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Attachment & Human Development

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/rahd20

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To cite this article: Theodore E. A. Waters , Christopher R. Facompré , Or Dagan , Jodi Martin , William F. Johnson , Ethan S. Young , Jessica Shankman , Yoojin Lee , Jeffry A. Simpson & Glenn I. Roisman (2020): Convergent validity and stability of secure base script knowledge from young adulthood to midlife, Attachment & Human Development, DOI: 10.1080/14616734.2020.1832548

To link to this article: https://doi.org/10.1080/14616734.2020.1832548

Published online: 12 Oct 2020.

ATTACHMENT & HUMAN DEVELOPMENT
https://doi.org/10.1080/14616734.2020.1832548

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Convergent validity and stability of secure base script knowledge from young adulthood to midlife

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ABSTRACT

Attachment theory posits that early experiences with caregivers are made portable across development in the form of mental representations of attachment experiences. These representations, the secure base script included, are thought to be stable across time. Here, we present data from two studies. Study 1 (N = 141) examined the degree of empirical convergence between the two major measures of secure base script knowledge in Study 2, we examined stability of secure base script knowledge from late adolescence to midlife combining data from both a high- and normative-risk cohort (N = 113). Study 1 revealed evidence for convergent validity (r = .50) and Study 2 revealed moderate rank-order stability (r = .43), which was not moderated by cohort risk status. Results support the validity of secure base script knowledge assessments and prediction that attachment representations show moderate stability across early adulthood and into midlife.

ARTICLE HISTORY
Received 2 July 2019
Accepted 1 October 2020

KEYWORDS
Attachment; secure base script; stability; adulthood

Attachment theory proposes a life-span view on the development of intimate relationship functioning. Bowlby (e.g., Bowlby, 1969/1982, 1973, 1980) argued that early experience with primary caregivers shapes our expectations for support during exploration and comfort during times of distress. These expectations then become organized into a mental representation or internal working model of attachment. Mental representations of attachment are, in turn, carried forward across development and impact our cognitions and behaviors in a variety of developmental contexts (e.g., parenting or romantic partnership; Hesse, 2008; Main et al., 1985; Waters et al., 2018).

Based on insights from cognitive psychology (e.g., Schank & Abelson, 1977; see also Schank, 1999), Bretherton (1987) suggested that attachment representations may take the form of a cognitive script summarizing the important temporal-causal sequences relevant to attachment relationships and supportive caregiving. Waters and Waters (2006) built upon this idea, proposing that securely attached individuals represent their early

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experiences with sensitive caregiving as a temporal-causal sequence of effective secure base use and provision of support (i.e., the secure base script; Waters & Waters, 2006, in press). The proposed secure base script included eight key, sequentially organized elements: (1) the dyad is meaningfully engaged in the environment; (2) meaningful engagement is disrupted by some obstacle; (3) the child signals for support; (4) the attachment figure recognizes the signal and appropriately responds; (5) the child accepts this support; (6) the support effectively addresses the obstacle; (7) emotional comfort is offered and accepted; (8) meaningful engagement with the environment resumes.

Two primary measures for assessing secure base script knowledge have emerged in the attachment literature: the Attachment Script Assessment (ASA; Waters & Rodrigues, 2001; Waters & Rodrigues-Doolabh, 2004) and a secure base script scale for use with the Adult Attachment Interview (AAI_{sbs}; Waters & Facompré, in press; see Posada et al., 2019; Vaughn et al., 2019 for additional approaches used for toddlerhood). Both measures attempt to quantify individual differences in secure base script knowledge reflected in attachment narratives. The ASA uses a word-prompt methodology and asks participants to construct fictional narratives using a series of word lists outlining various attachment scenarios (e.g., a child falling off a bike and needing to go to the doctor). The ASA assumes that those who know the secure base script will see the attachment themes implicit in each story outline and thus construct narratives based on those outlines that follow the secure base script and elaborate on aspects of support seeking, responsive caregiving, comfort, and resolution/return to exploration. In contrast, the AAI_{sbs} assesses secure base script knowledge from autobiographical narratives produced during the semi-structured Adult Attachment Interview (AAI; Hesse, 2008; Main et al., 1985). This coding system focuses on identifying secure base expectations as well as secure base script structure presented in the narratives of early caregiving experiences produced during the AAI (see Table 1).

Despite notable methodological differences, the ASA and AAI both produce comparable secure base script content that can be coded using parallel scoring criteria emphasizing the extent to which an attachment narrative reflects and elaborates on the secure base script. In the last decade or so, numerous empirical findings support the notion that the secure base script is learned in the context of early caregiving experiences and linked with cognition and behavior in various attachment contexts (see Waters & Roisman, 2019 for a review). Several recent prospective longitudinal studies have linked the development of secure base script knowledge in adolescence and early adulthood with the quality of caregiving received during infancy and childhood. For example, Steele et al. (2014) examined links between maternal and paternal sensitivity observed across the infant and childhood periods in the Study of Early Child Care and Youth Development (SECCYD), a prospective, longitudinal study of normative risk families studied from infancy into adulthood. Both maternal and paternal sensitivity assessed multiple times during the first 15 years of life significantly predicted secure base script knowledge at age 18 years (see also Vaughn et al., 2016). Building on this work, Waters et al. (2017) examined secure base script development in the high-risk Minnesota Longitudinal Study of Risk and Adaptation (MLSRA). Replicating previous findings, they found that secure base script knowledge at age 19 years and 26 years were each predicted by a composite of maternal sensitivity assessments collected across the first 13 years of life. Schoenmaker et al. (2015) found additional evidence linking secure base script knowledge in young adulthood to prior caregiving experiences in a longitudinal study of genetically unrelated parent-child

Table 1. Parallel AAI_{sbs} and ASA Examples Illustrating Convergence.

