

Adult Attachment States of Mind: Measurement Invariance Across Ethnicity and Associations With Maternal Sensitivity

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Abstract:

This study examined the developmental significance of mothers' adult attachment representations assessed prenatally with the Adult Attachment Interview in relation to observed maternal sensitivity at 6 months postpartum in an ethnically diverse sample ($N = 131$ African American; $N = 128$ European American). Multiple-group confirmatory factor analyses provided evidence for partial measurement invariance of a two-factor dismissing and preoccupied latent structure of adult attachment across the two ethnic groups of women. African American women showed modest elevations on the preoccupied factor relative to European American women. Although the dismissing factor showed an empirically equivalent negative association with maternal sensitivity in both ethnic groups, this effect was reduced to marginal significance when controlling for maternal socioeconomic status.

Keywords: Adult attachment interview | Maternal sensitivity | Ethnicity | Parenthood | Developmental Psychology

Article:

The Adult Attachment Interview (AAI; George, Kaplan, & Main, 1984-1996; Main, Kaplan, & Cassidy, 1985) serves developmental psychology as a gold-standard measure of adult attachment. Since its introduction to the field, the vast majority of research using the AAI has been organized by the view, implicit in Main and Goldwyn's (1984-1998) original coding system, that adult attachment security is a *unitary* construct that reflects the simultaneous ability to provide an internally consistent narrative about early attachment experiences without becoming emotionally entangled or preoccupied while doing so (Haydon, Roisman, & Burt, 2012). Large-sample factor analytic research, however, has suggested that adult attachment

security may be best characterized as the concurrent presence of relatively low levels of two modestly correlated attachment states of mind—dismissing and preoccupied (Haydon et al., 2012; Roisman, Fraley, & Belsky, 2007). In this study, we sought to empirically confirm a two-factor latent structure of adult attachment identified by Haltigan, Roisman, and Haydon (2013), as well as examine its measurement and predictive equivalence in relation to maternal sensitivity in a sample of African American and European American women.

The AAI measures the representation of attachment experiences in the mind of individuals (i.e., attachment state of mind) who provide a verbal narrative of those experiences in more or less coherent ways (Bakermans-Kranenburg, & van IJzendoorn, 2009; Hesse, 2008). Coherent discourse has two distinguishable components (Roisman, 2009). First, narrative coherence is present when the speaker is internally consistent when he or she discusses childhood attachment experiences. Narratives produced by individuals who are not internally consistent with respect to early attachment experiences during the AAI are characterized by discourse that either idealizes their caregivers (e.g., are unable to provide specific memories that support their overly positive descriptions of their relationship with parents) or normalizes objectively harsh childhood experiences. Second—and distinctively—narrative coherence is present when the speaker is able to discuss his or her early experiences without becoming emotionally overwrought while doing so, as reflected either in passive discussion of early life experiences (e.g., wandering off into irrelevancies) or, more commonly, by becoming actively upset while recounting early life experiences. Individuals who become either confused or angry during the course of the AAI are likely to provide too much information, fail to maintain focus on the question being asked, and, in so doing, produce disorderly, ambiguous narratives.

Most commonly, individuals' AAI transcripts are assigned to one of three mutually exclusive primary attachment categories: secure autonomous, dismissing, and preoccupied. The majority of transcripts, classified as secure autonomous, contain narratives in which adults freely and flexibly evaluate their childhood experiences, whether described as supportive or more adverse in nature. The second largest group of transcripts, classified as dismissing, contains narratives in which adults defensively distance themselves from the emotional content of the interview by normalizing harsh early memories or by idealizing their caregivers. The lowest base rate classification of transcripts is preoccupied transcripts that contain narratives in which adults are unable to discuss their childhood experiences without becoming overwhelmed (see Hesse, 2008). In addition to these three categories, individuals' transcripts are also classified as unresolved if their discourse becomes psychologically confused during the AAI while discussing loss or abuse experiences (e.g., a deceased person is spoken about as if alive in the physical sense).

There has been an increasing interest in understanding and empirically identifying more precisely what is measured by the AAI. A growing body of work (Bernier, Larose, Boivin, & Soucy, 2004; Haydon et al., 2012; Roisman et al., 2007) has converged on the finding that the latent structure of individual differences in adult attachment state of mind is distributed along two latent factors that are only weakly correlated: dismissing and preoccupied states of mind.

Moreover, recently, Haltigan, Roisman, and Haydon (2013) presented the first confirmatory factor analytic evidence in support of this AAI state of mind latent structure based on data from the National Institute of Child Health Care and Human Development (NICHD) Study of Early Child Care (SECCYD). This work is important because it suggests that a secure/autonomous state of mind is not a unitary or monolithic construct, but actually reflects the co-occurrence of relatively low levels of the two *empirically distinct* patterns of attachment-related variation—dismissing and preoccupied attachment states of mind.

Although confirmation of the dismissing and preoccupied factor structure of adult attachment as measured by the AAI state of mind scales (Haltigan et al., 2013) represents a methodological advancement in the developmental tradition of attachment theory and research, additional measurement and predictive significant work (e.g., Bernier et al., 2004; Fortuna, Roisman, Haydon, Groh, & Holland, 2011; Haydon et al., 2012; Haydon, Roisman, Marks, & Fraley, 2011; Whipple, Bernier, & Mageau, 2011) are needed. As evidence mounts for the robustness of the two-factor latent structure of the AAI, it is important to establish its measurement equivalence. Measurement equivalence refers to the degree to which a measure reflects the same empirical meaning and construct validity across diverse populations (e.g., racial/ethnic) and is crucial to establish before evaluating group differences in mean levels of a construct, or whether there are group differences in the relations between the construct(s) and hypothesized developmental antecedents and outcomes (Raykov, 2004). With respect to the AAI two-factor latent structure, it is important that measurement equivalence is established before examining: (a) group differences on the dismissing and preoccupied factors or (b) exploring their developmental significance. Below we discuss two key areas in attachment theory and research where demonstration of the measurement invariance of the two-factor AAI latent structure will facilitate and advance current work.

