

EUR Research Information Portal

Infant–parent attachment and lie-telling in young children

Published in:

Journal of Experimental Child Psychology

Publication status and date:

Published: 01/11/2024

DOI (link to publisher):

[10.1016/j.jecp.2024.106044](https://doi.org/10.1016/j.jecp.2024.106044)

Document Version

Publisher's PDF, also known as Version of record

Document License/Available under:

CC BY

Citation for the published version (APA):

Schröer, L., Talwar, V., Luijk, M., & Kok, R. (2024). Infant–parent attachment and lie-telling in young children: The Generation R Study. *Journal of Experimental Child Psychology*, 247, Article 106044. <https://doi.org/10.1016/j.jecp.2024.106044>

[Link to publication on the EUR Research Information Portal](#)

Terms and Conditions of Use

Except as permitted by the applicable copyright law, you may not reproduce or make this material available to any third party without the prior written permission from the copyright holder(s). Copyright law allows the following uses of this material without prior permission:

- you may download, save and print a copy of this material for your personal use only;
- you may share the EUR portal link to this material.

In case the material is published with an open access license (e.g. a Creative Commons (CC) license), other uses may be allowed. Please check the terms and conditions of the specific license.

Take-down policy

If you believe that this material infringes your copyright and/or any other intellectual property rights, you may request its removal by contacting us at the following email address: openaccess.library@eur.nl. Please provide us with all the relevant information, including the reasons why you believe any of your rights have been infringed. In case of a legitimate complaint, we will make the material inaccessible and/or remove it from the website.



Contents lists available at ScienceDirect

Journal of Experimental Child Psychology

journal homepage: www.elsevier.com/locate/jecp



Infant–parent attachment and lie-telling in young children: The Generation R Study



Lisanne Schröer^{a,*}, Victoria Talwar^b, Maartje Luijk^a, Rianne Kok^a

^a Department of Psychology, Education and Child Studies, Erasmus University Rotterdam, 3062 PA Rotterdam, The Netherlands

^b Department of Educational and Counseling Psychology, McGill University, Montréal, Quebec H3A 0G4, Canada

ARTICLE INFO

Article history:

Received 26 March 2024

Revised 17 July 2024

Available online 3 September 2024

Keywords:

Lying

Attachment security

Disorganized attachment

Cheating

Moral development

ABSTRACT

Insecure-attached adults are more likely to lie. However, it is unknown whether infant–parent attachment quality relates to lie-telling in early childhood. As in adults, lie-telling in early childhood might be related to attachment *insecurity*. However, a competing hypothesis might be plausible; lie-telling might be related to attachment *security* given that lie-telling in early childhood is considered an advancement in social-cognitive development. The current study is the first to investigate the link between insecure/secure and disorganized/non-disorganized attachment and lie-telling behavior in early childhood. Because lie-telling is studied in the context of cheating behavior, the association between cheating and attachment is additionally explored. A total of 560 Dutch children (287 girls) from a longitudinal cohort study (Generation R) were included in the analyses. Attachment quality with primary caregiver (secure/insecure and disorganized/non-disorganized attachment) was assessed at 14 months of age in the Strange Situation Procedure, and cheating and lie-telling were observed in games administered at 4 years of age. The results demonstrated no relationship of attachment (in)security and (dis)organization with cheating and lie-telling. Results are interpreted in light of evidence that lie-telling in early childhood is part of normative development. Limitations are discussed, including the time lag between assessments, the fact that lie-telling was measured toward a researcher instead of a caregiver, and the conceptualization of attachment in infancy versus adulthood. Attachment quality does

* Corresponding author.

E-mail address: schroer@essb.eur.nl (L. Schröer).

not affect early normative lie-telling, but how and when it may affect later lying in children remains to be explored.

© 2024 The Authors. Published by Elsevier Inc. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

Introduction

In adults, there is an association between attachment quality and lie-telling. Insecure attached adults tell more lies than secure attached adults (Cole, 2001; Ein-Dor et al., 2017; Elaad et al., 2012; Ennis et al., 2008; Gillath et al., 2010; Warr, 2007). Lie-telling involves making a false statement with the intention to create a false belief in the target (Lee, 2013). To date, no studies have addressed the question of whether an association between attachment quality and lying is already present in early childhood when children tell their first lies. This question is even more pressing because lie-telling in this developmental period is not unequivocally negative. The emergence of lie-telling can be considered an important advancement in social-cognitive development (Talwar & Crossman, 2011, 2022). Lie-telling is a universal human behavior developing at similar ages in children across cultures (Talwar & Crossman, 2011). It has been suggested that parents play an important role in the development of lie-telling as primary social agents in their children's lives (Talwar & Crossman, 2022) and that early social development may influence developmental trajectories of lie-telling (transactional model of lie-telling; Crossman & Talwar, 2021; Talwar & Crossman, 2011, 2022).

Likewise, infant–parent attachment relates to many social-cognitive outcomes in later life (e.g., Ding et al., 2014; Ranson & Urichuk, 2008). In a secure attachment relationship, parents provide consistently responsive and sensitive care and equip infants with a mechanism to regulate stressful stimuli (Ainsworth et al., 1978; Bowlby, 1969). We focus on investigating the relation between attachment quality and the development of lie-telling given that (a) attachment quality and lie-telling are related in adulthood (e.g., Ennis et al., 2008), (b) it has been suggested that attachment quality relates to moral development of children (e.g., Grusec, 2022; Thompson, 2019), (c) attachment security is related to certain individual characteristics such as empathy and self-control that are associated with lie-telling (Tong & Talwar, 2021), and (d) attachment security is thought to influence children's internalization of values of their parents (Kochanska et al., 2004), which could be applicable to values about lie-telling (Tong & Talwar, 2021). Attachment quality may be related to lie-telling in two opposing ways, namely that (a) insecure attachment relates to increased lie-telling in that it could be the precursor of greater frequency of (maladaptive) lie-telling, similar to associations found in adulthood (e.g., Cole, 2001; Ein-Dor et al., 2017; Elaad et al., 2012; Ennis et al., 2008; Gillath et al., 2010), or (b) secure attachment could be the precursor of greater frequency of lie-telling in childhood when the development of the ability to tell lies is considered a sign of advancement in cognitive development in early childhood. Our results can shed light on the question of whether early lie-telling behavior is an indication of early antisocial behavior or an advancement in social-cognitive development. Both frameworks are explained below and result in contrasting hypotheses.

