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A sibling adoption study of adult attachment: The influence of shared environment on attachment states of mind

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Abstract

This study extends existing research investigating sibling concordance on attachment by examining concordance for adult attachment in a sample of 126 genetically unrelated sibling pairs. The Adult Attachment Interview (George, Kaplan, & Main, 1985; Main, Goldwyn, & Hesse, 2003) was used to assess states of mind with regard to attachment. The average age of the participants was 39 years old. The distribution of attachment classifications was independent of adoptive status. Attachment concordance rates were unassociated with gender concordance and sibling age difference. Concordance for autonomous/non-autonomous classifications was significant at 61% as was concordance for primary classifications at 53%. The concordance rate for not-unresolved/unresolved was non-significant at 67%. Our findings demonstrate similarity of working models of attachment between siblings independent of genetic relatedness between siblings and generations (i.e., parent and child). These findings extend previous research by further implicating shared environment as a major influence on sibling similarities on organized patterns of attachment in adulthood. The non-significant concordance for the unresolved classification suggests that unresolved loss or trauma may be less influenced by shared environment and more likely to be influenced by post-childhood experiences or genetic factors.

Keywords

Shared environment; adult attachment; sibling concordance; adoption; working models of attachment

Introduction

Recent research into familial influences on the quality of attachment has resulted in an increasing number of genetically informative designs that allow separation of genetic and environmental sources of variance. To date, the majority of studies interested in identifying genetic and environmental effects have focused on attachment during early childhood and preschool (Bokhorst, Bakermans-Kranenburg, Fearon, van IJzendoorn, Fonagy, & Schuengel, 2003; O'Connor & Croft, 2001; Sagi et al., 1995; van IJzendoorn, Moran, Belsky, Pederson, Bakermans-Kranenburg, & Kneppers, 2000; Ward, Vaughn, & Robb, 1988). These studies have shown little evidence of genetic effects and strongest support for shared environmental

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influences. This study extends previous research by examining sibling similarity in attachment states of mind in adulthood using an adoption paradigm.

Previous authors have noted that adoption studies would be useful in elucidating the genetic and environmental influences on attachment (Bokhorst et al., 2003; Main, 1999; van IJzendoorn et al., 2000). Specifically, examination of concordance for attachment in genetically unrelated siblings who were raised in the same family ensures that attachment concordance for siblings is *not* due to shared genetic factors. The design of the current study (i.e., examining the concordance of attachment states of mind in siblings who were no longer living at home and were not biologically related) provides a rigorous test of attachment theory's contention that similar family experiences during childhood contributes to internal working models of attachment that continue to influence attachment relationships in adulthood.

Studies on concordance of infant – parent attachment for individuals with the same caregiver have relied on samples comprised of genetically related siblings, twins, and unrelated infants with the same non-parental caregiver in a kibbutzim. The differences in study designs allow for estimates of environmental and genetic influences on attachment. The earliest studies on similarities of attachment in siblings used original infant classifications of secure, avoidant, and resistant attachment from the Strange Situation Procedure (SSP; Ainsworth et al., 1978). The SSP is a behaviorally based observational system in which infant behaviors are rated during episodes of separation and reunion. Ward and associates (1988) examined concordance on SSP attachment derived organized classifications of attachment between first and second born genetically *related* siblings at 12 months of age. The overall concordance rate was 57% for primary attachment classifications (i.e., secure, avoidant, or resistant) and 61% for secure versus insecure attachment.

In order to address the degree to which genetic similarities might contribute to concordance between siblings, Sagi and associates (1995) examined concordance rates for SSP classifications among genetically *unrelated* infant pairs cared for by the same non-parental primary caregiver (i.e., metapelet) in a kibbutz. The overall concordance rate for secure versus insecure attachment with the same metapelet (62%) was similar to the rate found in the Ward et al. (1988) sample of genetically related siblings. Interestingly, concordance rates were highest (70% and 68%, respectively) in kibbutzim where infants slept in the family home with their parents. Among infants who slept in a communal infant house, concordance for attachment (48%) was not statistically significant.

