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Taxometric Analysis of Secure Base Script Knowledge in Middle Childhood Reveals Categorical Latent Structure

Theodore E.A. Waters and Christopher R. Facompré
New York University—Abu Dhabi

Adinda Dujardin, Magali Van De Walle, Martine Verhees, and Najda Bodner
University of Leuven

Lea J. Boldt
University of Iowa

Guy Bosmans
University of Leuven

Taxometric investigation of scripted attachment representations in lateadolescence and adulthood suggests that variations in secure base script knowledge consist of differences in degree (dimensional latent structure) rather than differences in kind (categorical latent structure). However, the latent structure of secure base script knowledge in younger cohorts has gone unexplored. This study presents a downward extension of prior taxometric work using the middle childhood version of the Attachment Script Assessment in a cross-sectional sample of 639 normative-risk children (age 8 to 13 years; $M = 10.77$, $SD = 1.06$). Results suggest that secure base script knowledge in middle childhood is categorically distributed. Taxometric curves revealed three distinct taxa, highlighting discontinuity in the latent structure of scripted attachment representations across development.

Bowlby's (e.g., Bowlby, 1969/1982, 1973) attachment theory proposes that the quality and consistency of early caregiving experiences is internalized by the child as a mental representation, or Internal Working Model (IWM), of attachment relationships. Individual differences in attachment are further reflected in the IWM such that children who receive consistent sensitive care are likely to conceptualize close others as available, competent, and supportive. Conversely, when parental care is inconsistent, insensitive, or rejecting, insecure attachments develop and the IWM reflects uncertainty in the availability and competency of caregivers. Attachment representations are expected to be stable across the transition from early childhood to adulthood. They are also thought to serve as a key mechanism by which early caregiving experiences shape cognitions, emotions, and guide behavior throughout life. Although the implications of attachment representations for a diverse suite of developmental outcomes and processes are well documented (e.g., Steele et al., 2014; Vaughn et al., 2007; Waters, Bosmans, Vandevivere, Dujardin, & Waters, 2015; Waters, Brockmeyer, & Crowell, 2013; Woodhouse, Ramos-Marcuse, Ehrlich, Warner, & Cassidy, 2009), by comparison, the nature and structure of attachment representations across development is less understood.

Research suggests that secure IWMs consist, at least in part, of a cognitive script which summarizes the temporal-causal structure of supportive and effective care during times of need (i.e., the secure base script; Waters & Waters, 2006). Cognitive scripts, more generally, have certain features or properties that provide insight into how the secure base script may develop across the lifespan. Specifically, scripts are (a) learned holistically (i.e., as a sequence of events containing a clear beginning, middle, and end); (b) generalized across similar or related contexts; and (c) elaborated with exposure to different script-relevant experiences (e.g., Schank,

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Correspondence concerning this article should be addressed to Theodore E.A. Waters, Department of Psychology, New York University—Abu Dhabi, Abu Dhabi, United Arab Emirates. Electronic mail may be sent to theo.waters@nyu.edu.

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1999; Schank & Abelson, 1977). Schank and Abelson (1977) suggests that these dynamic memory structures are well-suited for storing and organizing information about a wide variety of events and activities. The "restaurant script," for example, is initially acquired from a small set of dining experiences but becomes elicited even when eating at novel restaurants. As new and unique restaurants are explored, the script increases in detail and becomes elaborated to include idiosyncratic information (e.g., guests might be prompted to check their coat at a certain upscale restaurant). In this way, having temporally-organized, yet flexible, knowledge structures prepare us for navigating both familiar and unfamiliar situations.

To date, studies examining processes related to secure base script development have primarily focused on acquisition rather than on organization or elaboration. For example, the origins of secure base script knowledge have been well documented with studies finding significant links between script knowledge and parenting quality across childhood in normative-risk, high-risk, and genetically unrelated parent–child dyads (Schoenmaker et al., 2015; Steele et al., 2014; Vaughn et al., 2016; Waters, Ruiz, & Roisman, 2017). Although it is clear that sensitive care plays an important role in the *construction* of attachment representations, questions pertaining to how secure base script knowledge is organized, generalized, and elaborated have gone mostly unexamined.

Given that scripts are thought to emerge in a holistic but relatively unelaborated form, and then undergo a process of elaboration (Schank & Abelson, 1977), it is possible that the secure base script follows a similar trajectory. The secure base script may initially emerge in an "all or nothing" fashion with individual differences reflecting categorical distinctions (i.e., secure or insecure). However, as more relationships are explored, new attachments form (e.g., with peers and romantic partners), and opportunities to build and elaborate on the secure base script are encountered, individual differences may shift to reflect a matter of degree (i.e., being more or less secure) rather than kind. An exploration of the latent structure of secure base script knowledge at different developmental stages could substantially advance our understanding of how scripted attachment representations may change and evolve over time, as well as how scripts are constructed and evolve more broadly.

The taxometric method has become ubiquitous in research investigating latent structure in a variety of domains (Meehl, 1973; Meehl & Yonce, 1996; Waller & Meehl, 1998). Attachment research has a long tradition of defining individual differences in attachment as discrete patterns or classifications. As such, questions concerning taxonicity have been of particular interest to attachment researchers (Fraley, Hudson, Heffernan, & Segal, 2015; Fraley & Spieker, 2003; Roisman, Fraley, & Belsky, 2007). Interestingly, a first taxometric study of secure base script knowledge in late adolescence and in adulthood revealed dimensional latent structure at both ages (Waters, Fraley, et al., 2015). Script theory suggests that individual differences in secure base script knowledge may be categorical at some point earlier in development but becomes continuously distributed at later ages resulting from a process of elaboration.