Score	AAI_{sbs}	ASA		
	Can you remember what would happen when you were hurt physically? Do any specific incidents come to mind?	**Tommy**	**hurry**	**mother**
		bike	**doctor**	**toy**
		hurt	**cry**	**stop**
		mother	**shot**	**hold**
Low SBSK	Okay um, I do remember this um I live in a cul-de-sac and I had like this little Power Rangers bike and like I didn't have training wheels anymore at this point so I could- I was like a cool kid. I could bike around on my own and I thought it would be so cool to like- I didn't realize how physics worked yet. It wasn't even physics it was just like common sense. But I was just biking really fast and I was like let me try to find a new way to like stop this bike really quick. Let me hit the brakes, I would say. So I took my two front feet and clamped the front wheel but like the bike just flew over my head and I landed like on my face- like scratched my whole face up. **Do you remember how your parents responded when that happened?** They were confused and blamed me for being stupid – which I would have totally done too. But, oh, this was painful… my mom had to take an alcohol wipe and like wipe down my face. Ooo. And then she put a bandage on it I had like a chhh.	One afternoon, Tommy was riding his bike in front of his house. Before he got so far away from his house, he fell off of his bike, and he was hurt, but he was not hurt badly, he only had some scratches on his knees and elbows. So instead of going back home, he decided to go see a doctor. He was treated by the doctor, he got band aids, ointments on his injuries, he didn't cry, he wasn't that weak, after all. And since Tommy was young, the doctor contacted his mother, and his mother came to the doctor's office to pick Tommy up. And she thought he is badly injured, so she was crying, but as soon as she saw Tommy, she stopped crying because she realized that he wasn't injured that badly. On their way home, Tommy's mother asked Tommy why he went to the doctor's office instead of coming back home. Tommy answered that he didn't want mother to worry about him, so he instead went to the doctor's office. Tommy's mother decided to buy Tommy a toy on their way back home, so they stopped by a toy store, and after she got Tommy a toy, they held hands, went back home, happily.		
Instrumental Support	I fell off my bike. Still have the mark here – right here. Yeah the training wheel- in matter of fact, it wasn't- it wasn't a training wheel on the bike. It was- you know the part with the- the flagpole- that round thing? I was- I was speeding. I was riding a 5-speed bike and I was going around and around in circles and then I just took off. And as soon as I came back- and I was going real fast- and for some reason the bike fell and the brake caught the side of my leg and the bike piece was hanging out. That was when my mother was watching it. **What happened? How did she respond?** How did she respond? I probably don't remember. She cleaned it up and wrapped my leg up and that's all I remember.	One day, Tommy and his friends were hanging out at the park, and they were all riding their bikes. Tommy, fell and got extremely hurt. So his mother had to hurry to the park, pick him up, and all his friends came along to the hospital with them. They put Tommy in the emergency room, but he was too much of a strong boy to cry. He asked his mother, if he needed to get a shot, but she told him that he wouldn't have to, and that the doctor would be coming soon. Once, the doctor got to the room they were in, he brings Tommy a toy, and tells him to hold it close to where he hurts the most. He holds it close to his knee, and the doctor gives him an ice pack to stop the pain. At the end of the day, the mother brings Tommy home and everything is happy.		

(*Continued*)

Table 1. (Continued).

Score	AAI_{sbs}	ASA
High SBSK	I used to get injured a lot as a little kid. One time, in grade school I tried to jump off a picnic table outside at recess and ended up cutting my hand pretty bad, it was deep, when I fell. So, um, she came and picked me up like right away and carried me to the car. And like, she took me straight to the emergency clinic to get some stitches. **Can you talk a little bit more about that event?** Sure, I mean, I had done something I shouldn't have and cut my hand open on a rock or something when I hit the ground. School called her and she came as fast as possible and went immediately to the clinic, was by my side through it all, always telling me "you will be okay." **How did you react during that?** Oh, well, I believed her, that everything was going to work out and I didn't have to worry. She said stitches weren't a big deal and they weren't, so it ended up ok.	One day, Tommy was riding his bike. As he was riding his bike, he fell over and he got hurt. So he started crying and his mother hurried over immediately at the sound of his tears, and gave him a hug and told him that they would have to go to the doctor. So she bandaged up the cut herself, and she takes him to the doctor. All the way there he's crying, so the mother gives him his favorite toy so that he can be consoled. At the doctor's office, he's told that he has to get a shot, in order to make sure that his cut doesn't get infected, because it's really deep. So the mother holds his hand. As she does that, he's holding his toy in the other hand. Finally, after the shot is over, the mother gives the boy a hug and he stops crying. He holds onto her hand for the rest of the trip back to the car. He holds onto the toy for the ride home. He isn't crying anymore and he's feeling better.

dyads, suggesting further that secure base script knowledge is constructed from lived experience with caregivers. This evidence provides critical validation for the secure base script perspective on attachment representations as script theory predicts that any cognitive script should have its origins in recurring real world experiences (i.e., caregiving experiences in the case of the secure base script).

Beyond origins in early caregiving, attachment theory predicts that attachment representations are carried forward into novel developmental contexts and serve as a guide for relationship behavior and cognition. In line with this premise, secure base script knowledge has demonstrated positive associations with adaptive functioning in a variety of contexts. In terms of parenting behavior, secure base script knowledge has been linked with caregiving behavior and the quality of infant attachment in a variety of cultures and across high- and low-risk samples suggesting that the script plays a role in the provision of high quality caregiving (e.g., Bost et al., 2006; Coppola et al., 2006; Huth-Bocks et al., 2014; Monteiro et al., 2008; Vaughn et al., 2007; Waters, Raby, et al., 2018). Secure base script knowledge has also been positively linked to social competence in childhood (e.g., Fernandes et al., 2019; Nóblega et al., 2019; Posada et al., 2019; Shin, 2019), romantic relationship functioning during adulthood (Waters et al., 2013; Waters, Raby, et al., 2018), and caring for aging parents (Chen et al., 2013) indicating that the quality of relationships more generally are served by the secure base script.

