3.05	[0.97, 9.57]	2.98	[0.93, 9.59]
Trust			2.33*	[1.03, 5.25]	2.26*	[1.01, 5.06]	2.17	[0.93, 5.07]
ToM					0.88	[0.43, 1.77]	0.68	[0.32, 1.43]
Secrecy endorsement					0.89	[0.54, 1.48]	0.89	[0.52, 1.52]
BRIEF GEC							0.53*	[0.31, 0.92]
Direct questions (2)								
Age	1.02*	[1.00, 1.04]	1.01	[1.00, 1.03]	1.02	[1.00, 1.04]	1.02	[1.00, 1.04]
Promise	2.78	[0.93, 8.33]	3.02	[0.97, 9.47]	2.90	[0.92, 9.14]	2.92	[0.90, 9.47]
Trust			2.40*	[1.05, 5.47]	2.34*	[1.03, 5.31]	2.41*	[1.03, 5.66]
ToM					0.88	[0.44, 1.77]	0.77	[0.37, 1.60]
Secrecy endorsement					0.91	[0.55, 1.51]	0.90	[0.53, 1.52]
BRIEF EC							0.54	[0.28, 1.05]

Note. Variables include child's age in months, whether the child promised, child's trust belief scores, child's ToM scores, child's secrecy endorsement scores, BRIEF GEC scores, and BRIEF EC scores. Direct questions (2) refers to the model that used forward selection to identify individual scales on the BRIEF that were related to children's secret-keeping throughout both interviews. OR = odds ratio; CI = confidence interval; ToM = theory of mind; GEC = global executive composite; EC = emotion control; BRIEF = Behavior Rating Inventory of Executive Function.

* $p < .05$. ** $p < .01$.

'Wobblyball'?" When asked, "Did someone else come in and break the 'Wobblyball'?" 91.2% (52) of children continued to keep the secret by not revealing that their parent had broken the toy (i.e., responded "No" to the question). When asked, "Did your mom or dad break the 'Wobblyball'?" 75.0% (39) of children continued to keep the secret. When asked, "Did your mom or dad ask you not to tell me that she broke the toy?" 87.2% (34) of children continued to keep the secret by responding "No" to this question.

Direct Questions (Second Interview)

Recall that Experimenter 2 interrupted the session at this point and asked children the same series of direct questions when Experimenter 1 left the room to answer an important telephone call. Of the 34 children who did not disclose their parent's secret during the first interview, 97.1% (33) of children kept the secret when asked, "What happened to the 'Wobblyball'?" From this point forward, no additional children disclosed that their parent had broken the toy. In other words, 30.8% of all children (33) continued to keep the secret when asked, "Did someone else come in and break the 'Wobblyball'?" "Did your mom or dad break the 'Wobblyball'?" and "Did your mom or dad ask you not to tell me that she broke the toy?" again.

Hierarchical logistic regression analyses identified factors that affected children's secret-keeping throughout the interviews. In these analyses, whether or not the child kept the secret throughout both interviews was the dependent variable. Child's age and promise were entered in the first step (the first model), children's trust beliefs scores were entered in the second step (the second model), children's ToM and Secrecy Endorsement scores were entered in the third step (the third model), and BRIEF GEC scores were entered in the fourth step (the fourth model). Sex of the child and education and income of the parent(s) were not included in the model because no significant effects were found. The first model was significant, $\chi^2(2, N = 94) = 9.81, p < .01$. Age ($\beta = .02, Wald = 6.65$) was a significant predictor of children's secret-keeping in response to direct questions about the broken toy: For every 1-month increase in age, children were 1.02 times more likely to keep the secret. The second model was significant, $\chi^2(1, N = 94) = 4.75, p < .05$. Children's trust beliefs scores significantly predicted children's secret-keeping in response to direct questions above and beyond children's age and promise ($\beta = .85, Wald = 4.16$) such that for every 1 point increase in children's trust

belief scores children were more than twice as likely to keep the secret. The third model was nonsignificant, $\chi^2(1, N = 94) = 0.39, ns$. The fourth model was significant $\chi^2(1, N = 94) = 5.89, p = .01$. Children's BRIEF GEC scores significantly predicted children's secret-keeping above and beyond all other factors entered previously in the regression model ($\beta = -0.63, Wald = 5.14$). For every 1 point increase in BRIEF scores, children were half as likely to keep the secret. Recall that lower scores on the BRIEF reflect better EF.

