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Parents' Secure Base Script Knowledge Predicts Observed Sensitive Caregiving and Discipline Toward Twin Children

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The present study investigated associations between parents' secure base script knowledge and parental sensitivity and sensitive discipline in 461 families with 922 same-sex twin children (M_{age} = 7.00, SD = 2.18). In addition, we explored whether the strength of the associations between parents' secure base script knowledge and parental sensitivity and sensitive discipline were similar for mono- and dizygotic twin siblings. Parental sensitivity was observed during a computerized version of a structured cooperative drawing task (Etch-A-Sketch). Sensitive discipline was observed during a "Don't touch task" or during a "Do-Don't task". Parental sensitivity and discipline strategies were observed twice, once with each twin sibling. Parents' knowledge of the secure base script was measured with the Attachment Script Assessment. Linear mixed model analyses showed that parents with more secure base script knowledge interacted with their twin children in a more sensitive manner and showed more sensitive discipline. These findings show for the first time that parents' secure base script knowledge predicts not only parental sensitivity but also sensitive discipline. Associations between parents' secure base script knowledge and parental sensitivity and sensitive discipline were not impacted by children's similarity in genetic makeup. Future longitudinal studies utilizing multiple measures of sensitivity and discipline across the infancy, childhood, and early adolescence periods could provide more insight into the continuity of relations between secure base script knowledge and parental sensitivity and sensitive discipline.

Keywords: sensitive caregiving, discipline, attachment representations, twin children, genetics

Supplemental materials: https://doi.org/10.1037/fam0001091.supp

Based on ideas from attachment theory (Bowlby, 1982), scholars proposed that experiences with attachment figures, particularly during infancy and also during later stages of life, are organized in the form of a cognitive script: the secure base script (Waters & Waters, 2006; Waters, Waters, et al., 2021). According to Waters and Waters (2006), individuals who have experienced consistent and sensitive caregiving develop complete, consolidated, and easily accessible secure base scripts in which attachment figures are available to provide effective help during times of distress. In contrast, individuals who have been exposed to inconsistent,

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The study design, hypotheses, and analysis plan were preregistered at the Open Science Framework (https://osf.io/xhsvw). Adaptations to the analysis plan were reported in an addendum (https://osf.io/wcyu4). Data on parental sensitivity and sensitive discipline have been previously included in two randomized controlled studies (Euser et al., 2020; Runze et al., 2022). Prior to publication, findings of this article have been presented in 2022 at the International Attachment Conference in Portugal and the Amsterdam Public Health Annual Meeting in the Netherlands. Pseudonymized data will be shared upon request. The data will be shared after approval of the request for data sharing and when a Data Transfer Agreement has been signed by both parties. The analysis code and research materials are available upon request.

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insensitive, or atypical caregiving are expected to possess incomplete, inconsistent, or ineffective knowledge of the secure base script (Nivison et al., 2021; Waters & Waters, 2006; see also Waters, Waters, et al., 2021). Importantly, secure base script knowledge guides behavior in interpersonal relationships, including parent–child relationships (for a review, see Waters & Roisman, 2019). Most parenting studies have examined secure base script knowledge in relation to parental sensitivity (e.g., Coppola et al., 2006; Huth-Bocks et al., 2014; Raby et al., 2021) and surprisingly little is known about whether secure base script knowledge shapes other important parenting behaviors, such as sensitive discipline. In the present study, we investigate associations between parents' secure base script knowledge and parental sensitivity and sensitive discipline in families with same-sex twin children. In addition, we explore whether associations between parents' secure base script knowledge and parental sensitivity and sensitive discipline are similar in strength for mono- and dizygotic (DZ) twin siblings.

Parental sensitivity is defined as the caregiver's ability to accurately notice and interpret child signals and to respond to these signals in a prompt and appropriate manner (Ainsworth et al., 1974). Parental sensitivity is critically important for the development of a secure infant–mother (Verhage et al., 2016) and infant–father (Lucassen et al., 2011) attachment relationship. Furthermore, parental sensitivity predicts a wide range of positive child outcomes, including better cognitive functioning, improved language skills, higher social–emotional competence, and lower levels of internalizing and externalizing behavioral problems (Cooke et al., 2022; Deans, 2020; Madigan et al., 2019; Rodrigues et al., 2021). Moreover, early sensitive caregiving experiences predict supportive parenting in the next generation through competence in subsequent relationships with peers and romantic partners (Raby et al., 2015).

Sensitive discipline includes noncoercive strategies to deal with difficult child behavior, such as using distraction, explaining the rules, or ignoring difficult child behavior (Van IJzendoorn et al., 2023). Sensitive discipline helps children to adhere to family and societal rules, fosters appropriate child behavior (Pinderhughes et al., 2000) and may promote children's self-regulatory capacities (Baron & Malmberg, 2019; Eaton, 1997; LeCuyer-Maus & Houck, 2002). Contrary to sensitive discipline strategies are harsh discipline strategies (e.g., shouting and spanking), which have been associated with negative outcomes in childhood and adolescence, including higher levels of internalizing and externalizing behavioral problems (Bender et al., 2007; Ferguson, 2013; Gershoff & Grogan-Kaylor, 2016). Several studies suggest that parents who show more sensitive discipline also show more sensitive caregiving (Euser et al., 2020; Joosen et al., 2012; LeCuyer-Maus, 2000). Sensitive discipline and parental sensitivity are, however, different constructs that tap into distinct aspects of parental caregiving (Euser et al., 2020).