Likewise, work examining the potential mechanisms by which secure base script knowledge impacts adaptive functioning has been examining its role in basic cognitive processes that may underlie caregiving and romantic behavior. For example, Groh and Haydon (2018) recently found that secure base script knowledge modulated mothers' neural responses to infant distress cues and their ability to identify their infants' facial expressions of distress (see also Groh et al., 2015). Waters et al. (2018) found that mothers' ability to observe and characterize high and low quality parenting was positively associated with their own secure base script knowledge. Overall, the emerging literature on secure base script knowledge suggests that it reflects prior caregiving experiences, plays a role in guiding behavior in attachment contexts, and impacts cognitive processing of attachment relevant information. Further, these results are largely consistent across secure base script measurement approaches as both measures have been linked with early caregiving experiences, parenting behavior, and relationship functioning outside the parenting context (e.g., romantic partnership).

Stability of attachment representations across context and over time is one of the primary assumptions underlying Bowlby's theory regarding the role of attachment representations in adaptive functioning. For early experience with caregivers to have a lasting impact, attachment representations must not only be formed from early experience but also be maintained across relatively long periods of time and across key developmental transitions (e.g., from middle childhood to adolescence or adolescence to adulthood). Examinations of attachment stability in the developmental literature have largely focused on shorter durations and provided mixed results. Further, data indicates that attachment stability may differ by risk status with lower stability in higher risk groups especially among securely attached infants (e.g., Pinquart et al., 2013; Vaughn et al., 1979). Longer term stability from infancy into adulthood has been shown to be quite modest overall (e.g., Groh et al., 2014; Raby et al., 2013; for a meta-analytic review, see Pinquart et al., 2013).

To date, however, much less work has examined the stability of attachment representations later in life, especially over long durations. This work is critical because it can provide a bridge between attachment development during childhood and parenting and romantic behavior later in life. To this end, some work has examined the stability of secure base script knowledge in adulthood. Vaughn et al. (2006) found moderate test-retest reliability in a normative-risk sample over a one-year period with the ASA. Likewise, Waters et al. (2017) found similar stability in secure base script knowledge across a seven-year period from late adolescence to young adulthood in a high-risk sample using the AAI_{sbs}.

Although work on secure base script knowledge suggests greater stability in attachment representations during adulthood compared to the modest stability observed from infancy to adulthood, work on this topic is limited. In addition to the limited data on secure base script stability, researchers have yet to take advantage of the multiple approaches to assessing secure base script knowledge when examining stability that might serve to minimize the potential impact of common method variance (e.g., Podsakoff et al., 2003) on estimates of stability. Common method variance refers to the spurious variance shared between two or more assessments that stems from the measurement method or context rather than to the underlying constructs of interest. Common method variance can lead to significantly inflated intercorrelations. As such, the current data for the secure base script, which relies on either the ASA or the AAI_{sbs}, may significantly over-estimate the stability of the construct. To address this, researchers can adopt multiple remedies (Podsakoff et al., 2003) including the use of different measurement tools and response formats (e.g., utilizing the ASA and the AAI_{sbs} in combination). In addition to the potential overestimation of stability due to common method variance, the longest latency between secure base script assessments currently reported in the literature has been seven years (age 19 years to 26 years in the MLSRA). This makes it difficult to compare findings with the longer latencies presented in the infancy-to-adulthood work and leaves a significant gap in our knowledge of longer term stability of attachment later in life. This is a significant gap given that young adulthood through midlife is a time when numerous attachment relevant changes likely take place including parenthood, marriage, and caring for aging parents.

Current investigation

To address two major gaps in the adult attachment literature on the secure base script, the convergent validity of the two primary assessment tools and long-term stability, we conducted two studies. The first study provides the first examination of convergent validity of the ASA and the AAI_{sbs}. An examination of convergent validity is critical as it further validates the secure base script construct and provides a benchmark to compare stability correlations using the two measures. Building on Study 1, the second study examines the stability of secure base script knowledge across a 20-year period from young adulthood to midlife in a normative-risk and a high-risk sample using the two primary measures of secure base script knowledge to minimize common method variance.

To examine convergent validity between the AAI_{sbs} and the ASA (Study 1), data were drawn from two samples. The first sample was drawn from a study of college students

from two northeastern US universities (for full sample characteristics, see Dagan et al., 2018). Data from the second sample was based on recent coding of archival data retrieved from a study of engaged couples recruited from the longitudinal Stony Brook Relationship Project (e.g., Crowell, Treboux, Gao et al., 2002; Crowell, Treboux, Waters et al., 2002) in which only a subsample received both the AAI and ASA during a follow-up wave (see Waters & Rodrigues, 2001). Participants in both cohorts were administered two concurrent attachment assessments used to tap individuals' knowledge of the secure base script. The first of these was the ASA, a narrative-based task that includes telling fictional attachment stories about events that might elicit secure base use and support. The second was the AAI, a retrospective, autobiographical interview focused on early relationships with primary caregivers. AAIs were coded for secure base-related expectations and event memories using the AAI_{sbs} scale (Waters & Facompré, in press). Prior research examining the convergent validity of secure base script knowledge was not available; thus, making a specific point prediction was difficult. However, convergent validities above $r = .70$ are recommended and those below $r = .50$ are considered a potential cause for concern (e.g., Carlson & Herdman, 2012). As such, we hypothesized a statistically significant bivariate association between the two measures of secure base script knowledge, with a moderate to large effect size (i.e. $r > .50$) for Study 1. Further, we predicted that this association would be robust to the inclusion of demographic covariates.