More recent studies of infants and toddlers have coded for disorganized attachment in which the infant displays conflicting approach/avoidance behaviors (Main & Solomon, 1990). van IJzendoorn and associates (2000) combined three samples of siblings pairs ranging in age from 12 to 18 months old. The overall concordance rate of 62% for secure (B) versus insecure (A, C, or D) was statistically significant. However, concordance for primary attachment classifications (A, B, C, or D; 44%), primary organized attachment classifications (A, B, or C; 49%), and disorganized versus organized (73%) failed to reach statistical significance.

Twin studies on sibling concordance of attachment have also been conducted. By comparing concordance rates for monozygotic (MZ) and dizygotic (DZ) twins, researchers are able to explicitly test whether greater genetic similarity influences greater similarity on attachment. Bokhorst and associates (2003) combined two samples of 12-month-old twins. Overall concordance for secure (B) versus insecure (A, C, or D) attachment was significant at 56% for MZ twins and 60% for DZ twins. Concordance rates for disorganized versus organized attachment were also very similar (72% for MZ twins and 73% for DZ twins) but non-significant. Genetic modeling showed 52% of the variance in sibling attachment security concordance was attributable to shared environment. Neither genetics nor shared environment explained a significant amount of variance in disorganized attachment.

Extending analyses into the preschool period, O'Connor and Croft (2001) tested sibling concordance in a sample of preschool twins (average age 43 months) using the preschool coding system for the Strange Situation Procedure (Cassidy & Marvin, 1992). The overall concordance rates of 67% for secure (B) versus insecure attachment (A, C, or D) and 50% for primary attachment classifications (A, B, C, or D) were similar to concordance rates found in previous studies of non-twin siblings. Concordance rates for secure versus insecure attachment were similar for MZ twins (70%) and DZ twins (64%). As in studies of non-twin siblings, concordance rates for secure versus insecure attachment were statistically significant while concordance rates for primary attachment classifications were not. Genetic modeling of continuous measures of attachment security showed environmental factors as the major source of influence on concordance (shared = 32%; nonshared = 53%).

Our expectation of significant sibling concordance for attachment during adulthood relies strongly on the concept of internal working models. According to attachment theory, internal working models of attachment influence subsequent experiences and perceptions of intimate relationships (Bowlby, 1973, 1969/1982; Bretherton, 1985; Bretherton & Munholland, 1999; Main, 1990; Main, Kaplan, & Cassidy, 1985; Sroufe & Waters, 1977; Thompson, 2000; Thompson & Raikes, 2003). Siblings with similar internal working models should interpret and engage in future relationships in a similar fashion (Carlson, Sroufe, & Egeland, 2004; Main et al., 1985). Thus, it can be hypothesized that siblings concordant for attachment will have similar experiences in post-childhood relationships that will reinforce their states of mind and, ultimately, maintain similarity on attachment (Bokhorst et al., 2003; Carlson et al., 2004; Crowell, Treboux, & Waters, 2002; Fraley, 2002; Hazen & Shaver, 1987; Sroufe, 2005). We recognize, however, that it is possible that sibling concordance of attachment seen in studies of children who are still dependent on caregivers is due to the ongoing impact of parent – child relationships. Thus, concordance for attachment between siblings may decrease during adulthood once this influence is removed resulting in lower concordance rates in adulthood. Furthermore, Main (1996) has argued that there may be a larger heritable component to adult attachment states of mind due to the potential for genetic differences to affect an individual's ability to process difficult experiences and develop a secure attachment state of mind despite a difficult childhood.

A recent twin study examining concordance among late adolescent and young adult MZ twins provides preliminary support for our hypothesis of continued sibling concordance in adulthood (Constantino et al., 2006). Substantial sibling attachment similarities were observed among adolescent and young adult monozygotic twins with concordance rates ranging from 64% to 79%. Ages of the sibling pairs ranged from 13 to 26 years old. Although the Constantino et al. (2006) study extends previous research into familial contributions to adult attachment, understanding the persistence of family influence on sibling concordance was limited as a portion of the sample was still residing in the home. Furthermore, disentangling genetic from shared environmental influences was not possible due to the lack of a dizygotic twin comparison group.