Cultural Significance of Attachment

The cultural universality hypothesis of attachment theory constructs is rooted in the ethological foundation of attachment theory and refers to the idea of the universality of innate bias of infants to become attached, regardless of their specific cultural niche (van IJzendoorn & Sagi-Schwartz, 2008). Although claims for the cultural universality of attachment constructs have been made since Ainsworth's pioneering observational studies of infant–caregiver attachment in rural Uganda and then Baltimore, Maryland (Ainsworth, 1967; Ainsworth, Blehar, Waters, & Wall, 1978), other scholars (e.g., Rothbaum, Weisz, Pott, Miyake, & Morelli, 2000) have argued that research in attachment theory, which has largely been conducted primarily in Western cultures, may not be applicable to cultures with differing value systems. Moreover, there is a paucity of work comparing attachment constructs across ethnic groups *within* the United States. Examination of the measurement invariance of the two-factor AAI latent structure (i.e., construct validity) across ethnicities has the potential to contribute new insight regarding the cultural and ethnic universality of attachment theory constructs and processes (e.g., Bakermans-Kranenburg, van IJzendoorn, & Kroonenberg, 2004; Rothbaum et al., 2000; van IJzendoorn & Sagi-

Schwartz, 2008), particularly those measured in adulthood. That said, van IJzendoorn and Bakermans-Kranenburg (2010) found that AAI attachment classifications were largely invariant across gender and Western versus non-Western cultures. Roisman, Tsai, and Chiang (2004) likewise found that associations between dismissing states of mind and electrodermal reactivity during the AAI were comparable in magnitude in European American and Chinese/Chinese American subsamples.

It is important to note, however, that the universality thesis of attachment development does *not* imply that attachment constructs are unaffected by culture-specific influences, and thus leaves room for adaptive behavioral propensities to be realized in culturally specific ways depending on the ethnic niche in which individuals develop (Hinde & Stevenson-Hinde, 1990; van IJzendoorn & Sagi-Schwartz, 2008). For example, given the existence of some evidence that African Americans are more emotionally expressive than European Americans because African cultural heritage values emotional expression (Boykin, 1986; White & Parham, 1990), it might be anticipated that African Americans may show elevations on the preoccupied factor relative to European Americans. Therefore, although the dismissing and preoccupied factors might represent similar constructs across ethnicities, one might still expect mean-level differences across cultures on the dismissing and preoccupied factors.

Predictive Significance of Dismissing and Preoccupied States of Mind

Demonstration of the measurement invariance of the two-factor AAI latent structure would also strengthen work examining the predictive significance of dismissing and preoccupied states of mind. Main and Goldwyn (1984–1998) suggested that a mother's mental representation of attachment-related experiences is likely to be associated with a parent's ability to interpret and respond to her infant's needs, which in turn influences the development of the child's attachment security (van IJzendoorn, 1995). In light of established links between the categorical approach to AAI coding and parenting quality (e.g., maternal responsiveness; Pederson, Gleason, Moran, & Bento, 1998; van IJzendoorn, 1995), it is particularly important to explore the predictive significance of this alternate, two-factor system in relation to maternal behavior.

We are aware of only one published study that has demonstrated the predictive significance of the AAI two-factor latent structure with respect to observed parenting. Specifically, Whipple et al. (2011) found theoretically consistent negative associations between the dismissing dimension and prospectively observed maternal sensitivity when infants were 12 months old, and between the preoccupied dimension and prospectively observed maternal autonomy support when infants were 15 months old. Importantly, these effects were independent of each other. However, because the Whipple et al. sample was primarily Caucasian and middle class, it was not possible to examine whether predictive links between the dismissing dimension and sensitivity and the preoccupied dimension and maternal autonomy support were equivalent across different ethnic groups of participants. On the basis of the universality hypothesis of attachment theory and prior work that has shown that different ethnic groups do not differ with

respect to the developmental processes linking maternal sensitivity and infant attachment security (e.g., Bakermans-Kranenburg et al., 2004; Mesman, van IJzendoorn, & Bakermans-Kranenburg, 2012), we anticipated that the attachment state of mind factors would bear similar predictive significance with regard to later maternal behavior across different ethnic groups.

In summary, much remains to be known regarding the empirical meaning and developmental significance of the preoccupied and dismissing factors among different ethnic groups as well as whether there are ethnic differences on these factors. Accordingly, the current project was developed around three goals. The first was an attempt to provide confirmatory replication of the two-factor latent structure of the AAI state of mind scales identified and confirmed by Haltigan et al. (2013) in an independent sample of both African American and European American expectant mothers. Second, we examined the measurement invariance of the AAI dismissing and preoccupied factors across these two ethnic groups of women. To our knowledge, this is the first examination of the measurement invariance of the two-factor latent structure of the AAI. Following examination of measurement invariance, we also explored mean differences on the dismissing and preoccupied factor means between these two ethnic groups of women. Finally, we turned to the developmental significance of the dismissing and preoccupied factors (measured prenatally) for prospectively observed maternal sensitivity at age 6 months postpartum. Importantly, we did so in the context of functional measurement invariance and examined whether observed links between the dismissing and/or preoccupied factors and later maternal sensitivity were empirically equivalent for both African American and European American women.

Method

Participants

Participants in this study were drawn from a prospective longitudinal study in the Southeastern United States investigating the origins of maternal sensitivity during infancy. Expectant mothers were recruited from child birth education classes, breastfeeding classes, local obstetric practices, clinics, and by referrals from other participants via informational flyers or presentations by members of the research team. Women who were interested in learning more about the study either signed a consent form to be called at a later time or called our research office to hear the details of the study. Over the course of recruitment, a comparable number of class attendees were African American (925) and European American (897) based on recruiters estimation from physical appearance, and the proportion who ultimately completed the first phase of the study was comparable across ethnic groups. Thus, recruitment and participation were not confounded by ethnicity. Inclusion criteria required that women were 18 or older, African American or European American, fluent in English, and expecting their first child. The final prenatal sample included 259 participants. Upon enrollment in the study, women were mailed consent forms and a packet of questionnaires including measures of demographics, emotion socialization during childhood, depressive symptoms, and trait anger. Women returned their completed consent forms

and questionnaires when they visited the laboratory for a prenatal interview 6–8 weeks prior to their due date during which heart rate was recorded. Participants received \$50 and a small gift. All procedures were approved by the university's institutional review board.

