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## Children's secure base script knowledge as a mediator between early life stress and later behavior problems

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### ABSTRACT

Attachment theory posits that children's interactions with caregivers contribute to internalized representations that reflects the common and recurring elements of sensitive caregiving interactions (i.e. the secure base script). These internalized representations are theorized to influence later adaptation, including the development of psychopathology. Given prior research suggesting that stress exposure may undermine secure base script knowledge (SBSK), this study evaluated SBSK development in early childhood as a mechanism by which childhood stress exposure may influence later adaptation. We hypothesized that children's ( $N = 230$ ;  $M_{\text{age}} = 73.30$  months,  $SD = 2.51$ , 50% girls; 45.7% Latinx) stress exposure would be associated with lower levels of SBSK at age 6, which, in turn, would contribute to increased internalizing and externalizing symptoms at age 8. SBSK emerged as a significant mechanism by which early life stress may contribute to later externalizing, but not internalizing, child behavior problems. These findings highlight the role of SBSK as a profitable focus for both risk identification and intervention efforts aimed at reducing behavioral maladaptation among stress-exposed children.

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Attachment; behavior problems; psychopathology; secure base script; stress

## Secure base script knowledge as a mediator between early life stress and later child behavior problems

Attachment theory posits that children develop mental representations of themselves and close relationships based on interactions with caregivers in early development (Ainsworth, Blehar, Waters, & Wall, 1978; Bowlby, 1969/1982; Bretherton & Munholland, 1999). These representations are thought to, in part, include a script that reflects the common and recurring elements of sensitive caregiving interactions, and summarizes the basic features of seeking and receiving support from an attachment figure (i.e. the secure base script; Fivush, 2006; Waters, Rodrigues, & Ridgeway, 1998; Waters & Waters, 2006). In turn, secure base script knowledge (SBSK) is carried forward across development as an information processing heuristic that guides children's adaptation to future social challenges and opportunities (e.g. Bretherton, 1990; Posada & Waters, 2018; Waters & Roisman, 2019; Waters & Waters, 2006).

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In support of these predictions, research has demonstrated links between early caregiving quality and the development of a secure base script in late adolescence and adulthood (e.g. Steele et al., 2014; Vaughn et al., 2016; Waters, Ruiz, & Roisman, 2017). Further, the development of SBSK has been associated with better psychological functioning, including lower levels of internalizing and externalizing symptoms in middle childhood (Waters, Bosmans, Vandevivere, Dujardin, & Waters, 2015) and lower levels of non-attachment related maladaptive schemas in young adulthood (McLean, Bailey, & Lumley, 2014). Given the potential benefits of developing and holding a secure base script in mind, and the negative consequences of its absence on adaptive functioning, elucidating developmental pathways from early experience to psychological adjustment via SBSK development has significant implications for future research and practice.

Script development depends on consistency and regularity in the environment (Schank & Abelson, 1977), which may likewise impact the construction of internalized representations of the SBSK (Waters & Roisman, 2019; Waters & Waters, 2006). Thus, early life stress and instability may undermine SBSK development and compromise adaptive functioning later in life. Unfortunately, few studies have examined SBSK in young children, leaving unanswered questions about how SBSK develops during this period, as well as whether and how stressful conditions may undermine that process. Further, research testing relations between children's SBSK and (mal)adaptive outcomes has been limited, despite the empirical and applied value of evaluating these predicted relations in both typically and atypically developing samples (Cicchetti, 1990; Sroufe, 1990). To address these gaps in the literature, the current investigation tested a theoretically specified mediation model wherein we hypothesized that early stress exposure may compromise children's SBSK development, and, by extension, their psychological adjustment in middle childhood.

### *The development of secure base script knowledge*

Harriet Waters and colleagues (Waters et al., 1998; see also Waters & Waters, 2006) argued that attachment representations include a temporal-causal representation of secure base use and support known as the secure base script. The secure base script summarizes the most commonly occurring elements of sensitive and supportive care in times of need, including (1) an attached individual is engaged in constructive activity; (2) a challenge is encountered that disrupts this activity and/or leads to distress; (3) the attached individual signals for assistance; (4) the other dyad member recognizes the signal and responds in a manner consistent with the message; (5) the assistance is accepted; (6) the assistance is effective in resolving the challenge; (7) comforting/affect regulating behavior occurs; and (8) the attached individual/dyad resumes activity or initiates a new activity.

