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Does secure base script knowledge mediate associations between observed parental caregiving during childhood and adult romantic relationship quality and health?

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Abstract

Increasingly, attachment representations are being assessed via *secure base script knowledge* – the degree to which individuals show awareness of the temporal-causal schema that summarizes the basic features of seeking and receiving effective support from caregivers during times of need. Limited research has assessed the links between secure base script knowledge and aspects of adult functioning and the role that secure base script knowledge may play in accounting for associations between early caregiving quality and adulthood functioning. We used follow-up assessments of the NICHD Study of Early Child Care and Youth Development cohort ($N = 585$) to examine whether secure base script knowledge at age 18 years: (a) is associated with later romantic relationship quality, depressive symptoms, and body mass index (BMI) at age 26 years, and (b) mediates expected associations between the quality of maternal and paternal sensitivity across the first 15 years of life and age-26 outcomes. More access to, and elaborated knowledge of the secure base script predicted less extreme hostility with romantic partners, and better emotional and physical health. Moreover, secure base script knowledge mediated the links between early maternal and

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paternal sensitivity and both later romantic partner hostility and depressive symptoms, but not BMI.

Keywords

Parental sensitivity; secure base script knowledge; romantic relationships; depressive symptoms; physical health

Attachment theory posits that the quality of early care, reflected in the caregiver's provision of contingent, appropriate, and consistent (i.e., sensitive) responses to a child's emotional needs, supports the development and consolidation of mental representations of the attachment figures' availability in times of distress (Ainsworth et al., 1978; Bretherton & Munholland, 2008; Marvin & Britner, 2008). The literature largely supports the claim that such attachment representations, in turn, contribute to individual differences in adult functioning, including interpersonal functioning with romantic partners (Collins & Sroufe, 1999), emotional well-being (Dagan, Asok et al., 2018a, 2020; Stovall-McClough & Dozier, 2016), and even aspects of physical health (Dagan, Facompré et al., 2018b; Ehrlich & Cassidy, 2019; Farrell et al., 2019).

Research suggests that attachment representations can be conceptualized, in part, as a cognitive script summarizing the quality of early caregiving interactions (e.g., Bretherton, 1985, 1987) – specifically, a *secure base* script (Waters & Waters, 2006). The secure base script is a temporal-causal generalization, or schema, that summarizes the basic features of seeking/receiving effective support from an attachment figure when this support is needed. More specifically, a history of reliable and effective secure base support is assumed to become generalized as an expectation that primary caregivers (and, indeed, secure base figures in general) will consistently be available, recognize and promptly respond to attachment-related threats, and will possess both the wisdom and the competence to restore balance to ongoing activities (Waters & Facompré, in press).

Secure base script knowledge and adult outcomes

Given that secure base script knowledge assesses individual's expectations of close others' availability and support during times of distress, it is plausible to expect such representations influence one's romantic relationship quality, mood, and health status. However, limited research has been conducted regarding the links between secure base script knowledge and aspects of adjustment in the adult years. Instead, in many investigations to date, secure base script knowledge has been studied either in relation to its caregiving antecedents (Nivison et al., 2020; Schoenmaker et al., 2015; Steele et al., 2014; Vaughn et al., 2016; Waters et al., 2017) or its role in shaping both adults' caregiving and attachment security in the next generation (Monteiro et al., 2008; Vaughn et al., 2007; Waters et al., 2018; see Waters & Roisman, 2019, for a review). Nonetheless, some research regarding the predictive significance of secure base script knowledge for adult functioning has been conducted, with a focus on three developmentally salient indicators of individual adjustment in the adult years: interpersonal functioning with adult romantic partners, emotional well-being, and physical health.

Two studies have thus far examined the relevance of secure base script knowledge for the quality of adults' romantic relationships. Waters et al. (2013) found that secure base script knowledge predicted care-seeking behavior with a romantic partner during a lab based conflict discussion task. Subsequently, Waters et al. (2018) replicated and extended these findings, reporting significant bivariate associations between secure base script knowledge and the quality of interaction with romantic partners, self-reported relationship satisfaction, and an interview-based assessment of effectiveness in romantic relationships in the higher-risk sample of the Minnesota Longitudinal Study of Risk and Adaptation (MLSRA; Sroufe et al., 2005).

Other studies have suggested a link between the quality of romantic relationships and attachment representations assessed via the coherence of discourse during the Adult Attachment Interview (AAI; Main et al., 2003–2008) which is moderately correlated with secure base script knowledge (e.g. Steele et al., 2014). In short, higher coherence scores are coded in interviews with discourse which entails descriptions of experiences and relationships with childhood caregivers in an internally consistent but not emotionally overwrought manner (e.g., Roisman, 2009). Secure attachment representations (i.e. high coherence scores) were associated with behaviors that indicate care seeking and caregiving with romantic partners (Crowell et al., 2002), and prospectively predicted romantic relationship quality, assessed via observer-rated couple interactions and self-reported relationship quality (Holland & Roisman, 2010; Roisman et al., 2001).

Secure base script knowledge was also found to predict symptoms of psychopathology, including depressive symptoms, in middle childhood (Ruiz et al., 2019; Waters, Fraley et al., 2015). The link between secure base script knowledge and depressive symptoms (i.e., emotional health) in adults has yet to be assessed; however, a recent meta-analysis summarizing research regarding the association between attachment representations (assessed using AAI coherence) and depressive symptoms in over 4,000 adults (Dagan, Facompré et al., 2018b) reported that adults classified as insecurely attached had more depressive symptoms than did their secure counterparts. These results support the notion that an individual's mental representations regarding past relationships with primary caregivers are significantly related to their depressive symptomatology in adulthood.