The extent to which parents show sensitive caregiving and sensitive discipline may (partly) depend on parents' secure base script knowledge. The secure base script consists of eight central elements that represent a temporal–causal sequence for eliciting and receiving effective secure base use and support: (a) the child or adult partner is constructively engaged with the environment, (b) the child or adult partner faces an obstacle or threat that hinders constructive engagement and/or leads to distress, (c) the child or adult partner signals that help or support is needed, (d) the parent or adult partner adequately interprets the signal and provides help and support, (e) the help is accepted, (f) the help offered by the parent or adult partner is effective in conquering the obstacle or threat, (g) the comfort provided by the parent or adult partner is effective in relieving the distress, and (h) the child or adult partner returns to constructive engagement with the environment (Waters & Waters, 2006). To assess an individual's knowledge of and access to the secure base script, a prompt word-outline method was developed: the Attachment Script Assessment (ASA; Waters & Waters, 2006). Scores on the ASA have been moderately to strongly associated with coherence scores and security scores on the Adult Attachment Interview (AAI; Coppola et al., 2006; Dykas et al., 2006; George et al., 1985; Hawkins et al., 2015; Steele et al., 2014), which is a valid instrument for assessing adult's attachment representations (Bakermans-Kranenburg & Van IJzendoorn, 1993).

Longitudinal studies have demonstrated that secure base script knowledge is relatively stable over time (Vaughn et al., 2006; Waters et al., 2017, 2022; Waters, Facompré, et al., 2021). However, secure base script knowledge is not set in stone but can be modified through attachment-related experiences (Bosmans et al., 2020, 2022; Cuyvers et al., 2023; see also Waters et al., 2019). In addition, adults' knowledge of the secure base is shaped (in part) by the quality of early caregiving experiences (Nivison et al., 2021; Schoenmaker et al., 2015; Steele et al., 2014; Vaughn et al., 2016; Waters et al., 2017). Notably in this regard, in a sample of genetically unrelated parent–child dyads, parental sensitivity during infancy and childhood predicted secure base script knowledge in young adulthood, suggesting no genetic influences on secure base script knowledge (Schoenmaker et al., 2015). Secure base script knowledge, in turn, has been found to shape parental sensitivity. For instance, middle-class mothers with more secure base script knowledge showed higher levels of sensitivity during interactions with their infant (Coppola et al., 2006). Similar findings have been reported in samples of trauma-exposed mothers (Huth-Bocks et al., 2014). Furthermore, in a sample of both high-risk and low-risk parents, parental secure base script knowledge was related to more sensitive caregiving toward school-aged children (Raby et al., 2021). The present study aims to extent this body of knowledge by examining whether parents' secure base script knowledge is associated with parental sensitivity in a relatively large sample of parents with mono- and dizygotic twin children.

To our knowledge, no previous studies have examined whether parents' knowledge of the secure base script is associated with parental sensitive discipline. However, if the secure base script summarizes a set of generalized expectations for secure base use and provision (Waters & Waters, 2006), the script may become activated in different kind of contexts, including parent–child disciplinary situations. It can be hypothesized that parents with secure base script knowledge respond to children's frustration or noncompliant behavior in a way that is consistent with the secure base script. That is, parents are sensitive to the child's signals (e.g., frustration), respond quickly and effectively (e.g., distraction), relieve any distress of the child (e.g., acknowledging the child's feelings and emotions), and help the child to return to constructive engagement with the environment (e.g., offering alternatives). In contrast, parents who lack secure base script knowledge may respond to a misbehaving child with inconsistent or insensitive disciplinary strategies, thereby violating important aspects of the secure base script. Of course, these are speculations that warrant further investigation but ones that deserve attention because they can provide important insights into whether secure base scripts shape the way in which parents discipline their children.

Another unanswered question is whether child-genetic factors play a role in associations between parents' secure base script knowledge and their sensitive caregiving and discipline behavior. A child-based behavioral genetic study showed that individual differences in observed parental sensitive discipline, but not parental sensitivity, are dependent on twins' zygosity and thus partly influenced by children's genetic makeup (Euser et al., 2020). In a similar vein, a study using an extended family design, demonstrated that experiences of childhood maltreatment were partly attributable to child-driven genetic factors (Pittner et al., 2019). Furthermore, a genome-wide meta-analysis found that child maltreatment is manifested through active (children's genetic makeup affects their behavior) and reactive (children's genetic makeup evoke different parental responses) gene–environment correlations (Warrier et al., 2021). Undisputedly, it is the parent who should provide an appropriate response to difficult child behavior, and the child should never be blamed for harsh parental treatment, but these studies suggest that greater genetic similarity between children may elicit more similar parental discipline, which might be relevant to our study with monozygotic (who share approximately 100% of their genetic makeup) and dizygotic twins (who share approximately 50% of their genetic makeup). Here, we explore for the first time whether associations between parental secure base script knowledge and parental sensitivity and sensitive discipline are moderated by child-genetic influences.

In sum, the primary aim of the study is to investigate relations between parents' secure base script knowledge and parental sensitivity and sensitive discipline. Based on the previous literature (Coppola et al., 2006; Hawkins et al., 2015; Huth-Bocks et al., 2014; Raby et al., 2021), we hypothesized that parents with more secure base script knowledge show higher levels of parental sensitivity during interactions with their twin children. Albeit speculatively, because empirical evidence is limited, we hypothesized that parents with more secure base script knowledge also use more sensitive discipline strategies. Yet, taking into account the nongenetic origin for parental sensitivity and the presence of child-driven genetic effects on parental sensitive discipline (Euser et al., 2020), we might expect that parental secure base script knowledge is more strongly related to parental sensitivity than sensitive discipline.