In Study 2, we present an investigation of the stability of the secure base script from early-adulthood into mid-life by combining data from two longitudinal samples: The MLSRA, an ongoing investigation of children born into poverty, and the Minnesota Longitudinal Study of Attachment (MLSA), which focused on normative-risk families (e.g., Waters et al., 2000). In both cohorts, participants were administered the AAI during early adulthood that were later coded for secure base script knowledge using the AAI_{sbs} (Waters & Facompré, in press; see also Waters et al., 2013). In midlife, participants were administered the ASA as part of larger data collection efforts (e.g., Martin et al., 2018). Based on previous stability data for secure base script knowledge (i.e., Waters et al., 2017), we predicted statistically significant stability with a moderate effect size. Further, we predicted that this association would be robust to the inclusion of demographic covariates.

Study 1

Method

Participants

Participants were drawn from two samples comprising a total of 141 adults from urban and suburban communities in New York, US. The first sample (Dagan et al., 2018) included 85 young adults recruited through two undergraduate subject pools. Of these, six participants were non-native English speakers and their English language difficulties were significant enough that their AAIs were deemed uncodable and subsequently excluded from the analyses. Three participants demonstrated insufficient English fluency and/or had an incomplete attachment interview; three others failed to complete both attachment assessments. Of the 80 participants for whom complete attachment data were available, all were currently enrolled in a four-year undergraduate college. The

sample ranged in age from 18 to 24.6 years (M = 20.5, SD = 1.7) and 61 (76.3%) reported their biological sex as female. Forty-six percent of the sample reported their ethnicity as White, with 26.3% Asian, 12.5% Hispanic, 5.0% African American, 1.3% Pacific Islander, and 8.8% reporting "Other".

The second sample included a subsample of 56 engaged women recruited for the longitudinal Stony Brook Relationship Project (e.g., Crowell, Treboux, Waters et al., 2002; Waters & Rodrigues, 2001). Two participants were excluded because they did not have complete attachment data. Of the 54 participants with complete data, their age ranged from 20.5 to 26.44 years (M = 23.93, SD = 1.53). All but two participants in the sample reported their ethnicity as White (96.3%), with 1.9% reporting Hispanic, and 1.9% reporting "Other". Participants were generally well educated. Approximately thirty-four percent (34%) completed high school, 7.6% percent received an associate's degree, 47.2% percent received their bachelor's degree, and 11.3% percent received an advanced degree. Education level was unavailable for one participant, so the above percentages reflect a sample of 53. Taken together, the current study included 134 participants across both samples. All data collection received Institutional Review Board approval.

Procedure

Participants in the college sample attended one laboratory session (approximately 90–120 minutes) and received research credit for their participation in the study. After obtaining consent, participants were asked to answer a series of basic demographic questions. Participants were then administered two attachment assessments in a set sequence, starting with the AAI and followed with the ASA. Additional (unrelated) tasks spanning 20 minutes were administered between both attachment assessments. AAIs and ASAs were digitally recorded and later transcribed verbatim for coding and analysis. Similar administration procedures were implemented in the Stony Brook Relationships Project but participants visited the lab with their romantic partner (although AAIs and ASAs were collected one-on-one with the experimenter) and received financial compensation for their visit. Full details on the data collection procedures can be found in Dagan et al. (2018; for sample 1) and Crowell, Treboux, Waters (2002; for sample 2).

Measures

The adult attachment interview. The AAI (George et al., 1987) is a 20-question semi-structured interview which asks participants to describe early-caregiving relationships (before the age of 13) with primary caregivers. Participants are prompted to recall specific event memories about their relationships in childhood, describe experiences of trauma and loss, and evaluate how their childhood relationships and experiences influence who they are today. AAI transcripts are traditionally coded for narrative coherence and assigned a three- or four-way attachment classification. The AAI has demonstrated good validity, stability, and reliability (Bakermans-Kranenburg & Van IJzendoorn, 1993) and has been used extensively in attachment research. In recent years, an alternative coding procedure for the AAI has been developed to assess the extent to which participants conceptualize relationships with primary caregivers in terms of a secure base script. Using a 9-point scale, the AAI_{sbs} measures individual differences in secure base script knowledge from implicit or explicit secure base-related expectations and recall of secure base-related memories.

At the upper end of the AAI_{sbs} scale, a score of nine represents the strongest evidence that the interviewee is organizing their experiences in terms of a secure base script. These transcripts typically include several generalized secure base expectations as well as two or more well-elaborated event-memories that demonstrate secure base use and support. Scores between four and nine reflect differences in the number of secure base scenes and expectations as well as the elaboration of such content. Transcripts that are mostly event-focused and include little to no secure base script content are scored a three. Scores between one and two are reserved for transcripts that include expectations or event memories that directly contradict the secure base script (i.e., proximity seeking is met with hostility or rejection). Previous research (e.g., Waters et al., 2017) indicates that the AAI_{sbs} scale has a significant positive correlation with the coherence of mind scale from the traditional AAI coding system, which is the primary scale used to assess attachment security from the interview (e.g., Hesse, 2008). Links between the AAI_{sbs} and other approaches to coding AAI transcripts have yet to be explored.