Finally, building on accumulating evidence suggesting that the quality of early experiences with one's caregivers "gets under the skin" to influence adult physical health (e.g. Puig et al., 2013), one study assessed the predictive significance of secure base script knowledge for adult physical health. Farrell et al. (2019) found that secure base script knowledge at ages 19 and 26 years was negatively associated with a cardiometabolic index composed of four anthropometric indicators and biomarkers of health, including an objective assessment of body mass index (BMI), at ages 37 and 39 years. Other studies reporting on adult attachment representations as assessed in the AAI likewise support the link between secure base script knowledge and obesity. For example, one study that assessed 215 adults at midlife observed that individuals who exhibited lower coherence of discourse in the AAI had higher metabolic syndrome indicators, including obesity, elevated blood pressure, elevated fasting glucose, high triglycerides, and low high-density lipoprotein cholesterol (Davis et al., 2014) – all of which are associated with higher BMI (Rodriguez et al., 2015). Taken together,

these studies and others (for a review, see Diener et al., 2016) support the claim that attachment representations in general, and secure base script knowledge in particular, may play a significant role in regulation of physiological stress response systems, which in turn has implications for BMI and other aspects of physical health (Lambert & Lambert, 2011).

Secure base script knowledge may account for associations between early sensitivity and adult outcomes

Studies have shown that early parental sensitivity predicts higher quality of secure base script knowledge in later life (Schoenmaker et al., 2015; Steele et al., 2014; Vaughn et al., 2016; Waters et al., 2017). Moreover, secure base script knowledge is thought to influence adult functioning by constituting a heuristic for guiding behaviors (Schank & Abelson, 1977), especially during distress (Waters & Waters, 2006). Taken together, secure base script knowledge may play a role in *explaining* the association between parental sensitivity and adult functioning. Thus, we turn to evidence for: (a) the link between early sensitive care and adult outcomes, and (b) the role of secure base script knowledge and its attachment representation correlates in mediating these associations.

From early sensitivity to adult outcomes

Longitudinal studies of human development have reported consistent associations between the quality of early child–parent interactions and romantic functioning in young adulthood. For example, several reports based on the MLSRA (Englund et al., 2011; Raby, Lawler et al., 2015; Raby, Roisman et al., 2015) demonstrate that maternal sensitivity during infancy and childhood is reliably associated with adult romantic relationship competence; the latter was assessed via both interviews regarding the stability and quality of past and current romantic relationships and electrodermal activity during conflict discussions with their adult partners. Other studies (e.g., Conger et al., 2000) have supported the link between early child–parent interactions and behaviors in romantic relationships during adulthood, as assessed in observed conflict tasks with romantic partners and self-reported thoughts and feelings regarding their romantic relationships.

Maternal sensitivity during infancy and childhood has also been linked to later depressive symptoms. A longitudinal study found a link between maternal sensitivity and depressive symptoms in MLSRA participants between the ages 16 and 17.5 years (Duggal et al., 2001). Compared with individuals who experienced sensitive care in infancy and childhood, those who experienced more maternal *insensitive* care during infancy and childhood tended to report more depressive symptoms in adolescence.

Accumulating evidence has also demonstrated that the quality of early parent–child relationships is an important predictor of obesity later in life. For example, Anderson et al. (2012) found that lower maternal sensitivity observed in the first 3 years of life was associated with higher BMI at age 15 years. Independent bodies of research indicate robust negative associations between early maternal care and childhood obesity (for review, see Anderson & Keim, 2016). Moreover, childhood obesity and adulthood obesity are positively correlated (for review, see Simmonds et al., 2016). Taken together, these findings lend

further support to our hypothesized link between early caregiving experiences and obesity later in life.

The mediating role of secure base script knowledge

Evidence is limited for the role that attachment representations in general, and secure base script knowledge specifically, play in explaining the multiple links between parental sensitivity and adult outcomes. Using a sample of at-risk individuals assessed across time in the MLSRA, Roisman et al. (2001) found a significant association between child–mother dyadic behaviors observed at age 13 years and dyadic behaviors with romantic partners at age 20–21 years. Moreover, this link was mediated by attachment representations assessed at age 19 years, as inferred from their coherence of discourse scored from their AAI transcripts.

Recently, the role of secure base script knowledge was also examined as a mediator between early sensitivity and health outcomes in the MLSRA. Using MLSRA data, Farrell et al. (2019) found that maternal sensitivity in the first four years of life predicted scores on a cardiometabolic index, including BMI, 30 years later. Importantly, Farrell et al. (2019) showed that attachment representations at age 19 and 26 years, as indicated by secure base script knowledge, partially mediated this link.

The present study

Taken together, evidence suggests that attachment representations, as reflected in secure base script knowledge, partially account for associations between early experiences with primary caregivers and adult functioning in an at-risk sample (i.e., the MLSRA). In the current study, we sought to leverage the larger, normative-risk NICHD Study of Early Child Care and Youth Development (SECCYD) – a 26-year prospective, longitudinal investigation of human development – to attempt to replicate and extend the pattern of results obtained thus far. In addition, we aimed to extend previous findings in two ways. First, because studies have yet to assess the role secure base script knowledge may play in emotional health during adulthood, we incorporated depressive symptoms as an adult outcome. Second, the MLSRA did not acquire measures of paternal sensitivity, so previously reported studies could only assess the effects of *maternal* sensitivity on subsequent outcomes via secure base script knowledge. The SECCYD included assessments of sensitivity with both maternal and paternal caregivers so we were able to consider effects of each parent as a predictor of both secure base script knowledge and relevant relationship and health outcomes.

We hypothesized, first, that secure base script knowledge assessed at age 18 years would be associated with adult functioning, as indicated by self-reported romantic relationship quality (i.e. perceived romantic partner's warmth and hostility), depressive symptoms, and BMI (derived from self-reported height and weight) at age 26. Second, we tested whether secure base script knowledge mediated the hypothesized associations between the quality of early parental caregiving – as reflected in observations of maternal and paternal sensitivity across the first 15 years of life – and reported romantic relationship quality, depressive symptoms, and BMI in young adulthood, around age 26 years. Of note, little research exists on the differential effects of early paternal and maternal sensitivity on adult outcomes. Given that

previous research indicated similar maternal and paternal sensitivity effects on secure base script knowledge in the current sample (Steele et al., 2014), we hypothesized that secure base script knowledge would mediate the expected links between both maternal and paternal sensitivity and adult outcomes.