Evidence supports the prediction that these secure base scripts are informed by the quality of children's early caregiving experiences in both low- and high-risk community samples (Steele et al., 2014; Vaughn et al., 2016; Waters et al., 2017), as well as among internationally adopted children (Schoenmaker et al., 2015). For example, in a recent study, Steele et al. (2014) found that observer ratings of maternal and paternal sensitivity across the first 15 years of life predicted adolescents' SBSK at age 18. Moreover, these findings replicated in a high-risk sample wherein maternal sensitivity from childhood to adolescence predicted young adults' SBSK at ages 19 and 26 (Waters et al., 2017).

Importantly, studies have demonstrated that SBSK continues to develop beyond infancy, and is informed by experiences outside of parental sensitivity. For example, Vaughn et al. (2016) found that adolescents' SBSK was only partially accounted for by prior parenting sensitivity, continued to develop into adolescence, and was influenced by several parenting practices and values, such as parental involvement and monitoring, many of which fall outside the traditional sensitivity measures thought to be critical for attachment development. These findings are consistent with Bowlby's (1973) conceptualization of inner *working* models, which continue to develop beyond infancy and are (re) constructed throughout development. Together, these studies suggest that SBSK may be a modifiable mechanism by which experiences in and beyond the caregiving milieu are carried forward across time and contexts to influence later adaptation.

Although research has demonstrated that consistent and sensitive care supports the formation of a secure base script, little work has examined if and how other experiences may influence this developmental process. The child's broader environmental context, including stressful life events, may affect parents' abilities to provide sensitive care and/or undermine the child's confidence that support will be available and effective. Indeed, stressful and unstable environments have long been of interest in studies of attachment development. For example, in a study of infants drawn from "high-risk" contexts, changes in maternal life stress were associated with shifts in attachment organization from ages 12–18 months (Vaughn, Egeland, Sroufe, & Waters, 1979). Specifically, increases in life stress were associated with greater propensities for change towards insecure attachment, whereas decreases in life stress were associated with changes toward secure attachment.

Extending beyond infancy, longitudinal studies have shown that individuals exposed to higher levels of childhood risk (e.g. housing instability, family conflict) evidence greater discontinuity towards attachment insecurity from infancy to adulthood than their comparatively low-risk peers (Weinfield, Sroufe, & Egeland, 2000; Weinfield, Whaley, & Egeland, 2004). This shift towards insecurity is theorized to follow from less stable caregiving environments and relationships that eventuate in lawful discontinuities in attachment representations over time. Indeed, recent meta-analytic evidence supports the assertion that parenting stress and socioeconomic strain are negatively associated with maternal sensitivity (Booth, Macdonald, & Youssef, 2018). Although some degree of discontinuity is to be expected in both high- and normative-risk samples (Booth-LaForce & Roisman, 2014; Weinfield et al., 2000), consistent with the tenets of attachment theory (Bowlby, 1973, 1980) and prior research (Fraley, 2002), meta-analytic data indicate that attachment security is less stable in high-risk contexts as compared to low- or normative-risk contexts. For this reason, we hypothesized that stressful life events would undermine the construction of SBSK in early childhood.

### ***The developmental significance of SBSK***

The capacity to expect well of others and believe in the value and agency of the self are reflected in the secure base script, and promote positive adaptation across settings and in novel situations (Bowlby, 1973; Sroufe, Carlson, Levy, & Egeland, 1999). In support of this assertion, research has shown that mothers' own SBSK is associated with positive parenting behaviors, and, by extension, children's secure base behavior in various sociocultural contexts (e.g. Vaughn et al., 2007; Waters et al., 2015; Waters, Raby, Ruiz, Martin, & Roisman, 2018).

Extending to the pre-school setting, two studies have found that children's own SBSK is positively related to social competence (Fernandes et al., 2019; Posada et al., 2019), and others have found positive associations between children's own SBSK and their general school adaptation including peer and teacher relationships, verbal intelligence, cognitive competence and effortful control (Nichols, Vaughn, Lu, Krzysik, & El-Sheikh, 2019). In the context of adult romantic relationships, SBSK is positively associated with both care-giving and care-seeking behaviors, as well as with more general relationship functioning (Waters, Brockmeyer, & Crowell, 2013; Waters et al., 2018). Although these findings suggest that SBSK may influence adaptive behavior across development and in different relational domains, less is known about if and how young children's SBSK influences later childhood adjustment.