The analytic sample for this project was inclusive of the full prenatal sample of 259 primiparous mothers (128 European American and 131 African American) and their infants. Ethnicity was measured as African American (ethnicity = 0) or European American (ethnicity = 1) and assignment was based on participant self-report. For purposes of this study, eight women who self-identified as biracial (i.e., African American and European American) were coded as African American. At recruitment, participants ranged in age from 18 to 44 years ($M = 25.1$ years, $SD = 5.4$). Twenty-seven percent had a high school degree or less, 27% had some college, and 46% had a 4-year college degree or beyond. The majority of mothers were married or living with their child's father (57%), 24% were in a relationship with their child's father, and 19% were single. Annual family income ranged from < \$2,000 to over \$100,000; median income was \$35,000. Family income information was used to construct a family income-to-needs variable based on government-issued poverty threshold guidelines as well as participant self-reported family income and family size. African American mothers were younger, $t(256) = -5.97, p < .01$; less well educated, $t(255) = -5.65, p < .01$; and more financially disadvantaged, $t(240) = -7.94, p < .01$, than European American mothers. Note that effect sizes for these socioeconomic differences were all medium by Cohen's (1992) standards ($r_s = .35, .33, \text{ and } .46$ for age, education, and income to needs, respectively). All infants were full term and healthy; 51% were female. Of the 259 participants who completed AAIs at the prenatal interview, 211 returned for a 6-month assessment during which child–caregiver interactive tasks were performed (see below), which were later coded for observed maternal sensitivity. Those participants who did not participate in the 6-month observational assessment were less well educated, $t(255) = -2.87, p < .01$, than the full prenatal sample. To address missing data, all modeling analyses described elsewhere in the article were conducted using full information maximum likelihood estimation, which produces less biased and more efficient and consistent parameter estimates than techniques such as pairwise or listwise deletion (Little & Rubin, 1987).

Maternal Socioeconomic Status (SES)

To maintain consistency with previous work investigating the developmental significance of the latent structure of the AAI (i.e., Whipple et al., 2011), we created a maternal socioeconomic composite by standardizing and averaging maternal education and family income to needs ($r = .55, p < .00$). This composite was then used to control for the influence of SES in our predictive significance analyses described elsewhere in the article.

Adult Attachment Interview

At the prenatal interview, women were administered the AAI (George et al., 1984-1996), which assesses adults' current states of mind regarding earlier attachment experiences with primary

caregivers. The AAI is a semistructured interview in which participants are asked to describe their early childhood relationships with their primary caregivers and the influences and or effects they perceive those experiences to have had on their development.

Coders used the primary AAI scoring method developed by Main and Goldwyn (1984–1998), consisting of a set of ratings on each transcript that inform assignment on adult attachment classification. Two sets of 9-point rating scales were used by the coders to inductively assign individuals to attachment categories described earlier (secure autonomous, dismissing, preoccupied, and unresolved). The first set, known as the inferred experience scales, reflects AAI coders' impressions of participants' experiences with caregivers during childhood, including assessments of maternal and paternal love, rejection, neglect, pressure to achieve, and role reversal. The second set of rating scales reflects the coherence of participants' discourse regarding their childhood attachment experiences (i.e., their state of mind). For example, these scales capture the tendency to idealize and/or normalize childhood experiences with caregivers (mother idealization and father idealization), the inability or unwillingness to recall events from childhood (lack of memory), the extent to which one or both caregivers are derogated (derogation), current active resentment toward parents (mother anger and father anger), and passive or rambling attachment-related discourse (passivity). A dismissing state of mind is reflected in any combination of high scores on scales that tap a participant's tendency to idealize parents, derogate them, or show failures of memory. Preoccupation is identified through signs of anger and/or passivity. Security is defined by the relative absence of high scores on these indicators as well as evidence that an adult is able to freely explore and evaluate his or her thoughts and feelings about childhood experiences. By definition, such an ability to “freely evaluate” one's experiences without becoming emotionally overwrought is reflected in the overall coherence of mind and coherence of transcript scales. Additional state of mind scales included unresolved loss and unresolved abuse, which reflect the degree to which the individual's discourse becomes disorganized while discussing loss or abuse experiences, respectively. Participants received a primary unresolved classification (irrespective of whether they were otherwise classified as secure, dismissing, or preoccupied) when they scored at, or above the midpoint on either of these scales.

According to established protocol, AAIs were transcribed verbatim and all identifying information was removed from the transcripts before they were coded by coders trained through and reliable with the lab of Dr. Mary Main using the AAI scoring and classification system (Main & Goldwyn, 1984–1998). To establish sample-specific reliability estimates, 50 (19%) of the AAI transcripts were double coded independently with 82% agreement ($\kappa = .67, p < .001$). Differences on scale scores and major classifications were resolved by conferencing. Reliability for the AAI state of mind scales used in this report were computed using intraclass correlation coefficients (ICCs; each secondary coder was compared with a primary coder), using a minimum a priori criterion of .6 to designate acceptable reliability. These scales were indicators of the two-factor AAI latent structure identified by Haltigan et al. (2013) that we aimed to replicate and

