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Origins of Secure Base Script Knowledge and the Developmental Construction of Attachment Representations

Theodore E. A. Waters
New York University – Abu Dhabi

Sarah K. Ruiz and Glenn I. Roisman
University of Minnesota

Increasing evidence suggests that attachment representations take at least two forms: a secure base script and an autobiographical narrative of childhood caregiving experiences. This study presents data from the first 26 years of the Minnesota Longitudinal Study of Risk and Adaptation (N = 169), examining the developmental origins of secure base script knowledge in a high-risk sample and testing alternative models of the developmental sequencing of the construction of attachment representations. Results demonstrated that secure base script knowledge was predicted by observations of maternal sensitivity across childhood and adolescence. Furthermore, findings suggest that the construction of a secure base script supports the development of a coherent autobiographical representation of childhood attachment experiences with primary caregivers by early adulthood.

Bowlby's (e.g. 1969/1982; 1973) attachment theory argues that the quality and consistency of parental secure base support is internalized by the child as a mental representation of attachment relationships. In turn, this representation serves as a key mechanism by which early caregiving experiences come to influence cognitions, emotions, and behavior in novel developmental contexts. Nonetheless, as Hinde (1988) and others (e.g., Bretherton, 1992; Thompson, Laible, & Ontai, 2003) have emphasized, Bowlby left much to the imagination as to the precise form and substance of these developing representations of early caregiving experiences. As a result, attachment researchers have explored a variety of representational constructs—including cognitive scripts and autobiographical memories—in an effort to understand how, when, and in what form attachment representations emerge (e.g., Main, Kaplan, & Cassidy, 1985; Waters & Waters, 2006).

Arguably, the most well-developed methodology for studying attachment representations is the Adult Attachment Interview (AAI; Hesse, 2008; Main et al., 1985). The AAI is a semistructured interview protocol that focuses on adults' autobiographical memories of childhood experiences with their primary caregivers, and is typically coded in relation to the *coherence* of the discourse produced during the interview (e.g., Van IJzendoorn, 1995). Coherence is defined as the degree to which an individual's narrative conforms to Grice's (1975) maxims for conversational implicature (Main, Goldwyn, & Hesse, 2003–2008), specifically, that discourse be truthful/supported by evidence, be informative/detailed, stays on topic, and be well organized. Individuals rated as coherent in their AAI discourse describe their experiences and relationships with caregivers in an internally consistent but not emotionally overwrought autobiographical manner (e.g., Roisman, 2009). Coherence is either used in its own right as a measure of attachment representations or as a variable used to assign individuals a secure (high coherence) or insecure (low coherence) attachment classification. This operationalization of the attachment representation has facilitated a large body of research on the development of individuals' representations of attachment in adolescence and adulthood (see Bakermans-Kranenburg & Van IJzendoorn, 2009, for a review; see also Grossman, Grossman, & Waters, 2006). The largest studies in this area suggest that adult attachment representations tapped by the AAI

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Correspondence concerning this article should be addressed to Theodore E. A. Waters, New York University–Abu Dhabi, P.O. Box 129188, Abu Dhabi, U.A.E. or Glenn I. Roisman, Institute of Child Development, University of Minnesota, 51 East River Parkway, Minneapolis, MN. E-mail: theo.waters@nyu.edu or roism001@umn.edu.

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are *weakly* associated with attachment security in infancy and *moderately* associated with having received sensitive care from parents during the years prior to maturity (e.g., Groh et al., 2014; Haydon, Roisman, Owen, Booth-LaForce, & Cox, 2014; Weinfield, Sroufe, & Egeland, 2000).

Three decades of research with the AAI supports the idea that early experiences with primary caregivers are internalized and eventually reflected in adults' autobiographical narratives about their childhood experience with caregivers. In turn, the coherence of those narratives is associated with individuals' functioning in salient developmental contexts (e.g., peer relationships, romantic partnerships, and childrearing; e.g., Allen, Moore, Kuperminc, & Bell, 1998; Crowell et al., 2002; Holland & Roisman, 2010; Shlafer, Raby, Lawler, Hesemeyer, & Roisman, 2015; Van IJzendoorn, 1995; Van Ryzin, Carlson, & Sroufe, 2011). That said, a recently emerging perspective on the development of attachment representations suggests that the quality of early experience with caregivers may *also* be internalized as a cognitive script (Bretherton, 1985, 1987)—specifically the *secure base script* (Waters & Waters, 2006).