In sum, our primary hypothesis is that sibling concordance for organized attachment classifications will persist into adulthood. We base our hypothesis on the role of internal working models of attachment in shaping post-childhood experiences and research demonstrating modest continuity of attachment across the lifespan (Bokhorst et al., 2003; Fraley, 2002; Hamilton, 2000; Sroufe, 2005; Waters, Merrick, Treboux, Crowell, & Albersheim, 2000). We further hypothesize that sibling concordance will be less pronounced for the unresolved classification given the lack of significant concordance in earlier age periods, the role of life experiences in unresolved attachment (i.e., loss) that may be unshared between siblings, and possibly, albeit inconsistently supported, genetic variants underlying disorganized attachment (Bakermans-Kranenburg & van IJzendoorn, 2004; Caspers, Paradiso, Troutman, Yucuis, Langbehn, Philibert, & Cadoret (under review); Lakatos et al., 2002; Lakatos, Toth, Nemoda, Ney, Sasvari-Szekely, & Gervai, 2000). Our sample of adult adoptees provides a unique opportunity to assess the impact of shared environment on attachment across the lifespan.

Methods

Participants

The sample for this study originated from five separate adoption studies conducted between the years of 1975 through 1994 (Yates, Cadoret, & Troughton, 1999). Adoptees were originally selected on the basis of the psychiatric status of their biological parent(s). The offspring of a birth parent with a documented psychiatric problem (e.g., alcohol problems, antisocial behavior, depression) determined a "proband." For each proband, an age and gender matched "control" adoptee was recruited from the same agency when available records gave no indication of birth parent pathology. Adoptees and their adoptive parents were interviewed at the initial wave of data collection. All adoptees were at least 18 years of age at the time of initial interview.

The adoptee was followed-up and re-interviewed during a recent wave of data collection (1999 – 2003). At this time, psychiatric histories were updated and the Adult Attachment Interview (AAI; Main et al. 2003) was administered to the adoptees. A competitive supplement was funded allowing a sibling that was a biological offspring of the adoptive parents, whose age was within 10 years of the adoptee and of the same gender of the adoptee when possible, to be invited to participate in the study. The sibling was administered the same battery as the adoptee. A total of 128 sibling and 217 adoptee interviews were coded. Complete matched data were available for 126 sibling pairs (n = 252 individuals). Excluded sibling pairs arose due to mechanical failure of one sibling tape, lack of participation or availability by a sibling, or unavailability of resources to conclude coding of all available tapes.

Average ages of the adoptee and non-adopted sibling were equivalent ($M_{adoptee} = 38.34$, $SD_{adoptee} = 7.67$; $M_{natural} = 38.36$, $SD_{natural} = 8.82$, respectively) with an average age difference of 4.85 years (SD = 2.87). Sixty-nine percent of both siblings were currently married. Average length of education was 14 years and average household income was between $50,000 and $74,000 (USD) per year for both adoptees and siblings. Adoptees were adopted on average by 2 months of age (SD = 5.44) with 67.8% adopted prior to 1 month and 94.2% adopted prior to 6 months of age.

Measures

Adult Attachment Interview—The Adult Attachment Interview (AAI) is a semi-structured interview that assesses an individual's internal working model of attachment (Main et al. 2003; Main, Kaplan, & Cassidy, 1985; van IJzendoorn, 1995). Scores reflect the degree of internal mental consistency when describing experiences with parents during childhood. Participants are asked to provide five adjectives describing their childhood relationship with their mother and father. The interviewer then asks for experiential support for the chosen descriptors. Questions about parental responses during episodes of emotional upset, illness, and injury are also probed, as are experiences with death and trauma. Finally, the individual is asked to describe changes in and current feelings about their relationship with their parents.

Three primary organized states of mind are derived from the transcripts: dismissing (Ds), autonomous (F), and preoccupied (E). A dismissing state of mind is characterized by an inability to recall primary memories for positive adjectives used to describe either the mother and/or father. Such individuals show a high degree of self-reliance, place minimal value on attachment relationships, and portray their childhoods as positive but are unable to provide experiential support for descriptors. Those with a preoccupied state of mind demonstrate an inability to focus on questions at hand. They respond in either a vague manner making it difficult to determine their childhood experiences or become actively angry when discussing past or current interactions with their parents. Individuals with an autonomous state of mind, conversely, are able to provide experiential support for adjectives, are consistent in their portrayal of early experiences, and are willing to evaluate past and current relationships objectively. They show valuing of attachment and forgiveness or compassion for negative experiences. A fourth category is assigned when a clear organized pattern is not discernible. For example, a subject may be classified as preoccupied for mother but dismissing for father. These transcripts are classified as Cannot Classify (CC) with the organized classifications also designated (e.g., CC/E/Ds).