Method

Participants

The SECCYD is an ongoing longitudinal study that has followed a sample of children and their families (original $N = 1364$) at 10 sites across the United States from birth to age 15 years. In addition, follow-ups have occurred, most notably for this report at age 18 years and then again at age 26 years. The primary purpose of the original SECCYD was to examine the characteristics of relevant contexts (e.g. childcare, home, school, neighborhood) and individual characteristics of the child and the family in relation to children's developmental outcomes (e.g. socio-emotional, cognitive, language, health) (for detailed information, see https://www.nichd.nih.gov/research/supported/seccyd).

The analytic frame for this report was the subsample of young adults who had completed an Attachment Script Assessment at an age 18-year follow-up of the SECCYD ($N = 673$; see Steele et al., 2014), and who also completed any of the five relevant outcome measures (i.e. three romantic relationship indices, depressive symptoms, and BMI) in an online survey at age 26 years. Accordingly, romantic relationship outcome analyses (i.e., partner's warmth, and partner's moderate and extreme hostility) included data from 400 participants (a subset of age 26-year-old participants who were also in a current romantic relationship). Depressive symptoms outcome analyses included data from 584 participants and BMI outcome analyses included data from 578 participants. Overall, 54.4% of participants were female, and the majority were White/non-Hispanic (80.7%) and middle-class (average of income-to-needs ratio was 4.22; $SD = 2.89$). See Table 1 for additional sample characteristics.

Attrition analysis

We compared demographic characteristics for the 26-year outcomes subsample (hereafter "26-year sample"; $n = 585$) with those in the original SECCYD sample not included in the current sample (hereafter "attriters"; $n = 779$). The 26-year sample comprised a higher percentage of White/non-Hispanic (80.7%) and females (54.4%) compared with the attriters (73.2% and 43.8%, respectively), $\chi^2(1, N = 1{,}364) = 14.99$, $p < .001$, $d = .21$, and $\chi^2(1, N = 1{,}364) = 10.46$, p = .001, $d = .18$, respectively. The 26-year sample participants had higher Full Scale IQ scores ($M = 108.35$, $SD = 13.80$) compared with the attriters ($M = 104.93$, $SD = 15.02$), $t(1010) = 3.42$, $p < .001$, $d = 0.24$. The 26-year sample participants also had mothers with significantly more years of education ($M = 14.68$, $SD = 2.39$) compared with the attriters ($M = 13.90$, $SD = 2.55$), $t(1361) = 5.69$, $p < .001$, $d = 0.32$; and had higher family income-to-needs ratio ($M = 4.18$, $SD = 2.86$) compared with the attriters ($M = 3.40$, $SD = 3.07$), $t(1354) = 4.73$, $p < .001$, $d = 0.26$. As indicated by Cohen's d effect sizes, all such differences between the two samples were small in magnitude as per Cohen's (1992) criteria.

Measures

Parental sensitivity—Maternal and paternal sensitivity were derived from direct observations of age-appropriate tasks performed by participants and their mothers/fathers; for information regarding the tasks and their scoring systems see Booth-LaForce et al. (2014), and Fraley et al. (2013). Observations took place at age 6, 15, 24, and 36 months with mothers only, and at age 54 months, Grades 1, 3, and 5, and age 15 years with mothers and fathers separately. Following prior studies using data from the SECCYD, separate observed maternal and paternal sensitivity composites were calculated by standardizing and averaging scores across time points. As noted in Steele et al. (2014), in the current sub-sample of the SECCYD Cronbach's alpha composite sensitivity scores were .83 and .72 (for maternal and paternal sensitivity, respectively).

Secure base script knowledge—The adolescent version of the Attachment Script Assessment (ASA; Dykas et al., 2006; Waters & Waters, 2006) was used to assess participants' secure base script knowledge. This version of the ASA consisted of four stories, with a 12 word-prompt outline for each story; two mother-related stories ("The Party," and either "Acne" [completed by girls] or "The Haircut" [completed by boys]), and two father-related stories ("The Tennis Match" and "Studying for an Exam"). Participants first completed a practice story ("A Trip to the Beach"; not coded) to ensure they understood the task. Participants were asked to tell the "best story" they could tell using the outline of each story. The task was not timed, and participants were asked to tell a story of approximately one page in length. Audio recordings of the ASA session were transcribed verbatim, and each story was coded on a 7-point scale, from 1 (no secure base script content) to 7 (extensive secure base script organization with substantial elaboration of script relevant details). Following the convention in prior studies using the ASA (e.g., ; Vaughn et al., 2006) and evidence that the scores share loadings on a single factor, a composite secure base script knowledge score was calculated by averaging the ASA scores across the four stories (for elaborated reliability data see Steele et al., 2014). All ASA stories were double coded, and intraclass correlation coefficient (ICC) was .95. Cronbach's alpha for the four-story composite of the ASA sub-sample of the SECCYD was .78.

Romantic relationship quality—At age 26 years, romantic relationship quality was assessed with the Behavioral Affect Rating Scale (BARS; Conger, 1989). The BARS measures warmth and hostility within a close relationship and was developed for research with rural families in Iowa. It has been shown to be a reliable and valid measure of warmth and hostility within family relationships across multiple ethnic groups (e.g. Taylor et al., 2012).

In this study, participants reported on their romantic partners' behavior towards them. The 20-item version was used, yielding scores for three subscales: Warmth, Moderate Hostility, and Extreme Hostility. Response categories were modified from the original 7-point Likert-type scale used in Conger's Iowa sample and the 4-point rating scale used in Conger's Mexican-American sample to a 5-point Likert-type scale that ranged from 1 (*never*) to 5 (*always*) used by Eccles and colleagues in the age-26 follow-up (Wave 9) of the Michigan Study of Achievement and Life Transitions. Sample items include: "Last month, how often

did your partner listen carefully to your point of view?" (Warmth); "Last month, how often did your partner criticize you or your ideas?" (Moderate Hostility); and "Last month, how often did your partner throw something at you?" (Extreme Hostility). Higher scores on each subscale indicated higher levels of warmth, moderate and extreme hostility, respectively.