AAI transcripts were assessed for secure base script knowledge using the AAI_{sbs}. AAI_{sbs} means and standard deviations for the college- and engaged women-sample were 3.08 (1.80) and 4.28 (1.80), respectively. The AAI_{sbs} mean and standard deviation for the full sample (N = 134) was 3.56 and 1.89. Seventy-three percent of transcripts from the full sample were double-coded by two reliable coders who were blind to participants' ASA scores. Inter-rater reliability with absolute agreement was high in each sample subset (ICC = .93, $p < .001$ for college sample; ICC = .85, $p < .001$ for engaged couples sample) and remained high when estimating reliability on the full sample (ICC = .90, $p < .001$). Disagreements between raters were resolved through discussion and consensus scores were used when available.

The attachment script assessment. The ASA is a narrative-based task that measures the degree to which individuals have knowledge of the secure base script. The adult version of the ASA used in this study includes four attachment-related story prompt outlines that feature both parent-child dyads and adult-romantic relationships, as well as two neutral stories depicting friendships. The attachment related outlines describe various challenges and stressors that might elicit secure base use and support (e.g., falling off a bicycle and getting injured, difficulties experienced during a camping trip). Each prompt word outline suggests a general story structure (i.e., beginning, middle, and end). To highlight individual differences in secure base script knowledge, participants are encouraged to tell narratives with as much information and detail as possible. As opposed to narrating in the first person or providing autobiographical accounts, participants are instructed to narrate stories about the fictional characters in the third person.

Each story is scored for secure base script knowledge on a seven-point scale. Scores between four and seven indicate the presence of secure base script knowledge, with higher scores in this range reflecting greater elaboration on elements central to the secure base script (e.g., seeking support when distressed, receiving effective instrumental support and emotional comfort). Event-focused narratives that focus mostly on instrumental care and provide minimal secure base content are typically assigned a score of three. Attachment narratives are assigned the lowest scores on the scale, ranging between one and two if they contain content that directly contradict the secure base script.

ASA transcripts were double-coded by two trained and reliable coders. Both coders were blind to participants' AAI_{SB} scores. ASA means and standard deviations for the college- and engaged women-sample were 2.85 (.75) and 3.98 (1.57), respectively. The ASA mean and standard deviation for the full sample (N = 134) was 3.30 and 1.28. Inter-rater reliability with absolute agreement was high in each sample subset (ICC range = .87 – .95, ps < .001 for college sample; ICC range = .95 – .97, ps < .001 for engaged couples sample) and remained high when estimating reliability on the full sample (ICC = .94 – .95, p < .001). Disagreements between raters were resolved through discussion.

Results

To explore the convergent validity of secure base script scores from the ASA and the AAI_{sbs} (N = 134) we computed bivariate correlations between both attachment assessments alongside basic demographic variables. These results are summarized in Table 2. The convergence of secure base script knowledge was statistically significant, positive, and moderate in magnitude (r = .50, p < .001) and was in line with our prediction, placing the convergent validity of the two secure base script measures at the lower end of the acceptable range (e.g., Carlson & Herdman, 2012). To examine the potential impact of demographic variables, the partial correlation between the ASA and AAI_{sbs} was calculated controlling for age, biological sex, and ethnicity (dichotomized; White/non-White). Results remained significant at p < .001 with a partial correlation of r = .46 indicting that potential demographic confounds had little impact on the observed convergent validity despite the significant correlations between both script measures and each of the demographic variables (except for AAI_{sbs} and biological sex which was not statistically significant).

Discussion

The convergent validity results supported the argument that the AAI_{sbs} assesses secure base script knowledge in the AAI and represents the first examination of convergent validity with the secure base script construct. Further, this result provides additional validation for the AAI_{sbs} beyond the currently available stability, developmental antecedents, and predictive significance data. The development and use of multiple assessment tools for the secure base script gives researchers more flexibility both in terms of measurement and research design, including pre-post designs aiming to minimize common method variance as a confound by using multiple methods for assessing secure base script knowledge.

Table 2. Convergent Validity of Secure Base Script Knowledge Assessed by the AAI_{sbs} and ASA, and Covariates.

	1.	2.	3.	4.	5.
1. AAI_{sbs}	––				
2. ASA	.50**	––			
3. Age	.19*	.34**	––		
4. Sex	–.14	–.21*	–.32**	––	
5. Ethnicity	–.25**	–.26**	–.38**	.15	––

Note. Correlations reported pairwise (N range = 134–139); Biological sex coded as 0 = female, 1 = male; Ethnicity coded as 0 = White, 1 = Non-White; ** p <.01, * p <.05

It is important to note that the convergent validity was at the low-end of the acceptable range of bivariate correlation coefficients. This may have been due, in part, to the fact that the adult version of the ASA used here consists of both parent-child and adult romantic partner storylines whereas the AAI focuses only on parent child relationships. Examining the convergent validity between the AAI_{sbs} and the adolescent version of the ASA, which focuses only on parent-child stories, is an important next step to further evaluate the convergent validity of secure base script measures. It is also important to note that the secure base script measures were significantly correlated with several basic demographic variables. Although these associations did not substantially impact the effect of interest (i.e. the convergent validity of the two script measures), these findings indicate that future work should be mindful of the potential impact of demographic characteristics on secure base script knowledge and be sure to include them as covariates.

Study 2

Method

Participants

Participants included 113 individuals drawn from two longitudinal samples that began in Minneapolis, MN. The first sample included families living under conditions of normative-risk recruited during the early 1970s and who were assessed as part of the larger MLSA (e.g., Waters et al., 2000). All families were intact at the time of enrollment and covered the full economic range of lower-middle to upper-middle class (see Waters, 1978). Fifty-two participants completed the AAI at age 20 years. Forty-one of these participants were located and contacted at age 41 and agreed to participate in the ASA. Two participants were dropped from the analyses due to lost or damaged AAI data files. Of the 39 participants with complete attachment data, 64.1% were female and all reported their ethnicity as White.