Finally, a category of unresolved/disorganized (U) is assigned and is evident when significant lapses in discourse are present during discussions of loss or trauma. A few examples of speech patterns indicative of the unresolved category are confusions of the dead person as living, excessive detail surrounding the event of death or trauma, identifying the self as causal in the death of a loved one or deserving of abuse, or extreme reactions to experiences of loss or trauma. Given a classification of Unresolved, subjects are also assigned a corresponding organized classification (e.g., U/Ds).

Interviews were transcribed verbatim and coded by coders deemed reliable by the laboratory of Mary Main and Eric Hesse (Rebecca Yucuis and Kristin Caspers, trained by Deborah Jacobvitz, Austin TX, 2000; Jeanne Frederickson and Beth Troutman, trained by June Sroufe, Minneapolis, MN, 1999 and 2001, respectively). Interviews were anonymously assigned to coders by an independent research assistant. Effort was made to ensure coders only rated one sibling from each sibling pair and were blind to adoptive status and biological background of the adoptees. Fifty percent of the interviews were double coded. If there was disagreement between coders and a consensus could not be reached, then a third coder was selected to code the interview. Overall, inter-rater agreement was 94% for the autonomous versus non-autonomous distinction ($\kappa = .86$, $p < .001$), 91% agreement for the primary classifications ($\kappa = .84$, $p < .001$), and 93% agreement for the unresolved/not unresolved classifications ($\kappa = .71$, $p < .001$). Intra-class correlations, exact agreement, were acceptable for the continuous attachment representation scales, i.e., the scale for unresolved loss or trauma, and the scale for coherence of transcript (see Main et al. 2003, for details), ranging from .63 to .90.

Statistical analyses

Descriptive statistics on distributions of AAI classifications are presented followed by calculation of concordance rates. Preliminary analyses consisted of testing concordance rates as a function of gender concordance, sibling age differences, and adoptee biological parent psychopathology. Adoptees were designated as the first sibling regardless of gender and age. We calculated concordance rates for three classification schemes: autonomous versus non-autonomous, primary attachment classifications (e.g., F, Ds, E, or CC), and unresolved versus not unresolved. We also compared our concordance rates with concordance rates from available published sibling studies. In addition, we tested mean differences and correlations to examine sibling differences on scale scores used to derive the overall classifications.

Results

Preliminary analyses

Distributional properties of attachment classifications—Table I presents distributions for attachment classifications of autonomous, dismissing, preoccupied, and cannot classify separately for adoptees and their siblings. The observed distributions for the primary attachment classifications, ignoring U and CC, for the present study differed significantly ($p < .0001$) from expected based on distributions from meta-analyses (van IJzendoorn & Bakermans-Kranenberg, 1996). The significant differences for both adoptees and their non-adopted siblings were due to higher rates of dismissing and lower rates of preoccupied classifications. Frequency for secure state of mind was not significantly different from expected. The observed frequency of not unresolved/unresolved was not significantly different from what would be expected for both adoptees, χ^2 (1) = 2.872, p = .0901, and non-adopted siblings, χ^2 (1) = 0.000, p = 1.000.

Gender and age differences—Distributional differences by gender concordance and age differences of siblings were compared for the autonomous versus non-autonomous attachment distinction. Sixty-three percent of the sibling pairs were discordant for gender. Chi-square analyses showed independence between autonomous versus non-autonomous concordance and sibling gender concordance (χ^2 (1) = 1.25, p = .26). Attachment concordance was also independent from sibling age difference (t (124) = −.30, p = .77). No association was found between unresolved attachment concordance and gender concordance (χ^2 (1) = .80, p = .37) and sibling age differences (t (110) = −.46, p = .65).