To investigate this, we conducted a downward extension of previous taxometric work using an age appropriate version of the Attachment Script Assessment in middle childhood (ASA; Waters, Fraley, et al., 2015). To our knowledge, there has been no taxometric study of attachment representations of any kind in this age group. As a result, we relied on a data-driven approach and made no specific predictions regarding the outcomes of the taxometric analyses.

Method

Participants

Meehl (1995) recommended that taxometric analyses be conducted with no <300 cases, preferably with 600 cases or more. In this study, the sample included 639 normative-risk children assessed during middle childhood. Data were collected from three different collection sites across urban and suburban cities in Belgium (83%) and the United States. Children were largely from white middle-class families and none of the samples were drawn from intervention studies. Child mean age for the pooled sample was 10.77 years (SD = 1.06), ranging from 8 to 13 years (for a demographic description across samples, see Table 1). Preliminary analyses revealed no significant differences between samples with respect to biological sex, $F(6, 632) = .324$, $p = .92$; however, the samples differed significantly from the others with respect to age, with sample 5 differing significantly from all other groups. However, the results presented here did not substantively differ when this group was dropped from the sample. Children from the United States were recruited through two separate subject pools which provided families the opportunity to participate in research

experiments though their respective universities. The Belgium samples were each recruited through the same university subject pool. Following approval from university ethics review boards, children completed the middle childhood ASA (Waters, Fraley, et al., 2015) as part of a larger battery of tasks. ASA means and standard deviations across each sample are presented in Table 2.

Measures

The ASA is a prompt-word outline method for assessing implicit knowledge of script-like (i.e., temporal-causal) expectations regarding secure base use and support. This is inferred from the content and organizational structure of self-produced narrative passages. The outlines describe familiar scenarios and depict an element of distress that would prompt a person to seek out their secure base (e.g., see Table 3). Each prompt-word outline contains a story title and 12–14 words, arranged in four columns. The order of the words suggests a general beginning, middle, and end of a story.

Although the ASA was developed for use with adults (Waters & Rodrigues-Doolabh, 2001), other prompt-word sets have been developed for use with children. The middle childhood version of the ASA (Waters, Fraley, et al., 2015) consists of three prompt word outlines featuring mother-child dyads: *Scary Dog in the Yard*, *At the Beach*, and *Soccer Game*. In cases where data were collected outside of North America, prompt word outlines were translated with only minor changes to the content based on differences in culture or context. The ASA word prompts appear in Waters, Fraley, et al. (2015), and can be found in Appendix.

Children are instructed to assume the role of the narrator and speak in the first person (i.e., as if the stories are about themselves and their mother). Each story is assigned a score ranging from 1 to 7. Scores between 4 and 7 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). Scores of 3 are given for event-focused narratives with minimal secure base script content, whereas scores ranging between 1 and 2 are given to stories that not only lack the secure base script, but also contradict it (e.g., mother shaming the child for getting hurt at the beach and ruining the trip). ASA double coding ranged from 39%–100% across data collection sites and no study had more than three trained and reliable coders involved in scoring. Disagreements were resolved either by taking the average of two scores or through consensus. Inter-rater reliabilities were high across all samples and are presented in Table 1.

The middle childhood version of the ASA has demonstrated moderate test–retest reliability over a 1 and 2 year period (*r*s = .43–.59; Waters et al., in press). Middle childhood ASA scores have also been found to be significantly correlated with concurrent Childhood Attachment Interview coherence scores, another method of assessing attachment security in middle childhood (Target, Fonagy, & Shmueli-Goetz, 2003; see also Shmueli-Goetz, 2014). Furthermore, middle childhood ASA scores were significantly positively associated with maternal ASA scores (adult version) as well as negatively associated with concurrent psychopathology (Waters, Fraley, et al., 2015).

Table 1
Sample Characteristics and Participant Demographic Data

Sample	Data collection site	*N*	% Female	Age			ICC
				M	*SD*	Range	
Sample #1	Leuven, BEL	119	54.6	10.48	0.97	9.00–13.00	.82–.88
Sample #2	Leuven, BEL	57	49.1	10.74	0.84	9.00–12.00	.82–.98
Sample #3	Leuven, BEL	154	51.3	10.39	0.94	9.00–12.00	.79–.91
Sample #4	New York, USA	40	55.0	11.10	0.70	10.30–12.00	.77–.85
Sample #5	Iowa, USA	72	52.8	12.25	0.25	11.92–13.08	.91
Sample #6	Leuven, BEL	56	46.4	10.43	1.02	9.00–12.00	.78–.90
Sample #7	Leuven, BEL	141	51.1	10.38	1.05	8.00–13.00	.77–.93

Note. Participant age demographics are presented in years; ICC = intraclass correlation coefficient for Attachment Script Assessment coding.

Table 2
Attachment Script Assessment (ASA) Means and Standard Deviations Across Samples

	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7
Dog	3.27 (1.0)	3.84 (1.26)	4.01 (1.0)	3.81 (1.14)	3.32 (0.94)	3.47 (0.68)	3.52 (0.90)
Beach	3.32 (0.83)	3.44 (0.71)	3.83 (0.84)	3.74 (1.18)	3.30 (0.99)	3.32 (0.87)	3.54 (0.72)
Soccer	3.36 (0.94)	3.76 (0.91)	3.85 (0.96)	4.11 (1.16)	3.30 (1.05)	3.43 (0.77)	3.57 (0.94)
ASA composite	3.32 (0.73)	3.68 (0.75)	3.90 (0.74)	3.89 (0.97)	3.31 (0.83)	3.41 (0.56)	3.54 (0.69)

Note. Values in parentheses represent standard deviations; ASA composite represents mean scores across story lines. The composite variable was not supplied to the taxometric analysis as an independent indicator.