included mother and father idealization, mother and father anger, lack of memory, passivity, unresolved abuse, and coherence of mind. Of note, unresolved abuse, not loss, was used in this project, as a reanalysis of AAI data from Roisman et al. (2007) using exploratory factor analysis (described in Haltigan et al., 2013), indicated that this scale demonstrated a stronger association with an AAI preoccupied factor (described elsewhere in the article) relative to unresolved loss, and as such comprised the AAI latent structure Haltigan et al. confirmed and that we sought to replicate in this study. One of the state of mind scales failed to meet our minimum a priori ICC criterion of .6 (paternal anger). In this case, range restriction was a problem in that 98.7% of the sample scored between scale points 1 and 3. However, percentage agreement was adequate (83% exact agreement) and it was retained. Finally, with respect to the presence/absence of an applicable abuse experience as defined in the AAI coding manual (i.e., for which the unresolved abuse scale could be rated), intercoder reliability was $\kappa = .78, p < .001$ (96% agreement). As was the case in the Haltigan et al.'s confirmatory analysis of NICHD SECCYD data, mother and father anger and idealization scales were averaged across all coded maternal and paternal caregiving figures prior to use as AAI state of mind indicators in the modeling analyses described elsewhere in the article.

Maternal Sensitivity

Within 2 weeks of their infant's 6-month birthday, mothers and infants returned to the laboratory and were videotaped during a laboratory assessment of several interactive tasks that provided both naturalistic play settings and settings that were designed to elicit infant distress. These tasks included a caregiving task (4 min), a free play with age-appropriate toys (7 min), a transition period in preparation for physiological assessments (~4 min), an arm-restraint task (4 min), a novel toy procedure using a remote-controlled truck (4 min), and the face-to-face/still-face procedure (Tronick, Als, Adamson, Wise, & Brazelton, 1978; 6 min). For the caregiving task, mothers were instructed to change their infant's diaper and to change their infant's outfit into a gender-neutral outfit. For the free play task, mothers were instructed to play with their infant as they normally would with age-appropriate toys while also completing a brief study questionnaire. During the transition period, an experimenter placed electrodes on the mother and infant in preparation for a physiological assessment; mothers were allowed to interact with their infants as they wanted. During the arm-restraint task, an experimenter gently held the infant's forearms immobile. During the novel toy procedure, a remote-controlled dump truck with flashing lights, motion, and sound approached the infant. For the 1st minute of the arm-restraint and novel toy tasks, mothers were instructed to remain neutral unless they wanted to terminate the task. For the remaining 3 min, mothers were allowed to interact with their infants as they pleased. Finally, during the face-to-face (2 min) and reunion (2 min) episodes of the still-face procedure (Tronick et al., 1978) mothers were instructed to talk and play with their infant's without using toys or objects.

Trained raters rated maternal sensitivity separately for each task (caregiving, free play, transition, arm restraint, truck, face-to-face/still-face procedure [face-to-face and reunion episodes were

rated separately]) using Ainsworth's 9-point Sensitivity–Insensitivity scale from (1) *highly insensitive* to (9) *highly sensitive* (Ainsworth, Bell, & Stayton, 1974). The focus of this scale is the extent to which the mother reads and responds to her infant's cues and demonstrates an awareness of the infant's state by adjusting her own behavior. The Ainsworth et al. (1974) scale is considered a gold-standard measure of the sensitivity construct in developmental psychology and has a rich history of use in prior work investigating relations between maternal sensitivity and other attachment constructs (e.g., infant attachment security; De Wolff & van IJzendoorn, 1997). Twenty percent of the current sample was double coded for reliability. Intraclass correlations across the interaction segments were high, ranging from .74 to .95 (mean ICC = .89). Sensitivity ratings across the various tasks were highly correlated ($r_s = .55$ to $.81$, all $p_s < .01$) and were averaged to form a maternal sensitivity composite. Internal consistency of the sensitivity composite was high, $\alpha = .93$.

Analytic Plan

Model testing was conducted in several steps relevant to the aims of confirming the two-factor dismissing and preoccupied latent structure for the AAI coding system, evaluating its measurement invariance and exploring group mean differences across African American and European American women, and finally, in the context of functional equivalence, examining the predictive validity of dismissing and preoccupied latent factors in relation to observed maternal sensitivity. Of note, the two-factor AAI latent structure modeled in this report was chosen from a set of three AAI latent confirmatory models presented by Haltigan et al. (2013). The AAI state of mind scales comprising the alternate two-factor dismissing and preoccupied AAI latent structure included maternal and paternal idealization, maternal and paternal anger, lack of memory, passivity, unresolved abuse, and coherence of mind as a cross-loader on both the dismissing and preoccupied factors (see Figure 1). We elected to focus on this model in the current report in particular because of its inclusion of the coherence of mind indicator (i.e., scale). This feature was of particular import to us as we were interested in replicating the work of Whipple et al. (2011), who, using AAI dimensional composites that included the coherence of mind scale, found relations between the dismissing dimension and later observed maternal sensitivity. All analyses were conducted in Mplus 6.12 (Muthén & Muthén, 1998–2010) using full information maximum likelihood estimation.

[Figure 1 Omitted]

We tested several forms of measurement invariance. Metric or measurement invariance refers to the *measurement* model and pertains to the measurement characteristics of the indicators (observed measures; i.e., AAI state of mind scale scores) and most often consists of testing the factor structure, loadings, and intercepts of the measurement model across groups. Although various ways have been proposed for testing the equivalence of measures when used with different populations (e.g., Byrne & Stewart, 2006; Vandenberg & Lance, 2000), in examining the measurement invariance of the AAI latent factor structure confirmed above, we followed the