In the current study, internal consistency of both romantic partner's Warmth and Moderate Hostility composite scores were high (α = .90 and .84, respectively), and the reliability of the romantic partner's Extreme Hostility composite score was lower (as expected given that only three indices were assessed; α = .60). We elected to use the standard composite for romantic partner's Extreme Hostility (i.e. a mean of three items that assess behaviors of hit/push/grab/shove person, throw something at person, and threaten person with a knife/gun) because the behaviors referenced are low base rate in the population and are *prima facie* indicators of extreme hostility. In the current sample, the romantic partner's Extreme Hostility composite scores were non-parametrically distributed (skewness of 6.17; *SE* = 0.12), with 17% of the subsample's participants endorsing the presence of any of the potential partner's extreme hostility indices.

Depressive symptoms—The Center for Epidemiological Studies-Depression (CES-D; Radloff, 1977) scale was used to measure participants' depressive symptoms within the last week. The 20-item measure consists of depressive symptoms, such as restless sleep, poor appetite, and feeling lonely. Response options range from 1 (rarely or none of the time) to 4 (most or almost all of the time). Items that indicated positive feelings (i.e. "I felt hopeful about the future") were reverse coded such that higher scores indicated greater depressive symptoms. The CES-D has proven to be a reliable and valid measure of the major facets of depression (e.g. Cosco et al., 2017), and its internal consistency in the current study was high (α = .94).

BMI—Participants' age-26 body mass index (BMI) was calculated based on their self-reported height (in feet) and weight (in pounds). Self-report and objective measures of height, weight, and overall BMI were shown to be very highly correlated (e.g. Wilson et al., 2019). Height and weight were first converted to meters and kilograms, respectively. Next, weight was divided by height squared to yield BMI.

Covariates—Covariates included child ethnicity (1 = White/non-Hispanic, 0 = Other), child gender (1 = Male, 2 = Female), child's IQ, maternal years of education, and family income. Child's IQ was quantified as the full-scale IQ obtained in the Wechsler Abbreviated Scale of Intelligence (1999) in fourth grade. Family income was operationalized by averaging the income-to-needs ratio (total family income divided by the year-specific poverty threshold for the appropriate family size) across the first 15 years of the individual's life. Income-to-needs ratio was calculated separately at 1, 6, 15, 24, 36, and 54 months; during Grade 1, 3, 4, 5, and 6; and at age 15 years.

Analytic strategy

First, Pearson correlations were computed to examine associations among the study variables. Next, to examine whether secure base script knowledge-mediated associations

between both maternal and paternal sensitivity across the first 15 years of life and adult functioning at age 26 years, we conducted mediation analyses using the PROCESS macro for SPSS, version 3.4 (Hayes, 2017; available at http://processmacro.org/index.html). Using a percentile bootstrap estimation method (Preacher & Hayes, 2008), PROCESS macro allows for non-parametric distributions. Given the low base rate of partner's extreme hostility indices, we also ran a binary logistic mediation analysis to assess this outcome dichotomously (i.e., whether participants endorsed none or any extreme partner hostility indices).

Consistent with the approach of Farrell et al. (2019), a separate model was conducted for each outcome measure, and each model was independently assessed with both maternal and paternal sensitivity as independent variables, as well as with and without covariates (child ethnicity, child gender, maternal years of education, and family income). Indirect effects were tested using a percentile bootstrap estimation approach with 10,000 samples, as recommended by Hayes (2017). When significant, indirect effect sizes were calculated based on Preacher and Kelley (2011) kappa-squared (κ^2) effect size metric recommendation for mediation models, with .01, .09, and .25 representing small, medium, and large effect sizes, respectively. Finally, we probed significant mediation models further to assess whether one caregiver's sensitivity (e.g., maternal sensitivity) affected the outcome of interest above and beyond the other caregiver's sensitivity (e.g., paternal sensitivity). To this end, we re-ran significant mediation analyses with one parental sensitivity score as an independent variable and the other parental sensitivity score as a covariate.

Results

Correlational analyses

Table 1 reports correlations among all study variables, derived from the sub-samples described above. Secure base script knowledge was negatively associated with romantic partner extreme hostility ($r = -.18$, $p < .001$), depressive symptoms ($r = -.13$, $p = .002$), and BMI ($r = -.10$, $p = .02$). These correlations indicate that more access to, and elaborated knowledge of the secure base script at 18 years was associated with less perceived extreme hostility from a romantic partner, fewer depressive symptoms, and a lower BMI at 26 years of age. The secure base script score was not significantly associated with either partner warmth ($r = .03$, $p = .62$) or partner moderate hostility ($r = .18$, $p = .054$).

Consistent with Steele et al. (2014), both maternal ($r = .28$, $p < .001$) and paternal ($r = .29$, $p < .001$) sensitivity were positively correlated with secure base script knowledge, suggesting that higher parental sensitivity across the first 15 years of life is associated with more secure base script knowledge at age 18 years. In addition, both maternal and paternal sensitivity were significantly and negatively correlated with both partner moderate hostility ($r = -.12$, $p = .02$ and $r = -.14$, $p = .007$, respectively) and extreme hostility ($r = -.17$, $p = .001$ and $r = -.14$, $p = 006$, respectively). Maternal ($r = -.09$, $p = .02$), but not paternal ($r = -.08$, $p = .09$) sensitivity was negatively correlated with depressive symptoms, indicating that more sensitivity received from mother across the first 15 years of life was associated with fewer self-reported depressive symptoms at age 26 years. Finally, both maternal ($r = -.25$, $p <$

.001) and paternal ($r = -.21$, $p < .001$) sensitivity were associated with lower BMI at age 26 years.