Procedure

A single score for each story was supplied as an indicator for a series of nonredundant taxometric procedures developed by Meehl and colleagues (e.g., Meehl, 1973; Meehl & Yonce, 1994; Waller & Meehl, 1998). Means or consensus scores were used when available, otherwise single coder scores were used. The taxometric method searches for patterns across indicator pairings to locate a possible latent boundary differentiating discrete groups. In the presence of such a boundary, individuals are thought to differ in kind, rather than degree. The taxometric method consists of numerous distinct data-analytic procedures, however, three are commonly applied in concert and have since become the standard in taxometric investigation. Namely, these include the MAXCOV (MAXimum COVariance; Meehl & Yonce, 1996), MAMBAC (Mean Above Minus Below A Cut; Meehl & Yonce, 1994), and L-Mode (Latent Mode; Waller & Meehl, 1998). A fourth procedure, MAXEIG (MAXimum EIGenvalue; Waller & Meehl, 1998), is viewed as interchangeable with the MAXCOV procedure as it often produces near identical results. In recent years, researchers have highlighted these similarities and have suggested that the MAXEIG replace the MAXCOV because, in some cases, the MAXEIG produces more reliable results (Walters & Ruscio, 2009). In this study, no differences were found when computing these two procedures. In light of this recent trend, results for the MAXEIG, rather than the MAXCOV, are reported.

The MAXEIG procedure operates by first assigning one indicator as an input and the remaining indicators as output. Values on the input variable are then sorted and subsamples are calculated via a series of overlapping windows. First (largest) eigenvalues for the covariance matrix in relation to the output indicators are then calculated within each window and plotted in sequence. Analyses are run until each indicator has served as the input

Table 3
Sample Middle Childhood Attachment Script Assessment Stories

High scoring story—Effective secure base support, instrumental care helps child get back on track

Scary Dog in the Yard

I was outside playing and planting my vegetable garden. Then there was a big dog. I was super afraid and went running away really fast, crying. The dog was barking super loud, and then I stood still, and the dog started sniffing me. I thought, "Maybe I can get mommy and maybe she can chase it." And then I called my mom, and she came and took the broom and chased away the dog. I was relieved and went inside. I never dared to play outside again, but then my mom said, "It was only once, the next time it will not happen, that does not always happen." And then I thought, "Okay, maybe she's right. Let me continue with my vegetable garden."

Moderate scoring story—No secure base support seeking, focus on instrumental care/resolution

Scary Dog in the Yard

One day, my mom took me to watch my uncle's dog. At first, we were playing, and he was very happy to see us. He was barking and sniffing us. He was a very big dog. We started playing. When I turned back around, the dog was gone. I started looking for the dog. I found the dog, and the dog started running away from me, so I started chasing it. A couple minutes into me chasing the dog, it turned around and started chasing me. I cried because it bit me in the back of my ankle. My mom fixed up my cut and me and the dog played some more.

Low scoring story—No secure base content/support seeking, fear of abandonment, no emotional resolution (safer to play inside).

Scary Dog in the Yard

The other day, my mom and I were playing outside in the yard when this big dog with snarling teeth and wild fur started sniffing us. It began to bark loudly. It looked like the neighbor's dog. I kind of freaked out a little and began to cry. My mom ran inside. "Don't leave me out here" I thought. But she came back with the broom. In a strange stabbing motion, she chased the dog away. The dog, obviously aggravated, ran off, so we decided to go inside in case it came back. Maybe it's safer to play in here.

variable. Results are then aggregated to produce a single averaged curve. If consistent with categorical latent structure, the plotted MAXEIG scores should produce a peaked graph. Conversely, if data assume a dimensional latent structure, the shape of the curve will not contain a peak.

The MAMBAC procedure computes the mean difference on one indicator between cases located above versus below a sliding cut score on another indicator. Accordingly, all possible indicator pairs are tested, and MAMBAC results are later aggregated to produce a single averaged curve. Categorically distributed data are characterized by plotted mean differences that contain a pronounced peak. When latent structure is continuous, however, the MAMBAC function will produce a concave curve with no peak, though values are typically raised at one or both ends.

The L-Mode procedure plots a distribution of the scores from the first principal factor from a factor analysis of all available indicators. Whereas taxonicity in the MAXEIG and MAMBAC figures can be inferred from peaked distributions, the critical feature for inferring taxonicity in the L-Mode figure is bimodality. That is, when data reveal a unimodal distribution, dimensional structure can be inferred; when data reveal a bimodal distribution, taxonicity can be inferred.

Interpreting Taxometric Results

Rather than relying entirely on the subjective interpretation of curve shapes or using statistical significance testing, taxometric results are interpreted using the Comparison Curve Fit Index (CCFI). The CCFI estimates the distance between observed values in relation to artificially generated categorical and dimensional comparison data sets. When observed residuals are smaller in relation to the categorical comparison data, this suggests that the data are better fit under a categorical model. On the other hand, when observed values map more closely onto the dimensional comparison data, the data are thought to better reflect dimensional latent structure.