The secondary explorative aim of the study was to examine whether associations between parents' secure base script knowledge and parental sensitivity and sensitive discipline are similar in strength for mono- and dizygotic twin siblings. We hypothesized that the association between parental secure base script knowledge and sensitive discipline is stronger for monozygotic twins than dizygotic twins. We further speculatively hypothesized that the association between parents' secure base script knowledge and parental sensitivity is similar in strength for mono- and dizygotic twin siblings. However, behavioral genetic research has shown that genetic variance estimates are not fixed. Instead, genetic influence may increase or decrease with age (Polderman et al., 2015). The present study will therefore explore whether the relation between parents' secure base script knowledge and sensitive discipline is differentially impacted by heritability dependent on child age.

Method

Participants

Families with same-sex twins participated in The Leiden Consortium on Individual Development (L-CID), an experimental cohort-sequential study focusing on two longitudinal cohorts: an early childhood twin cohort (ECC) and a middle childhood twin cohort (MCC; Crone et al., 2020). The present study included data from both the ECC and the MCC and focused on preintervention data from the second wave of data collection. Data from the ECC and MCC were combined into one final sample. The total sample included 461 primary parents and 922 twin children (ECC: 214 parents, MCC: 247 parents). Sample size was based on the number of families enrolled in each cohort. The primary parent (i.e., the parent who spent most time with the children) was invited to participate in the study (91.1% mothers). Data collection took place from 2015 to 2016 and from 2016 to 2017 for the ECC and MCC, respectively. Children (48.6% boys, 57.3% monozygotic pairs) were on average 7.00 years old (SD = 2.18; ECC: M = 4.77, SD = 0.58, MCC: M = 8.94, SD = 0.67). The primary parent's highest level of education was lower and intermediate vocational education (32.7%), higher vocational education (41.3%), and post-higher vocational education (26.0%). Families with same-sex twins in the western region of the Netherlands were recruited through municipal records. Families had to meet the following inclusion criteria: Parents and children had to be fluent in speaking Dutch, and both parents and grandparents had to be of European descent. Families were excluded from participation when reporting a congenital disability, psychological disorder, chronic illness, hereditary disease, visual/hearing impairment, or an IQ below 70. For a more detailed description of the recruitment procedures for the ECC and MCC, respectively, see also Euser et al. (2016) and Van der Meulen et al. (2018). Families received a financial compensation, travel expenses were covered, and children received a small gift after the research visit. Prior to the participation, parents provided written informed consent. The study was approved by the central committee on research involving human subjects in the Netherlands (Centrale Commissie Mensgebonden Onderzoek; ECC: NL49069.000.14; MCC: NL50277.058.14).

Procedure

The L-CID study includes yearly waves of data collection in two partly overlapping cohorts (ECC and MCC). For more information about the L-CID study, see also Crone et al. (2020). Data were collected during a laboratory visit (ECC) or during a visit at the family's home (MCC). During the visits, children completed a set of individual tasks and performed several interaction tasks with their primary parent. Parental sensitivity was observed during a Etch-A-Sketch task (Cents et al., 2014; Euser et al., 2016), and parental sensitive discipline was observed during a "Don't touch task/Do-Don't task" (Euser et al., 2016; Runze et al., 2022). During the individual child tasks, the primary parent completed the ASA (Waters & Waters, 2006).

Measures

Parental Sensitivity

Parental sensitivity toward each of the twin siblings was observed during a computerized version of a structured cooperative drawing task (Etch-A-Sketch; Cents et al., 2014). The primary parent performed the task twice: once with the oldest child and once with the youngest child (order was random across families). The

parent–child dyad was instructed to collaboratively copy three drawings from the printed examples using four buttons (Cents et al., 2014). Two buttons could be used to draw horizontal lines and two buttons could be used to draw vertical lines. Diagonal lines could be drawn by simultaneously pressing one of the buttons to draw a horizon line and one of the buttons to draw a vertical line. Both the parent and the child had to control two buttons, but they were free to decide who controlled which pair of buttons. The set of printed examples was different for each parent–child dyad and the printed examples increased in difficulty. The parent–child interactions were videotaped, and the copied drawings were recorded on screen video (see also Euser et al., 2016). In the ECC, the duration of the task was 8 min. In the MCC, the duration of the task was 10 min. In both the ECC and MCC, the computer instructed the parent–child dyad after 3 min to start copying the second drawing if they had not already done so. Parental sensitivity was coded using the revised Erickson 7-point rating scales for supportive presence (1 = *parent is highly unsupportive*, 7 = *parent is highly supportive*) and intrusiveness (1 = *parent is nonintrusive*, 7 = *parent is highly intrusive*; Egeland, 1990). Scores on the intrusiveness scale were recoded so that higher scores indicate lower levels of intrusiveness. Scores on the intrusiveness and supportive scales were significantly correlated, $r = .54$ (ECC: $r = .64$, MCC: $r = .53$). Therefore, scores on both scales were averaged into an overall score indicating parental sensitivity. Observers who were extensively trained by an expert coder coded the videotaped interactions. Intercoder reliability (intraclass correlation coefficient [ICC]; single measures, absolute agreement) with the expert coder and among coders was good. In the ECC (5 coders, 40 video's), mean ICC for supportive presence with the expert coder was .83 (range = .76–.89) and .83 among coders on average; for intrusiveness, mean ICC with the expert coder was .77 (range = .72–.81) and .79 among coders on average (see also Euser et al., 2020). In the MCC (5 coders, 49 video's), mean ICC for supportive presence with the expert coder was .74 (range = .68–.79) and .73 among coders on average; for intrusiveness, mean ICC with the expert coder was .73 (range = .64–.80) and .72 among coders on average (see also Runze et al., 2022). Coders never coded more than one video of one child from the same family and observers coding paternal sensitivity were not involved in the coding of parental sensitive discipline.