Lie-telling is considered one of the first covert antisocial behaviors in young children and might be the building block of other antisocial behaviors that develop later (Stouthamer-Loeber, 1986). In line, attachment anxiety in adults was related to increased frequency of lying to strangers, best friends (Ennis et al., 2008), and romantic partners (Cole, 2001), whereas attachment avoidance was related to increased lying to romantic partners only (Cole, 2001; Ennis et al., 2008). Similarly, dishonesty, in the form of both lying and cheating, was related to attachment insecurity (Gillath et al., 2010), and good liars and cheaters in the lab were more likely to be insecurely attached (Ein-Dor et al., 2017). Furthermore, adolescents who lied more to their parents reported decreased feelings of attachment to their parents (Warr, 2007), and greater secret-keeping was bidirectionally associated with lower relationship quality with parents over time in adolescence (Dykstra et al., 2020). However, this association remains to be examined in young children when attachment bonds are being developed

and lie-telling is first emerging. In line with findings in adulthood, we can hypothesize that insecure attachment in infancy relates to increased lie-telling in early childhood.

In contrast, the emergence of lie-telling in early childhood has been described as an advancement in social-cognitive development and lying behavior as a form of “theory-of-mind in action” (Talwar & Crossman, 2011, 2022). Learning how to lie is a cognitive skill that relates to the development of other cognitive abilities such as executive functions and theory of mind (Talwar & Crossman, 2011). Children learn to tell lies around 2 to 4 years of age (e.g., Lewis et al., 1989; Talwar & Lee, 2002b). Evidence of lie-telling in preschool-aged children might reflect positive cognitive development (or even a cognitive head start). While there is plenty of evidence that improvements in executive functions are related to improved lie-telling in early childhood (e.g., Sai et al., 2021; Talwar et al., 2017), there is also some evidence that secure attachment is related to improved executive functions in the same period (Bernier et al., 2012, 2015; Matte-Gagné et al., 2018; Regueiro et al., 2020). However, the evidence for theory of mind is more mixed; better theory of mind is related to improved lie-telling (e.g., Lee & Imuta, 2021; Sai et al., 2021), but there is conflicting evidence about the relation between attachment quality and theory of mind (Carpendale & Lewis, 2004; Hughes & Leekman, 2004; Laranjo et al., 2010; Ontai & Thompson, 2008). In line, the competing hypothesis is that secure attachment in infancy relates to increased lie-telling in early childhood.

We used longitudinal data from a large population-based cohort study to investigate the relation between infant–parent attachment quality assessed by the Strange Situation Procedure and the emergence of lie-telling in early childhood. We focused on lie-telling to conceal transgressions because these lies are among the first lies told in the preschool period (Wilson et al., 2003). We had two contrasting hypotheses, namely that (1) insecure attachment at 14 months of age relates to more lie-telling about cheating at 4 years of age or (2) secure attachment at 14 months relates to more lie-telling about cheating at 4 years. Because lie-telling was studied in the context of cheating behavior, the association between cheating and infant–parent attachment was explored. There were no expectations on whether and how cheating and attachment quality are related. Our study should shed light on the question of whether lie-telling in early childhood should be considered a precursor of antisocial behavior or a sign of social-cognitive advancement.

Method

Analyses were preregistered on the Open Science Framework (OSF; <https://osf.io/xwfu7>). The analyses reported in this article did not deviate from the pre-registration. Additional analyses were performed based on suggestions during the review process.

Participants

This study used data from the Generation R Study, a longitudinal population-based prospective birth cohort from fetal life onward in Rotterdam, the Netherlands (Jaddoe et al., 2008; Kooijman et al., 2016). Specifically, the data from the Focus Cohort, a subgroup of children of Dutch national origin (i.e., the children, their parents, and their grandparents all were born in The Netherlands) with a delivery date between February 2003 and August 2005, was used. The medical ethics committee approved the study, and written informed consent was obtained from all caregivers (Jaddoe et al., 2008; Kooijman et al., 2016).

The sample consisted of 560 children (287 females) with full data for all tasks and no delay in expressive vocabulary at 30 months of age. Expressive vocabulary delay was defined by a score below the 10th percentile (Henrichs et al., 2011) on the Dutch parent-report Language Development Survey (Rescorla, 1989). A total of 27 children were excluded from the analyses. The sample for the lie-telling analyses included participants who cheated at least once in a game ($n = 482$; 243 females; $M_{\text{age}} = 4.28$ years, $SD = 1.30$ months).

Children in the full sample were on average 4.28 years old ($SD = 1.31$ months) at the lie-telling assessment. 31.6% of mothers reported having finished either primary or secondary education, while

68.4% of mothers reported having completed higher education. The missing information on maternal education level of 5 mothers was imputed based on questionnaires at either 36 months or 5/6 years.

Measures

Attachment quality: Strange Situation Procedure at 14 months

Parent–infant dyads were observed in a shortened version of the Strange Situation Procedure (SSP; Luijk et al., 2010) in the lab to assess attachment quality with their primary caregiver (482 mothers and 78 fathers). The SSP consisted of seven episodes of 1 to 3 min each and was designed to evoke mild stress in the infants to trigger attachment behavior. Four elements of attachment behavior toward the parents were coded when the parent re-entered the room: (1) proximity and contact seeking, (2) contact maintaining, (3) avoidance of proximity and contact, and (4) resistance to contact and comforting (Ainsworth et al., 1978; Main & Solomon, 1990). Based on these scores, infants were classified as secure, insecure–avoidant, or insecure–resistant (Ainsworth et al., 1978). Furthermore, infants were classified as disorganized or non-disorganized; infants with a disorganized attachment relationship showed an inconsistent way of coping with stress, for example crying during separation but avoiding parents upon return (Main & Solomon, 1990). Both attachment classifications as well as the continuous attachment scores were used in the analyses. The continuous scores were computed using an adaptation of Richter’s algorithm (Luijk et al., 2011; van Ijzendoorn & Kroonenberg, 1990). The inter-coder reliability of two coders was 77% for the attachment security ($\kappa = .63$) and 87% agreement on disorganized attachment ($\kappa = .64$) based on 70 participants (Luijk et al., 2010).