The mean CCFI across procedures indicates the extent to which taxometric results converge (Ruscio, Walters, Marcus, & Kaczetow, 2010). CCFI values range from 0 to 1. Values closer to 0 indicate dimensional latent structure, whereas values closer to 1 indicate categorical latent structure. Latent structure can be confidently inferred when the mean CCFI value falls outside the range of .45–.55 (Ruscio et al., 2010). Simulation studies suggest that the below .45 and above .55 CCFI mean threshold accurately identifies latent structure 99.4% of the time (Ruscio et al., 2010). Mean values falling within this range, however, should be interpreted with caution. MAXEIG, MAMBAC, and L-Mode results are also presented graphically. This permits the visual inspection of model fit and can serve as a consistency check on the CCFIs. The fit between observed data and taxonic or dimensional comparison data provides auxiliary evidence in determining latent structure.

Results

Evaluation of Indicator Validity

To evaluate the adequacy of indicators for detecting taxonicity, cases were first assigned to groups following base rate classification techniques described by Ruscio (2008). See Base Rate Estimation Procedures for additional details. Within-group correlations were then computed to determine if correlations were small enough to successfully distinguish taxon from complement groups; for this, researchers have frequently adopted the criterion of $r \leq .30$ (Meehl, 1995). Mean within-group indicator correlations for both the putative taxon and complement group were below the recommended cutoff ($r = -.05$ and .23, respectively). Second, we examined between-group indicator validities (denoted as d) to test the extent to which the current data set risked "overlooking" taxonic distributions (Ruscio, Haslam, & Ruscio, 2012). Mean between-group validity was high ($d = 1.98$) and well above the recommended threshold of $d = 1.25$ (Meehl, 1995). Lastly, we examined the normality of indicator distributions. Close examination of each indicator's distributional properties confirmed normality (skewness range = 0.07–0.49; kurtosis range = 0.01–0.50). Taken together, these factors support the suitability of this indicator set in producing interpretable taxometric results.

Base-Rate Estimation Procedures

Taxometric analyses were conducted using the statistical software R under the "TaxProg" package (R Core Team, 2017; Ruscio, 2014). Researchers are encouraged to provide the program an initial estimate for the proportion of cases that would comprise the taxon and complement groups (i.e., the base-rate). Given the absence of taxometric work on middle childhood attachment, we implemented a data-driven base-rate estimation procedure

described in Ruscio (2008). Specifically, we calculated a preliminary Bayesian base-rate estimation via the MAXEIG function which was then re-supplied to the traditional "base-rate method." A resulting 17.8% base-rate was subsequently applied to all planned taxometric procedures.

MAXEIG, MAMBAC, and L-Mode Analyses

Data submitted to the MAXEIG function were more consistent with a dimensional distribution, as plotted eigenvalues formed an irregular concave curve with no pronounced peaks (middle panel of Figure 1). Statistical output paralleled this distribution, producing a CCFI of 0.44. In contrast, data submitted to the MAMBAC and L-Mode functions yielded results that were more consistent with taxonic latent structure. The MAMBAC produced a steadily rising curve (top panel of Figure 1) accompanied by a CCFI of 0.61. Taxonicity was most prominent for the L-Mode procedure, as a discernable second mode emerged to the right of the distribution (CCFI = 0.70). Aggregated across MAXEIG, MAMBAC, and L-Mode analyses, the mean CCFI of 0.58 indicated that middle childhood attachment representations are better conceptualized categorically (child knows the secure base script or not) than dimensionally.

Upon closer inspection, the L-Mode seemed to indicate a potential additional taxon group on the far-left side of the distribution (see bottom panel of Figure 1). Although taxometric procedures are designed to test for a single categorical boundary at a time, it is sometimes possible for taxometric outputs to hint at multiple boundaries and there are certain procedures that may allow for an investigator to explore the potential of three or more latent taxa (McGrath & Walters, 2012). Once an initial taxonic boundary is identified, the sample can be trimmed in an effort to explore the existence of additional taxa in the trimmed sample. Results of such procedures should be viewed as exploratory as their reliability has not been fully explored (but see McGrath & Walters, 2012). In an attempt to isolate the observed lower boundary, we trimmed scores toward the high-end of the distribution that comprised the initial taxon discovered (i.e., the upper 114 cases, or 17.8%). Following base-rate estimation procedures described earlier, cases were once again assigned group membership and the same taxometric procedures were applied on the trimmed distribution (for trimmed distribution indicator validity summary statistics, see Table 4). Analyses confirmed the presence of a small nonambiguous taxon (n = 96, or 15.0% of the full sample) as the MAXEIG, MAMBAC, and L-Mode procedures produced CCFI values of 0.69, 0.67, and 0.44, respectively (mean CCFI = 0.60). Graphical output inspection presented further evidence in support of a latent boundary (Figure 2).

In order to test the robustness of the taxon initially identified in the full sample, we re-supplied the upper 114 cases and trimmed scores toward the low-end of the distribution (the 96 cases that comprised the newly identified taxon). Analyses for the lower-trimmed distribution again confirmed categorical latent structure as the MAXEIG, MAMBAC, and L-Mode procedures produced CCFI values of 0.37, 0.79, and 0.69, respectively (mean CCFI = 0.61, see also Figure 3). When eliminating the lower-end taxon group, results from the initial taxometric analysis were replicated.

We were then interested in approximating the range of scores described in the ASA coding system that corresponded to each taxon group. To do this, mean ASA scores were sorted from highest to lowest and taxometric base-rate estimates were examined. Individuals who comprised the upper taxon group were found to have mean ASA scores >4.25. In contrast, the individuals who comprised the lower taxon group were found to have mean scores <2.88. The final base-rates for the full sample were 15.0% for the lower-end taxon, 67.2% for the middle group, and 17.8% for the upper-end taxon. Taken together, taxometric results identified three qualitatively distinct classes of individuals with respect to secure base script knowledge in middle childhood.