Parental Sensitive Discipline

In the ECC, parental sensitive discipline toward each of the twin siblings was observed during a "Don't touch task" (Euser et al., 2016; van der Mark et al., 2002). The primary parent performed the task twice: once with the oldest child and once with the youngest child (order was random across families). In the ECC, a researcher handed the parent a card with written instructions and a bag with toys. The parent was instructed to take all the toys out of the bag and to tell the child to not touch any of the toys. After 2 min, the parent was instructed to tell the child that only the least attractive toy could be used for play. After 2 min of play, the child was allowed to play with all the toys (this play episode is not included in the present study). In the MCC, parental sensitive discipline toward each of the twin siblings was observed during a "Do-Don't task" (MCC; Kochanska, 1995; Runze et al., 2022; van der Mark et al., 2002). The parent was handed a laptop with written instructions and the child received the materials needed to perform the task. Parents were instructed to watch a video and to make sure that the child did not watch the video. While the parent watched the video, the child had to perform an unattractive task: sorting perlerbeads by color. The duration of the task in the MCC was 8 min. Parent–child interactions were videotaped and coded for parental sensitive discipline using an adapted version of the revised Erickson 7-point scales for supportive presence (1 = *parent completely fails to provide sensitive discipline*, 7 = *parents skillfully provided positive discipline throughout the session*; Egeland, 1990). Parent–child interactions were also coded for parental sensitive discipline using the physical interference scale; however, scores on the physical interference scale were highly skewed. In accordance with Euser et al. (2020) and Runze et al. (2022), we did not include scores for physical interference in our analyses. Observers who were extensively trained by expert coders coded the videotaped interactions. ICC with the expert coder and among coders was good. In the ECC (4 coders, 48 video's), mean ICC for positive discipline with the expert coder was .74 (range .71–.79) and .76 among coders on average (see also Euser et al., 2020). In the MCC (7 coders, 49 video's), mean ICC for positive discipline with the expert coder was .84 (range .81–.89) and .88 among coders on average (see also Runze et al., 2022). Coders did not code more than one video of one child from the same family and observers coding paternal sensitive discipline were not involved in the coding of parental sensitivity.

Secure Base Script Knowledge

Parental knowledge of the secure base script was measured with the ASA (Waters & Waters, 2006). Parents were instructed to tell four different stories using prompt word sets, each containing a title and a list of 12 prompt words organized in three columns. The prompt words imply a beginning, middle, and end of a possible story. One prompt word set, designed to elicit a neutral story, was used for practice purposes (ECC: Afternoon Shopping [mothers] or Saturday Afternoon [fathers], MCC: Trip to the Park). The other three prompt word sets were designed to elicit secure base script content. Two of the prompt word sets focused on the mother–child relationship (Baby's Morning and Doctor's Office) and one of the prompt word sets focused on the adult–adult relationship (The Accident). Parents were told that they did not have to use all the prompt words and that they could change the order of the words if they wanted to. Parents' narratives were audio recorded and subsequently transcribed. The transcripts were scored on a 7-point rating scale to summarize the amount of parental use of elements of a secure base script (H. S. Waters & Rodrigues, 2004). Narratives that contained extensive secure base script with detailed elaborations received the highest scores (6–7), narratives that contained elements of the secure base script but fell short in elaboration received moderately high scores (4–5), narratives that were event focused and contained no evidence of the secure base script received a moderately low score (3), and narratives with unusual or atypical content as well as narratives that seem disjointed received the lowest scores (1–2). All narratives were double coded and a consensus score was created through discussion when ratings differed 1.5 point or more. For each narrative, we averaged the scores assigned by the two coders. ICC with the expert coder and among coders was good. In the ECC (4 coders), mean ICC for secure base script knowledge with the expert coder was .75 (range .70–.79) and .73 among coders on average. In the MCC (3 coders), mean ICC for secure base script

knowledge with the expert coder was .80 (range .77–.83) and .76 among coders on average. As per preregistered plan, we did not code autobiographical stories (Baby's Morning, $n = 24$; Doctor's Office, $n = 11$; The Accident, $n = 9$). Coders were blind to which story belonged to which parent and were therefore allowed to score more than one transcript of the same parent. In total, six parents only told autobiographical stories, resulting in missing data on parents' secure base script knowledge. For participants with one or more autobiographical story, only scores for the nonautobiographical stories were included. Consistent with previous studies (e.g., Hawkins et al., 2015; Raby et al., 2021), scores across the three stories were correlated (*r*s between .38 and .40) and were averaged into an overall score indicating parental knowledge of the secure base script. The Cronbach's α for the three secure base script prompt word sets was in the low end of the acceptable range, α = .65 (Vaske et al., 2017). Two outliers for secure base script knowledge ($z < -3.29$) were winsorized, thereby maintaining the rank order within the distribution.