Participants in the second sample, characterized as high risk, included 74 individuals born to mothers (45% in their teenage years) living in poverty with the majority being single mothers and the entire sample receiving health related government assistance. This cohort was followed from birth as part of the larger MLSRA (see Sroufe et al., 2009). Participants in this study completed the AAI at age 19 years and the ASA at age 39 years. Only participants with available attachment data at both time points were included in the current study. Forty-three (58.1%) of the participants were female and 63.5% of the sample reported their ethnicity as White. For additional details on this subsample, see Martin et al. (2018). All data collection received Institutional Review Board approval.

Procedure

The protocol for the normative-risk MLSA included a brief demographic questionnaire followed by the ASA and a non-attachment related autobiographical interview about significant life events (e.g., McAdams, 2001). Similarly, individuals participating in the high-risk MLSRA completed a demographic questionnaire, the ASA, as well as a series of cognitive, psychophysiological, and physical health assessments as part of a larger data collection effort. For further details, see Martin et al. (2018).

Measures

The adult attachment interview. AAIs were administered following the same procedures described in Study 1. In the normative-risk MLSA sample, AAI_{sbs} means and standard deviations were 3.96 and 2.28 for the full sample (N = 50), and 3.81 and 2.35 for the subsample that included follow up ASA data at age 41-years (N = 39). Thirty-seven (94.9%) AAIs with complete attachment data were double coded by two trained and reliable coders. Discrepancies were resolved through consensus and inter-rater reliability with absolute agreement was high (ICC = .92, $p < .001$).

In the high-risk MLSRA sample, AAI_{sbs} means and standard deviations were 3.33 and 1.67 for the full sample (N = 169), and 3.00 and 1.65 for the subsample that included follow-up ASA data at age 39-years (N = 74). AAIs from the MLSRA were coded by two trained and reliable coders, with 54% of the age 19-year AAIs double coded. All disagreements were resolved through consensus. Inter-rater reliability with absolute agreement was high (ICC = .83, $p < 001$).

The attachment script assessment. ASAs were administered following the same procedures described in Study 1, with the same version being administered across all studies and all samples. In the normative-risk MLSA, the mean and standard deviation for the composited ASA (N = 39) was 3.44 and 1.19, respectively. In the high-risk MLSRA, the mean and standard deviation for the included subsample (N = 74) was 3.18 and .83, respectively. In the MLSA, 20 of the available 41 ASAs (48.8%) were double coded. Inter-rater reliability with absolute agreement was high for each story (ICC range = .87 to .95, $ps < .001$). In the MLSRA, all attachment stories were double coded. Inter-rater reliability with absolute agreement was high for each story (ICC range = .85 to .93, $ps < .001$). In both samples, discrepancies were resolved through consensus.

Results

To examine the longitudinal stability of secure base script knowledge, we first examined the bivariate correlations between the AAI_{sbs} at Time 1 (young adulthood) with the ASA at Time 2 (midlife) along with biological sex, ethnicity (dichotomized; White/Non-White), and risk status (dichotomous; normative-risk/high-risk). These results are summarized in Table 3. As hypothesized, secure base script knowledge assessed by the AAI_{sbs} in early adulthood was significantly correlated with ASA scores 20 years later, r = .43, $p < .001$ (N = 113). Results remained significant at $p < .001$ when including biological sex, ethnicity, and risk status as covariates (partial correlation r = .42).

Table 3. Stability of Secure Base Script Knowledge from Early Adulthood (AAI_{sbs}) to Midlife (ASA).

	1.	2.	3.	4.	5.
1. AAI_{sbs}	––				
2. ASA	.43**	––			
3. Sex	.06	–.13	––		
4. Ethnicity	–.19**	–.10	.05	––	
5. Risk	–.10	–.13	.14*	.26**	––

Note. Correlations reported pairwise (N range = 113–308); Biological sex coded as 0 = female, 1 = male; Ethnicity coded as 0 = White, 1 = Non-White; Risk status coded as 0 = normative-risk, 1 = high-risk; ** p <.01, * p <.05

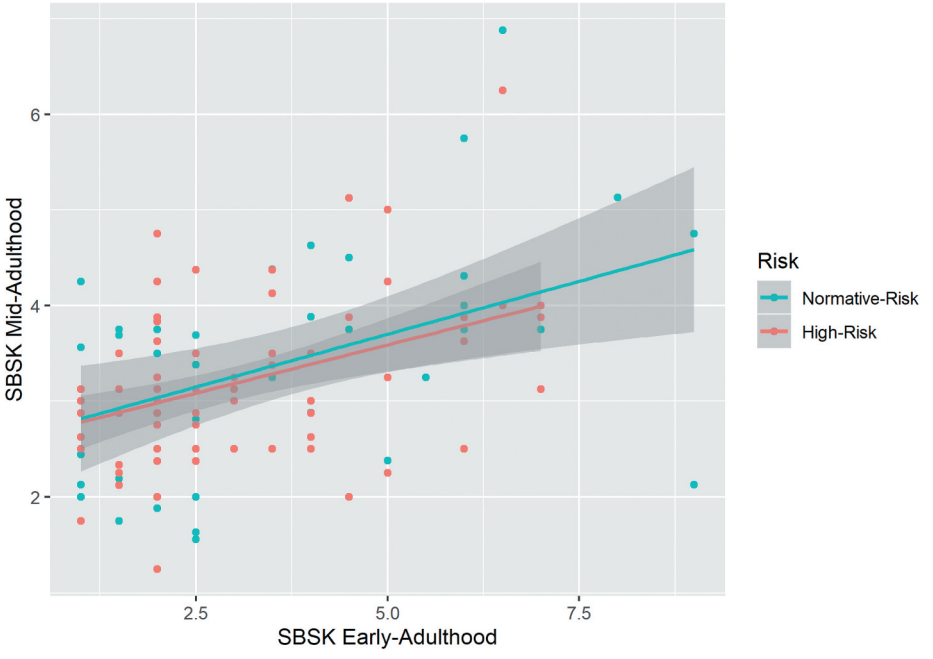

Figure 1. Moderation analysis of attachment stability by risk status.