Secure Base Script Knowledge

The secure base script is a temporal-causal generalization, or schematic, that summarizes the basic features of receiving support from an attachment figure. To date, secure base script knowledge has been assessed using two complementary methods: the Attachment Script Assessment (ASA; Dykas, Woodhouse, Cassidy, & Waters, 2006; Waters, Bosman, Vandevivere, Dujardin, & Waters, 2015; Waters & Waters, 2006) and a secure base script coding scheme developed for use with the AAI (AAI_{sbs}; Waters, Brockmeyer, & Crowell, 2013). Both methods involve coding narratives produced by participants for the extent to which they follow, or are organized around, the secure base script. The secure base script—like cognitive scripts more generally (see Abelson, 1976; Abelson, 1981; Schank & Abelson, 1977)—is believed to be acquired through repeated experiences of a similar kind, in this case secure base support and sensitive care from primary caregivers and other attachment figures.

This claim regarding the developmental origins of secure base script knowledge received its strongest support to date from a recent comparative analysis of attachment representations assessed in a large subsample ($N = 673$) of the normative-risk NICHD Study of Early Child Care and Youth Development (SECCYD) cohort (Steele et al., 2014) as well as in an adoptive sample followed into young adulthood (Schoenmaker et al., 2015). Importantly, Steele et al. (2014) found not only that (a) direct observations of maternal and paternal sensitivity measured across the first 15 years of life predicted variation in secure base script knowledge at the age of 18 years but also that (b) variation in secure base script knowledge *partially accounted for* associations between the same early experience variables and the coherence of AAI narratives measured contemporaneously with secure base script knowledge in the SECCYD.

In short, emerging evidence suggests that secure base script knowledge shares similar developmental origins as the autobiographical representations tapped by the AAI. However, attachment theory gives little guidance as to whether script-like and autobiographical attachment representations develop independently and in parallel or whether they develop in series (but see Bakermans-Kranenburg, 2006; Waters et al., 2013). Although no longitudinal data currently exist to address this issue, insights into the development of memory and basic cognition, in contrast, might provide some guidance into resolving this matter.

Development of Event Representations and Implications for Attachment

The basic cognitive skills and neurological development required to represent and recall events (i.e., episodic memory) are in place relatively early in development. Even before the second year of life infants are able to encode sequences of events and maintain those representations over long delays, even up to a year (see Bauer, 2006, for a review; see also Bauer, Wenner, Dropik, & Wewerka 2000). As children's language development advances, they begin to represent and recall the past using rudimentary narratives (e.g., Nelson, 1986; Nelson & Fivush, 2004). These rudimentary narratives are often script like in that they follow a generalized temporal–causal structure and do not necessarily contain a first-person perspective (e.g., Fivush & Slackman, 1986). Furthermore, children abstract scripts automatically, even after their initial encounter with an event. As children develop a sense of self, their episodic representations become autobiographical in nature and suggest the child sees their memories as *their own* and different from the memories and perspectives of others (Nelson & Fivush, 2004). In adolescence, individuals begin to abstract meaning from their experiences with increasing frequency and sophistication (e.g., Fivush, Habermas,

Waters, & Zaman, 2011; Habermas & Bluck, 2000; Habermas & Reese, 2015). Finally, the transition into adulthood is marked by the ability to construct elaborate and integrative autobiographical narratives or a life story (e.g., McAdams, 2001; McAdams et al., 2006). These life stories contain not only the specific events of an individual's past but also the connections between those events and their impact on the individual and their relationships. These sorts of autobiographical histories emerge relatively late in development and share many similarities with the kinds of narrative and reflective content brought about in the AAI.