To explore the significant effect of children's BRIEF GEC scores further, we conducted a hierarchical logistic regression model similar to that described earlier with the exception that scores on individual scales included in both the BRIEF-P and BRIEF (i.e., inhibit, shift, emotional control, working memory, and plan or organize) were included in the fourth step rather than GEC Scores. Forward selection was used because there was no theoretical basis for determining order in which to include the scales. The fourth model was significant, $\chi^2(1, N = 94) = 5.08, p < .05$. Children's scores on the Emotional Control scale approached significance as a predictor of children's secret-keeping ($\beta = -.62, Wald = 3.34, p = .07$) and was included in the overall significant model. Similar to BRIEF GEC scores, this suggests that for every 1 point increase in Emotional Control scale scores children were half as likely to keep the secret. The other individual scales were not significant predictors ($p > .14$).

The Relation Between Age, Secret-Keeping, and Social and Cognitive Factors

Separate 3 (age: 4- to 6-year-olds, 7- to 9-year-olds, 10- to 12-year-olds) \times 2 (child's behavior: secret-keeper, secret-teller) analyses of variance were conducted on children's scores on each of the social and cognitive tasks (see Table 4 for descriptive statistics). These analyses were completed to further examine the relation between age, secret-keeping, and children's performance on the social and cognitive tasks. For the purposes of these analyses, secret-keepers were those children who did not disclose their parents' transgression throughout questioning and secret-tellers were those children who disclosed their parents' transgression at some point during the interviews (i.e., the same variable as the dependent measure for the hierarchical logistic regressions performed on children's responses to direct questions).

For trust beliefs, there were significant main effects for age, $F(2, 101) = 3.23, p < .05$, partial

Table 4
 Mean Scores and Standard Deviations on the Trust Scales, ToM Stories, Secrecy Stories, and BRIEF by Age and Child's Behavior

	Trust	ToM	Secrecy stories	BRIEF GEC
4- to 6-year-olds				
Secret-keepers	20.70 (5.21)	3.50 (1.43)	8.70 (2.41)	47.38 (10.35)
Secret-tellers	18.27 (8.50)	3.83 (1.73)	8.21 (2.29)	52.86 (11.03)
Overall	18.87 (7.82)	3.74 (1.65)	8.33 (2.30)	51.68 (10.98)
7- to 9-year-olds				
Secret-keepers	24.22 (3.46)	4.38 (1.85)	8.67 (1.73)	44.44 (8.97)
Secret-tellers	18.86 (5.24)	4.96 (1.11)	8.96 (1.56)	54.93 (8.74)
Overall	20.16 (5.36)	4.82 (1.31)	8.89 (1.58)	52.31 (9.81)
10- to 12-year-olds				
Secret-keepers	24.07 (3.25)	5.71 (0.47)	8.50 (1.22)	50.14 (12.22)
Secret-tellers	23.13 (6.59)	5.29 (1.07)	8.53 (1.64)	53.69 (12.27)
Overall	23.57 (5.24)	5.50 (0.84)	8.52 (1.43)	52.03 (12.17)
Overall				
Secret-keepers	23.09 (4.18)	4.69 (1.55)	8.61 (1.73)	47.77 (10.82)
Secret-tellers	19.54 (7.17)	4.55 (1.52)	8.56 (1.91)	53.82 (10.42)

Note. ToM = theory of mind; BRIEF = Behavior Rating Inventory of Executive Function; GEC = global executive composite.