Lie-telling and cheating: Cheating games at 4 years

Two cheating games (Zwirs et al., 2015) were conducted during a home visit. Children were instructed to play two games in which winning was impossible if the children followed the rules. However, children were promised an attractive prize for winning. In the *dart game*, children were instructed to throw balls at a dartboard on the floor without stepping over a line, but the dartboard was positioned too far away to reach. In the *frog game*, children needed to find three brown frogs hidden under a cloth without looking, but there were only green frogs under this cloth. Children were left alone for 3 min to play each game. Children were asked, “How did you play the game? Did you follow the rules? Did you cross the line/peek under the cloth? Did you put balls manually on the dartboard/take brown frogs from the table? Was it hard to remember the rules?” Children’s behavior for each game was coded as cheating or non-cheating, and children’s verbal response was coded as lie-telling (“no” response to all questions if they cheated, i.e., lied about cheating) or truth-telling (“yes” response to at least one question if they cheated, i.e., admitted cheating). The games were video-recorded with visible cameras. Cheating and lie-telling were double-coded with a total of three coders, and consensus scores were used in the analyses. Data were compiled into three groups for cheating [children who did not cheat ($n = 78$), children who cheated in one of the games ($n = 226$), and children who cheated in both games ($n = 256$)] and three groups for lie-telling [children who told the truth ($n = 216$), children who lied in one of the games ($n = 185$), and children who lied in both games ($n = 81$)]. In our sample, 86.1% cheated in one or more games and 55.2% of the cheaters told a lie about one or more games. In the lie-telling analyses, only children who cheated were included, following previous studies on the development of lie-telling about peeking (e.g., Bender et al., 2018; Ding et al., 2023).

Data analysis

Analyses were run according to the pre-registration on OSF (<https://osf.io/xwfu7>) and are summarized below. For each logistic regression, we included child’s gender, child’s age at time of lie-telling assessment, and maternal education level as covariates.

To answer our main question of how infant–parent attachment quality is related to lie-telling, we ran two logistic regressions. Specifically, we performed (a) a multinomial logistic regression to investigate whether attachment quality (continuous Richter score) predicts cheating (three levels: no cheating/cheating in one game/cheating in both games) at 4 years of age and (b) a multinomial logistic regression to investigate whether attachment quality (continuous Richter score) predicts lie-telling

(three levels: truth-telling/lie-telling in one task/lie-telling in both tasks). Furthermore, we ran follow-up chi-square tests to investigate whether cheating and lie-telling were related to particular attachment classifications, namely (c) a chi-square test of association between attachment quality (three levels: insecure avoidant/insecure resistant/secure) and cheating (three levels: no cheating/cheating in one game/cheating in both games) at 4 years and (d) a chi-square test of association between attachment quality (three levels: insecure avoidant/insecure resistant/secure) and lie-telling (three levels: truth-telling/lie-telling in one game/lie-telling in both games) at 4 years.

Lastly, we ran two (pre-registered) exploratory analyses to test the association between infant-parent disorganized attachment at 14 months of age and children's cheating and lie-telling at 4 years of age. Specifically, we ran (e) a multinomial logistic regression to investigate whether disorganized attachment (continuous score) predicts cheating (three levels: no cheating/cheating in one game/cheating in both games) at 4 years and (f) a multinomial logistic regression to investigate whether disorganized attachment (continuous score) predicts lie-telling (three levels: truth-telling/lie-telling in one task/lie-telling in both tasks) at 4 years. In all multinomial logistic regressions, no cheating/no lie-telling was used as the reference level. In the [online Supplementary Materials A](#), we have included two binary logistic regressions with lie-telling (two levels: truth-telling/lie-telling) as dependent variable and attachment quality (continuous Richter score)/disorganized attachment (continuous score) as predictors based on a reviewer's suggestions. Bayes factors to confirm the null findings were calculated for each regression based on the reviewer's suggestions.

Results

[Table S3 in the Supplementary Materials B](#) displays descriptive information and correlations between the variables used in the analyses.

Attachment security and cheating

A multinomial logistic regression, controlled for covariates, showed that continuous attachment security was not related to cheating, $\chi^2(8) = 8.91, p = .350$ ([Table 1](#)). The Bayes factor comparing the model including attachment security and covariates with the model with only the covariates strongly supported the model with only covariates (null model; $BF = 0.07$).

Furthermore, a chi-square test of the association between attachment quality classification (insecure-avoidant, insecure-resistant, or secure) and cheating showed no significant association, $\chi^2(4) = 1.32, p = .858$.

Attachment security and lie-telling

A multinomial logistic regression, controlled for covariates, with continuous attachment security as independent variable and lie-telling as dependent variable showed a significant model, $\chi^2(8) = 22.31$,

Table 1
Predicting cheating by attachment security

	Odds ratio	Logistic regression (n = 304) No cheating vs. cheating on one task				Odds ratio	Logistic regression (n = 334) No cheating vs. cheating on both tasks			
		β	SE	z	p		β	SE	z	p
Intercept		4.11	5.04	0.82	.414	5.87	4.97	1.12	.261	
Attachment security (continuous)	1.08	-0.08	0.05	1.54	.122	1.05	0.05	0.93	.353	
Child age	0.95	-0.06	0.10	-0.57	.566	0.92	-0.08	0.10	-0.80	.424
Child gender	0.92	-0.09	0.27	-0.35	.727	0.65	-0.41	0.26	-1.59	.111
Maternal education level	0.81	-0.21	0.29	-0.73	.469	0.71	-0.34	0.29	-1.18	.239