The developmental sequence of event representations outlined above suggests that script-like event representations develop from infancy and childhood, and precede the development of the organized autobiographical representations tapped by the AAI in adulthood. Furthermore, the influence of scripts on memory performance in terms of encoding, organization, and retrieval is well documented in the cognitive literature (e.g., Abelson, 1981; Abbott, Black, & Smith, 1985; Barclay & DeCooke, 1988; Bower, Black, & Turner, 1979; Graesser, Gordon, & Sawyer, 1979; Graesser, Woll, Kowalski, & Smith, 1980; see also Dykas & Cassidy, 2011; Dykas, Woodhouse, Jones, & Cassidy, 2014, for discussions of attachment-specific influences on memory and information processing). For example, Smith (1981) found that encoding of information was facilitated when the sequence of information was presented in a manner consistent with existing script knowledge. Graesser et al. (1980) tested memory for passages involving scripted and atypical actions after a short and long delay. They found that recall of atypical actions significantly declined across delay conditions, suggesting that scripts bias our memories to conform to our existing scripted representations. In addition to research demonstrating the influence of scripts on encoding and memory organization, Yekovich and Walker (1986; see also Reiser, Black, & Abelson, 1985) found a significant retrieval advantage for script-central compared to script-peripheral information. On the basis of the findings suggesting that scripts influence encoding and memory organization/retrieval, we hypothesize that knowledge of the secure base script should be influential in terms of the coherence of the narratives produced in the AAI. Based on the extant cognitive literature on scripts and memory, individuals with a secure base script may encode more attachment-relevant information during childhood, have an easier time recalling those experiences later in life, and have more organized narratives that follow a consistent script-like structure with a beginning, middle, and end. All of these influences likely support the construction of an autobiographical representation of attachment and facilitate the adherence of narratives describing those representations to the AAI principles of coherence.

Taken together, the developmental and cognitive literatures on memory suggest that (a) experiences with attachment figures are likely represented as a script prior to the formation of an organized overarching autobiographical representation like those tapped by the AAI, and (b) the secure base script likely influences the construction of adults' autobiographical representations of their attachment relationships later in development (see also Waters et al., 2013). As such, secure base script knowledge may serve as the representational foundation upon which organized autobiographical representations of attachment are built—essentially a mediating link between attachment experiences with caregivers (e.g., early sensitive care) and the coherence of AAI narratives in adulthood.

The Present Study

Building on the recent findings by Steele et al. (2014) in the normative-risk SECCYD, in the present study we tested two core hypotheses with respect to the development and developmental significance of secure base script knowledge. First, we anticipated that the quality of early caregiving experiences (i.e., maternal sensitivity) would emerge as important *predictor* of secure base script knowledge in late adolescence and adulthood. Second, we hypothesized that secure base script knowledge would serve as a *mechanism* by which maternal sensitivity experienced during childhood contributes to the development of a coherent autobiographical representation of attachment in adulthood, as assessed by the AAI.

It was possible to examine these hypotheses for the first time using a prospective, longitudinal research design by leveraging archival data of a cohort from birth through age 26 years from the Minnesota Longitudinal Study of Risk and Adaptation (MLSRA), one of the largest, long-term longitudinal studies of attachment based on a sample born into poverty. More specifically, the MLSRA data set includes direct observations of early caregiving experiences from infancy through midadolescence and AAI assessments tapping the coherence of adults' narratives about their early caregiving experiences in both late adolescence (age 19 years) and young adulthood (age 26 years).

By recoding these AAI data for secure base script knowledge, it was possible to attempt to replicate and examine the generalizability of evidence from Steele et al. (2014) that secure base script knowledge in a higher risk sample has its origins in childhood and young adult attachment experiences. We were also able to test the mediational hypothesis that early caregiving experiences contribute to the coherence of adults' AAI narratives via the acquisition of secure base script knowledge (as well as the competing hypothesis that early caregiving contributes to secure base script knowledge in adulthood via the development of coherent autobiographical narratives; Bakermans-Kranenburg, 2006). This analysis improves upon the limitations of the Steele et al. (2014) because here we (a) do not confound our conceptualization of attachment representations with the method used to acquire relevant data (i.e., in this study, secure base script knowledge and coherence of narratives both derive from AAI narratives and not different attachment assessments) and (b) explore these research questions with two methods of assessment of attachment representations measured over time rather than concurrently.