$\eta^2 = .06$, and child's behavior, $F(1, 101) = 4.71$, $p < .05$, partial $\eta^2 = .06$. Tukey's HSD post hoc comparisons revealed that trust beliefs scores for 4- to 6-year-olds and 7- to 9-year-olds were similar, but lower than those for 10- to 12-year-olds. In addition, trust beliefs scores for secret-keepers were higher than those for secret-tellers. For ToM understanding, there was a significant main effect of age, $F(2, 95) = 13.25$, $p < .01$, partial $\eta^2 = .22$. Tukey's HSD post hoc comparisons revealed ToM understanding scores were the lowest for the youngest children (4- to 6-year-olds) and similar for 7- to 9-year-olds and 10- to 12-year-olds. Separate analyses were conducted on children's first-order false belief understanding scores and second-order false belief understanding scores. The pattern of results was similar to that reported for children's overall ToM scores (i.e., age main effects only). There were no significant main effects or interactions for children's responses to the secrecy stories. For BRIEF GEC scores, there was a significant main effect of child's behavior, $F(1, 97) = 7.62$, $p < .01$, partial $\eta^2 = .07$, such that secret-tellers had higher scores

(i.e., poorer ratings of EF) than secret-keepers. Given that age did not interact with child's behavior, these results suggest that age did not moderate the relation between secret-keeping and children's performance on the social and cognitive tasks.

Discussion

The current study examined the development of children's secret-keeping and its relation to social (i.e., trust) and cognitive (i.e., ToM, secrecy endorsement, and EF) factors. There were several key findings: (a) secret-keeping increased with age, (b) promising to keep the secret led to fewer disclosures when asked open-ended questions about events surrounding the transgression, (c) disclosure rates increased over the course of the interviews, and (d) children who kept the secret in direct questioning exhibited greater trust and (e) received better parental ratings of EF than children who disclosed the secret. Each of these findings is discussed in turn below.

The current study found that for both types of interview questions, secret-keeping increased with age. Interestingly, these findings are supported by research on children's endorsement of secrecy. Recall that nonmaltreated children in Lyon et al. (2010) endorsed less disclosure against a parent transgressor with age. However, other studies investigating children's actual secret-keeping for a parent have found no age-related changes (e.g., Bottoms et al., 2002; Talwar et al., 2004). The current study included a wide range of ages, which may have allowed for sufficient variability in secret-keeping to detect age differences, but Talwar et al. (2004) examined secret-keeping in children of similar ages (3- to 11-year-olds) and did not find age-related differences. In their study, children promised an interviewer to tell the truth. It is possible that older children, who better understand the consequences of disclosing secrets, were more motivated to keep their parent's secret in the current study because of their parent's request to promise to keep the secret.

Indeed, we found that children who promised to keep their parent's secret were less likely to disclose the secret when asked open-ended questions about what happened at the time the transgression occurred. The promise measure in the current study was different from studies that report its truth-promoting effects. All parents asked children to promise to keep the secret, but some children did not make this promise. Thus, it occurred naturally

between parent and child without prompt by the experimenters. It also occurred at the time of the transgression rather than during the interview. An interesting avenue for future research would be to examine the interaction between the truth-impeding effects of a promise made to a trusted transgressor, like a parent, with the truth-promoting effects of a promise made to an interviewer.

The vast majority of children (82.2%) kept the secret when asked open-ended questions about what they did with their parent when Experimenter 1 was out of the room. The rate of children's secret-keeping dropped in response to each subsequent direct question asked by Experimenter 1, but plateaued at 30.8% after the first question was repeated in the second interview. These findings are supported by previous research that demonstrated that children eventually disclose secrets when questioned about them repeatedly (e.g., Talwar et al., 2004; Wilson & Pipe, 1989). In the current study, maintaining the secret became more difficult for children and more children disclosed their parent's transgression over the course of the interview. In the legal context where children may be asked to keep abuse committed by a parent or loved one a secret, this effect is promising in which a disclosure of abuse may remove a child from the risk of further harm. However, some research suggests that repeated questions may not increase accurate reporting (e.g., Poole & White, 1991) and may actually increase the rate of false allegations. False allegations were infrequent in the current study. Only two children falsely implicated someone when asked if someone else came in and broke the toy. In other words, even when provided with an explicit opportunity to blame someone else for committing their parent's transgression, very few children did so.