Discussion

We applied a downward extension of prior taxometric work on secure base script knowledge using a large sample of children assessed during middle childhood. Inconsistent with evidence for dimensional latent structure in ASA data collected with older cohorts (Waters, Fraley, et al., 2015), our results indicate that individual differences in secure base script knowledge assessed during middle childhood are categorically distributed. Furthermore, exploratory evaluation of taxometric curves revealed two latent boundaries—which is indicative of three distinct taxa.

The taxometric analyses suggest that individual differences in secure base script knowledge during middle childhood are categorically distributed. However, current academic practice is at odds with this conceptualization. The measurement of secure

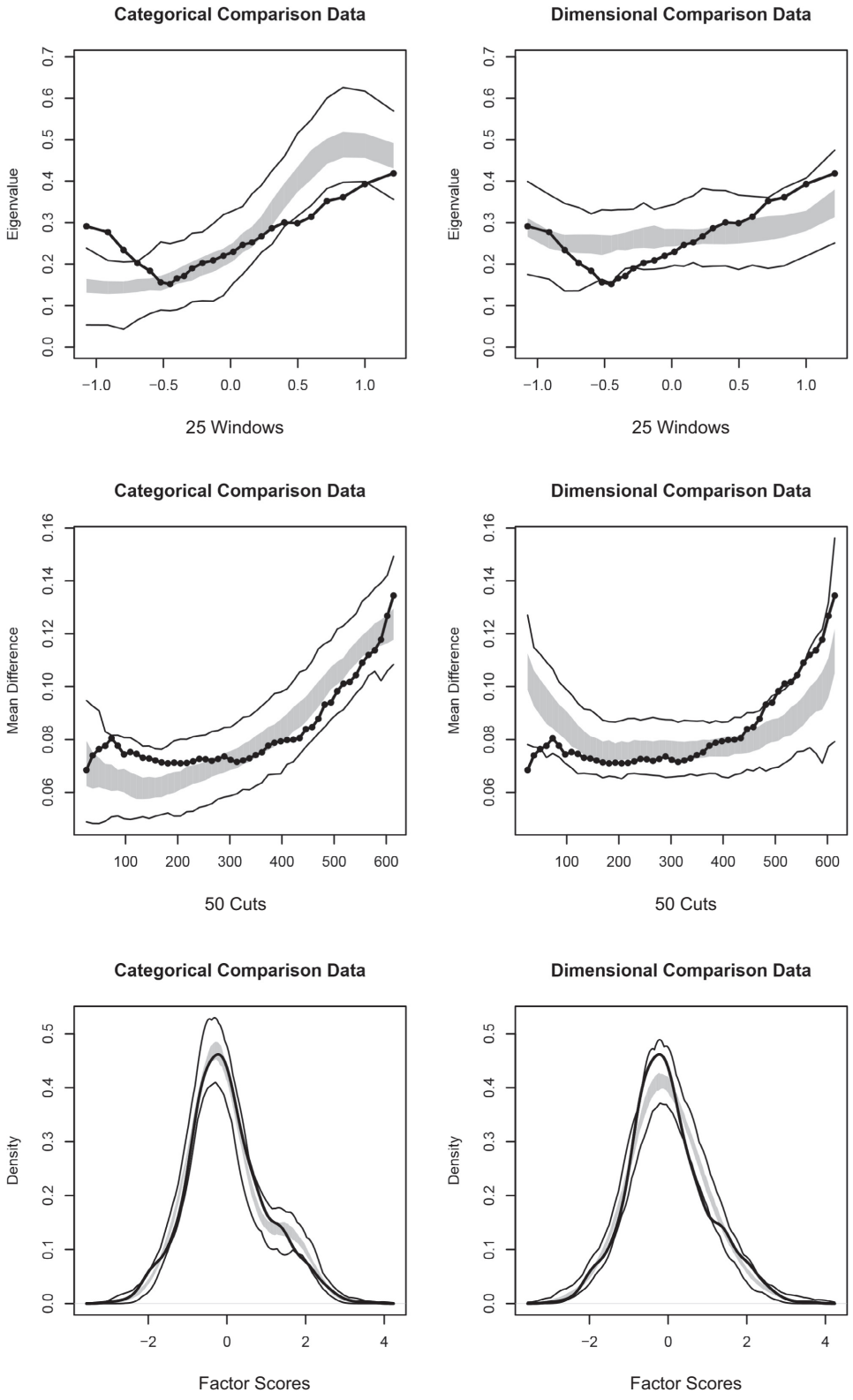

Figure 1. Taxometric graphical output from the full sample (N = 639). Indicators represent secure base script knowledge as measured by the middle childhood version of the Attachment Script Assessment. Top to bottom: MAXimum EIGenvalue, Mean Above Minus Below A Cut, and Latent Mode, respectively.

Table 4
Attachment Script Assessment Indicator Descriptives

	M	*SD*	Skewness	Kurtosis	*d*	*r*(taxon)	*r*(comp)
Full sample distribution							
Dog	3.61	1.02	0.07	0.01	1.95	−.05	.22
Beach	3.53	0.87	0.49	0.39	2.14	−.03	.23
Soccer	3.61	0.98	0.18	0.50	1.86	−.06	.24
Upper-trimmed distribution							
Dog	3.33	0.84	−0.35	−0.01	1.74	−.06	−.18
Beach	3.27	0.66	−0.04	0.54	1.41	.00	−.22
Soccer	3.34	0.81	−0.30	0.32	1.54	−.03	−.12
Lower-trimmed distribution							
Dog	3.84	0.89	0.33	0.15	1.97	−.05	−.06
Beach	3.69	0.80	0.73	0.37	2.13	−.03	.00
Soccer	3.81	0.88	0.43	0.91	1.84	−.06	−.06