Method

Participants

During 1975–1977, primiparous women living below the poverty line and receiving prenatal services from the local Minneapolis health department were recruited for participation in the MLSRA. At the time of their child's birth, 48% of the sample were teenagers, 65% were single, and 42% had not completed a high school education. The current subsample was selected based on their completion of the age 19 years (n = 169) and age 26 years (n = 164) assessments of the MLSRA cohort. Overall, the subsample comprised 47% female and 66% of the sample were non-Hispanic Caucasian, 18% were multiracial, 10% were African American, paternal ethnicity data were unavailable for 4%, and 2% were Native American, Hispanic, or Asian American. Mean maternal age at the time of delivery of the target child was 20.6 years of age (SD = 3.4).

Measures

Maternal Sensitivity

Maternal sensitivity was assessed at seven separate time points during the MLSRA. In infancy, mother–child interactions were videotaped during semistructured tasks when the participants were 3 and 6 months old. In the 3-month-old observation, the infant–mother pairs were filmed at home during a feeding interaction. Mothers were asked only to interact with their child as they normally would during feeding. For the 6-month observation, the dyads were filmed at home during two feeding situations and one play interaction across two separate days. Feeding instructions remained the same. For the play interaction, mothers were asked to play with their child with and without a standard set of toys provided by the experimenter. Each interaction at 3 and 6 months was coded for maternal sensitivity using Ainsworth's 9-point sensitivity scale (Ainsworth, Blehar, Waters, & Wall, 1978). Agreement for the 3-month assessment was measured using the Lawlis–Lu index (Tinsley & Weiss, 1975), with agreement defined as a coding discrepancy of two points or less. Coder agreement was moderate to high for the 3-month observation coding (T = .75, p < .05). The 6-month sensitivity scores across the three tasks were averaged (α = .87), and interrater reliability was high (intraclass correlations [ICC] = .89).

Sensitivity and emotional support were assessed in the laboratory during problem-solving tasks at three time points, when the child was 24 months, 42 months, and 13 years old. At each assessment, the tasks were designed to become increasingly difficult resulting in the child failing to solve the problem independently. Mothers were asked to allow the child to attempt each task independently and then to give them help if and when they thought it was needed. Maternal sensitivity was assessed using a rating scale of the mother's supportive presence during the tasks. The supportive presence rating scale reflects the mother's provision of secure base support during the task as well as her positive involvement in facilitating the child completing the tasks. ICCs for the 24-month, 42-month, and 13-year assessments of supportive presence were .84, .87, and .86, respectively.

A proxy for maternal sensitivity, maternal emotional responsivity, was assessed using the Home Observation for Measurement of the Environment (HOME) Inventory (Caldwell & Bradley, 1984), which was completed when each child was 30 and 72 months old. The HOME is an interview and observation-based instrument used to assess the quality of the child's home environment during a home visit. The HOME produces multiple subscales, the maternal emotional and verbal

responsivity subscale was selected, as responsivity is a central component of maternal sensitivity and secure base support. The subscale comprised 11 items ($\alpha = .72$) at 30 months and 6 items ($\alpha = .68$) at 72 months.

Based on the previous work with the MLSRA sample indicating that these assessments scale well as a single reliable component (Raby, Roisman, Simpson, Collins, & Steele, 2015), the measures of maternal sensitivity were standardized and averaged to create a maternal sensitivity composite variable (standardized $\alpha = .74$) representing the child's experience with sensitive caregiving assessed 7 times from 3 months to 13 years of age.

Adult Attachment Interview

The AAI (Main et al., 1985; Main et al., 2003–2008) is a semistructured interview designed to assess adults' state of mind with respect to their attachment relationships with primary caregivers. The focus of the interview is to elicit narrative recollections of experiences with caregivers before the age 13. The AAI has demonstrated good reliability, stability, and discriminant validity (e.g., Bakermans-Kranenburg & Van IJzendoorn, 1993; Crowell et al., 1996). In addition, security in the AAI has been linked to maternal sensitivity experienced during childhood (e.g., Haydon et al., 2014), romantic relationship functioning (e.g., Crowell et al., 2002; Holland & Roisman, 2010), and the quality of parenting (e.g., Van IJzendoorn, 1995).