guidelines of Brown (2006). As a preliminary step, we first examined whether the two-factor model fit the data adequately in the European American and African American groups of women separately. Next, we used multiple-group confirmatory factor analysis (MGCFA) to examine the measurement equivalence of the AAI latent structure. First, we tested for equal factor structures or the *configural invariance* of the AAI latent structure indicators across both ethnic groups. This test evaluates whether the number of factors and pattern of indicator factor loadings is identical across groups. We then evaluated tests of equality of factor loadings and equality of indicator intercepts, respectively. The test for equality of factor loadings or *metric invariance* examines whether the factor loadings for the latent variables are equivalent in both groups. Factor loading equivalence implies equivalent scale intervals across the groups. Said differently, this test determines whether the measures have the same meaning and structure for different groups of respondents (i.e., the empirical definition of the AAI factors is equivalent for European American and African Americans; Brown, 2006). Noninvariance of factor loadings across groups suggests that certain indicator(s) are stronger indicators of the latent construct(s) of interest for one group relative to the other (Adamsons & Buehler, 2007). The test for equality of indicator intercepts or *scalar invariance* tests for the presence of systematic bias across groups. This test refers to the indicator intercepts, which are the location parameters (i.e., values) of each indicator when the respective latent factor(s) they define (i.e., the dismissing and preoccupied state of mind factors) is zero. Item intercepts are analogous to the concept of the *item difficulty parameter* in item response theory (Schmitt & Kuljanin, 2008) and, when noninvariant, point to the presence of an indicator bias whereby an indicator yields a different mean response for the members of different groups with the same value of the underlying attribute (McDonald, 1999). In contrast, to the extent that indicator intercepts are invariant across groups, one can conclude that the measurement indicators have the same origin or latent factor zero point.

Following evaluation of measurement invariance, we compared African American and European American mothers on the AAI dismissing and preoccupied latent factor means in the context of tests of population heterogeneity. Tests of population heterogeneity refer to the examination of group concordance of the *structural parameters* of the model (i.e., latent variances, covariance, and means) and ask the question of whether the dispersion, interrelationships, and levels of the latent factors vary across groups (Brown, 2006). We examined the tenability of models in which factor variances, factor covariances, and finally structured latent means (i.e., the latent dismissing and preoccupied means) were constrained to equality across the two ethnic groups of women relative to models in which these parameters were freely estimated. Note that these structural parameters describe characteristics of the population from which the sample was drawn and thus nonequivalence in structural parameters do not represent critiques of the measures themselves, but rather reflect differences in the distribution of the underlying construct between the two groups (i.e., “true” substantive differences; Adamsons & Buehler, 2007).

Lastly, we examined the predictive significance and functional equivalence of the latent dismissing and preoccupied state of mind factors via multiple-group structural equation

modeling (MGSEM; Muthén & Muthén, 1998–2010) by regressing observed maternal sensitivity at 6 months on the latent dismissing and preoccupied factors. To the extent that invariant predictive associations between the dismissing and preoccupied factors and maternal sensitivity are uncovered across the two groups (i.e., these associations function similarly in both groups), the AAI latent structure can be viewed as *functionally equivalent* across African American and European American women.

Results

Confirmatory Factor Analysis (CFA) for AAI States of Mind Scales

Descriptive statistics of the AAI dismissing and preoccupied indicators for European American and African American women are presented in Table 1. Consistent with Haltigan et al. (2013) all indicators were freely estimated and the metric of the latent factors was defined by fixing the variance of the latent factors to 1. In addition, model fit was assessed utilizing guidelines presented by Hu and Bentler (1999), who outline ranges of acceptable fit values for model fit indices. In particular, adequately fitting models should have a comparative fit index (CFI) value $\geq .95$, a root mean square error of approximation (RMSEA) value $\leq .06$, and a standardized root mean square residual (SRMR) $< .08$ to suggest that there is a relatively good fit between the hypothesized model and the observed data. Relative to these criteria, the model fits the data exceptionally well, CFI = .99, RMSEA = .03, SRMR = .03 (see Table 2 for CFA parameter estimates both overall as well as separately by ethnic group).

[Table 1 Omitted]

[Table 2 Omitted]

Measurement Invariance

Having confirmed the fit of the hypothesized two-factor AAI latent structure with the current sample, we next proceeded to examine its measurement invariance and population heterogeneity in a stepwise, additive fashion in which subsequent invariance models were compared with a prior, less restricted invariance model. Thus, degradation in model fit between models would point to noninvariance in the parameters constrained to equality in the subsequent, more restricted model. Table 3 presents tests of measurement invariance and population heterogeneity of the AAI latent structure in European American and African American women. The first thing to note from Table 3 is that the two-factor AAI confirmatory model fits the data well in both European American and African American women when examined as separate groups. Next, fit indices of multiple-group analysis testing for configural invariance (i.e., test of equal factor structure; Model 1) across ethnic groups indicated that the number of factors and pattern of indicator–factor loadings was equivalent. Note that we identified this model by fixing the latent variance of the AAI dismissing and preoccupied factors to 1, as in the above single-group CFA models. We next evaluated whether the factor loadings for the indicators of the AAI dismissing

and preoccupied factors were equivalent across European American and African Americans. As Table 3 (Model 2a) shows, when the factor loadings were constrained to be equal across the groups there was a significant decrement in model fit relative to the configural model in which factor loadings were freely estimated. This indicated that one or more of the indicators of the dismissing and/or preoccupied factors did not evidence comparable factor loadings across the two ethnic groups.

[Table 3 Omitted]

To explore why the constraint of equality of factor loadings significantly degraded model fit relative to the one in which the factor loadings were freely estimated across the groups, we examined both the factor loadings from the configural solution and the modification indices from the equality constraint factor loadings solution. As can be seen from Table 2, the largest absolute difference in factor loadings across the two groups was for the mother anger indicator of the preoccupied factor, with African American women showing a substantially larger loading for the mother anger indicator relative to European American women. This, along with the modification indices from the model in which all factor loadings were constrained to equality, suggested that freely estimating mother anger in both groups would improve the fit of the model. Thus, we modified the equality constraint model such that all indicator factor loadings were constrained to be equal across groups with the exception of the mother anger indicator. As Table 3 demonstrates (Model 2b), when we respecified the equality of factor loadings model in this manner there was no longer a decrement in model fit relative to the equal form solution. These results provided evidence that the mother anger indicator was the only indicator that was noninvariant across the groups.