Note. Full sample distribution sample size = 639, upper-trimmed distribution sample size = 525, lower-trimmed distribution = 543. *d* = between-group validity; *r*(taxon) = mean within-group correlations of the taxon group; *r*(comp) = mean within-group correlations of the complement group.

base script knowledge with the ASA in middle childhood, adolescence, and adulthood is obtained by continuous rating scales and assessment is typically evaluated under dimensional models (Bost et al., 2006; Coppola, Vaughn, Cassibba, & Costantini, 2006; Dykas, Woodhouse, Cassidy, & Waters, 2006; Groh & Roisman, 2009; Monteiro, Veríssimo, Vaughn, Santos, & Bost, 2008; Schoenmaker et al., 2015; Steele et al., 2014; Tini, Corcoran, Rodrigues-Doolabh, & Waters, 2003; Vaughn et al., 2007; Veríssimo & Salvaterra, 2006; Waters, Fraley, et al., 2015; Wong et al., 2011). The treatment of categorical constructs as continuous (and vice versa) negatively impacts statistical power and precision (Fraley & Spieker, 2003; Fraley & Waller, 1998). Given this, researchers should consider treating data coded from the middle childhood version of the ASA categorically, rather than continuously, in an effort to optimize statistical inference.

Interestingly, our exploratory findings produced results that diverged from the traditional secure-insecure dichotomy by differentiating three classes of secure base script knowledge. Individuals comprising the upper-taxon had mean ASA scores >4.25. Scores >4.0 are assigned when narratives portray both instrumental care and emotional comfort (or a clear bid for support) that directly leads to resolution of distress. Differences in the upper-most scale points typically reflect the degree of elaboration on that care, comfort, and resolution of distress. In contrast, individuals comprising the middle-taxon construct narratives centered mostly around instrumental support (mean ASA range = 2.88–4.25). Based on the ASA coding system, scores of 3.0 are representative of event-focused narratives. In these narratives, caregivers typically concentrate on the instrumental (e.g., putting a bandage on a cut) rather than the psychological states of the child (e.g., indicating that the bandage made the child feel better or telling the child that "everything is going to be okay"). According to the ASA coding, narratives receiving a 4.0 present some evidence of secure base script knowledge. Coders will usually assign a 4.0 as long as narratives illustrate explicit proximity seeking and a contingent instrumental response. Emotional comfort may be absent or described with minimal detail. The lower-taxon comprised individuals with mean ASA scores below 2.88. Narratives receiving scores below 3.0 generally lack emotional *and* instrumental support. Furthermore, these stories are typically characterized by insensitive care or demonstrate a propensity for the child to self-regulate (e.g., instead of seeking support, the child takes care of the injury themselves).

Taking into account the latent boundaries and the traditional coding system, three kinds of children emerge, those who: (a) expect their caregiver to provide comfort and resolve distress, (b) primarily portray their caregiver as a source of instrumental support, and (c) either do not expect support or view the parent's involvement as ineffective or distressing. See Table 3 for examples. Our data indicate that most individuals in middle childhood expect at least some instrumental care (85.0%). Only 17.8% (the upper-most taxa) align with traditional descriptions of attachment security (e.g., Bowlby, 1980; Bretherton, 1991; Cassidy, 2008; Waters &