AAIs were collected at two time points during the MLSRA, when the participants were 19 and 26 years old. Both AAIs were coded using the Main and Goldwyn (1984–1998) system. For the analyses presented here, we focused on the overall coherence of mind score (1–9), which is thought to indicate the organization of an individual's attachment representation such that individuals who tell more coherent AAI narratives have a secure/organized attachment representation. Coherent AAI narratives are judged to be internally consistent, detailed, plausible, and not emotionally overwrought (see Haltigan, Roisman, & Haydon, 2014; Hesse, 2008, for detailed discussion of the coding system). All AAIs were coded by trained and reliable coders, and ICCs for the 19- and 26-year coherence scores were .83 and .87, respectively. In addition, coders assigned each transcript to a dichotomous secure versus insecure category. Agreement between coders was 87% ($\kappa = .722$, $p < .001$) for age 19 and 81% for age 26 ($\kappa = .59$, $p < .001$) transcripts.

Secure Base Script Knowledge

In addition to the traditional AAI coding system, participants' AAIs were coded for secure base script knowledge using the secure base script coding system for the AAI (AAI_{sbs}; Waters, in press; Waters et al., 2013). The 9-point scale is applied only to the first six questions of the AAI (up to and including the upset question) and focuses on the extent to which the narratives produced in the interview follow, or imply, the secure base script. Coders focus on two types of content: (a) explicit or implied expectations that are consistent with the secure base script (e.g., caregiver availability, responsiveness, or provision of effective comfort) and (b) recall of specific autobiographical memories that follow the secure base script. Transcripts receiving a score of 9 contain several specific event narratives that follow secure base script structure. Transcripts receiving a score of 4 do not contain any specific event narratives organized around the script but do contain numerous expectations consistent with secure base script knowledge. Transcripts receiving a score of 1 contain several specific scenes that directly violate secure base script structure (e.g., caregiver signaled, but signal rejected and help not offered) and may also reflect alternative relationships expectations (e.g., recurring abuse).

Unlike the AAI coherence score, the AAI secure base script score makes no attempt to evaluate clarity, brevity, or any other linguistic markers of coherence. Furthermore, the secure base script coding system does not make any direct attempt to evaluate the types of content measured by the existing AAI inferred experience scales (i.e., maternal and paternal love, rejection, neglect, pressure to achieve, and role reversal). When assigning scores for the inferred experience scales, raters use the content of the interview to make their best judgment about the types of experiences the interviewee most likely had with their caregivers during childhood. The secure base script coding system may indirectly address these aspects of AAI content, but they are not formally included in the system, which solely focuses on evaluating script structure. That said, in this sample, there were no statistically significant associations between secure base script knowledge coded from the AAI and the inferred experience scales at age 26 (data not available for age 19). Correlations ranged from −.12 to .09.

The AAIs were coded by two trained and reliable coders, with 54% of the 19-year AAIs and 55% of the 26-year AAIs double coded. The secure base

coders were not formally trained or certified to code the AAI using the traditional coding system and had not participated in the original coding of the AAIs in the MLSRA. All coder disagreements were resolved through consensus. The remaining AAIs were coded independently by a single coder. ICCs for the 19- and 26-year AAIs were .83 and .82, respectively.

Covariates

In follow-up analyses summarized below, we examined the robustness of all results presented in this article to a set of four potential control variables consistently used in the third author's analyses of the MLSRA and SECCYD cohorts (e.g., Raby et al., 2015; Steele et al., 2014): child gender (male = 1; female = 2), child ethnicity (1 = White/non-Hispanic; 2 = other), childhood socioeconomic status (SES), and maternal education. SES was measured using the Duncan Socioeconomic Index (Stevens & Featherman, 1981). We created a composite of SES by averaging scores assessed at seven time points during the study (42 months, 54 months, Grade 1, Grade 2, Grade 3, Grade 6, and age 16 years). Maternal education (i.e., number of years of schooling) was collected eight times across the study (3 months prior to the target child's birth, at birth, 42 months, Grade 1, Grade 2, Grade 3, Grade 6, and age 16 years) and a composite was created.

Results

Analyses were conducted to address two major questions. First, does secure base script knowledge show a significant positive correlation with maternal sensitivity in an at-risk sample? Second, does secure base script knowledge mediate the association between maternal sensitivity and the development of coherent autobiographical attachment representations in adulthood?

Origins of Secure Base Script Knowledge and Coherence During the AAI

Bivariate correlations among maternal sensitivity, secure base script knowledge, and AAI coherence are presented in Table 1. Results demonstrated that direct observations of maternal sensitivity were significantly associated with secure base script knowledge at both ages 19 and 26 years. In contrast, maternal sensitivity was only significantly associated with AAI coherence at the 26-year assessment.