We show for the first time that children's trust beliefs predicted secret-keeping: Children who kept the secret throughout both interviews had higher trust beliefs scores than children who disclosed the secret at some point during questioning. These findings are consistent with the BDT interpersonal trust framework (e.g., Betts et al., 2014; Rotenberg, 1994; Rotenberg et al., 2011). According to the BDT framework, trust beliefs include the belief that others will keep a secret and trustworthiness is the act of actually keeping the secret. The framework also suggests that parents and children share reciprocal interactions that lead to common beliefs and behaviors. In other words, high-trusting parent-child relationships should demonstrate higher trust beliefs and trustworthiness toward each other than

low-trusting parent-child relationships. This was evidenced in the current study, in which children's trust beliefs in their parents predicted children's trustworthiness toward their parents (i.e., keeping the secret). Although not examined in the current study, the BDT framework predicts that a similar pattern would be found between parents' trust beliefs in their children and parents' trustworthiness toward their children (e.g., Rotenberg & Boulton, 2013). It should be noted that the current study did not seek to test the BDT framework specifically and future research is merited. For example, future research could use all items from the ECGTBS and CGTBS to enable a more complete analysis of the contribution of trust beliefs to secret-keeping.

The role of trust beliefs in children's secret-keeping behavior has important implications for the forensic situation in which a child is either a witness to or victim of abuse. Indeed, it is the case that children are more often subjected to offenses committed by adults they know and trust than by strangers (e.g., Connolly & Read, 2006). Furthermore, children are less likely to disclose abuse committed by parents than abuse committed by strangers (e.g., London, Bruck, Wright, & Ceci, 2008; Lyon et al., 2010), which is then less likely to be reported to police (Hanson, Resnick, Saunders, Kilpatrick, & Best, 1999). Arguably, during this period of nondisclosure, children keep the abuse secret from others. These secrets have serious forensic consequences. Failure to report details of abuse not only undermines the integrity of an investigation but may also place the child and others at risk of continued abuse (Sas & Cunningham, 1995). Understanding the relation between trust and secret-keeping for a parent may inform the development of effective interviewing techniques that maximize the accuracy of children's reports. For example, given the potential contribution of trust on children's disclosure, interviews about suspected abuse where the suspect shares a close relationship with the child may benefit from a greater focus on techniques that reduce the motivation to conceal (e.g., removing the suspect and interviewing the child alone) than on cognitively based techniques (e.g., narrative elaboration).

Children who kept the secret were rated by their parents as having better EF than children who did not keep the secret. Additional analyses revealed that children's scores on the Emotional Control scale approached significance as a predictor of secret-keeping. Scores on the Emotional Control scale reflect the influence of executive functions on the expression and regulation of one's emotions.

This finding speaks to the interpersonal and social skills required for keeping secrets. It has been proposed that keeping secrets is one method that children use to develop emotional autonomy (Finkenauer, Engels, & Meeus, 2002). Although this theory was used to explain why children keep secrets *from* their parents, it may also apply to children keeping secrets *for* their parents. Secrecy involves the creation of boundaries between self and others, and this includes both emotional and cognitive boundaries.