The final test of measurement invariance we conducted tested for equivalence of indicator intercepts. As can be seen in Table 3 (Model 3a), the model in which the indicator intercepts were constrained to equality fit the data somewhat worse relative to the metric equivalence model in which all factor loadings (except the mother anger indicator) were constrained to equality. Similar to the approach with the examination of factor loadings, we examined the modification indices from the fully constrained intercepts model, which indicated that freely estimating the intercept of the coherence of mind indicator would improve model fit. After freeing this intercept parameter, the respecified model fit the data equally as well as the previously established metric equivalence model in which all factor loadings (except the mother anger indicator) were constrained to equality (Model 3b). Inspection of the coherence of mind intercept estimates in this revised model revealed that the intercept estimate for African American mothers (5.25) was significantly lower than that for European American mothers (5.69), $\chi^2_{\text{diff}}(1) = 10.21, p < .01$. In sum, across metric and intercept model invariance testing, only two parameters were found to be noninvariant across the ethnic groups of a possible 17 (9-item loadings and 8-item intercepts). Thus, we considered the two-factor AAI measurement model to be sufficiently equivalent across the two groups to proceed with a preliminary evaluation of group mean differences and the predictive significance of the dismissing and

preoccupied factors in the context of partial measurement invariance (see Byrne, Shavelson, & Múthen, 1989; Vandenberg & Lance, 2000).

Population Heterogeneity

As shown in the bottom half of Table 3, tests of equality of factor variances and equality of factor covariances (Models 5 and 6, respectively) did not significantly degrade model fit relative to models in which these parameters were freely estimated, thus establishing invariance for these parameters across the two ethnic groups. Finally, the fit of the model in which the structured latent means were fixed to zero in both ethnic groups (Model 7) significantly degraded the fit of the model relative to a model in which the structured means were allowed to vary for African Americans (i.e., the reference group). This indicated that the two groups differed in their mean levels of the underlying dismissing and/or preoccupied latent factors. African American women, on average, scored .30 ($p < .05$) units higher on the preoccupation factor than did European American women.

Functional Invariance: Predictive Significance

We examined the predictive significance of the dismissing and preoccupied factors for later maternal sensitivity in the context of multiple-group modeling as described earlier. This allowed us to examine not only whether the two latent factors were associated with later maternal sensitivity but also whether they were related to maternal sensitivity in equivalent ways for African American and European American women (i.e., functional invariance; Hui & Triandis, 1985). Observed maternal sensitivity at 6 months was regressed on the dismissing and preoccupied state of mind factors as modeled in the previously best fitting model (i.e., in which only the factor loading of the mother anger indicator and the intercept of the coherence of mind indicator were allowed to freely vary across groups). Note that this modeling strategy ensures that, to the degree we established partial measurement invariance described earlier, the dismissing and preoccupied latent factors are empirically identical across African American and European American women prior to an examination of their predictive effects. In addition, the regression estimates of the dismissing and preoccupied factors on maternal sensitivity were constrained to equality across the two groups to test the hypothesis that associations between the preoccupied and dismissing factors and maternal sensitivity would not differ across African American and European American women. This fully constrained model fits the data well, CFI = 1.00, RMSEA = .00, SRMR = .06. When the structural regression paths of maternal sensitivity on the dismissing and preoccupied factors were allowed to freely vary across groups, model fit was not improved, $\chi^2_{\text{diff}}(2) = .26, p = .88$. Thus, associations between the preoccupied and dismissing factors and maternal sensitivity did not differ across African American and European American women. In the fully constrained model, the estimated effect of the dismissing factor on maternal sensitivity was significant, $-.24, p < .05$, whereas for the preoccupied factor it was not, $-.10, p = .28$. Lastly, to conservatively control for the influence of SES in our functional invariance model, we ran a separate model in which we included the

maternal SES composite as a freely estimated covariate to the model above in which the effects of the dismissing and preoccupied effects on maternal sensitivity were constrained to equality. In this model, the association between the dismissing factor and sensitivity was weakened ($-.17, p < .10$), whereas the association between the preoccupied factor and sensitivity remained nonsignificant ($-.06, p = .53$).

Discussion

The primary objectives of this study were to build upon existing work attempting to characterize the AAI latent structure by replicating its factor structure and examining its measurement invariance and developmental significance in an independent sample of African American and European American pregnant women. Measurement invariance is a prerequisite for confident between-group comparisons on the structured (i.e., latent) means of the dismissing and preoccupied factors as well as their developmental associations with conceptually and theoretically relevant outcomes. Independent confirmatory replication of the latent structure of the AAI state of mind scales lends further confidence to prior empirical evidence, indicating that adult attachment security as measured by the AAI is in fact a synthetic reflection of low levels of two independent aspects of incoherent attachment-relevant discourse (i.e., dismissing and preoccupied states of mind) rather than a unitary construct—which is what is assumed within the standard Main and Goldwyn (1984–1998) categorical coding system (Bernier et al., 2004; Haltigan et al., 2013; Haydon et al., 2011; Haydon et al., 2012; Roisman et al., 2007). Furthermore, confirmatory factor replication provides additional evidence of the convergence between the latent structure of attachment in infancy (Fraley & Spieker, 2003) and adulthood.

With respect to the cross-ethnic equivalence of the attachment state of mind constructs, our analyses provided evidence for partial measurement invariance, with only the mother anger and coherence of mind indicators demonstrating metric and scalar noninvariance, respectively. When the mother anger indicator was freely estimated for each group, it was observed that it significantly loaded on the preoccupied factor in both groups, but was appreciably stronger for African American women than European American women (i.e., for African American women, the preoccupied factor explained a greater proportion of variance in the mother anger indicator than for European American women). When the coherence of mind intercept was freely estimated, it was observed that the coherence of mind intercept estimate was somewhat lower among African American mothers relative to European American mothers.