Importantly, results of Steiger's Z comparisons revealed that secure base script knowledge at both the 19- and 26-year assessments were more strongly associated with maternal sensitivity than was AAI coherence (age 19 years: $Z = 2.15$, $p = .03$; age 26 years: $Z = 2.13$, $p = .03$). Similarly, although stability correlations revealed that both secure base script knowledge and AAI coherence were significantly stable across the 7-year gap between assessments, secure base script knowledge was significantly *more* stable across that period ($Z = 2.42$, $p = .02$). Secure base script knowledge was also moderately associated with AAI coherence at both time points. Although our emphasis was on coherence here, parallel analyses were conducted with dichotomous security in the place of AAI coherence, and results did not substantively differ from those focused on AAI coherence (see Table 1).

Table 1
Bivariate Correlations Among Maternal Sensitivity, Romantic Relationship Effectiveness, and Attachment Representation Variables

Measure	1	2	3	4	5	6	7
1. Maternal sensitivity	—						
2. Secure base script knowledge at age 19	.33***	—					
3. Secure base script knowledge at age 26	.37***	.55***	—				
4. AAI coherence at age 19	.12	.23**	.22**	—			
5. AAI coherence at age 26	.19*	.24**	.29**	.36**	—		
6. Secure versus insecure at age 19	.10	.15	.16	.80***	.21*	—	
7. Secure versus insecure at age 26	.20*	.24**	.33**	.29***	.86***	.20*	—
M	−0.01	3.33	3.25	3.92	4.44	0.33	0.45
SD	0.70	1.67	1.22	1.67	1.86	0.47	0.50

Note. *N*s ranged from 144 to 169. Secure/insecure at ages 19 and 26: 0 = *insecure*; 1 = *secure*. AAI = Adult Attachment Interview. *$p < .05$. **$p < .01$. ***$p < .001$.

Test of Mediated Association Between Maternal Sensitivity and AAI Coherence by Secure Base Script Knowledge

To directly test the developmental model discussed in the Introduction whereby secure base script knowledge mediates the association between maternal sensitivity and AAI coherence in adulthood (Waters et al., 2013; see also Steele et al., 2014), we conducted a set of mediation analyses using PROCESS for SPSS (Hayes, 2012; available at http://www.afhayes.com). PROCESS produces bias-corrected bootstrap confidence intervals as well as effect size metrics for mediation analyses. In addition to testing the focal model with script knowledge at the age of 19 years serving as the mediator, we conducted a second analysis in which AAI coherence at 19 years served as the mediator between maternal sensitivity and secure base script knowledge at 26 years to serve as a test of discriminant validity. These analyses are summarized in Table 2.

Results indicated that secure base script knowledge at 19 years significantly mediated the association between maternal sensitivity and AAI coherence at 26 years (as demonstrated by the confidence intervals produced for the product of the indirect paths: $a \times b$). The ratio of the indirect to the total effect indicated that secure base script knowledge mediated 40% of the effect of maternal sensitivity on AAI coherence at 26 years. According to Preacher and Kelley's (2011) κ^2 effect size metric (small effect = .01, medium effect = .09, large effect = .25), the mediation effect was approximately medium in magnitude. In contrast, the alternative model in which 19-year coherence served as the mediator for the development of secure base script knowledge at 26 years of age produced no significant evidence of mediation. The confidence intervals for the mediation path included zero ($a \times b$), the ratio of the indirect to total effect was 6%, and the κ^2 suggested a small effect. Furthermore, we ran parallel analyses with dichotomous security versus insecurity substituted for AAI coherence and found similar results. Specifically, secure base script knowledge at age 19 was a significant mediator of the association between maternal sensitivity and attachment security at age 26. Additionally, there was no evidence to support the alternative model whereby maternal sensitivity gives rise to script knowledge at age 26 by way of dichotomous attachment security at age 19. All results did not substantively differ when covariates were included in the analyses.