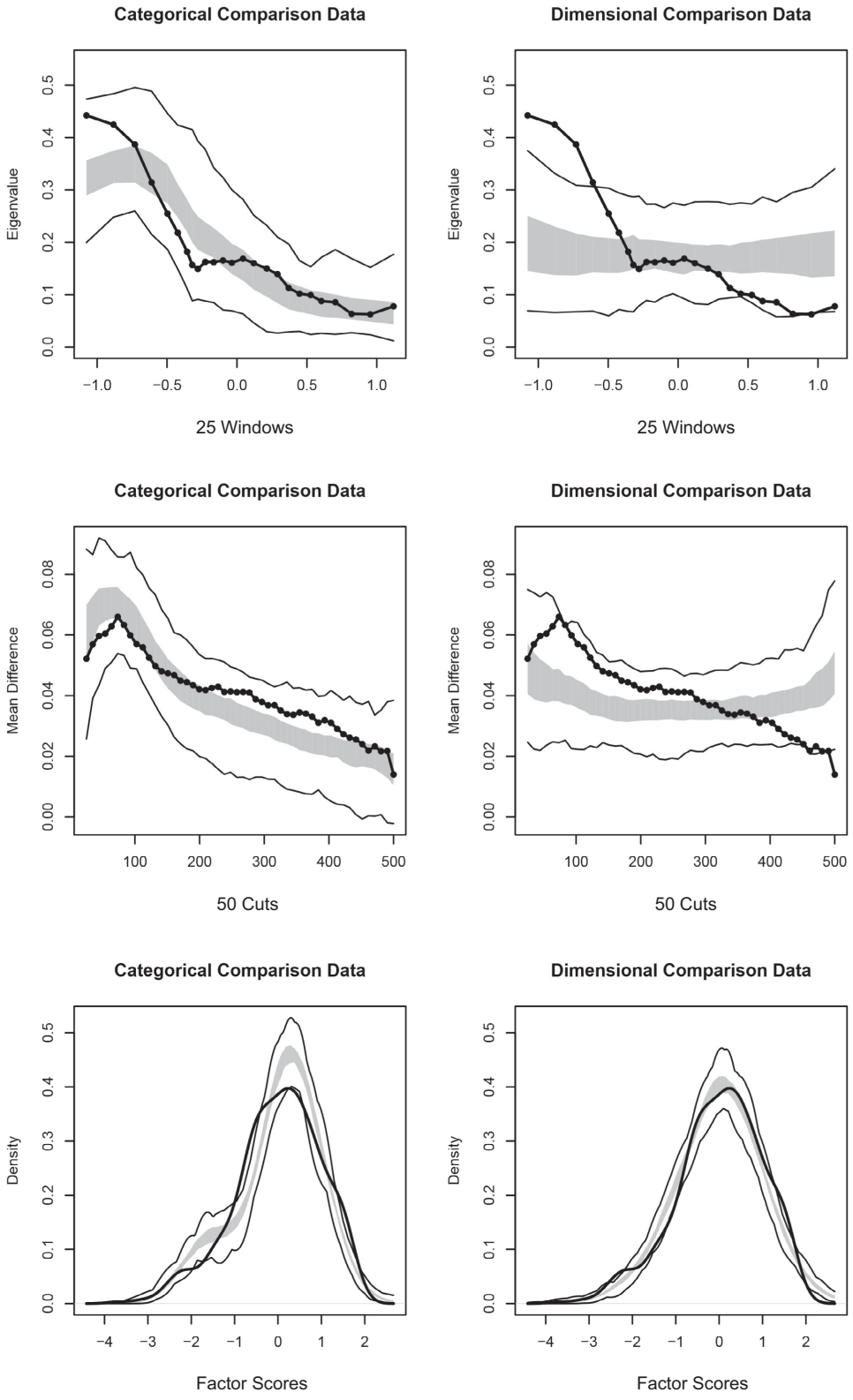

Figure 2. Taxometric graphical outputs from the trimmed distribution (upper-taxon removed; $N = 525$). Indicators represent secure base script knowledge as measured by the middle childhood version of the Attachment Script Assessment. Top to bottom: MAXimum EIGenvalue, Mean Above Minus Below A Cut, and Latent Mode, respectively.

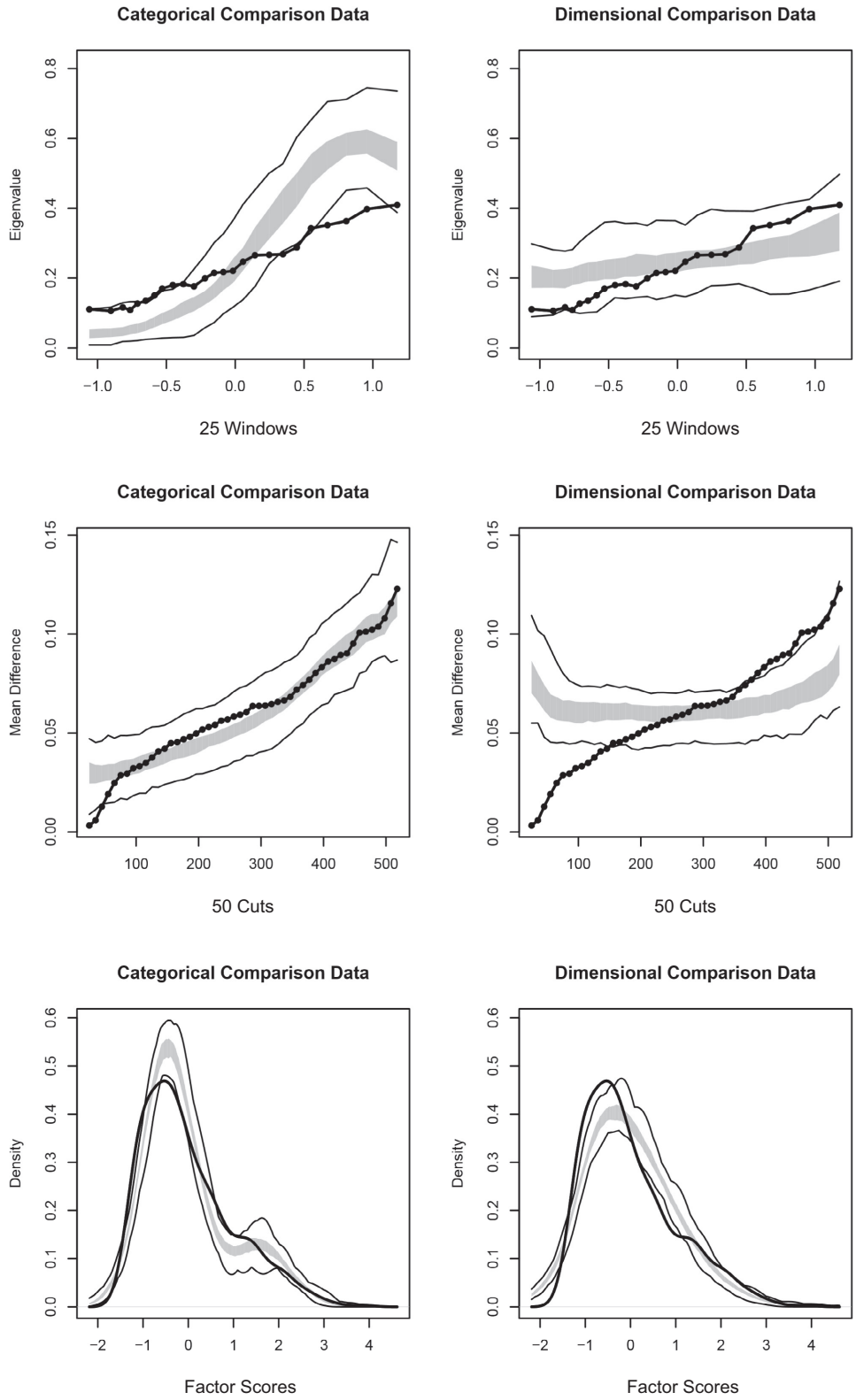

Figure 3. Taxometric graphical output from the trimmed distribution (lower-taxon removed; $N = 543$). Indicators represent secure base script knowledge as measured by the middle childhood version of the Attachment Script Assessment. Top to bottom: MAXimum EIGenvalue, Mean Above Minus Below A Cut, and Latent Mode, respectively.