Zygosity

To determine zygosity of the twins, DNA samples were collected by means of buccal swabs for an identity by descent analysis. No DNA samples were available for three twin pairs in the ECC and for one twin pair in the MCC. Therefore, zygosity of the twins was determined using primary parental reports on a questionnaire including eight items about the twins' physical resemblance, and the extent to which people can accurately distinguish the twins (Rietveld et al., 2000). A previous study from our lab showed that the questionnaire reliably predicted zygosity in 93% of the cases as compared with our own DNA analyses (Euser et al., 2020). Two samples were reanalyzed as parents had doubts about the results of the DNA analysis. More than likely, there was an accidental switch as reanalysis of the DNA samples indicated that one twin pair was monozygotic (not dizygotic), and the other twin pair was dizygotic (not monozygotic).

Covariates

Parental age, child age, and socioeconomic status (SES) were taken into account as potential covariates. SES was based on parents' self-reported education level at Wave 1 and classifications were made as follows: Families were classified with high SES when both parents received at least preparatory college education. Families were classified with low SES when both parents completed vocational education at most. The middle SES classification included the remaining combinations education levels of both parents.

Data Analytic Strategy

To account for the nested structure of the data (i.e., twins within families), we performed linear mixed models (LMMs) with full information maximum likelihood (FIML) as the estimator in IBM SPSS Statistics Version 27. In the first step, we included parental knowledge of the secure base script (mean centered) as fixed factor and fitted separate LMM's for the two dependent variables: parental sensitivity and sensitive discipline. In the second step, we added zygosity (dummy coded) as fixed factor and added interaction terms of Secure Base Script Knowledge (mean centered) × Zygosity (dummy coded). Subsequently, we added potential covariates to the models. Finally, we fitted a LMM and included parental secure base script knowledge (mean centered), age (mean centered), and zygosity (dummy coded) as fixed factors, and we added lower level interaction terms and the interaction term of Parental Secure Base Script Knowledge (mean centered) × Zygosity (dummy coded) × Age (mean centered) to the model. As per preregistered plan, this LMM was only fitted for sensitive discipline. Effect sizes for the relationship between parental knowledge of the secure base script and parental sensitivity vary between $r = .25$ (Hawkins et al., 2015) and $r = .58$ (Coppola et al., 2006). With a sample size of 461 families and an α level of .05, the present study had sufficient power (>.80) to detect effects.

Transparency and Openness

The study design, hypotheses, and analysis plan were preregistered at the open science framework (https://osf.io/xhsvw). Adaptations to the analysis plan were reported in an addendum (https://osf.io/wcyu4). The analysis code and research materials are available upon request. We report how we determined our sample size, all data exclusions, and all measures in the study. There were no manipulations as this was not an experimental study.

Results

Descriptive Statistics

Table 1 shows the sample characteristics for the total group and for the ECC and MCC separately. The rate of missing data ranged from 0% to 3.9%. Little's Missing Completely at Random test was nonsignificant, $\chi^2(37) = 45.56$, $p = .156$, indicating that data were missing completely at random and thus justifying the use of FIML (Lang & Little, 2018). Correlations were examined between potential covariates and the dependent variables. Age of the child was negatively correlated with parental sensitive discipline ($r = -.44$, $p < .001$). Furthermore, SES was positively associated with parental sensitivity ($r = .16$, $p < .001$) and sensitive discipline ($r = .18$, $p < .001$). Therefore, LMMs both with and without the inclusion of age and SES as covariates were conducted.

Correlations Between Secure Base Script Knowledge, Parental Sensitivity, and Sensitive Discipline

Table 2 reports (within-twin) correlations between secure base script knowledge, parental sensitivity, and sensitive discipline. In the total sample, parental secure base script knowledge was significantly correlated with parental sensitivity ($r = .11$, $p = .001$), and the strength of the correlation was similar for monozygotic ($r = .12$, $p = .007$) and dizygotic twin children ($r = .10$, $p = .065$). Similarly, the correlation between parental secure base script knowledge and parental sensitive discipline was significant ($r = .12$, $p < .001$), and the magnitude of the correlation was similar for monozygotic ($r = .12$, $p = .007$) and dizygotic twin children ($r = .12$, $p = .017$). Finally, Steiger's *Z* analyses suggested no significant differences in the strength of the relation between secure base script and parental sensitivity ($r = .11$) and secure base script knowledge and parental sensitive discipline ($r = .12$). Separate correlation analyses for each cohort (ECC and MCC) are provided in Supplemental Table 1.

Table 1
Sample Characteristics of the Total Sample and Separately for the ECC and MCC

Characteristics	Total (N = 922)	ECC (N = 428)	MCC (N = 494)
Twin characteristics			
Age in years M (SD)	7.00 (2.18)	4.77 (0.58)	8.94 (0.67)
Sex (% boys)	48.6	48.1	49.0
Zygosity (% monozygotic)	57.3	59.8	55.1
Country of birth (% the Netherlands)	99.1	99.5	98.8
Family characteristics			
Age primary parent M (SD)	39.51 (5.14)	37.24 (4.70)	41.48 (4.67)
Educational-level primary parent (%)			
Lower and intermediate vocational	32.7	30.5	34.7
Higher vocational, university bachelor	41.3	40.9	41.6
Posthigher vocational, university master	26.0	28.6	23.7
Family SES (%)			
Low	7.8	7.0	8.5
Medium	42.3	38.0	45.9
High	49.9	55.0	45.5
Number of other children in the family M (SD)	0.91 (0.81)	0.77 (0.74)	1.02 (0.84)
Primary parents' marital status (%)			
Married, registered partnership, cohabiting	95.4	98.6	94.3
Single parent	4.6	1.4	5.7
Main variables of interest			
Secure base script knowledge M (SD)	3.99 (0.67)	4.01 (0.65)	3.96 (0.66)
Parental sensitivity M (SD)	4.01 (1.33)	4.09 (1.41)	3.93 (1.26)
Parental sensitive discipline M (SD)	4.33 (1.62)	5.14 (1.31)	3.64 (1.53)

Note. ECC = early childhood twin cohort; MCC = middle childhood twin cohort; SES = socioeconomic status.