Next, given previous work indicating less security and greater instability of attachment in higher risk contexts (e.g., Fraley, 2002; Pinquart et al., 2013) along with the observed mean level differences, we explored differences between the MLSA and the MLSRA cohorts on secure base script knowledge at the mean level as well as in terms of risk status moderating stability. Secure base script scores in the MLSA were significantly higher compared to secure base script scores in the MLSRA in early-adulthood ($t(111) = 2.13$, $p = .04$, $d = .81$), but not at midlife ($t(111) = 1.32$, $p = .19$, $d = .25$). Next, we examined whether or not risk status, based on characterization of each cohort at their inception (see Sroufe et al., 2009; Waters, 1978), moderated the stability finding. Moderation analyses were conducted using PROCESS, a macro for SPSS that produces bias corrected bootstrapped confidence intervals for mediation, moderation, and conditional process analysis using Ordinary Least Squares estimation (Hayes, 2013). Results indicated that stability in secure base script knowledge (normative-risk MLSA, $r = .44$, $p = .005$; high-risk MLSRA, $r = .40$, $p < .001$) was not moderated by risk-status of the two cohorts ($B = -.02$, $p = .83$; see Figure 1). Conditional analyses did not substantially differ with the inclusion of demographic covariates. In addition, the demographic variables were not significant moderators of stability in our data.

Discussion

Results indicated statistically significant stability in secure base script knowledge across a roughly 20-year period spanning from young adulthood to midlife. This result replicates and extends previous work showing significant stability in secure base script knowledge

over shorter durations across adulthood. In addition, secure base script knowledge was significantly correlated with ethnicity in Study 2 ($r = -.19$, $p < .01$), as it was in Study 1, with White participants scoring hire on script knowledge. Unfortunately, the present studies were not well positioned to further explore this association. Future work should consider an explicit focus on unpacking observed links between ethnicity and secure base script knowledge. Again, researchers should also, at the very least, be mindful of these links and utilize demographic covariates in their studies.

In this study, rank order stability was examined using two different measures of secure base script knowledge, the AAI_{sbs} and the ASA, which helps eliminate potential contributions of common method variance to our estimate of stability. In contrast to early evidence that stability in attachment security from infancy to young adulthood is small in magnitude and potentially moderated by risk status (e.g., Fraley, 2002; but see Groh et al., 2014; Raby et al., 2013), stability in secure base script knowledge across the early adulthood to midlife period was moderately stable and showed no evidence of being conditional on risk status. In contrast, risk status was related to mean-levels of secure base script knowledge; at least in young adulthood. Unfortunately, given subsample differences in available demographic and contextual information, we were unable to explore additional moderators in the current study that may help account for which individuals were more likely to remain stable or to explore elements of lawful change. Future work is needed to help understand additional predictors of stability and change in secure base script knowledge (see Waters et al., 2019).

General discussion

We set out to address two significant gaps in the adult attachment literature on secure base script knowledge. First, the issue of convergent validity of the two primary assessments of secure base script knowledge in adults (i.e. ASA and AAI_{sbs}) had yet to be examined. Demonstrating convergent validity between these two measures would allow for researchers to more confidently employ these assessment tools in their studies, as well as allow for more general conclusions about secure base script knowledge to be drawn across studies using the different measures. Second, we sought to examine the long-term stability of secure base script knowledge across the young adult to midlife period. Examining stability across this period is critical as numerous significant life events with potential to impact attachment representations occurs (e.g., marriage, divorce, birth of children) and, to date, no study had examined stability of attachment representations assessed in any manner across this developmental period. In addition, attachment security over similar latencies earlier in life (i.e., infancy to late adolescence/young adulthood) have shown minimal to non-trivial stability and raised questions about the stability of attachment more generally.

Study 1 presented the first test of convergent validity between two measures of secure base script knowledge. Results indicated a moderate correlation between the two predominant measures of the secure base script used with adult samples. In Study 2 we examined the long-term stability of secure base script knowledge over a roughly 20-year period spanning young adulthood and extending into midlife in a high-risk and a normative-risk sample. Moderate stability in secure base script knowledge was observed and this stability was not moderated by risk status. The results from both studies support

the prediction that attachment representations show non-trivial stability across early adulthood and into midlife. In addition, the data indicate that this stability is not attributable to common method variance.

Previous work examining the validity of secure base script knowledge assessments have found evidence of theory-consistent antecedents (e.g., Steele et al., 2014; Waters et al., 2017), behavioral (e.g., Waters et al., 2013) and cognitive correlates (e.g., Waters, Corcoran, et al., 2018), as well as moderate and long-term test-retest reliability (Vaughn et al., 2006; Waters et al., 2017). However, developmental research on convergent validity of representation-based attachment assessments in adulthood have been extremely rare. As such, the observed convergent validity using two independent measures of secure base script knowledge represent a significant step forward in terms of establishing the validity of the secure base script construct and opens up new opportunities to study stability and change in attachment representations with reduced concerns over common method variance.