A recent study examined the association between preschooler's concurrent SBSK and teacher-reported externalizing behavior, and found that attachment representations were negatively associated with externalizing, but not significantly associated with internalizing, behaviors (Fernandes et al., 2019). Another study examined the association between childhood SBSK and psychopathology symptoms in a cross-sectional investigation of children between the ages of 9 and 11 years old. In this study, Waters et al. (2015) showed that SBSK was negatively associated with concurrent internalizing and externalizing behaviors. Although the current investigation was the first to evaluate childhood SBSK effects over time, childhood attachment security, which reflects a broader construct that includes SBSK, does show moderate relations with psychopathology across the lifespan. For example, recent meta-analytic data support a moderate link between infant attachment security and lower rates of both internalizing and externalizing symptoms in childhood (Brumariu & Kerns, 2010; Fearon, Bakermans-Kranenburg, van IJzendoorn, Lapsley, & Roisman, 2010; Groh et al., 2014; Groh, Roisman, van IJzendoorn, Bakermans-Kranenburg, & Fearon, 2012). Given these findings, we hypothesized that children's exposure to stressful life events would be associated with lower levels of SBSK and increased behavior problems over time, though we remained agnostic as to if and how these predicted relations would differ across internalizing and externalizing behavior problems.

### *The current study: stress, SBSK, and child behavior problems*

Stressful life events are a prominent risk for child behavior problems (Gundermuth-Anthony et al., 2005; Crnic, Gaze, & Hoffman, 2005; see Morgan, Robinson, & Aldridge, 2002 for review). Thus, in addition to preventing early life stress, research efforts must strive to elucidate modifiable mechanisms by which stress may undermine adaptation to inform and expand future opportunities for intervention. We propose SBSK as an environmentally responsive and developmentally impactful mechanism by which early life stress may contribute to later internalizing and externalizing problems. Specifically, we evaluated four hypotheses. First, we predicted that children's stress exposure during the early childhood period would be associated with increased internalizing and externalizing behavior problems from ages 6 to 8. Second, we predicted that childhood stress exposure would be associated with lower levels of SBSK at age 6. Third, we predicted that children's SBSK at age 6 would be negatively associated with child behavior problems at age 8. Fourth, we predicted that SBSK would explain a significant portion of the hypothesized relation between early childhood stress and later behavior problems, which would indicate that SBSK acts as a mechanism through which early stress may contribute to the development

of later behavior problems. Importantly, when evaluating this theoretically-specified mediation model, we held factors with known relations to SBSK and/or child psychopathology constant, including child sex, race/ethnicity, family socioeconomic status (SES), and child IQ.

## Methods

### *Participants*

The sample was drawn from an ongoing study of development among 250 caregiver-child dyads. Participants in these analyses ( $N = 230$ ; 50% female) completed a laboratory assessment at age 6 ( $N = 215$ ;  $M_{\text{age}} = 73.30$  months,  $SD = 2.51$ ) and/or age 8 ( $N = 214$ ;  $M_{\text{age}} = 97.58$  months,  $SD = 3.18$ ). The children represented diverse racial/ethnic groups (i.e. 45.7% Latinx, 18.3% Black, 11.7% White, and 24.3% multiracial) that reflected the southern California community from which they were recruited (US Census Bureau, 2011). At age 6, caregivers were biological mothers (91.6%), foster/adoptive mothers (2.8%), and grandmothers or other female kin (5.6%). The average family SES score, based on the Hollingshead (1975) Four-Factor Index of Social Status, was 32.98 ( $SD = 11.91$ ), which corresponds to semi-skilled employment (e.g. sales clerk). Children who completed assessments at both ages 6 and 8 ( $n = 199$ ; 86.5%) did not differ from those who completed just one assessment ( $n = 31$ ; 13.5%) with regard to child sex, race/ethnicity, IQ, and family SES.

### *Procedures*

Participants were recruited for “a study of early learning and development” via flyers distributed to community-based child development agencies. Caregivers completed a brief intake screening by phone to rule out exclusionary criteria, including children who were diagnosed with developmental disabilities ( $n = 3$ ), not able to understand English ( $n = 4$ ), and/or outside the age range of 45–54 months (not tracked). At each data wave, dyads completed a 3-hour laboratory visit, including assessments and tasks completed by the child and caregiver in adjacent rooms, as well as the child and caregiver together. Measures in these analyses included individually administered assessments of child IQ (age 6), stressful life events (age 6), narrative assessments of SBSK (age 6), and observational measures of child behavior problems (ages 6 and 8). Informed consent was obtained from the child’s legal guardian at each laboratory visit, and child assent was obtained at the start of the age 8 visit. Caregivers were compensated with US \$25/hour of assessment and children received a small gift following each visit. All procedures were approved by the human research review board of the participating university.