The finding of stronger associations between the mother anger indicator and the preoccupied factor for African American women relative to European American women suggests the possibility that the preoccupied factor may have a different empirical definition for African American women than for European American women. Specifically, preoccupation for African American women may be empirically defined more strongly and homogeneously by the mother anger indicator rather than by a relatively equivalent contribution from the mother anger, father anger, passivity, unresolved abuse, and coherence of mind indicators. Why mother anger, and not

father anger, was more strongly associated with the preoccupied factor among African American women relative to European American women is less clear. One possibility is the influence of paternal absenteeism in African American families (Connor, 2006). In our study, African American women were more likely to report the absence of a father figure than were European American women. Thus, for African American women relationships with maternal caregiving figures may be more salient and emotionally charged than is the case for European American women. In cases where these maternal relationships are marked by conflict and tension, AAI discourse may be especially likely to reflect varying degrees of continuing mental involvement and emotional entanglement with these early relational struggles. A second and related possibility concerns the extended and multiple caregiver nature of many African American families (e.g., Howes, 1999). In our sample, African American mothers were more likely than European American mothers to report two maternal caregivers. Most often, this second maternal caregiving figure was reported as a grandmother, who has historically assumed an important caregiving status as a “second mother” in the African American family (Frazier, 1966). It is possible that relational tensions operating within and between multiple maternal caregiving figures, as well as the potential for different mental representations of the self and other vis-à-vis these maternal figures, may amplify associations between maternal anger and preoccupation for African American women.

Our finding that the coherence of mind indicator intercept estimate was somewhat lower among African American mothers in the current sample is consistent with their lower observed mean score for coherence of mind relative to European American mothers (see Table 1). Morgenstern (2008) also found lower scores on the AAI coherence of mind scale among African Americans relative to European Americans. Regarding measurement invariance more specifically, it should be noted that intercept noninvariance does *not* reflect group differences in the discriminating power of an indicator across groups (i.e., metric invariance), and hence is less problematic with respect to group differences in specific components of the theoretical or empirical structure of the underlying construct (i.e., construct validity; Cooke, Kosson, & Michie, 2001). Moreover, Schmitt and Kuljanin (2008) have shown that partially invariant intercept models, as is the case here, are unlikely to influence the estimates of latent means that are evaluated for group differences. Lastly, we believe it is unlikely that the noninvariance of the coherence of mind intercept points to a systematic coder bias, given that AAI transcripts are masked with respect to participant identifying information prior to coding. Rather, our view is that the coherence of mind intercept noninvariance may reflect actual “true” mean threshold differences in coherence of mind ratings in the current sample. The latter possibility is consistent with African American women's elevation on the preoccupied latent factor discussed next. Independent replication in other samples of African American and European American women is needed to further determine whether these measurement findings may be indicative of differences in construct meaning between the two ethnic groups of women or are specific to the current sample. In addition, a search for functionally equivalent distinctive antecedents and correlates of the preoccupied factor across the two groups will also serve to address its construct validity.

Our analyses of the population heterogeneity of the AAI dismissing and preoccupied latent factors revealed that African American women in this sample showed modest elevations on the preoccupied factor mean relative to European American women. It should be noted that the magnitude of this mean difference corresponds to a Cohen's (1992) d of .30 ($r = .15$), which reflects a small effect size. Note that this difference reflects meaningful "true" substantive differences between the two groups of women with respect to the emergence of preoccupied discourse during the AAI. As discussed earlier, African Americans may be more emotionally expressive than European Americans because African cultural heritage values emotional expression (Boykin, 1986; White & Parham, 1990) and discourages emotion inhibition (Samter, Whaley, Mortenson, & Burleson, 1997). Moreover, as Parker et al. (2012) point out, a consistent finding in the emotion literature is that African American adults are more willing to express anger when they feel it compared to European American adults (Durik et al., 2006; Matsumoto, 1993). These findings, in conjunction with the work in our laboratory (Leerkes, Supple, Su, & Cavanaugh, in press) using this same sample in which African American women showed elevations in self-reported trait anger relative to European American women, suggest, at least in part, one possible explanation of African American women's elevations on the AAI preoccupied factor.

Lastly, our finding that the dismissing factor was negatively associated with prospectively observed maternal sensitivity replicates and extends earlier work by Whipple et al. (2011) by demonstrating that this association was empirically equivalent for African American and European American women. Said differently, this finding provides support for a *no group difference* hypothesis (Bakermans-Kranenburg et al., 2004; Mesman et al., 2012; Rowe, Vazsony, & Flannery, 1994): African American and European American mothers in the United States may be exposed to culturally specific experiences, but these do not alter the negative association between dismissing states of mind and maternal sensitivity. Interestingly, the point estimate of the strength of the negative link between the dismissing factor and later maternal sensitivity we found, $r = -.24$ (Cohen's $d = .49$), is comparable in magnitude to the negative association between the dismissing dimension and maternal sensitivity, $r = -.30$ ($d = .63$), first reported by Whipple et al. (2011) in a smaller sample and also with the meta-analytic findings of van IJzendoorn (1995) who found a combined effect size of $r = .34$ ($d = .72$) between parents' secure-autonomous attachment representations and parental responsiveness. When we conservatively controlled for the effects of SES, the magnitude of the association between the dismissing factor and maternal sensitivity was weakened ($r = -.17$) but still exerted a marginally significant effect on later maternal sensitivity. Thus, the effect of dismissing states of mind on maternal sensitivity should be interpreted with some caution. That said, it should be kept in mind that the current sample was more diverse with respect to socioeconomic risk than that of Whipple et al. and thus it is not altogether surprising that the effects of SES on predictive associations between the dismissing and preoccupied factors and maternal sensitivity were more pronounced than in their study.