Table 2
Predicting lie-telling by attachment security

	Odds ratio	Logistic regression (n = 401) No lie-telling vs. lie-telling on one task				Odds ratio	Logistic regression (n = 297) No lie-telling vs. lie-telling on both tasks			
		β	SE	z	p		β	SE	z	p
Intercept		7.46	4.01	1.86	.062	16.30	5.92	2.75	.006*	
Attachment security (continuous)	0.95	-0.06	0.04	-1.41	.159	0.92	-0.08	0.05	-1.49	.136
Child age	0.86	-0.15	0.08	-1.88	.060	0.72	-0.32	0.12	-2.80	.005*
Child gender	0.91	-0.10	0.20	-0.45	.604	0.63	-0.46	0.27	-1.71	.087
Maternal education level	0.93	-0.06	0.22	-0.29	.775	0.50	-0.70	0.27	2.54	.011*

* p < .05.

p = .004, R² = .022 (Table 2). Attachment security did not significantly predict lie-telling. Child age and maternal education level were significantly related to lie-telling (age: β = -0.32, p = .005; education level: β = -0.70, p = .011). The Bayes factor comparing the model including attachment security and covariates with the model with only the covariates anecdotally supported the model with only covariates (null model; BF = 0.33).

Furthermore, a chi-square test of the association between attachment quality classification (insecure-avoidant, insecure-resistant, or secure) and lie-telling showed no significant association, $\chi^2(4) = 6.31, p = .177$.

The null results were confirmed in a binary logistic regression with lie-telling versus truth-telling as dependent variable (presented in Supplementary Materials A) and Bayes factors suggesting anecdotal evidence of the null hypothesis.

Attachment disorganization and cheating

A multinomial logistic regression, controlled for covariates, showed that continuous disorganized attachment was not related to cheating, $\chi^2(8) = 7.09, p = .527$ (Table 3). The Bayes factor comparing the model including attachment security and covariates with the model with only the covariates moderately supported the model with only covariates (null model; BF = 0.10).

Attachment disorganization and lie-telling

A multinomial logistic regression, controlled for covariates, with continuous disorganized attachment as independent variable and lie-telling as dependent variable showed a significant model, $\chi^2(8) = 21.28, p = .006, R^2 = .21$ (Table 4). Disorganized attachment was not significantly related to lie-telling; however, similar to the results in Table 2, age and maternal education level were signifi-

Table 3
Predicting cheating by disorganized attachment

	Odds ratio	Logistic regression (n = 304) No cheating vs. cheating on one task				Odds ratio	Logistic regression (n = 334) No cheating vs. cheating on both tasks			
		β	SE	z	p		β	SE	z	p
Intercept		4.84	5.06	0.87	.386	5.82	5.00	1.16	.245	
Disorganized attachment (continuous)	0.95	-0.06	0.07	-0.79	.427	0.95	-0.05	0.07	-0.77	.442
Child age	0.94	-0.06	0.10	-0.59	.558	0.93	-0.08	0.10	-0.80	.421
Child gender	0.94	-0.06	0.27	-0.24	.812	0.67	-0.40	0.26	-1.54	.124
Maternal education level	0.81	-0.21	0.29	-0.73	.465	0.71	-0.34	0.29	-1.19	.234

Table 4
Predicting lie-telling by disorganized attachment

	Logistic regression (<i>n</i> = 401) No lie-telling vs. lie-telling on one task					Logistic regression (<i>n</i> = 297) No lie-telling vs. lie-telling on both tasks				
	Odds ratio	β	SE	<i>z</i>	<i>p</i>	Odds ratio	β	SE	<i>z</i>	<i>p</i>
Intercept		7.08	4.01	1.77	.077		15.84	5.95	2.66	.007*
Disorganized attachment (continuous)	1.06	0.06	0.05	-1.07	.285	1.09	0.09	0.07	1.29	.197
Child age	0.87	-0.14	0.08	-1.84	.067	0.73	-0.32	0.12	-2.76	.005*
Child gender	0.86	-0.11	0.20	-0.55	.584	0.61	-0.49	0.27	-1.83	.067
Maternal education level	0.95	-0.05	0.22	-0.25	.804	0.50	-0.68	0.27	-2.50	.012*

* $p < .05$.

cantly related to lie-telling (age: $\beta = -0.32$, $p = .005$; education level: $\beta = -0.68$, $p = .012$). The Bayes factor comparing the model including attachment security and covariates with the model with only the covariates anecdotally supported the model with only covariates (null model; $BF = 0.31$).

The null results were confirmed in a binary logistic regression with lie-telling versus truth-telling as dependent variable (presented in [Supplementary Materials A](#)) and Bayes factors suggesting anecdotal evidence of the null hypothesis.

Discussion

The current study used longitudinal data from a population-based cohort study to investigate the association between infant–parent attachment quality at 14 months of age and children’s lie-telling behavior at 4 years of age. We had two contrasting hypotheses, namely that (1) insecure attachment relates to more lie-telling or (2) secure attachment relates to more lie-telling behavior at 4 years. Our results demonstrated that there was no relationship between quality of attachment and lie-telling in early childhood.

The lack of association between infant–parent attachment quality and lie-telling was in contrast with earlier findings in adulthood (Cole, 2001; Ein-Dor et al., 2017; Elaad et al., 2012; Ennis et al., 2008; Gillath et al., 2010; Warr, 2007) and could potentially be explained by four reasons. First, it might be that our null findings are explained by the time between assessment of attachment quality at 14 months and lie-telling assessment at 4 years. However, plenty of studies have demonstrated that infant–parent attachment quality assessed with the SSP is relatively stable over time (e.g., Opie et al., 2021; Pinquart et al., 2013) even into late adolescence and adulthood (Waters et al., 2000). Furthermore, several studies have indicated the predictive value of attachment quality in infancy for developmental outcomes in early childhood and beyond (e.g., Ding et al., 2014; Madigan et al., 2013; Ranson & Urichuk, 2008).