## Measures

### *Stressful life events*

At age 6, caregivers reported on stressful life events using a list of 19 items from the Parent Stress Inventory (PSI; Abidin, 1995). Caregivers were asked to report on stressful events, such as divorce, death, and residential moves, which had occurred in the immediate family during the preceding 12 months. If they reported that an event had happened, caregivers were asked to rate the impact of the event on the child using a 5-point Likert scale, from extremely

positive (1) to extremely negative (5) (Sarason, Johnson, & Siegel, 1978). Scores were recoded from extremely negative (2) to neutral (0) to extremely positive (−2) and composited to yield an index of children's stress exposure. The PSI has been well-validated in the literature, including in ethnoracially diverse samples, such as the one used here (Barker et al., 2011; Costin & Chambers, 2007; Kratochvil et al., 2007; Lee, Taylor, & Bellamy, 2012).

### *Secure base script knowledge*

At age 6, children completed the MacArthur Story Stem Battery (Emde, Wolf, & Oppenheim, 2003). This task is designed to elicit children's verbal and enacted narratives about specific themes (e.g. moral, attachment, peer, sibling, and parent conflict) using story stems that are completed by the child. Following a warm-up birthday story, five stories were drawn from the MSSB to capture: (1) parental comfort in response to fear (Monster Under the Bed); (2) parental comfort in response to child injury (Hot Gravy); (3) parental conflict (Lost Keys); (4) separation from parents (Departure); and (5) reunion with parents (Reunion). Children completed each story stem, using a "family" of grey rabbits from the Calico Critters™ doll series. The examiner initiated each story using a variety of props, and the child was asked to "show me and tell me what happens next." Examiners provided encouragement in accordance with standardized guidelines (e.g. "Does anything else happen in the story?") and structured queries if the child did not spontaneously address (or apprehend) the main issue of the story (e.g. "What did they do about George's burned hand?").

The first two stories were transcribed at age 6 to code SBSK. The Monster Under the Bed and Hot Gravy stories were selected for this coding because they most clearly set up the required elements of the secure base script with regard to a child being scared (Monster Under the Bed) or injured (Hot Gravy) in the presence of a caregiver. Although other stories (e.g. Parents' Departure/Reunion) activate attachment-relevant themes, they are not as well-suited to capture children's SBSK, which emphasizes child distress and parental provision of a safe haven, or they were not collected at the age 6 assessment (e.g. Park Outing).

The stories and actions the children produced were transcribed from video-recorded narrative assessments and coded for SBSK on a 7-point scale (see Waters & Waters, *in press*, for further details regarding the coding system). A score of 7 reflects a transcript that includes a detailed and well-elaborated script, usually with the caregiver acting successfully as a secure base, and children stating the problem had been resolved as a result of the caregiver's actions. A score of 4 reflects a transcript in which the caregiver is responsive to the child and aids them in reaching a resolution to the problem, but elements of the script are not explicitly expressed by the child. A score of 1 reflects a poorly elaborated secure base script that may have elements of abuse or maltreatment by the caregiver. Each transcript was coded by the first and second authors, both of whom were naïve to all other information about the dyads. Coding discrepancies were resolved by consensus (ICC = 0.81). These procedures are similar to those used in recent studies using story-stem measures of SBSK (e.g. Nichols et al., 2019; Vaughn, Posada, Veríssimo, Lu, & Nichols, 2019).

### *Child behavior problems*

Examiners completed the Test Observation Form (TOF; McConaughy & Achenbach, 2004) following the three-hour laboratory assessments at ages 6 and 8. Examiners rated the child across 125 behavioral descriptors using a four-point scale that ranged from no occurrence of the behavior (0), to very slight or ambiguous occurrence of the behavior



(1), to a definite occurrence with mild to moderate intensity and frequency and less than three minutes total duration (2), to a definite occurrence with high intensity, high frequency, or three or more minutes total duration (3). The TOF broadband psychopathology scales, which assess internalizing (e.g. withdrawn/depressed) and externalizing (e.g. attention problems) problems, were used in these analyses.

Although not available from the single rater data in this study, McConaughy and Achenbach (2004) reported interrater reliabilities of  $r = .43$  and  $.78$  for the broadband internalizing and externalizing behavior problem scores, respectively, and test-retest reliabilities of  $r = .83$  for both scale scores in their validation sample. Moreover, they used a diverse sample to develop and validate the TOF, which has since been used in similarly diverse samples (McConaughy, Ivanova, Antshel, & Eiraldi, 2009; Rettew, Stanger, McKee, Doyle, & Hudziak, 2006).