To follow-up on the meditational analyses and further explore empirical support for the hypothesized direction of effects, we ran a set of two cross-lagged regressions. More specifically, we examined the incremental predictive significance of secure base script knowledge on AAI coherence at age 26 over and above AAI coherence at age 19 and the predictive significance of AAI coherence at age 19

Table 2
Test of Mediation Models of the Development of Attachment Representations in Adulthood From Observed Maternal Sensitivity in Childhood

Model 1: Maternal sensitivity to AAI coherence at age 26 mediated by script knowledge at age 19

Predictor/outcome	Total effect	Direct effect	Indirect effect: Mediation by SBSK19			Effect size	
	c	*c′*	*a*	*b*	*a* × *b*		
	B [95% CI]	*B* [95% CI]	*B* [95% CI]	*B* [95% CI]	*B* [95% CI]	κ^2	*I/T*
Mat. sen./AAIcoh26	.53 [.05, .99]	.32 [−.18, .81]	.90 [.49, 1.31]	.23 [.05, .41]	.21 [.05, .41]	.07	.40

Model 2: Maternal sensitivity to script knowledge at age 26 mediated by AAI coherence at age 19

Predictor/outcome	Total effect	Direct effect	Indirect effect: Mediation by AAIcoh19			Effect size	
	c	*c′*	*a*	*b*	*a* × *b*		
	B [95% CI]	*B* [95% CI]	*B* [95% CI]	*B* [95% CI]	*B* [95% CI]	κ^2	*I/T*
Mat. sen./SBSK26	.71 [.40, 1.02]	.67 [.37, .98]	.33 [−.11, .77]	.13 [.02, .24]	.04 [−.003, .14]	.02	.06

Note. AAIcoh19 = Adult Attachment Interview coherence of mind measured at 19 years; AAIcoh26 = AAI coherence of mind measured at 26 years, SBSK19 = secure base script knowledge coded from the AAI at 19 years; SBSK26 = secure base script knowledge coded from the AAI at 26 years, Mat. sen. = maternal sensitivity; κ^2 = Preacher and Kelley (2011) effect size; *I/T* = indirect effect/total effect; *c* = slope of the regression of the outcome variable on the predictor variable; *c′* = slope of the outcome variable on the predictor variable (after controlling for the intervening variable); *a* = slope of the regression of the intervening variable on the predictor variable; *b* = slope of the regression of the outcome variable on the intervening variable; *a* × *b* = product of the *a* and *b* paths.

Table 3
Cross-Lagged Hierarchical Regression Exploring the Order of Effects Between Secure Base Script Knowledge and Adult Attachment Interview Coherence of Mind

	B	*SE B*	β	R^2	ΔR^2
Step and predictor variables					
DV: Coherence at age 26					
Step 1:					
Coherence at age 19	.40	.09	.36***	.13***	.13***
Step 2:					
Coherence at age 19	.36	.09	.33***	.16***	.03*
Secure base script knowledge at age 19	.19	.09	.17*		
Step and predictor variables					
DV: Secure base script knowledge at age 26					
Step 1:					
Secure base script knowledge at age 19	.41	.05	.55***	.30***	.30***
Step 2:					
Secure base script knowledge at age 19	.39	.05	.53***	.31***	.01
Coherence at age 19	.08	.05	.10		

*$p < .05$. ***$p < .001$.

on secure base script knowledge at age 26 controlling for script knowledge at age 19 (Table 3). Consistent with the meditational analyses, we found that script knowledge at age 19 was a significant predictor of AAI coherence at age 26 when controlling for coherence at age 19 ($\Delta R^2 = .03$, $p = .03$). However, AAI coherence at age 19 was not a significant predictor of script knowledge at age 26 when controlling for script knowledge at age 19 ($\Delta R^2 = .01$, $p = .14$). These results are consistent with a developmental model in which secure base script knowledge precedes, and influences the development of, a coherent autobiographical narrative based attachment representation.

Discussion

In the present study, we tested the hypothesis that experience with sensitive maternal care from infancy through early adolescence supports the acquisition of higher levels of secure base script knowledge in late adolescence and adulthood. Consistent with these expectations, we found that maternal sensitivity significantly predicted secure base script knowledge at ages 19 and 26. These results suggest that secure base script knowledge is built from experiences with sensitive care during childhood. In addition, our results replicated and extended recent work by Steele et al. (2014): (a) in a higher risk longitudinal cohort and (b) a later developmental period.