The second explanation is that our null findings are explained by the fact that attachment quality was assessed in relation to the primary caregiver, whereas the lie-telling behavior of the child was examined toward an experimenter unknown to the child. Indeed, studies that have demonstrated a link between attachment quality and lie-telling in adults focused primarily on attachment quality with the romantic partner and lie-telling to the same romantic partner (Cole, 2001; Ennis et al., 2008). However, in one study, adult insecure attachment to a romantic partner was also related to more lie-telling to strangers and best friends (Ennis et al., 2008). Although it remains unclear whether the association between attachment security and lie-telling is person-specific or not, based on data in adults there is some evidence that it generalizes to other relationships and social interactions.

A third explanation could be that attachment quality assessed in infancy does not match attachment quality assessed in adulthood. For example, attachment quality in adolescence and adulthood not only reflects past experiences (i.e., infant–parent attachment) but also is influenced by current

relationships as well as growing cognitive and emotional abilities (Allen & Tan, 2016). Furthermore, many new attachment bonds beyond the infant–parent relationship are formed in the period between childhood and adulthood (Rosenthal & Kobak, 2010). An important additional difference in attachment between adults and infants is how it is measured. In the current study, infants' behavior was observed to assess attachment quality in infancy in the SSP, whereas many of the studies in adults used self-reported questionnaires to examine attachment quality (Cole, 2001; Ein-Dor et al., 2017; Elaad et al., 2012; Ennis et al., 2008; Gillath et al., 2010). It is possible that the different types of measurements tap into different aspects of attachment quality in adulthood versus infancy.

A fourth explanation of our null findings is that the association between attachment quality and lie-telling emerges over time and is not yet present in early childhood when lie-telling behavior is first developing. Early lie-telling has been considered a part of normative development, and lie-telling may be a common strategy among children at this age period (Talwar & Crossman, 2022). It reflects children's emerging cognitive and social development in early childhood (Talwar & Crossman, 2011), and lie-telling in childhood is a typical aspect of normal child development appearing at similar ages in children across cultures (Talwar & Crossman, 2011). Maladaptive lie-telling in later childhood, when children learn that antisocial lies are not considered socially acceptable but still tell antisocial lies, might still be shaped by socialization. This maladaptive lie-telling development in later childhood might be influenced by attachment quality (or vice versa), resulting in the association between increased lie-telling and insecure attachment found in adolescence and adulthood.

Our study did not explore potential indirect mediations between attachment and lie-telling. There could be an indirect relationship between attachment and lie-telling, for example, via cognitive abilities such as executive functions (e.g., Sai et al., 2021; Talwar et al., 2017) or socialization mechanisms such as parental teaching (Tong & Talwar, 2021). Future research should investigate this possibility.

Despite our study's strengths, including the fact that we tested innovative and pre-registered hypotheses in a large sample cohort study with standardized observations of both attachment quality and lie-telling, the results must be interpreted within the context of some limitations. First, the Focus cohort of the Generation R Study is a homogeneous sample with limited variation in socioeconomic status (Jaddoe et al., 2006), which limits the generalizability of our findings.

Furthermore, the cheating games used in this study are different than the typical *temptation resistance paradigm* used in the literature to assess lie-telling to conceal cheating, transgressions, or misdeeds in children. The temptation resistance paradigm involves a setting where the child is left alone and is tempted to peek. The paradigm is filmed using hidden cameras (Talwar & Lee, 2008), whereas in the current study the cameras were visible and the child was aware of being filmed. The presence of visible cameras might have influenced lie-telling tendencies in children given that even 4-year-olds are already able to adjust their lie-telling based on the presence or absence of an eyewitness (Fu et al., 2012). Previous studies have reported 50% to 90% lie-telling rates around 4 years of age (e.g., Ding et al., 2023; Polak & Harris, 1999; Talwar et al., 2017; Talwar & Lee, 2002a), whereas only 55.2% of the children in our sample told a lie. It might be possible that the visible presence of video cameras affected children's lie-telling rates in the current study. Furthermore, it might be possible that children realized they were fooled in the task, for example, when they could not find the brown frogs if they peeked under the cloth. A previous study has found that school-aged children aged 5 to 7 years were more likely to tell a lie if the experimenter had lied to them previously but that 3- and 4-year-olds were not (Hays & Carver, 2014). Still, it could be that children who realized they were fooled were more likely to lie, increasing lie-telling rates among cheating children.

A further limitation is that we are unable to distinguish between children who intentionally tell a lie and children who unintentionally tell a lie. Children might have misunderstood the question or demonstrated a "yes bias" to answer questions, meaning that children react spontaneously and typically agree with adults (Fritsley & Lee, 2003). A recent study showed that 40% of 2.5-year-olds falsely confessed to having peeked, which was considered a demonstration of the yes bias (Białecka-Pikul et al., 2022). Most studies of lie-telling provide no evidence of whether (or not) children's confessions might be false confessions or whether they demonstrate a yes bias. It might be that in the current study the intentional lie-telling sample is lower given that we cannot check for children who unintentionally gave a yes answer when cheating.

Furthermore, the “misdeed” (i.e., cheating) in the current study was more impactful than the standard peeking in the temptation resistance paradigm given that it involved actively breaking the rules instead of peeking or turning around quickly. In our study, approximately 86.1% of the 4-year-olds cheated in at least one of the games. These rates are very similar to the percentages of children peeking in a temptation resistance paradigm (>80%; e.g., Bender et al., 2018; Ding et al., 2023), suggesting that, at least for cheating and peeking, the different paradigms elicited similar behavior in this age group.

Because we found no relationship between infant–parent attachment quality and lie-telling in early childhood, and of our cheating sample 55.2% of the children told a lie, our results could suggest that the emergence of lie-telling in early childhood is part of normative social–cognitive development instead of either a maladaptive precursor of antisocial behavior or its opposite, a cognitive advancement. This can be especially true for lies to conceal transgressions, which are generally considered to be antisocial in nature but are also thought to be developmentally appropriate in early childhood.. Future research should investigate bidirectional associations between insecure attachment and maladaptive lie-telling in later childhood and adolescence.