Secure Base Script Knowledge Predicting Parental Sensitivity

LMM analyses showed that parental secure base script knowledge positively and significantly predicted parental sensitivity, $t(441) = 2.69$, $\beta = .15$, $B = 0.22$, $SE = 0.08$, $p = .007$, 95% CI [0.06, 0.39], indicating that parents with more secure base script knowledge interacted with their twin children in a more sensitive manner (see Table 3). Results remained significant after controlling for SES of the family (see Supplemental Table 2). However, SES was a significant covariate in the model such that parents with a high SES showed higher levels of sensitivity than parents with a middle or low SES. There was no significant interaction effect of Secure Base Script Knowledge × Zygosity, $t(441) = -0.24$, $\beta = -.03$, $B = -0.04$, $SE = 0.17$, $p = .815$, 95% CI [−0.37, 0.29], suggesting that the strength of the association between secure base script knowledge and parental sensitivity was similar for mono- and dizygotic twin children.

Table 2
Correlations Between Parental Secure Base Script Knowledge, Parental Sensitivity, and Sensitive Discipline

Construct	Construct	Total	MZ	DZ
Within-twin correlations				
Parental sensitivity		.50**	51**	.49**
Sensitive discipline		.72**	.74**	.69**
Within-twin correlations per cohort				
Parental sensitivity (ECC)		.58**	.60**	.55**
Sensitive discipline (ECC)		.60**	.59**	.63**
Parental sensitivity (MCC)		.41**	.42**	.41**
Sensitive discipline (MCC)		.66**	.74**	.57**
Correlations between variables				
Parental sensitivity	Sensitive discipline	.20**	.19**	.21**
Parental sensitivity	SBS	.11*	.12*	.10
Sensitive discipline	SBS	.12**	.12*	.12*

Note. SBS = secure base script knowledge; ECC = early childhood twin cohort; MCC = middle childhood twin cohort; MZ = monozygotic; DZ = dizygotic.
* $p < .05$. ** $p < .001$.

Secure Base Script Knowledge Predicting Parental Sensitive Discipline

The LMM for parental sensitive discipline showed that more parental secure base script knowledge predicted more parental sensitive discipline, $t(441) = 2.70$, $\beta = 0.19$, $B = 0.29$, $SE = 0.11$, $p = .007$, 95% CI [0.08, 0.50]. Results remained significant after controlling for SES of the family and age of the child (see Supplemental Table 3). However, SES was a significant covariate in the model such that parents with a high SES showed higher levels of sensitive discipline than parents with a middle or low SES. Moreover, inclusion of age as a covariate showed that parents used more sensitive discipline during interactions with younger children than older children (see Supplemental Table 3). There was no significant interaction of Secure Base Script Knowledge × Zygosity, $t(440) = 0.11$, $\beta = .02$, $B = 0.02$, $SE = 0.22$, $p = .910$, 95% CI [−0.41, 0.45], indicating that the strength of the association between parental secure base script knowledge and parental sensitive discipline was similar for mono- and dizygotic twin children (see Table 4). Finally, we found no evidence that the positive relation between parents' secure base script knowledge and sensitive discipline was impacted by increasing heritability with age, as the interaction term of Parental Secure Base Script Knowledge × Zygosity × Age was nonsignificant, $t(440) = 0.72$, $\beta = 0.09$, $B = 0.06$, $SE = 0.09$, $p = .475$, 95% CI [−0.11, 0.24].

Table 3
Secure Base Script Knowledge as a Predictor of Parental Sensitivity (Model 1) and Moderation Effects of Zygosity (Model 2)

Predictor	*B* (*SE*)	*df*	*t*	*p*	[95% CI]
Model 1					
Intercept	4.00 (0.05)	443	73.05	<.001	[3.89, 4.11]
SBS	0.22 (0.08)	441	2.69	.007	[0.06, 0.39]
Model 2					
Intercept	3.98 (0.07)	442	55.08	<.001	[3.84, 4.13]
SBS	0.24 (0.11)	441	2.20	.028	[0.03, 0.46]
Zygosity	0.04 (0.11)	443	0.34	.737	[−0.18, 0.26]
SBS × Zygosity	−0.04 (0.17)	441	−0.24	.815	[−0.37, 0.29]

Note. SBS = secure base script knowledge; *SE* = standard error; CI = confidence interval.

Sensitivity Analyses

We performed sensitivity analyses, using LMMs, to assess whether relations between secure base script knowledge and parental sensitivity and sensitive discipline were moderated by cohort. Results showed no moderation effects of cohort (see Supplemental Table 4 and 5). Finally, we performed sensitivity analyses, using LMMs, by excluding children with a psychiatric diagnosis. Note that at the time of inclusion, none of the twin children were diagnosed with a psychiatric disorder. However, during the second wave of data collection, some children in the MCC ($n = 11$) were diagnosed with a psychiatric disorder (attention deficit hyperactivity disorder, $n = 5$; attention deficit disorder, $n = 2$; autism spectrum disorder, $n = 2$; developmental coordination disorder, $n = 1$; and severe anxiety symptoms, $n = 1$). None of the children in the ECC were diagnosed with a psychiatric disorder during the second wave of data collection. Results of the sensitivity analyses did not lead to different conclusions.