Clinical, Empirical, and Theoretical Implications

Results of this study have important clinical, empirical, and theoretical implications. Considered at the broadest level, the relative invariance of the AAI two-factor structure across both European American and African American women suggests that the AAI is a valid instrument that largely possesses the same empirical meaning in both groups. However, our findings of maternal anger and coherence of mind noninvariance also suggest that additional work examining the influence of ethnicity on the production and structure of AAI narratives, especially the potential influence of ethnicity on AAI scale scores, is needed. Relatedly, in light of the possibility that ethnic variation in talking about and reflecting on one's early life experiences with an authority figure (i.e., AAI interviewer) may exist, the ethnic match between AAI interviewer and participant should be considered when examining ethnic variation in dismissing and preoccupied states of mind. Given the aforementioned evidence that African Americans may be more emotionally expressive than European Americans (Boykin, 1986; Durik et al., 2006) and that African American families have been characterized as extended with multiple caregivers (e.g., Howes, 1999), both clinicians and researchers alike should be attuned to possible ethnic and sociocultural influences on the production of AAI narratives to inform their clinical interpretations and research questions. More specifically, such ethnic influences should be considered with respect to processes of emotion socialization that may give rise to stylistic ways of talking about and mentally integrating early maternal relationship difficulties and conflict described in AAI narratives into representational models of attachment (Cole & Tan, 2007; Montague, Magai, Consedine, & Gillespie, 2003). Such a perspective is important both clinically and with respect to research on adult attachment because it highlights the possibility that angry discourse with respect to maternal caregivers among African American women in AAI narratives and its association with preoccupation *may not necessarily* be associated with problematic or unintegrated mental representations of early attachment experiences. Although virtually no work has been done examining the possible influence of ethnicity on AAI narratives, work by Morgenstern (2008; see also Morgenstern & Magai, 2010) has highlighted the point that consideration of how ethnicity may impact the generation of AAI narratives is an important issue that requires attention when researchers administer the AAI to ethnically diverse groups. We agree and encourage researchers to examine this possibility in future work with the AAI in ethnically diverse samples.

From an empirical and theoretical perspective, these results support the idea that adult attachment security is empirically reflected by the *simultaneous* presence of low levels of relatively distinct dismissing and preoccupied states of mind rather than a unitary construct (Haydon et al., 2012). This distinction is important because it suggests that adult attachment security is *not* a broad dimension (i.e., one is “secure” or not) and that the two major forms of adult attachment insecurity (i.e., dismissing and preoccupied) are not mutually incompatible as is assumed in the standard account of adult attachment security reflected in the (Main & Goldwyn, 1984–1998; Main, Goldwyn, & Hesse, 2003–2008) AAI coding system. Importantly,

this conceptualization of attachment security affords the opportunity to explore fundamental questions in attachment scholarship, such as ethnic influences on attachment states of mind that are not conflated with a security–insecurity perspective. Thus, the elevation in preoccupation for African American women in this study relative to European American women may be understood in the context of their cultural niche (Hinde & Stevenson-Hinde, 1990; van IJzendoorn & Sagi-Schwartz, 2008) rather than associated with insecurity per se.

Finally, the link between the dismissing dimension and maternal sensitivity provides some support for Main and Goldwyn's (1984–1998) original theoretical assertion that how mothers reflect on and integrate their own early attachment experiences is associated with their (in)ability to accurately read and respond to their own infants' emotional states and needs and to engage in sensitive caregiving behaviors. African American *and* European American mothers in this study who minimized, downplayed, or diverted attention away from the importance of early relational experiences by either failing to recall these experiences or by idealizing them displayed less sensitivity to their infants' need for comfort and security in the context of laboratory tasks that provide both naturalistic play settings and settings that are designed to elicit infant distress. However, because both this association was reduced to marginal significance when SES was controlled and there was a positive association between SES and the coherence of mind scale in the current sample (mean r estimate = .31 across ethnic groups), as well as similar associations between socioeconomic variables and AAI coherence ratings in other studies (Crowell et al., 1996), this underscores the need for additional research in economically diverse samples. Such work will permit a better understanding of the nature of the association between SES and adult attachment states of mind as well as allow for the empirical assessment of the robustness of dismissing and preoccupied states of mind as predictors of maternal sensitivity.

Limitations and Conclusions

Although the ethnic composition of the current sample ideally positioned us to study the measurement invariance of the AAI latent factors across two ethnic groups that have been featured in a large share of adult attachment research utilizing the AAI, there were limitations to the current project that limit the generalizability of the findings. Perhaps most importantly, our study sample was composed entirely of pregnant women residing in the Southeastern United States. Thus, whether the same findings with respect to measurement invariance would emerge in other ethnically and geographically diverse samples is an open question. In addition, given the unavailability of a measure of maternal autonomy support in this study, we were not able to test Whipple et al.'s (2011) finding of a distinctive negative link between the preoccupied factor and maternal autonomy support measured at 15 months. Nevertheless, the lack of a significant association between the preoccupied factor and maternal sensitivity found here is consistent with the Whipple et al. report and furthermore this finding was also empirically invariant (equivalent) across the two ethnic groups of women.

In summary, given that evidence has now accumulated converging on the finding that the state of mind indicators on the AAI load on two distinct, modestly correlated axes of dismissing and preoccupied states of mind, it is now incumbent upon researchers to ensure that these latent factors are represented in equivalent ways across diverse ethnic and other groups (e.g., clinical or high-risk samples). This not only safeguards empirical work evaluating between-group differences on the dismissing and preoccupied factors and their predictive significance, but can also provide additional insight to the dialogue surrounding the cultural universality of attachment theory constructs (Rothbaum et al., 2000; van IJzendoorn & Sagi-Schwartz, 2008). Moreover, evidence that the dismissing and preoccupied factors are empirically equivalent across diverse populations will buttress work that applies the AAI latent structure detailed herein to questions related to the stability of attachment-related variation within individuals and across generations (Haydon et al., 2012). That is, stability of attachment constructs should also be evaluated in the context of their equivalent meaning across diverse populations. Future work examining the latent structure and measurement equivalence of adult attachment will continue to sharpen our understanding of the universality and developmental significance of adult attachment representations.

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