Mediational analyses

We analyzed all hypothesized models using ordinary least squares regression analysis, with and without covariates. We found that results were highly similar in these cases (see Tables 2 and 3 for results of both types of analyses). For the sake of simplicity, the results below are reported only on the models that were adjusted for covariates (i.e., child gender, age, and IQ, maternal education, and income/needs ratio).

Romantic relationship quality

We tested the hypothesis that secure base script knowledge mediates the link between parental sensitivity across the first 15 years and romantic relationship quality, as assessed via three self-reported indicators at age 26 years: partner warmth, moderate hostility, and extreme hostility.

With respect to partner's warmth, results indicated that both maternal ($b = .20$, $SE = .06$, $p < .001$) and paternal ($b = .20$, $SE = .05$, $p < .001$) sensitivity were significant predictors of secure base script knowledge. However, when adjusted for parental sensitivity, secure base script knowledge did not significantly predict partner's warmth ($b = .00$, SE = .03, $p = .99$ and $b = .01$, $SE = .04$ $p = .94$, respectively). These results did not support our mediational hypothesis.

A similar pattern of results was obtained when we examined partner's moderate hostility as the dependent variable. The indirect link between parental sensitivity and partner's moderate hostility through secure base script knowledge was not significant. Although both maternal ($b = .20$, $SE = .06$, $p < .001$) and paternal ($b = .20$, $SE = .05$, $p < .001$) sensitivity were significant predictors of secure base script knowledge, in both models secure base script knowledge was not a significant predictor of partner's moderate hostility when adjusting for parental sensitivity ($b = -.03$, $SE = .03$ $p = .44$ and $b = -.02$, $SE = .04$ $p = .67$, respectively). Again, the results were not consistent with the mediational hypothesis.

In contrast, when we modeled partner extreme hostility, results indicated that both maternal ($b = .20$, $SE = .06$, $p < .001$) and paternal ($b = .20$, $SE = .05$, $p < .001$) sensitivity were significant predictors of secure base script knowledge, which in turn significantly predicted partner's extreme hostility ($b = -.03$, $SE = .01$ $p < .03$ and $b = -.02$, $SE = .00$ $p = .04$, respectively). Moreover, coefficients for the indirect effects in both cases were significant, as evidenced by the absence of a zero value within the bootstrap confidence intervals ($b = -.01$, 95% CI = −.02, −.01 and $b = -.01$, 95% CI = −.01, −.001, respectively). These results support the mediational hypothesis. Approximately 5% of the variance in partner's extreme hostility was accounted for by the predictors in both models ($R^2 = .05$). Effect sizes (κ^2) were .01 for both models, corresponding to a small indirect effect size (Preacher & Kelley, 2011).

Assessing partner extreme hostility as a binary outcome (0 = endorsing no indices; 1 = endorsing any indices) yielded similar results (see Table 4). Both maternal ($b = .20$, SE

= .06, $p < .001$) and paternal ($b = .20$, $SE = .05$, $p < .001$) sensitivity were significant predictors of secure base script knowledge, which in turn significantly predicted higher likelihood of partner's extreme hostility ($b = -.48$, $SE = .26$ $p = .06$ and $b = -.48$, $SE = .29$ $p = .09$, respectively). Moreover, coefficients for the indirect effects in both cases were significant ($b = -.10$, 95% CI = −.24, −.01 and $b = -.10$, 95% CI = −.23, −.01, respectively).

To assess whether each parental sensitivity variable had a unique effect on partner's extreme hostility, we conducted mediation analyses with one parental sensitivity variable serving as the independent variable and the other as a covariate. Results showed that maternal and paternal sensitivity each contributed uniquely to the explained variance in partner's extreme hostility, as indicated in both mediation analyses remaining significant (see Table 5).

Depressive symptoms

We next assessed whether secure base script knowledge mediated the link between parental sensitivity across the first 15 years of life and self-reported depressive symptoms at age 26. For completeness, we also conducted a mediational analysis examining whether secure base script knowledge accounted for the association between paternal sensitivity and depressive symptoms despite the focal correlation being nonsignificant ($r = -.08$, $p = .09$). Supporting our mediation hypothesis, results indicated that both maternal ($b = .18$, $SE = .05$, p < .001) and paternal ($b = .21$, $SE = .04$, p < .001) sensitivity were significant predictors of secure base script knowledge, which in turn significantly predicted depressive symptoms ($b = -.07$, $SE = .03$ p = .007 and $b = -.07$, $SE = .03$ $p = .02$, respectively). The indirect coefficients were significant, as evidenced by the absence of a zero value within the bias-corrected bootstrapped confidence intervals ($b = -.01$, 95% CI = −.03, −.001 for both models). Approximately 4% ($R^2 = .04$) of the variance in depressive symptoms was accounted for by the predictors in both models. In both models, indirect-path effect sizes were small, $\kappa^2 = .02$.

We also assessed whether maternal and paternal sensitivity each uniquely predicted depressive symptoms by conducting the mediation analysis with the opposite parental sensitivity variable as a covariate. In both cases the mediation model remained significant (see Table 4), indicating the unique contribution of each parental care over the first 15 years of life on depressive symptoms at age 26.

BMI

Finally, we tested whether secure base script knowledge mediated the link between parental sensitivity across the first 15 years of life and BMI at age 26 years. Results indicated that both maternal ($b = .18$, $SE = .05$, $p < .001$) and paternal ($b = .21$, $SE = .04$, $p < .001$) sensitivity were significant predictors of secure base script knowledge. However, we did not find that secure base script knowledge mediated the link between parental sensitivity and BMI for either parent ($b = -.15$, SE = .25, $p = .56$ for maternal sensitivity as an independent variable and $b = -.05$, $SE = .28$ $p = .85$ for paternal sensitivity as an independent variable).