Waters, 2006). Just the same, what would traditionally be considered insecurely attached—expectations that do not include care and support—is notably small (15.0%, the lower-most taxa). Meta-analytic evidence regarding the prevalence of attachment security in adulthood suggests that approximately 55.0% of individuals are securely attached (Verhage et al., 2016; see also Bakermans-Kranenburg & van IJzendoorn, 2009). Which individuals from the middle-taxon go on to develop more complete or elaborate secure base script knowledge consistent with secure attachment is an open question.

If secure base script knowledge in middle childhood does indeed fit a three category model it would appear that these categories exhibit a potential hierarchy or ordinality. That is, the qualitative differences between the taxa can be ordered to reflect increasing alignment with traditional views of attachment security. Interestingly, in addition to the secure and insecure classifications, attachment research acknowledges an organized versus disorganized distinction. Although links between infant attachment security and maladaptive developmental outcomes are well-established (e.g., Weinfield, Sroufe, Egeland, & Carlson, 1999), children with insecure attachments are still thought of as having "organized" strategies for regulating their emotions and coping with distress (i.e., avoidance, resistance). Some children, however, demonstrate disorganized and incoherent responses when confronted with challenges in the presence of the parent, indicative of a breakdown in regulatory strategy (Main & Solomon, 1990). Theory suggests that this would arise when the caregiver is presented simultaneously as both a haven of safety and a source of distress (Main & Hesse, 1990). Disorganized attachment is therefore thought to be the least adaptive attachment strategy and several studies have associated disorganization with elevated risk for negative developmental outcomes (e.g., Fearon, Bakermans-Kranenburg, Van IJzendoorn, Lapsley, & Roisman, 2010). Given this distinction, the lowest taxa observed in this study may potentially map onto the disorganized attachment classification, whereas the middle and upper taxa might map onto the organized insecure and secure strategies. Unfortunately, research has yet to examine connections between disorganized and organized attachment in infancy and secure base script knowledge in middle childhood. Despite the theory consistent nature of the three category findings, it is important to keep in mind that taxometric analyses were developed to detect a single latent boundary (i.e., the existence of two categories, not three or more). Their ability to detect multiple boundaries is still being evaluated. As such, replication of these exploratory findings will be a critical next step for researchers.

Future Directions

Studies examining the latent structure of secure base script knowledge with larger and higher risk samples represent an important future direction. This would strengthen confidence in the exploratory findings presented here by allowing for a test of replication and doing so under potentially better conditions for discovering latent taxa, as the taxometric methods may perform better with even larger samples and with more even distributions of members in each taxon. Further taxometric work offers a unique approach to studying the potential distinction between organized and disorganized categories of attachment.

As a result of the present investigation and others (Steele et al., 2014; Waters, Fraley, et al., 2015), the processes related to the acquisition, generalization, and elaboration of secure base script knowledge across different stages of development are beginning to come into view. Although we find evidence of discontinuity in the latent structure of secure base script knowledge at different ages, it is important to note that these conclusions are drawn from findings that are cross-sectional in nature which limits our ability to infer developmental change. However, evidence supports the stability of secure base script knowledge from middle childhood to adulthood (Waters et al., under review). In a 3-year longitudinal study beginning in middle childhood, secure base script knowledge was significantly correlated across four assessment points and different versions of the ASA (i.e., middle childhood scores predicted ASA scores in adolescence on the adolescent version). Therefore, it is reasonable to assume that the shift from categorical to dimensional latent structure from middle childhood to adulthood might be replicated if the same participants were followed over time.

Although secure base script knowledge in middle childhood is categorical in nature, there still remains a significant gap regarding the representational properties of secure base script knowledge earlier in development. Taxometric results in younger cohorts should be categorical given the way that the secure base script is thought to emerge (i.e., in an all or nothing fashion). Further downward extension of taxometric study of secure base script knowledge is critical. The secure base script

has been measured in younger children and with other narrative based tests (e.g., Apetroaia & Waters, 2018; Posada, Trumbell, Lu, & Kaloustian, 2018; Psouni & Apetroaia, 2014), but these could not be included here because of methodological differences.

It is also important to note that values on the ASA coding system are—at least to some extent—qualitatively informed. Thus, categorical taxometric results might be an artifact of discontinuities in the meaning of values on the rating scale itself. However, using the same 1–7 rating scale, Waters, Fraley, et al. (2015) found continuous latent structure in ASAs collected in older cohorts (i.e., late adolescence and adulthood). Nevertheless, the development and use of alternative measures for assessing secure base script knowledge, along with subsequent analysis of their latent structure, is fertile ground for future study.

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Appendix: Middle Childhood Assessment—Narrative Prompt Word Outlines

Scary dog in the yard			
Outside	Sniff	Mom	Dog gone
Play	Bark	Broom	Go inside
Big dog	I cry	Chase	Play
At the beach (*changes in Belgium Version*)			
Mom and I	Climb (*sandcastle*)	Mom	Bandage
Picnic	Rocks (*glass*)	Hurry	Hug
Beach	I'm cut	Doctor	Home
Soccer game			
Morning	Play	I miss	Mom
Big game	Tired	Lose	Talk
Nervous	Easy shot	Upset	Practice