In sum, we found no evidence that lie-telling or cheating in early childhood is related to the quality of the attachment relationship in infancy. Our null results line up with evidence that lie-telling in early childhood is not maladaptive, and the null results could be explained by different conceptualizations of attachment quality in adulthood versus infancy or task-related factors. When and how relationship quality and socialization by parents affects children’s lie-telling across childhood is yet to be further explored.

CRedit authorship contribution statement

Lisanne Schröer: Writing – review & editing, Writing – original draft, Formal analysis, Conceptualization. **Victoria Talwar:** Writing – review & editing, Conceptualization. **Maartje Luijk:** Writing – review & editing, Conceptualization. **Rianne Kok:** Writing – review & editing, Funding acquisition, Conceptualization.

Data availability

The authors do not have permission to share data.

Acknowledgments

This article is part of the FAMI-LIES project that has received funding from the European Research Council (ERC) under the Horizon 2020 research and innovation program (949041). This grant was awarded to R.K. and supports R.K. and L.S. The Generation R Study was conducted by the Erasmus Medical Center in close collaboration with the School of Law and Faculty of Social Sciences of Erasmus University Rotterdam, the Municipal Health Services Rotterdam area, Rotterdam, the Rotterdam Homecare Foundation, Rotterdam, and the Stichting Trombosedienst & Artsenlaboratorium Rijnmond (STAR-MDC), Rotterdam. We gratefully acknowledge the contribution of participating children and parents, general practitioners, hospitals, midwives, and pharmacies in Rotterdam, The Netherlands.

Appendix A. Supplementary material

Supplementary material to this article can be found online at <https://doi.org/10.1016/j.jecp.2024.106044>.

References

Ainsworth, M. S., Blehar, M. C., Waters, E., & Wall, S. (1978). *Patterns of attachment: A psychological study of the Strange Situation*. Lawrence Erlbaum.

- Allen, J. P., & Tan, J. S. (2016). The multiple facets of attachment in adolescence. In J. Cassidy & P. R. Shaver (Eds.), *Handbook of attachment: Theory, research, and clinical applications* (3rd ed., pp. 399–415). Guilford Press.
- Bender, J., O'Connor, A., & Evans, A. (2018). Mirror, mirror on the wall: Increasing young children's honesty through inducing self-awareness. *Journal of Experimental Child Psychology*, 167, 414–422. <https://doi.org/10.1016/j.jecp.2017.12.001>.
- Bernier, A., Beauchamp, M. H., Carlson, S. M., & Lalonde, G. (2015). A secure base from which to regulate: Attachment security in toddlerhood as a predictor of executive functioning at school entry. *Developmental Psychology*, 51, 1177–1189. <https://doi.org/10.1037/dev0000032>.
- Bernier, A., Carlson, S. M., Deschênes, M., & Matte-Gagné, C. (2012). Social factors in the development of early executive functioning: A closer look at the caregiver environment. *Developmental Science*, 15(1), 12–24. <https://doi.org/10.1111/j.1467-7687.2011.01093.x>.
- Białecka-Pikul, M., Białek, A., Stepiń-Nycz, M., Talwar, V., & Bosacki, S. (2022). Peeking and lying in the temptation resistance paradigm in 2.5-year-olds: The role of inhibitory control. *PLoS One*, 17(12), e278099. <https://doi.org/10.1371/journal.pone.0278099>.
- Bowlby, J. (1969). *Attachment and loss, Vol. 1: Attachment*. Basic Books.
- Carpendale, J. I. M., & Lewis, C. (2004). Constructing an understanding of mind: The development of children's social understanding within social interaction. *Behavioral and Brain Sciences*, 27, 79–151. <https://doi.org/10.1017/S0140525X04000032>.
- Cole, T. (2001). Lying to the one you love: The use of deception in romantic relationships. *Journal of Social and Personal Relationships*, 18(1), 107–129. <https://doi.org/10.1177/0265407501181005>.
- Crossman, A., & Talwar, V. (2021). On building a model of lie and truth-telling trajectories. *Academia Letters*, 3648.
- Ding, X. P., Cheng, J. K. T., Cheng, Q., & Heyman, G. D. (2023). An assessment of when moral stories promote children's honesty. *Applied Developmental Science*. <https://doi.org/10.1080/10888691.2023.2195182>. Advance online publication.
- Ding, Y.-H., Xu, X., Wang, Z.-Y., Li, H.-R., & Wang, W.-P. (2014). The relation of infant attachment to attachment and cognitive and behavioural outcomes in early childhood. *Early Human Development*, 90(9), 459–464. <https://doi.org/10.1016/j.earlhumdev.2014.06.004>.