Adoptee biological parent psychopathology—To rule out the possible influence of the unique nature of the adoptee sample on attachment (i.e., birth parent psychopathology), the association between adoptee biological background and attachment was examined (see Table II). Evidence of alcohol problems by adoptee biological parents did not significantly predict adoptee primary classifications (i.e., F, Ds, E, or CC) (χ^2 (3) = 4.25, p = .24; Phi = .18), autonomous versus non-autonomous classification (χ^2 (1) = 1.75, p = .19; Phi = −.12), nor the unresolved versus not unresolved distinction (χ^2 (1) = 0.20, p = .66; Phi = .04). Documented antisocial behavior in an adoptee biological parent also did not predict adoptee attachment classification: primary classification (χ^2 (3) = 1.48, p = .69; Phi = .11), autonomous versus non-autonomous classification (χ^2 (1) = .27, p = .60; Phi = −.05), and unresolved versus not unresolved (χ^2 (2) = .00, p = .95; Phi = .00).

Finally, we examined the association between adoptee biological risk and sibling attachment concordance. None of the comparisons were significant: autonomous/non-autonomous concordance and alcohol biological background (χ^2 (1) = .02, p = .90; Phi = −.01), autonomous/non-autonomous concordance and antisocial biological background (χ^2 (1) = .62, p = .43; Phi = −.07), unresolved concordance and alcohol biological background (χ^2 (1) = .1.46, p = .23; Phi = −.11), and unresolved concordance and antisocial biological background (χ^2 (1) = .07, p = .79; Phi = .03). Based on these findings, gender pair composition, age difference, and adoptee biological risk status were excluded from the following analyses.

Primary analyses

Sibling concordance for attachment classifications—Concordance for autonomous versus non-autonomous states of mind showed 60% of sibling pairs in agreement (see Table III; 76/126; χ^2 (1) = 5.11, p = .02; Phi = .20). Analysis of the primary (i.e., F, Ds, E, or CC) classifications showed a significant 53% concordance (67/126; χ^2 (9) = 32.64, $p < .001$; Phi = .51) (see Table IV). Examination of the adjusted standardized residuals showed Bonferroni-corrected significance for pairings of cannot classify and preoccupied. Concordance for autonomous state of mind was marginally significant (see Table IV). Finally, concordance rates for the two-way unresolved/not-unresolved distinction was non-significant with 67% of siblings concordant (see Table V; 77/112; χ^2 (1) = .18, $p = .68$; Phi = .04).

Similarity to published sibling concordance studies—A summary of the findings from this study and published studies examining sibling concordance for attachment is presented in Table VI. We wanted to test whether the significant observed sibling similarities in autonomous versus non-autonomous attachment found in our data were comparable to other estimates in the literature. There is some difficulty in conducting such a test on the basis of observed concordance (percent agreement) because this value is also dependent upon the relative frequency of attachment types in the data samples being compared. Instead, the odds ratio provides a suitable statistic for association comparisons among samples when the attachment frequencies vary (Hennekens & Buring, 1987; Woolson & Clarke, 2002).[1]

After first checking the Breslow-Day test for odds ratio heterogeneity, we used the Cochran-Mantel-Haenszel (CMH) method to estimate the common odds ratio across previously published samples and also the standard deviation of this estimate (Agresti, 2002). Data used was taken from Bokhorst et al. (2003) (MZ and DZ samples considered separately), O'Connor and Croft (2001) (MZ and DZ samples considered separately), Constantino et al. (2006) (MZ only), van IJzendoorn et al. (2000), and Ward et al. (1988). We compared the estimate from our current study to this pooled estimate by a *z* test of differences in the log (odds ratio), estimates of the relevant, independent standard deviations being available from the CMH method for the pooled estimator and the well-known delta method approximation for the single 2 × 2 table representing the current data (e.g., Woolson & Clarke, 2002). Among the literature sources cited above, the CMH pooled odds ratio estimate for autonomous versus non-autonomous attachment sibling similarity was 2.88 (95% CI = [1.98 – 4.1], $\chi^2 = 31.69$, 1*df*, $p < .001$). The Breslow-Day test for odds ratio heterogeneity was non-significant ($\chi^2 = 6.48$, 6*df*, $p = .37$), suggesting that there is not strong evidence for an inconsistent odds ratio among these previously published reports. In comparison, the estimated odds ratio from the current data is 2.29 (95% CI = [1.11 – 4.73], $\chi^2 = 5.07$, 1*df*, $p = .02$). The difference in these estimated values is not large, and the *z* test comparing them showed no statistical significance ($z = -0.55$, $p = .58$). We gain further insight into the similarity in estimates if we translate the pooled odds ratio into the equivalent concordance conditional on insecure attachments levels in the current data (48% in adoptees and 41% in non-adopted siblings). The pooled odds ratio estimate of 2.88 then translates to 63% concordance, which agrees quite closely with the 61% rate observed in our data.