Discussion

The primary goals of this study were (1) to assess whether secure base script knowledge predicts later adult functioning, as reflected in romantic relationship quality, emotional

health (i.e. depressive symptoms), and physical health (i.e. BMI); and (2) to determine the degree to which secure base script knowledge mediated links between early maternal and paternal sensitivity and these adult outcomes. Results suggested that more access to, and elaborated knowledge of the secure base script at age 18 predicted better romantic functioning quality as evidenced by lower frequencies of perceived romantic partner's extreme hostility, as well as better emotional health (i.e. fewer depressive symptoms) and physical health (i.e., lower BMI) at age 26 years. Moreover, secure base script knowledge partially mediated the link between early maternal and paternal sensitivity and later perceived romantic partner extreme hostility and depressive symptoms, although the explained amount of variance by the outcomes was modest (i.e. 4–5%). Individuals who experienced higher levels of maternal and paternal sensitivity showed more access to, and elaborated knowledge of the secure base script in late adolescence, which, in turn, was associated with less perceived romantic partner extreme hostility and fewer depressive symptoms in adulthood.

Secure base script knowledge and romantic functioning

This study provides a partial replication and extension of previous results reported by Roisman et al. (2001). Paralleling their results, we found that attachment representations (i.e., secure base script knowledge as assessed via the ASA) mediated the association between quality of early child-parent interactions, and one aspect of romantic relationship behaviors in young adulthood (i.e. partner's extreme hostility). As mentioned, one should consider the low base rate of partner's extreme hostility when interpreting the findings; accordingly, the results may be generalized to only a small segment of the population, where extreme hostility behaviors are present. We also extended prior findings by showing that this mediational path was significant for each parent (i.e. both maternal and paternal sensitivity scores), and that each parent's sensitivity uniquely contributed to explained variance in outcomes above and beyond the other. Together, these results are consistent with an emerging literature suggesting that: (a) attachment representations in the form of secure base script knowledge are shaped by early experiences with primary caregivers (as previously reported in Steele et al., 2014; see also Nivison et al., 2020; Schoenmaker et al., 2015; Vaughn et al., 2016; Waters et al., 2017), and that (b) these representations, in turn, influence the processing of interpersonal information and behaviors in subsequent interpersonal relationships (e.g. Collins & Sroufe, 1999; Dykas & Cassidy, 2011; Waters et al., 2013, 2018).

We did not, however, find evidence in the SECCYD data to support the hypothesis that secure base script knowledge was associated with two other aspects of perceived romantic relationship quality (i.e., moderate hostility and warmth). Worth noting in this context is that Roisman et al. (2001) focused on direct observations of the quality of young adults' romantic relationships, whereas this study was based on self-reports. For this reason, it falls to future research to determine whether and how much attachment representations are predictive of a range of quality indicators in adults' romantic relationships.

Secure base script knowledge and depressive symptoms

With regard to emotional health, we found that maternal, but not paternal sensitivity, was significantly and negatively associated with depressive symptoms, and that links between parental sensitivity and depressive symptoms were partially mediated by secure base script knowledge. Of note, the indirect effect of paternal sensitivity on depressive symptoms via secure base script knowledge proved significant in the absence of a direct effect of paternal sensitivity on depressive symptoms ($r = -.08$, $p = .09$). Taken together, these findings partially support a core premise of attachment theory; that is, that the quality of early care, reflected in parents' provision of sensitive care, shapes the development and consolidation of later constructed mental representations, which, in turn, influence mental health (Bowlby, 1973, 1980; Sroufe et al., 2005).

Secure base script knowledge reflects individuals' expectations regarding the sequence of events following distress (i.e. seeking comfort, being effectively soothed, returning to exploration; Waters & Roisman, 2019). The failure to establish a belief in the availability of caregivers at times of need (e.g. a parent who is unresponsive, rejecting, or overinvolved), which is often a derivative of parental insensitivity (Biringen, 2000), is likely to stand in the way of constructing more access to, and elaborated knowledge of the secure base script. A schematic representation that lacks the expectation that one may be effectively soothed by close others at times of need contributes, in turn, to a reappraisal of stressful events as disproportional to one's ability to cope with them (Rueger et al., 2016; Stice et al., 2004). Ultimately, such a gap between presence of psychosocial stressors and perceived lack of support leads to more depressive symptomatology (Eberhart & Hammen, 2009; Hammen, 2005; Rudolph et al., 2000).

Secure base script knowledge and physical health

Similar to findings reported by Farrell et al. (2019), our analyses suggested that higher levels of parental sensitivity experienced during childhood predicted lower BMI in young adulthood. Early negative parent–child relationships (e.g. non-supportive parenting, low levels of maternal warmth and nurturance) can lead to chronic distress that is associated with physiological wear and tear (Brody et al., 2015; Chen et al., 2011; Miller et al., 2011). Over time, these negative experiences may lead to impairment in inhibitory control and poor health-related behaviors, contributing to obesity risk in adulthood (Anderson & Keim, 2016). Future research that incorporates assessments of stress-regulation and biological markers of stress and metabolic function would help clarify these mechanisms.

However, in contrast to the results reported by Farrell et al. (2019), we did not find that secure base script knowledge mediated the association between early parental sensitivity and weight status as indicated by BMI. These results are somewhat surprising, given that variability in secure base script knowledge was previously found to be related to parental sensitivity during childhood (Steele et al., 2014; Waters et al., 2017), and to cardiometabolic risk, of which BMI is major contributor (Farrell et al., 2019). Our failure to replicate the mediated pathway between early parental sensitivity and BMI in adulthood found in Farrell

et al. (2019) may be due to one or a combination of three major methodological differences between the two studies.

First, in Farrell et al. (2019) BMI was examined as one indicator in an overall cardiometabolic risk index, together with three other health markers (i.e. blood pressure, waist-to-hip ratio, and C-reactive protein). Second, the difference in secure base script knowledge measurements used in Farrell et al. (2019; AAI_{sbs}) versus the one used in the current study (ASA) may contribute to the different results between the studies regarding its mediating effects. Third, secure base script knowledge in Farrell et al.'s study (Farrell et al., 2019) was derived by (a) averaging assessments at two time points (versus a single time point in our study), and (b) assessing at later ages (ages 19 and 26 years, compared with age 18 in the current study).