### Child IQ

At age 6, children completed the Vocabulary and Block Design subtests of the Wechsler Preschool and Primary Scale of Intelligence – III (Wechsler, 2002). Verbal IQ was measured using the Vocabulary test in which the child verbally explained what orally-presented words meant. Performance IQ was assessed using the Block Design subtest in which the child was asked to assemble red and white blocks to match models. Estimated Verbal and Performance IQs were averaged to yield a prorated measure of Full Scale IQ (Sattler, 1988).

### Data analysis

All analyses were performed in SPSS version 25. Data were examined for non-normality to render parametric statistics valid (Afifi, Kotlerman, Ettner, & Cowan, 2007). Missing data were handled using the expectation-maximization (EM) algorithm for imputation to support analyses with the sample of 230 child-caregiver dyads. This procedure is superior to prior approaches, such as deletion and mean substitution, as well as prior imputation approaches with limited numbers of iterations. The EM algorithm estimates expected values of missing data from observed values and then repeats the process until the values stabilize to yield the best and most likely pooled estimate (Musil, Warner, Yobas, & Jones, 2002). The current data were imputed across 100 iterations. Data were missing due to attrition or recording errors for stressful life events at age 6 ( $n = 15$ ; 6.5%), SBSK at age 6 ( $n = 20$ ; 8.7%), internalizing ( $n = 18$ ; 7.8%) and externalizing ( $n = 18$ ; 7.8%) behavior problems at age 6, and internalizing ( $n = 25$ ; 10.9%) and externalizing ( $n = 25$ ; 10.9%) behavior problems at age 8. Little's MCAR test indicated that there was no identifiable pattern in the missing data ( $\chi^2[46] = 56.09, p = .15$ ).

A multivariate analysis of variance (MANOVA) evaluated group differences in study variables as a function of the child's sex, race/ethnicity, and their interaction. Bonferroni-corrected post hoc comparisons were used to probe pairwise differences by child race/ethnicity. Following the examination of bivariate relations among study variables, separate regression models evaluated the indirect effects of children's stressful life event exposure on increases in internalizing and externalizing behavior problems from ages 6 to 8 through SBSK at age 6. Mediation analyses were run using Hayes' (2012) PROCESS routine, which yields 95% bootstrapped confidence intervals (CIs) for all effects. Bootstrapping is a non-parametric technique that minimizes the influence of non-normality across study variables,



and yields a more reliable estimation of mediation than Sobel's (1982) test, particularly in smaller samples (Preacher, Rucker, & Hayes, 2007). Bootstrapping allows for direct estimation of mediation and mitigates power problems due to the asymmetric and non-normal sampling distribution of indirect effects (Edwards & Lambert, 2007).

## Results

### Descriptive analyses

A MANOVA revealed significant differences across study variables by sex and by race/ethnicity, but not by their interaction (see Table 1). Girls came from families of higher SES than boys, and girls were rated as having higher levels of internalizing symptoms at age 8 than boys. In terms of race/ethnicity, Latinx children were rated as having higher levels of internalizing symptoms at age 8 than multiracial children.

### Bivariate analyses

As shown in Table 2, early childhood stressors were positively related to externalizing problems at age 8, but were not significantly associated with internalizing problems at age 8, and were negatively associated with SBSK at age 6. SBSK was related to fewer internalizing problems concurrently, and to fewer internalizing and externalizing problems at age 8. Children's IQ was positively associated with SES and SBSK at age 6, but negatively associated with internalizing and externalizing problems at ages 6 and 8. Family SES was positively associated with SBSK, and negatively associated with internalizing and externalizing problems at age 6. Internalizing problems at age 6 were positively associated with internalizing problems at age 8, and externalizing problems at age 6 were positively associated with future internalizing and externalizing problems.