Discussion

The present study examined relations between parents' secure base script knowledge and observed parental sensitivity and sensitive discipline in a sample of parents with 4–9-year-old twin children. In addition, we examined whether associations between parents' secure base script knowledge and parental sensitivity and sensitive discipline were similar in strength for mono- and dizygotic twin children. As expected, parents with more secure base script knowledge interacted with their twin children in a more sensitive manner and showed more sensitive discipline. We found no evidence that parents' secure base script knowledge was more strongly associated with parental sensitivity than with sensitive discipline. In line with our hypothesis, the strength of the association between parents' secure base script knowledge and parental sensitivity was not significantly different for monozygotic twins and dizygotic twins. Against our expectations, results showed that the association between parents' secure base script knowledge and sensitive discipline was not stronger for monozygotic twins than for dizygotic twins either. Finally, exploratory analyses showed that the positive relation between parents' secure base script knowledge and sensitive discipline was not differentially impacted by heritability with increasing child age.

Prior research reported that parents with greater secure base script knowledge show higher levels of sensitivity during interactions with their infants (Coppola et al., 2006; Hawkins et al., 2015; Huth-Bocks et al., 2014; Waters et al., 2018) and their middle school-aged children (Raby et al., 2021). Moreover, mothers with lower secure base script knowledge (compared to mothers with higher secure base script knowledge) exhibited heightened neural responses to infant's negative facial expressions (Groh & Haydon, 2018) and processed infant cry sounds in a less flexible manner (Groh et al., 2015). Results of the present study add to previous findings by showing that parents with more secure base script knowledge were

Table 4
Secure Base Script Knowledge as a Predictor of Parental Sensitive Discipline (Model 1), Moderation Effects of Zygosity (Model 2), and a Three-Way Interaction Effect Between Secure Base Script Knowledge, Age, and Zygosity (Model 3)

	Parental sensitive discipline				
Predictor	*B* (*SE*)	*df*	*t*	*p*	[95% CI]
Model 1					
Intercept	4.30 (0.07)	440	60.76	<.001	[4.16, 4.44]
SBS	0.29 (0.11)	441	2.70	.007	[0.08, 0.50]
Model 2					
Intercept	4.28 (0.09)	440	45.74	<.001	[4.09, 4.46]
SBS	0.28 (0.14)	443	1.98	.048	[0.00, 0.56]
Zygosity	0.05 (0.14)	439	0.36	.723	[−0.23, 0.33]
SBS × Zygosity	0.02 (0.22)	440	0.11	.910	[−0.41, 0.45]
Model 3					
Intercept	4.27 (0.08)	440	52.07	<.001	[4.11, 4.43]
SBS	0.23 (0.13)	444	1.86	.063	[−.01, 0.48]
Zygosity	0.11 (0.13)	440	0.86	.389	[−0.14, 0.36]
Age	−0.32 (0.04)	441	−8.44	<.001	[−0.39, −0.24]
SBS × Zygosity	0.08 (0.19)	441	0.41	.685	[−0.30, 0.45]
SBS × Age	−0.01 (0.06)	441	−0.15	.878	[−0.13, 0.11]
Zygosity × Age	−0.03 (0.06)	440	−0.43	.664	[−0.14, 0.09]
SBS × Zygosity × Age	0.06 (0.09)	440	0.72	.475	[−0.11, 0.24]

Note. SBS = secure base script knowledge; *SE* = standard error; CI = confidence interval.

more sensitive during interactions with their school-aged twin children.

To our knowledge, this was the first study to demonstrate a significant association between parents' secure base script knowledge and sensitive discipline such that parents with higher levels of secure base script knowledge used more discipline behaviors such as distraction, ignoring difficult child behavior, or providing explanations for why limits are set. Some studies, using the AAI (George et al., 1985), showed that mothers' with insecure attachment representations engaged in less sensitive discipline behaviors (Bus & Van IJzendoorn, 1992; Verschueren et al., 2006). Our results, together with previous findings with the AAI, point to the importance of examining parents' attachment representations not only in relation to traditional attachment constructs such a parental sensitivity but also in relation to other caregiving behaviors, such as parental sensitive discipline.

The reported effect sizes for associations between parents' secure base script knowledge and parental sensitivity and sensitive discipline leave room for other factors to shape parents' sensitive caregiving and sensitive discipline. According to Belsky's (1984) model, parenting behavior is determined by multiple factors. For instance, parenting behavior is directly impacted by characteristics of the parent (e.g., depression), characteristics of the child (e.g., temperament), and characteristics of the environment (e.g., marital satisfaction; Belsky, 1984; Taraban & Shaw, 2018). Furthermore, parent, child, and environmental characteristics interact with one another to predict parenting behavior (Belsky, 1984; Taraban & Shaw, 2018). Considering the above, findings of the present study showed that parents with a high SES exhibited higher levels of parental sensitivity and sensitive discipline than parents with a middle or low SES. Moreover, parents used more sensitive discipline during interactions with younger children than older children.

The association between parents' secure base script knowledge and parental sensitivity is consistent with a meta-analysis reporting a combined effect size of $r = .20$ for the relation between parents' attachment representations (as measured with the AAI) and parental sensitivity (Verhage et al., 2016). The finding that both the AAI and the secure base script procedure yield similar effect sizes in the prediction of parental sensitivity, adds to a body of research providing support for the use of the secure base script procedure as a complement or alternative to the AAI for measuring adult's attachment representations (Coppola et al., 2006; Dykas et al., 2006; Hawkins et al., 2015; Steele et al., 2014).