Stability in behavioral patterns and later internal working models of attachment has long been a cornerstone of validation of any attachment construct. Beyond validation, attachment (in)stability has also been the source of some of the strongest critiques of Bowlby's theory. Early criticism of attachment research in infancy emphasized how little stability was observed at the level of discrete behaviors in the caregiving context (e.g., Masters & Wellman, 1974). In response to these criticisms, attachment researchers set out to examine stability of individual differences in attachment and establish principles of lawful change (e.g., Booth-LaForce et al., 2014; Sroufe & Waters, 1977; Waters, 1978). Results from the past 40-plus years of research on attachment stability have provided mixed results, with smaller than expected long-term stability in attachment security from infancy to young adulthood (e.g., Groh et al., 2014) and generally less stability (short or long term) in higher-risk samples (e.g., Pinquart et al., 2013). It is worth noting, however, that attachment insecurity is more strongly linked with home-observation based assessments of early caregiving compared to security assessed via the Strange Situation Procedure (SSP; Ainsworth et al., 1978/2015; see Haydon et al., 2014; Steele et al., 2014). This suggests that stability during the childhood and early adolescent period may actually be higher than the meta-analytic estimates based on SSP to AAI associations (e.g., Groh et al., 2014).

That said, stability in attachment across the adulthood period has received far less attention (but see Crowell, Treboux, Waters et al., 2002). Similar to what has been observed in stability work in the field of adult personality traits (e.g., McCrae & Costa, 1994), findings from this study suggest that as we get older our attachment expectations, and perhaps our behavior as well, may become increasingly consistent. There are a variety of processes that may underlie this potential increase in stability including biological factors such as decreases in plasticity and cognitive functioning related to biological maturation and/or learning (e.g., Burke & Barnes, 2006). From a more cognitive perspective, secure base script knowledge may increase in stability across the lifespan through a process similar to cognitive entrenchment, such that as more experience/expertise is acquired in a specific domain (i.e., attachment relationships) the more entrenched, inflexible, and stable an individual becomes within that domain (e.g., Dane, 2010). Similar predictions, of increasing stability with age, are made under prototype models of developmental dynamics as well (see Fraley, 2002). Future work will be needed to

evaluate the possibility that attachment stability increases later in life as well as what may be potential underlying causes.

Despite the non-trivial stability correlation observed in Study 2, it is important to note that the overall effect size was moderate and indicated substantial rank-order change also occurred during the two time points. Future work would be well served by exploring lawful change in secure base script knowledge across adulthood keeping with the tradition of work done on change in attachment during infancy, childhood, and adolescence (e.g., Allen, McElhaney, Kuperminc & Jodl, 2004; Booth-LaForce et al., 2014; Grossmann et al., 1999; Waters et al., 2000; Weinfield et al., 2000). Experiences with personal mental or physical health issues, mental or physical health issues of romantic partners or children, financial or occupational stress, marriage, divorce, and remarriage might all contribute to changes in adult attachment representations more generally, and secure base script knowledge specifically. To date, however, no studies have examined factors that contribute to change in secure base script knowledge during adulthood.

Unfortunately, we were unable (and underpowered) to explore moderators of stability due to several limitations to the current study, including modest sample sizes, modest diversity, and limited data on contextual factors during the interval between waves. Interestingly, in a multi-wave longitudinal study from middle childhood to adolescence, Waters et al. (2019) found that mild daily hassles/stress (e.g., falling out with peers) predicted increases in secure base script knowledge when experienced in the three months prior to assessment. They argued that mild stressors offer an opportunity for individuals to practice secure base use and support across a variety of contexts, perhaps leading to a more generalized and consolidated attachment representation. In contrast, however, Ruiz et al. (2019) found that life stress in a high-risk sample of children was negatively related to secure base script knowledge. They argued that high levels of environmental stress, especially early in life, may serve to undermine secure base script development. The complex relations between type of stress and timing of exposure remain largely unexplored with respect to the secure base script. The stability findings presented here, and elsewhere in the literature, are promising but future research is needed to better understand when and why some individuals remain stable in their secure base script knowledge and others change.

The results of this study also carry with them several important methodological implications. Our convergent validity results (Study 1) suggest that future work can explore issues related to stability and change in the secure base script using the ASA and AAI in combination, allowing them to at least partially account for common method variance. It also suggests that researchers need not choose a single approach to assessing adult attachment representations. Rather, researchers can collect full AAIs and code those transcripts with both the traditional coherence based scoring system and effectively assess the secure base script from those same transcripts using the AAI_{sbs}. This will allow future research to tease apart the relative contributions of each representational construct to attachment behavior and evaluate what factors contribute to change universally across attachment representational constructs and which, if any, disproportionately affect one representational construct over the other. Finally, the results from this study serve to bridge the two emerging literatures on secure base script knowledge, one focused on the ASA and the other on the AAI_{sbs}.

Overall, this paper set out to systematically study the convergent validity and stability of secure base script knowledge using the two primary assessment tools of script knowledge for adult samples. Findings were generally supportive of the view that these assessments tap into the same underlying construct and that this construct is moderately stable across long periods of adult development (roughly twenty years) irrespective of risk-status during early development. In the larger context of research on attachment stability, our results suggest that attachment security may increase as individuals move into later and later developmental periods.

Acknowledgments

The authors would like to thank all the individuals who participated in this research. The authors would also like to acknowledge the recent passing of Dr. Lisa Rodrigues-Doolabh. Without Dr. Rodrigues-Doolabh's early work on the development of the Attachment Script Assessment this research would not have been possible. She made lasting contributions to the study of attachment and will be greatly missed.

Disclosure statement

In accordance with Taylor & Francis policy and my ethical obligation as a researcher, I am reporting that the authors of this manuscript have no interests to disclose.

Funding

Research reported in this publication was supported by the National Institute on Aging under Award Number R01 AG039453 to Jeffry A. Simpson and by the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development under Award Number F32 HD078250 to Theodore E. A. Waters. The content is solely the responsibilities of the authors and does not necessarily represent the official views of the National Institutes of Health. The authors would like to thank all those who participated in this research.

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