**Table 1.** Descriptive means for main variables of interest by child sex and race/ethnicity.

Variables	Child Sex		Child Race/Ethnicity				$F_{\text{sex}}$	$F_{\text{race/ethnicity}}$
	Male	Female	White	Black	Latinx	Multi		
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)		
1. Child IQ age 6	89.80 (11.73)	90.26 (11.59)	92.40 (11.00)	88.46 (10.48)	89.28 (11.82)	91.49 (12.37)	0.50	1.21
2. SES age 6	31.44 (11.67)	34.52 (11.98)	37.58 (12.77)	34.33 (13.05)	31.56 (10.56)	32.41 (11.55)	4.98*	1.61
3. SBSK age 6	3.05 (0.74)	3.28 (0.83)	3.20 (0.82)	3.16 (0.84)	3.13 (0.80)	3.22 (0.74)	3.15	0.12
4. Stressful Life Events age 6	-1.22 (2.38)	-1.39 (2.76)	-1.14 (3.07)	-1.33 (2.56)	-1.37 (2.44)	-1.25 (2.64)	0.02	0.60
5. Internalizing Problems age 6	60.12 (5.02)	60.30 (5.62)	58.80 (4.74)	59.86 (4.73)	61.07 (5.72)	59.53 (5.07)	0.16	2.01
6. Externalizing Problems age 6	60.95 (6.54)	61.90 (6.20)	63.53 (7.40)	60.90 (6.78)	60.60 (5.67)	62.36 (6.63)	1.52	1.73
7. Internalizing Problems age 8	60.18 (5.92)	61.24 (5.74)	59.32 (4.79)	59.89 (5.16)	62.22 (6.40)	59.17 (5.08)	4.65*	5.19**
8. Externalizing Problems age 8	61.84 (7.24)	61.23 (5.73)	62.00 (6.97)	61.79 (6.44)	61.15 (6.71)	61.85 (6.13)	0.01	0.25

Note: \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ . The  $F_{\text{sex} \times \text{race/ethnicity}}$  is not reported due a nonsignificant wilks  $\Lambda$ . SBSK = Secure Base Script Knowledge.

**Table 2.** Descriptive statistics and bivariate relations among study variables.

Variables	1	2	3	4	5	6	7	8
1. Child IQ age 6	–	.22**	.17**	–.13*	–.25**	–.29**	–.28**	–.31**
2. SES age 6		–	.20**	–0.01	–.17**	–.25**	–0.11	–0.11
3. SBSK age 6			–	–.17**	–.23**	–0.08	–.18**	–.23**
4. Stressful Life Events Age 6				–	0.02	0.03	0.08	.30**
5. Internalizing Problems Age 6					–	0.10	.47**	0.05
6. Externalizing Problems Age 6						–	.15*	.50**
7. Internalizing Problems Age 8							–	.23**
8. Externalizing Problems Age 8								–
Mean	90.03	32.98	3.17	–1.02	60.21	61.43	60.71	61.54
SD	11.64	11.91	0.79	3.51	5.32	6.38	5.84	6.52

Note: \* $p < .05$ . \*\* $p < .01$ . SBSK = Secure Base Script Knowledge.

### Regression analyses

Mediation analyses using Hayes' (2012) PROCESS routine evaluated two mediation models predicting from life stress at age 6 to children's psychopathology at age 8, as mediated through their SBSK at age 6. Separate models were run for internalizing and externalizing symptoms, controlling for child sex, race/ethnicity, IQ, SES, and prior internalizing or externalizing symptoms at age 6. Although there were no significant direct or indirect effects of children's stressful life events on examiner reports of internalizing symptoms (see Table 3), there was a significant direct effect of children's stressful life events on externalizing symptoms, as well as a significant indirect effect from stress to increased externalizing symptoms at age 8 through SBSK at age 6 (see Table 4).

### Discussion

Prior research suggests that stress and instability may compromise SBSK development by various processes, which may include undermining the child's sense of safety and predictability in and beyond the caregiving milieu (Posada, Trumbell, Lu, & Kaloustian, 2018). Likewise, both stressful life events and compromised representations of security and safety are related to child behavior problems (Crnic et al., 2005; Groh et al., 2014, 2012). The current

**Table 3.** Indirect effect of stressful life events at age 6 on examiner-reported internalizing behavior problems at age 8 through children's secure base script knowledge (SBSK) at age 6.

Internalizing Symptom Effects	B	$\beta$	Bootstrapped SE	$t$	$p$	95% CI Bias Corrected	
						LLCI	ULCI
Sex → SBSK	.19	.12	.10	1.89	.06	–.01	.37
Sex → Int. age 8	1.15	.10	.68	1.68	.09	–.19	2.49
Child IQ → SBSK	.005	.07	.005	1.09	.28	–.004	.02
Child IQ → Int. age 8	–.08	–.16	.03	–2.64	.01	–.14	–.02
SES → SBSK	.01	.14	.004	2.14	.03	.001	.02
SES → Int. age 8	–.002	–.004	.03	–.06	.95	–.06	.06
Int age 6 → SBSK	–.03	–.18	.01	–2.82	.01	–.05	–.01
Int. age 6 → Int. age 8	.46	.42	.07	6.85	<.001	.33	.59
Stress → SBSK	–.04	–.16	.01	–2.47	.01	–.06	–.01
SBSK → Int. 8	–.47	–.06	.45	–1.03	.30	–1.36	.42
Stress → Int. age 8 (direct)	.07	.04	.10	.70	.48	–.12	.26
Stress → Int. age 8 (indirect)	.02	.01	.02	–	–	–.004	.07