Longitudinal studies have shown that secure base script knowledge is relatively stable over time (Vaughn et al., 2006; Waters, Ruiz, & Roisman, 2017; Waters et al., 2022; Waters, Facompré, et al., 2021) and continuity in observed relations between secure base script knowledge and parental sensitivity and discipline might therefore be expected. At the same time, secure base script knowledge can be modified in response to attachment-related experiences (Bosmans et al., 2020, 2022; Cuyvers et al., 2023). Furthermore, Waters et al. (2019) demonstrated that stressful life events predicted change in adolescents' knowledge of the secure base script. Thus, associations between secure base script knowledge and parenting behavior might also be (to some extent) impacted by individual developmental processes. Future longitudinal studies utilizing multiple measures of sensitivity and discipline across the infancy, childhood, and early adolescence periods could provide more insight into the continuity of relations between secure base script knowledge and parental sensitivity and sensitive discipline.

As expected, results showed no significant differences in the strength of the relation between secure base script knowledge and parental sensitivity for monozygotic twin children and dizygotic twin children. However, in contrast to our expectations, we found no evidence that the strength of the relation between parents' secure base script knowledge and sensitive discipline was stronger for monozygotic twin children than dizygotic twin children. Previous behavioral genetic studies showed that the variance in observed parental sensitivity could be largely explained by shared environmental factors (i.e., experiences that are shared within a given family such as family's social economic status) while no child-driven genetic effects were found (Euser et al., 2020; Fearon et al., 2006; Roisman & Fraley, 2008). In contrast, the variance in observed parental sensitive discipline was partly explained by children's genetic makeup, in addition to shared environmental factors (Euser et al., 2020). Yet, in that study, genetic influences on parental sensitive discipline decreased over time such that genetic factors explained a moderate amount of variance (44%) when children were on average 3.8 years old and explained only a small amount of variance (13%) when children were on average 4.8 years old. It is currently unclear how much of the variance in sensitive discipline can be explained by children's similarity in genetic makeup in broader age groups. Results derived from our exploratory analyses provided no evidence that the positive association between parents' secure base script knowledge and sensitive discipline was impacted by increasing genetic influences with age. Meta-analytic evidence shows increasing heritability for cognitive functioning (Briley & Tucker-Drob, 2013) but not for a wide range of other human traits (Polderman et al., 2015). Longitudinal studies could provide more insight into whether the relation between parents' secure base script knowledge and sensitive discipline is differently impacted by children's genetic makeup at various developmental phases. It should be noted that the present study design does not allow for drawing inferences about whether parents' own genetic makeup plays a role in relations between secure base script knowledge and parental sensitivity and sensitive discipline. To examine effects of parents' genetics on their caregiving behavior, parent-based twin studies (Bakermans-Kranenburg & Van IJzendoorn, 2016) or genome-wide parental polygenic scores are needed (Wertz et al., 2019).

The present study has several strengths, including preregistration of our study, observational measures of parental sensitivity and sensitive discipline, and a relatively large sample size. However, the results of the present study should be interpreted in light of the following limitations. First, the sample consisted mainly of mothers. Relatively little is known about the extent to which secure base script knowledge shapes the quality of fathering behaviors. This is surprisingly as fathers have become increasingly involved in child caregiving (Bakermans-Kranenburg et al., 2019) and play an important role in their children's development (Cano et al., 2019; Sarkadi et al., 2008; Torres et al., 2014). Future studies could examine whether our findings can be generalized to samples of fathers. Second, we used slightly different tasks to measure sensitive discipline in the ECC and MCC. Consequently, it remains unclear whether age or task differences may have elicited different levels of sensitive discipline. Yet, the inclusion of different discipline tasks for younger and older children may be considered a more age-

appropriate approach to measure sensitive discipline. Moreover, the relation parents' secure base script knowledge and parental sensitivity remained significant after controlling for age of the child. Third, parental sensitivity and parental sensitive discipline were observed twice, once with each twin sibling. This allowed for a valid comparison of parenting behaviors toward each of the two twin siblings. Nonetheless, future studies may adapt a family system approach to generate a more complete picture of how secure base script knowledge shapes parental sensitivity and sensitive discipline within the family context. Finally, the adult version of the ASA (Waters & Waters, 2006, 2021) includes four prompt word sets. Yet, the present study included three prompt word sets because of time constraints and to minimize participation burden. Three prompt words sets have been reliably and validly used to assess secure base script knowledge in middle childhood (T. E. A. Waters et al., 2015, 2019) However, the inclusion of three and not four adult prompt word sets may have limited the magnitude of the observed effect sizes because the full ASA might show less error variance.

In conclusion, the present study showed that parents with more secure base script knowledge interacted with their twin children in a more sensitive manner and showed more sensitive discipline strategies. These findings show for the first time that parents' secure base script knowledge predicts not only parental sensitivity but also sensitive discipline. We found no evidence that the strength of the relation between parents' secure base script knowledge and parental sensitivity and sensitive discipline was impacted by children's similarity in genetic makeup. Future longitudinal studies utilizing multiple measures of sensitivity and discipline across the infancy, childhood, and early adolescence periods could provide more insight into the continuity of relations between secure base script knowledge and parental sensitivity and sensitive discipline.

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