Study limitations and future research

Although findings of this study partially replicate and extend previous research on the role of secure base script knowledge in shaping adult functioning, two limitations should be noted. First, all outcomes in the current study were assessed via self-reports from a single follow-up assessment at around age 26 years. New research should expand our results by using multiple informants to evaluate the functioning of the target individuals (e.g., assessing romantic partners' evaluations of the target's warmth and hostility in romantic relationships). Second, as indicated by our attrition analyses, the subsample assessed in the current study was more affluent than the participants in original SECCYD NICHD sample who were lost due to attrition. This limits the generalizability of the current results. In the future, results should be replicated in more at-risk samples to enhance the external validity of this study. Third, due to the single time point administration of the ASA, we were not able to infer the stability of attachment-related information processing in early adulthood. Future research would benefit from multiple assessments of secure base script knowledge over time to trace the trajectory of growth/change in these representations Finally, whereas the composite scores of parental sensitivity over multiple observations at different age points provided a robust representation of the quality of early child–parent interactions, it leaves open the question of whether or not sensitivity at a specific developmental period has unique and critical implications for future psychological and relational adaptations.

Conclusion

This study provides new evidence to highlight the pathway by which early life experiences with one's primary caregivers endures to influence multiple domains of functioning in young adulthood. With recent calls for better understanding of the mechanisms linking close relationships in early life to both interpersonal and health outcomes later in life (Farrell & Stanton, 2019; Thoits, 2011), this report provides a further step towards understanding such developmental pathways via secure base script knowledge measured using the ASA. Although we partially replicated and extended some of the results from previous studies assessing the role of secure base script knowledge in the association between early parental sensitivity and later adult outcomes, additional research using multiple attachment

representation measures in more diverse samples is clearly needed to determine the robustness of these mediational paths.

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Table 1.

Correlations among parental sensitivity, secure base script knowledge, and adult functioning at age 26 years.

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. SBSK[1]	-												
2. Partner Warmth[2]	.03	-											
3. Partner MH[2]	−.10	−.54**	-										
4. Partner EH[2]	−.18**	−.32**	.38**	-									
5. Depression[2]	−.13**	−.29**	.31**	.19**	-								
6. BMI[2]	−.10*	−.08	.15**	.04	.07	-							
7. Maternal sensitivity	.28**	.08	−.12**	−.17**	−.09*	−.25**	-						
8. Paternal sensitivity	.29**	.07	−.14**	−.14**	−.08	−.21**	.42**	-					
9. Child gender	.20**	.02	.08	−.12*	.05	−.05	.11**	.08	-				
10. Child ethnicity	.13**	.09	−.03	.13**	−.12**	−.04	.36**	.09*	.02	-			
11. Maternal education	.19**	−.02	−.04	−.03	−.08	−.19**	.49**	.22**	.06	.25**	-		
12. Income/needs ratio	.18**	−.00	−.13*	−.08*	−.15**	−.25**	.43**	.24**	.05	.25**	.56**	-	
13. IQ	.21**	.00	−.09	−.08	−.01	−.21**	.45**	.27**	−.02	.27**	.46**	.38**	-
Means	3.78	4.35	1.76	1.05	1.75	26.46	0.00	0.00	54.4[a]	80.7[b]	14.68	4.22	
*SD*s	1.05	0.63	0.63	0.22	0.60	6.19	1.00	1.00	-	-	2.39	2.89	

[1] Secure Base Script Knowledge at Age 18

[2] At Age 26

[a] Percent female

[b] Percent White/Non-Hispanic

MH = Moderate Hostility; EH = Extreme Hostility; BMI = Body Mass Index. Child gender (1 = male, 2 = female); Child ethnicity (0 = other, 1 = White, non-Hispanic); Income/needs ratio = income-to-needs-ratio.

* $p < .05$.

** $p < .01$.

Table 2.

Path coefficients and indirect effects for mediation models with **maternal sensitivity** as independent variable and secure base script knowledge as mediator.

	Path A			Path B			Path C′			Indirect Effects		
Outcome Variable (*n*)	***b***	***SE***	***t***	***b***	***SE***	***t***	***b***	***SE***	***t***	***Effect***	***BootLLCI***	***BootULCI***
Partner Warmth												
No covariates (400)	.32**	.05	6.33	.00	.03	.01	.05	.04	1.52	.00	−.02	.02
With covariates (390)	.20**	.06	3.30	.00	.03	−.01	.05	.04	1.17	.00	−.01	.01
Partner Moderate Hostility												
No covariates (400)	.32**	.05	6.33	−.04	.03	−1.27	−.07	.03	−1.89	−.01	−.03	.01
With covariates (390)	.20**	.06	3.30	−.03	.03	−.88	−.03	.04	−.77	−.01	−.02	.01
Partner Extreme Hostility												
No covariates (400)	.32**	.05	6.33	−.03**	.01	−2.83	−.03*	.01	−2.47	−.01	−.02	−.01
With covariates (390)	.20**	.06	3.30	−.03*	.01	−2.20	−.02	.01	−1.62	−.01	−.02	−.01
Depressive Symptoms												
No covariates (584)	.29**	.04	6.85	−.07*	.03	−2.57	−.04	.08	−1.47	−.02	−.03	−.01
With covariates (570)	.18**	.05	3.59	−.07**	.03	−2.70	.01	.03	−.03	−.01	−.03	−.001
BMI												
No covariates (578)	.29**	.04	6.67	−.18	.26	−.72	−1.62**	.28	−5.88	−.05	−.22	.11
With covariates (564)	.18**	.05	3.49	−.15	.25	−.58	−.92**	.31	−2.95	−.03	−.14	.08

Path A = Direct effect of the independent variable (Maternal Sensitivity) on the mediator (Secure Base Script Knowledge; SBSK); Path B = Direct effect of the mediator (SBSK) on the dependent variable; Path C′ = Direct effect of the independent variable (Paternal Sensitivity) on the dependent variable, controlling for the mediator (SBSK); BootLLCI = Bootstrapping lower limit confidence interval; BootULCI = Bootstrapping upper limit confidence interval; SE = Standard Error; BMI = Body Mass Index. Covariates are Child Gender, Child Ethnicity, Maternal Education, Income-to-Needs Ratio, and Full Scale IQ in 4th Grade.