Note: SE = Standard Error. LLCI = Lower limit confidence interval. ULCI = Upper limit confidence interval. SE and confidence intervals are bias-corrected based on 5000 samples. No  $p$ -values given for indirect effects, as indirect effects are known to be non-normal. Int = Internalizing behavior problems; SES = socioeconomic status.

**Table 4.** Indirect effect of stressful life events at age 6 on examiner-reported externalizing behavior problems at age 8 through children's secure base script knowledge (SBSK) at age 6.

Externalizing Symptom Effects	B	$\beta$	Bootstrapped SE	<i>t</i>	<i>p</i>	95% CI Bias Corrected	
						LLCI	ULCI
Sex → SBSK	.18	.11	.10	1.76	.08	-.02	.38
Sex → Ext. age 8	-.76	-.06	.71	-1.07	.29	-2.15	.64
Child IQ → SBSK	.01	.11	.05	1.62	.11	-.002	.02
Child IQ → Ext. age 8	-.08	-.13	.03	-2.37	.02	-.14	-.01
SES → SBSK	.01	.16	.005	2.40	.02	.002	.02
SES → Ext. age 8	.04	.07	.03	1.15	.25	-.03	.10
Ext. age 6 → SBSK	-.001	-.01	.01	-.16	.87	-.02	.02
Ext. 6 → Ext. age 8	.47	.46	.06	8.06	<.001	.35	.58
Stress → SBSK	-.03	-.15	.01	-2.40	.02	-.64	-.01
SBSK → Ext. age 8	-1.12	-.14	.46	-2.45	.02	-2.03	-.22
Stress → Ext. age 8 (direct)	.45	.24	.10	4.44	<.001	.25	.65
Stress → Ext. age 8 (indirect)	.04	.02	.02	—	—	.01	.10

Note: SE = Standard Error. LLCI = Lower limit confidence interval. ULCI = Upper limit confidence interval. SE and confidence intervals are bias-corrected based on 5000 samples. No *p*-values given for indirect effects, as indirect effects are known to be non-normal. Ext = Externalizing behavior problems; SES = socioeconomic status.

investigation offered a novel evaluation of prospective associations among childhood stress exposure, SBSK development, and changes in internalizing and externalizing behavior problems during childhood. In partial support of our first hypothesis, there was a significant association between childhood stress exposure and increased externalizing problems, but not internalizing problems. Further, in support of our second prediction, childhood stress was negatively related to SBSK. Third, our findings partially supported hypothesized relations between children's SBSK and later symptomatology with significant predictions to later externalizing problems, but not to internalizing problems. Finally, there was a significant indirect pathway from childhood stress to increased externalizing problems, but not internalizing problems, via SBSK. In addition to integrating prior theory and research suggesting promotive relations between the quality of children's caregiving milieu and SBSK (Schoenmaker et al., 2015; Steele et al., 2014; Vaughn et al., 2016; Waters et al., 2017), and between SBSK and socioemotional adjustment outcomes (Nichols et al., 2019; Vaughn et al., 2019; Waters et al., 2013, 2018), this research demonstrates that early stressful life events may undermine SBSK development and, in turn, child adaptation.

Stressful contexts have long been of interest to attachment researchers, with prior studies showing that infants in high-risk developmental contexts demonstrate greater insecurity in their attachment as compared to infants in normative-risk contexts (Cicchetti & Barnett, 1991; Cyr, Euser, Bakermans-Kranenburg, & van IJzendoorn, 2010). Such findings have been replicated using longitudinal data to demonstrate similar patterns of representational instability over time (Booth-LaForce & Roisman, 2014; Vaughn et al., 1979; Weinfeld et al., 2000). Consistent with prior findings, children's stress exposure was negatively associated with SBSK over and above the influence of children's IQ, race/ethnicity and SES. Despite preliminary support for our hypothesis, additional research using concurrent measures of stress and SBSK across multiple data waves is needed to establish causal pathways between childhood stress and SBSK, as well as to elucidate mechanisms that may account for these directional effects. Promising candidate mechanisms include the impact of stressful life events on parenting quality (Booth et al., 2018; Crnic et al., 2005) and/or on children's perceived sense of safety and stability (Posada et al., 2018), which, in turn, are known to influence SBSK development (Steele et al., 2014; Vaughn et al., 2016; Waters et al., 2017).