- Dykstra, V. W., Willoughby, T., & Evans, A. D. (2020). A longitudinal examination of the relation between lie-telling, secrecy, parent-child relationship quality and depressive symptoms in late-childhood and adolescence. *Journal of Youth & Adolescence*, 49, 438–448. <https://doi.org/10.1007/s10964-019-01183-z>.
- Ein-Dor, T., Perry-Paldi, A., Zohar-Cohen, K., Efrati, Y., & Hirschberger, G. (2017). It takes an insecure liar to catch a liar: The link between attachment insecurity, deception and detection of deception. *Personality and Individual Differences*, 113, 81–87. <https://doi.org/10.1016/j.paid.2017.03.015>.
- Elaad, E., Lavy, S., Cohenca, D., Berholz, E., Thee, P., & Ben-Gigi, Y. (2012). Lies, truths, and attachment orientation in late adolescence. *Personality and Individual Differences*, 52, 670–673. <https://doi.org/10.1016/j.paid.2011.12.018>.
- Ennis, E., Vrij, A., & Chance, C. (2008). Individual differences and lying in everyday life. *Journal of Social and Personal Relationships*, 25(1), 105–118. <https://doi.org/10.1177/0265407507086808>.
- Fritzley, V. H., & Lee, K. (2003). Do young children always say yes to yes-no questions? A metadepvelopmental study of the affirmation bias. *Child Development*, 74(5), 1297–1313. <https://doi.org/10.1111/1467-8624.00608>.
- Fu, G., Evans, A. D., Xu, F., & Lee, K. (2012). Young children can tell strategic lies after committing a transgression. *Journal of Experimental Child Psychology*, 113, 147–158. <https://doi.org/10.1016/j.jecp.2012.04.003>.
- Gillath, O., Sesko, A. K., Shaver, P. R., & Chun, D. S. (2010). Attachment, authenticity, and honesty: Dispositional and experimentally induced security can reduce self- and other-deception. *Journal of Personality and Social Psychology*, 98(5), 841–855. <https://doi.org/10.1037/a0019206>.
- Grusec, J. E. (2022). Moral development from a socialization perspective. In M. Killen & J. G. Smetana (Eds.), *Handbook of moral development* (3rd ed., pp. 323–338). Routledge. <https://doi.org/10.4324/9781003047247>.
- Hays, C., & Carver, L. J. (2014). Follow the liar: The effect of adult lies on children's honesty. *Developmental Science*, 17(6), 977–983. <https://doi.org/10.1111/desc.12171>.
- Henrichs, J., Rescorla, L., Schenk, J. J., Schmidt, H. G., Jaddoe, V. W. V., Hofman, A., Raat, H., Verhulst, F. C., & Tiemeier, H. (2011). Examining continuity of early expressive vocabulary development: The Generation R study. *Journal of Speech, Language, and Hearing Research*, 54(3), 854–869. [https://doi.org/10.1044/1092-4388\(2010\)09-0255](https://doi.org/10.1044/1092-4388(2010)09-0255).
- Hughes, C., & Leekman, S. (2004). What are the links between theory of mind and social relations? Review, reflections and new direction for studies of typical and atypical development. *Social Development*, 13(4), 590–619. <https://doi.org/10.1111/j.1467-9507.2004.00285.x>.
- Jaddoe, V. W. V., Mackenbach, J. P., Moll, H. A., Steegers, E. A. P., Tiemeier, H., Verhulst, F. C., ... Hofman, A. (2006). The Generation R Study: Design and cohort profile. *European Journal of Epidemiology*, 21, 475–484.
- Jaddoe, V. W. V., van Duijn, C. M., van der Heijden, A. J., Mackenbach, J. P., Moll, H. A., Steegers, E. A. P., ... Hofman, A. (2008). The Generation R Study: Design and cohort update until the age of 4 years. *European Journal of Epidemiology*, 23, 801–811. <https://doi.org/10.1007/s10654-008-9309-4>.
- Kochanska, G., Aksan, N., Knaack, A., & Rhines, H. M. (2004). Maternal parenting and children's conscience: Early security as moderator. *Child Development*, 75(4), 1229–1242. <https://doi.org/10.1111/j.1467-8624.2004.00735.x>.
- Kooijman, M. N., Kruijthof, C. J., van Duijn, C. M., Duijts, L., Franco, O. H., van IJzendoorn, M. H., ... Jaddoe, V. W. V. (2016). The Generation R Study: Design and cohort update 2017. *European Journal of Epidemiology*, 31, 1243–1264. <https://doi.org/10.1007/s10654-016-0224-9>.
- Laranjo, J., Bernier, A., Meins, E., & Carlson, S. M. (2010). Early manifestations of children's theory of mind: The roles of maternal mind-mindedness and infant security of attachment. *Infancy*, 15(3), 300–323. <https://doi.org/10.1111/j.1532-7078.2009.00014.x>.
- Lee, J. Y. S., & Imuta, K. (2021). Lying and theory of mind: A meta-analysis. *Child Development*, 92(2), 536–553. <https://doi.org/10.1111/cdev.13535>.
- Lee, K. (2013). Little liars: Development of verbal deception in children. *Child Development Perspectives*, 7(2), 91–96. <https://doi.org/10.1111/cdep.12023>.