Additionally, we tested two competing developmental models regarding the construction of attachment representations. Consistent with developmental and cognitive theories of memory representation (e.g., Nelson & Fivush, 2004; Schank & Abelson, 1977; Waters & Waters, 2006), our results suggested that early attachment experience is first represented as a cognitive script and that this script then facilitates the development and organization of a coherent overarching autobiographical representation of attachment. The alternative model we tested—whereby autobiographical representations facilitate script development—was not supported by the data. This result informs our understanding of the developmental processes that underlie the internalization and representation of attachment experiences, and representations of early experiences more generally. It is important to emphasize that results consistent with our hypothesis regarding the developmental construction of attachment representations were observed in two *empirically distinct* sets of analyses: first, in the mediational analyses focused on links between maternal sensitivity and adult attachment representations (Table 2) and second, in the cross-lagged regression models assessing incremental predictive significance of adult attachment representations (Table 3).

Interestingly, direct observations of maternal sensitivity during the years prior to maturity were actually *more* strongly associated with secure base script knowledge coded from AAI transcripts at ages 19 and 26 than the more well-established method of coding the coherence of AAI discourse. Furthermore, we found that secure base script knowledge was significantly more stable across the transition from adolescence to adulthood than AAI coherence. The rank order continuity of secure base script knowledge ($r = .55$)—in some contrast to AAI coherence—was notably stable in the absolute sense. That said, it is not clear on the basis of these data from the MLSRA alone how to interpret the more robust findings generated by coding AAIs for secure base script knowledge versus coherence of discourse. It is possible that the at-risk nature of the MLSRA sample complicates the assessment of coherence in late adolescence or perhaps in some way delays or protracts the construction the autobiographical narrative representations tapped by the AAI. This could have led to the observation of stronger retrodictive and mediational effects in this study for secure base script knowledge.

In contrast to the current study, Steele et al. (2014) found that secure base script knowledge and AAI coherence at the age of 18 years were *equally* strongly predicted by observations of maternal caregiving during childhood and adolescence in the normative-risk SECCYD—although in that study secure base script knowledge *was* more strongly predicted by *paternal* caregiving than was AAI coherence. Although we await further evidence as to whether variation in secure base script knowledge provides a stronger or merely equivalent window into early experiences with primary caregivers than AAI coherence, it seems significant that—at least in this higher risk sample—coders were more able to identify variation in AAI narratives correlated with early experiences via a focus on the secure base script than when focused on the coherence of AAI narratives or via the secure versus insecure classification. Narrative coherence—perhaps especially when coded in the context of the more challenging lives—may inadvertently be confounded with other features of cognitive development, particularly at the age of 19 years when the ability to construct a complex autobiographical history is still developing (e.g., Habermas & Bluck, 2000; Habermas & Reese, 2015). The development of scripts and their influence on memory, in contrast, is well ensconced early in childhood (e.g., Nelson, 1986) and thus may be less influenced by the development of the autobiographical memory system in late adolescence.

In addition to attention to the methodological questions just noted, future research is also needed to provide convergent validity of the secure base coding system for the AAI presented here. Script knowledge assessed via the AAI has been linked to secure base behavior in romantic relationships (Waters et al., 2013) and now to early caregiving in the present study but has not been studied in relation to performance on the ASA. Establishing this connection is an important next step in terms of validation of the secure base coding system for the AAI and for the secure base script construct more generally. Also, it is important to note that although secure base script knowledge was significantly correlated with AAI coherence in this study, this association was modest. This suggests that the secure base script knowledge and coherence coding systems for the AAI are distinct.

Finally, we argued here that secure base script knowledge is established early in childhood and is carried forward across development. However, very little is known about the developmental origins, stability, or influences on change of secure base script knowledge across the childhood period. To date, only one study on secure base script knowledge in early childhood exists (Waters, Rodrigues, & Ridgeway, 1998). Research on secure base script knowledge in middle childhood and adolescence is equally rare (but see, Dykas et al., 2006; Kerns, Abraham, Schlegelmilch, & Morgan, 2007; Waters et al., 2015). Such work on secure base script knowledge across childhood and adolescence is critical in order to establish when the secure base script develops, what influences those developmental processes, and what impact acquiring the secure base script has on aspects of typical and atypical development.

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