The relation between attachment and later psychopathology has been well researched, but less is known about SBSK. One study on this topic found a negative association between SBSK and internalizing and externalizing symptoms in middle childhood (Waters et al., 2015), while another study found a negative association only with externalizing symptoms in the pre-school age (Fernandes et al., 2019). In the current study, SBSK was significantly and negatively associated with later externalizing problems, but not later internalizing symptoms, though the model predicting later internalizing symptoms from stress was marginally significant. Although Waters et al. (2015) found significant concurrent associations of SBSK with both internalizing and externalizing symptoms in middle childhood, the current finding mirrors meta-analytic evidence that infant attachment may be more strongly associated with later externalizing, as compared to internalizing, symptoms (Groh et al., 2014). This differential finding may be because a history of insecure attachment contributes to emotion regulation deficits that make it difficult for children to control intense negative emotions and heighten impulsivity, both of which are associated with externalizing behaviors (Eisenberg et al., 2001; Groh et al., 2014; Main & Solomon, 1986). Alternately, because children's behavior problems were assessed using an observational report in the current study, the pattern of obtained findings could reflect the greater difficulty external observers have perceiving and rating children's internalizing symptoms (e.g. De Los Reyes & Kazdin, 2005; Seifer, Sameroff, Dickstein, Schiller, & Hayden, 2004).

The current study suggests SBSK may partially account for known associations between early stress exposure and later behavior problems. Notable strengths of this study include our use of a diverse sample with varying degrees of risk-exposure, as well as multiple methods and informants to examine changes in behavior problems over time. However, a number of limitations qualify the interpretability of the obtained findings while illuminating future directions for research. As noted earlier, notwithstanding the added value of an independent assessment of child behavior, reliance on outside observers to assess child behavior problems may have contributed to the relatively weaker relations of later internalizing problems with both stress and SBSK, and, by extension, the marginal indirect effect from stress to internalizing behavior problems via SBSK. Similarly, although the ethnic-racial diversity of the current sample enhanced the generalizability of the findings, several of the measures used here await further validation in diverse samples. That said, the absence of significant mean group differences in either SBSK or IQ in the current sample bolstered our confidence in these findings. Despite the prospective data in these analyses, our inability to assess all constructs at all time points necessarily limits the conviction with which we can offer directional interpretations of the obtained results. In particular, additional research is needed to ascertain if and how stressful life events may disrupt SBSK. Likewise, the relatively modest indirect effects found here, highlight the need for further research to identify additional mechanisms by which early childhood stress may contribute to later problem behaviors, as SBSK offers only one possible explanatory pathway. For example, future studies may evaluate parenting quality (Crnic et al., 2005), children's perceived sense of safety and stability (Posada et al., 2018), and/or access to protective supports (Booth-LaForce & Roisman, 2014) as potential mechanisms by which stress may undermine SBSK and/or contribute to elevated behavior problems. Together, these effects may heighten the risk for later problem behaviors directly and/or magnify the indirect pathway suggested here via additional disruptions in SBSK development.

## Conclusions and implications

This study extends our understanding of SBSK by demonstrating negative associations with stressful life events, as well as significant relations with later behavioral adaptation, particularly externalizing problems. Although research has focused on infant attachment development, fewer studies have sought to understand how attachment representations develop across childhood (see Posada & Waters, 2018, for exception). Childhood is an important period during which attachment processes and systems continue to develop and expand into new settings, such as school and peer groups (Bosmans & Kerns, 2015; Kerns, Aspelmeier, Gentzler, & Grabill, 2001). SBSK is likely to take on particular salience during childhood as the attachment system shifts from the reliance on parent involvement and proximity that characterizes infancy, to greater emphasis on parental availability amidst children's increased capacities for self-regulation and reduced dependence on direct parental assistance (Kerns & Brumariu, 2016). The current findings offer valuable insights about experiences that may undermine SBSK development in childhood, and illuminate SBSK as a contextually responsive and behaviorally important developmental construct. Although this research suggests that SBSK may be a promising point of intervention in child clinical practice, particularly for children living in highly-stressed families and communities, further support for SBSK as a mechanism by which early stress may contribute to later behavior problems is needed using more rigorous research designs and analytic models that can support causal conclusions.

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