The current study did not find a relation between children's ToM understanding and their secret-keeping for a parent. Although the stories used to measure ToM in the current study are commonly used in the extant literature, they may not have challenged the older children. In fact, approximately 68% of 10- to 12-year-old children responded to all six ToM questions correctly (38% of 7- to 9-year-olds and 13% of 4- to 6-year-olds). Potential ceiling effects, combined with the fact that the older children were more likely to keep their parent's secret, may have affected our ability to detect a relation between ToM and secret-keeping. At least two new measures, developed to aid in assessing children with autism spectrum disorder, have emerged that may warrant exploration in future studies: ToM Storybooks (Blijd-Hoogewys, van Geert, Serra, & Minderaa, 2008) and ToM Inventory (Hutchins, Prelock, & Bonazinga, 2012). Both can be used with typically developing children and accommodate a broader age range of children, which could address potential ceiling effects. It is also worth noting the positive correlation between children's ToM understanding and trust beliefs. Chandler and Hala (1991) argued that children's false belief understanding affects their trust in others by making them aware that others can behave dishonestly. Using more comprehensive measures for trust beliefs and ToM than were used in this study, an interesting opportunity for future research would be to explore the interplay between secret-keeping, trust beliefs, and ToM understanding.

We found that children's endorsement of secrecy in response to stories about different types of secrets did not predict their secret-keeping for a parent. For the younger children, this may partially be accounted for by their reduced understanding of the secrecy stories. However, this does not apply to the older children who understood the stories quite well. We know from previous research that children's endorsement of disclosure varies as a function of the relationship they share with the instigator and the recipient (e.g., Lyon et al., 2010).

In the current study, the secrecy endorsement stories involved a peer instigator and parent recipient, whereas the secret-keeping behavior procedure involved a parent instigator and a stranger recipient. That a parent or trusted caregiver was the recipient in the former but the instigator in the latter may have counteracted any potential effect of children's responses to the stories on their secret-keeping behavior. Furthermore, it may be the case that children value secrets requested by peers differently from those requested by parents. Indeed, secrecy is an important aspect of friendship formation and development (e.g., Rotenberg, 1991) that may become increasingly important with age and change a child's tendency to protect a parent instigator. Future studies could examine the interplay between these complex relationships and how they affect secrecy endorsement versus secret-keeping behavior.

There are at least two limitations in the current study. First, the current study examined whether children would keep a parent's transgression a secret and there may be limits to the applicability of these methods to other secret-keeping situations. Kim, Harris, and Warneken (2014) found differences in children's evaluations of different types of secrets using vignettes and it is reasonable to extrapolate that children's actual secret-keeping behavior may differ depending on the type of secret requested. Furthermore, the repercussions of disclosing a secret about a broken toy may be different from those experienced in more real-world situations like when a child is asked to keep abuse secret. A child's motivation to keep a secret in the legal context may be considerably more complex—and include a tension between loyalty to the abuser and fear of the courtroom—than children's motivation to keep the secret in the current study (Lyon, 2000). Second, although the current study found several new and interesting relations between children's secret-keeping and their social and cognitive development, there are limitations to the measures used. For example, trust was measured by using a subset of items from two trust beliefs scales. It is possible that an even stronger relation could be found by measuring trust in a more holistic way by completing all items on these scales and including additional measures of parental trust. In addition, the current study measured EF using parental ratings on the BRIEF only. Future studies could include a battery of EF tasks for children to complete to examine whether specific executive functions like working memory and inhibitory control play a role in secret-keeping. These limitations

speak to the importance of continuing this work both to gain greater ecological validity and to investigate the complicated relation between secret-keeping and aspects of children's social and cognitive development.

To summarize, findings demonstrate that the majority of children will keep a parent's secret when asked open-ended questions, and that secret-keeping for a parent increases with age. The current study was the first to examine the role of social and cognitive factors in children's secret-keeping behavior. Most notably, children who exhibited greater trust beliefs were more likely to keep their parent's secret than children who exhibited low trust beliefs. In addition, children whose parents rated their EF higher were more likely to keep the secret. These findings suggest that the development of children's secret-keeping coincides with the development of other social and cognitive skills. However, as noted earlier, there are several opportunities to explore this area of research further. This includes not only the expansion of tools used but also the measurement of additional factors like cross-cultural differences that may affect children's secret-keeping for a parent.

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