- Lewis, M., Stanger, C., & Sullivan, M. W. (1989). Deception in 3-year-olds. *Developmental Psychology*, 25(3), 439–443. <https://doi.org/10.1037/0012-1649.25.3.439>.
- Luijk, M. P. C. M., Saridjan, N., Tharner, A., van IJzendoorn, M. H., Bakermans-Kranenburg, M. J., Jaddoe, V. W. V., ... Tiemeier, H. (2010). Attachment, depression, and cortisol: Deviant patterns in insecure-resistant and disorganized infants. *Developmental Psychobiology*, 52(5), 441–452. <https://doi.org/10.1002/dev.20446>.
- Luijk, M. P. C. M., Tharner, A., Bakermans-Kranenburg, M. J., van IJzendoorn, M. H., Jaddoe, V. W. V., Hofman, A., ... Tiemeier, H. (2011). The association between parenting and attachment security is moderated by polymorphism in the mineralocorticoid receptor gene: Evidence for differential susceptibility. *Biological Psychology*, 88(1), 37–40. <https://doi.org/10.1016/j.biopsycho.2011.06.005>.
- Madigan, S., Atkinson, L., Laurin, K., & Benoit, D. (2013). Attachment and internalizing behavior in early childhood: A meta-analysis. *Developmental Psychology*, 49(4), 672–689. <https://doi.org/10.1037/a0028793>.
- Main, M., & Solomon, J. (1990). Procedures for identifying infants as disorganized/disoriented during the Ainsworth Strange Situation. In M. T. Greenberg, D. Cicchetti, & E. M. Cummings (Eds.), *Attachment in the preschool years: Theory, research, and intervention* (pp. 121–160). University of Chicago Press.
- Matte-Gagné, C., Bernier, A., Sirois, M.-S., Lalonde, G., & Hertz, S. (2018). Attachment security and developmental patterns of growth in executive functioning during early elementary school. *Child Development*, 89(3), e167–e182. <https://doi.org/10.1111/cdev.12807>.
- Ontai, L. L., & Thompson, R. A. (2008). Attachment, parent–child discourse and theory-of-mind development. *Social Development*, 17(1), 47–60. <https://doi.org/10.1111/j.1467-9507.2007.00414.x>.
- Opie, J. E., McIntosh, J. E., Esler, T. B., Duschinsky, R., George, C., Schore, A., Kothe, E. J., Tan, E. S., Greenwood, C. J., & Olsson, C. A. (2021). Early childhood attachment stability and change: A meta-analysis. *Attachment and Human Development*, 23(6), 897–930. <https://doi.org/10.1080/14616734.2020.1800769>.
- Pinquart, M., Feußner, C., & Ahnert, L. (2013). Meta-analytic evidence for stability in attachments from infancy to early adulthood. *Attachment and Human Development*, 15(2), 189–218. <https://doi.org/10.1080/14616734.2013.746257>.
- Polak, A., & Harris, P. L. (1999). Deception by young children following noncompliance. *Developmental Psychology*, 35(2), 561–568. <https://doi.org/10.1037/0012-1649.35.2.561>.
- Ranson, K. E., & Urichuk, L. J. (2008). The effect of parent–child attachment relationships on child biopsychological outcomes: A review. *Early Child Development and Care*, 178(2), 129–152. <https://doi.org/10.1080/03004430600685282>.
- Regueiro, S., Matte-Gagné, C., & Bernier, A. (2020). Patterns of growth in executive function during school years: Contributions of early mother–child attachment security and maternal autonomy support. *Journal of Experimental Child Psychology*, 200, e104934. <https://doi.org/10.1016/j.jecp.2020.104934>.
- Rescorla, L. (1989). The Language Development Survey: A screening tool for delayed language in toddlers. *Journal of Speech and Hearing Disorders*, 54, 587–599. <https://doi.org/10.1044/jshd.5404.587>.
- Rosenthal, N. L., & Kobak, R. (2010). Assessing adolescents' attachment hierarchies: Differences across developmental periods and associations with individual adaptation. *Journal of Research on Adolescence*, 20(3), 678–706. <https://doi.org/10.1111/j.1532.7795.2010.0065.x>.
- Sai, L., Shang, S., Tay, C., Liu, X., Sheng, T., Fu, G., Ding, X. P., & Lee, K. (2021). Theory of mind, executive function, and lying in children: A meta-analysis. *Developmental Science*, 24(5), 1–27. <https://doi.org/10.1111/desc.13096>.
- Stouthamer-Loeber, M. (1986). Lying as a problem behavior in children: A review. *Clinical Psychology Review*, 6, 267–289. [https://doi.org/10.1016/0272-7358\(86\)90002-4](https://doi.org/10.1016/0272-7358(86)90002-4).
- Talwar, V., & Crossman, A. (2011). From little white lies to filthy liars: The evolution of honesty and deception in young children. *Advances in Child Development and Behavior*, 40, 139–179. <https://doi.org/10.1016/B978-0-12-386491-8.00004-9>.
- Talwar, V., & Crossman, A. (2022). Liar, liar . . . sometimes: Understanding social–environmental influences on the development of lying. *Current Opinion in Psychology*, 47, 101374. <https://doi.org/10.1016/j.copsyc.2022.101374>.
- Talwar, V., Crossman, A., & Wyman, J. (2017). The role of executive functions and theory of mind in children's lies for another and themselves. *Early Childhood Research Quarterly*, 41, 126–135. <https://doi.org/10.1016/j.ecresq.2017.07.003>.
- Talwar, V., & Lee, K. (2002a). Development of lying to conceal a transgression: Children's control of expressive behaviour during verbal deception. *International Journal of Behavioral Development*, 26(5), 436–444. <https://doi.org/10.1080/01650250143000373>.
- Talwar, V., & Lee, K. (2002b). Emergence of white-lie telling in children between 3 and 7 years of age. *Merrill-Palmer Quarterly*, 48(2), 160–181.
- Talwar, V., & Lee, K. (2008). Social and cognitive correlates of children's lying behavior. *Child Development*, 79(4), 866–881. <https://doi.org/10.1111/j.1467-8624.2008.01164.x>.
- Thompson, R. A. (2019). Early moral development and attachment theory. In D. Laible, G. Carlo, & L. M. Padilla-Walker (Eds.), *The Oxford handbook of parenting and moral development* (pp. 21–39). Oxford Library of Psychology. <https://doi.org/10.1093/oxfordhb/9780190638696.013.2>.
- Tong, D., & Talwar, V. (2021). Understanding the development of honesty in children through the domains-of-socialization approach. *Infant and Child Development*, 30(6), e2268. <https://doi.org/10.1002/icd.2268>.
- van IJzendoorn, M. H., & Kroonenberg, P. M. (1990). Cross-cultural consistency of coding the Strange Situation. *Infant Behavior and Development*, 13(4), 469–485. [https://doi.org/10.1016/0163-6383\(90\)90017-3](https://doi.org/10.1016/0163-6383(90)90017-3).
- Warr, M. (2007). The tangled web: Delinquency, deception and parental attachment. *Journal of Youth & Adolescence*, 36(5), 607–622. <https://doi.org/10.1007/s10964-006-9148-0>.
- Waters, E., Merrick, S., Treboux, D., Crowell, J., & Albersheim, L. (2000). Attachment security in infancy and early adulthood: A twenty-year longitudinal study. *Child Development*, 71(3), 684–689. <https://doi.org/10.1111/1467-8624.00176>.
- Wilson, A. E., Smith, M. D., & Ross, H. S. (2003). The nature and effect of young children's lies. *Social Development*, 12(1), 21–45. <https://doi.org/10.1111/1467-9507.00220>.
- Zwirs, B. W. C., Székely, E., Herba, C. M., Verhulst, F. C., Jaddoe, V. W. V., Hofman, A., ... Tiemeier, H. (2015). Social and non-social fear in preschoolers and prospective associations with lying about cheating. *International Journal of Behavioral Development*, 39(5), 477–484. <https://doi.org/10.1177/0165025414553>.