* $p < .05$.

** $p < .01$.

Table 3.

Path coefficients and indirect effects for mediation models with **paternal sensitivity** as independent variable and secure base script knowledge as mediator.

	Path A			Path B			Path C′			Indirect Effects		
Outcome Variable (*n*)	***b***	***SE***	***t***	***b***	***SE***	***t***	***b***	***SE***	***t***	***Effect***	***BootLLCI***	***BootULCI***
Partner Warmth												
No covariates (357)	.29**	.05	6.12	.01	.03	.37	.04	.03	1.20	.00	−.02	.02
With covariates (348)	.20**	.05	4.09	.00	.04	.08	.04	.03	1.23	.00	−.01	.01
Partner Moderate Hostility												
No covariates (357)	.29**	.05	6.12	−.04	.04	−1.07	−.07*	.03	−2.24	−.01	−.03	.01
With covariates (348)	.20**	.05	4.09	−.02	.04	−.43	−.05	.03	−1.45	.00	−.02	.01
Partner Extreme Hostility												
No covariates (357)	.29**	.05	6.12	−.03**	.01	−2.89	−.02	.01	−1.75	−.01	−.02	−.01
With covariates (348)	.20**	.05	4.09	−.02*	.01	−2.08	−.01	.01	−1.27	−.01	−.01	−.001
Depressive Symptoms												
No covariates (510)	.28**	.04	6.79	−.07*	.03	−2.40	−.03	.03	−.96	−.02	−.04	−.01
With covariates (500)	.21**	.04	4.89	−.07*	.03	−2.34	−.02	.03	−.63	−.01	−.03	−.001
BMI												
No covariates (506)	.28**	.04	6.72	−.27	.28	−.95	−1.21**	.27	−4.43	−.07	−.25	.09
With covariates (496)	.21**	.04	4.80	−.05	.28	−.19	−.77*	.28	−2.80	−.01	−.14	.12

Path A = Direct effect of the independent variable (Paternal Sensitivity) on the mediator (Secure Base Script Knowledge; SBSK); Path B = Direct effect of the mediator (SBSK) on the dependent variable; Path C′ = Direct effect of the independent variable (Paternal Sensitivity) on the dependent variable, controlling for the mediator (SBSK); BootLLCI = Bootstrapping lower limit confidence interval; BootULCI = Bootstrapping upper limit confidence interval; SE = Standard Error; BMI = Body Mass Index. Covariates are Child Gender, Child Ethnicity, Maternal Education, Income-to-Needs Ratio, and Full Scale IQ in 4th Grade.

* $p < .05$.

** $p < .01$.

Table 4.

Path coefficients and indirect effects for binary logistic regression mediation models with parental sensitivity as independent variable, secure base script knowledge as mediator, and Partner Extreme Hostility as a dependent variable.

	Path A			Path B			Path C′			Indirect Effects		
Independent Variable (*n*)	***b***	***SE***	***t***	***b***	***SE***	***z***	***b***	***SE***	***z***	***Effect***	***BootLLCI***	***BootULCI***
Maternal Sensitivity (390)	.20**	.06	3.30	−.48†	.26	−1.86	−.28	.27	−1.05	−.10	−.24	−.01
Parental Sensitivity (348)	.20**	.05	4.09	−.48†	.29	−2.22	−.27	.19	−1.37	−.10	−.23	−.01

Path A = Direct effect of the independent variable (Parental Sensitivity) on the mediator (Secure Base Script Knowledge; SBSK); Path B = Direct effect of the mediator (SBSK) on the dependent variable (Partner Extreme Hostility); Path C′ = Direct effect of the independent variable (Parental Sensitivity) on the dependent variable, controlling for the mediator (SBSK); BootLLCI = Bootstrapping lower limit confidence interval; BootULCI = Bootstrapping upper limit confidence interval; SE = Standard Error.

† $p < .10$

* $p < .05$.

** $p < .01$.

Table 5.

Path coefficients and indirect effects for mediation models with parental sensitivity as independent variable and secure base script knowledge as mediator, controlling for sensitivity of other parent.

	Path A			Path B			Path C′			Indirect Effects		
Outcome (*n*)	***b***	***SE***	***t***	***b***	***SE***	***t***	***b***	***SE***	***t***	***Effect***	***BootLLCI***	***BootULCI***
Maternal Sensitivity [1]												
Partner Extreme Hostility (357)	.23**	.05	4.20	−.03*	.01	−2.41	−.20	.01	−1.92	−.01	−.01	−.001
Depressive Symptoms (511)	.21**	.05	4.43	−.06*	.03	−2.22	−.20	.03	−.71	−.01	−.03	−.002
Paternal Sensitivity [1]												
Partner Extreme Hostility (357)	.20**	.05	3.90	−.03*	.01	−2.41	−.01	.01	−.95	−.01	−.01	−.001
Depressive Symptoms (511)	.20**	.04	4.43	−.06*	.03	−2.22	−.02	.03	−.64	−.01	−.03	−.002

[1] Independent variable. Path A = Direct effect of the independent variable (Parental Sensitivity) on the mediator (Secure Base Script Knowledge; SBSK); Path B = Direct effect of the mediator (SBSK) on the dependent variable; Path C′ = Direct effect of the independent variable (Parental Sensitivity) on the dependent variable, controlling for the mediator (SBSK); BootLLCI = Bootstrapping lower limit confidence interval; BootULCI = Bootstrapping upper limit confidence interval; SE = Standard Error.

* $p < .05$.

** $p < .01$.