Sibling similarities on scale scores of the Adult Attachment Interview—We examined sibling similarities on scale scores for inferred experience and states of mind. Preliminary analyses showed no association between gender concordance, biological parent psychopathology, and sibling differences on scale scores. Therefore, the presented findings are limited to the effects of sibling attachment concordance (see Table VII). Unadjusted *t*-tests showed significantly greater sibling differences on inferred loving and rejection from mother (Cohen's $d = .58$ and .47, respectively) and father (Cohen's $d = .53$ and .53, respectively). As expected, greater sibling discrepancies for inferred loving and rejection were found among the discordant sibling pairs. Significant differences in sibling differences were also found for the

[1]Consider the familiar 2 × 2 table of agreements between frequencies in the case of secure versus insecure attachment. Let a be the frequency with which both siblings 1 and 2 have secure attachment. Let b be the frequency with which sibling 1 is secure and sibling 2 insecure, c the frequency with which sibling 1 is insecure and sibling 2 secure, and d the frequency with which they are both insecure ($a + b + c + d = 1$). Whereas concordance is given by $a + d$, the odds ratio is defined by $(a/c)/(b/d) = (ad)/(bc)$. If similarity between siblings is exactly what is expected by chance, the odds ratio will always be 1. However, depending on the imbalance between secure and insecure attachment in the sample, chance expected concordance can vary from 0.5 to 1.0.

following states of mind scales: mother idealization (Cohen's *d* = 1.69), father idealization (Cohen's *d* = .93), insistence on lack of recall (Cohen's *d* = .49), and coherence of mind/ transcript (Cohen's *d* = 2.06/1.99). Again, greater sibling differences were observed in the discordant sibling group.

We also computed correlations between sibling ratings on the inferred experience and states of mind scales (see Table VIII). Few significant correlations were found in the discordant group for inferred experiences. Small, but significant, correlations between siblings were observed for mother loving and father pressure to achieve. In the concordant group, significant but surprisingly modest correlations were found for mother and father loving, mother and father rejection, pressure to achieve for mother and father, and mother neglect. Sibling states of mind scale scores showed strong associations in both the discordant and concordant groups. As expected, idealization of mother and father were negatively correlated between siblings in the discordant group and positively associated in the concordant group. The magnitudes of the correlations were equivalent across the two groups. Involving anger for mother and overall derogation were also significantly and positively correlated in the concordant group. Finally, highly significant correlations were found for coherence of mind and coherence of transcript in both groups.

Discussion

Behavioral genetics research can be useful for understanding genetic and environmental influences on important psychosocial phenomenon. In this study, we present findings demonstrating that shared environmental influences on attachment continue well into adulthood. Concordance of attachment was examined using an adult sample of adoptees and their genetically unrelated siblings. Based on attachment theory, we hypothesized continued sibling concordance for attachment in adulthood due to significant sibling concordance observed in early childhood and preschool, moderate stability of attachment, and the reinforcing influence of attachment states of mind on social interactions. Our findings supported our primary hypothesis by demonstrating concordance rates equivalent to those observed during earlier developmental periods.

Preliminary analyses showed sibling concordance for attachment states of mind was not affected by gender concordance or age differences between siblings. We also failed to find a significant association between biological risk in adoptees and sibling concordance. Furthermore, consistent with previous studies of infants and toddlers adopted during the first year, the distribution of primary attachment classifications was similar among adopted and non-adopted siblings (Juffer & Rosenboom, 1997; Singer, Brodzinsky, Ramsay, Steir, & Waters, 1985). Because of the elevated genetic risk for psychopathology among at least half of our adoptees, we also tested whether the presence of alcohol problems and antisocial behaviors in the biological parents influenced adoptee attachment and sibling concordance. Analyses showed a non-significant association suggesting that our indicators of genetic risk do not influence attachment in adulthood.

The significance of sibling concordance rates varied by classification scheme examined. Specifically, when only organized categories were examined, sibling concordance for autonomous versus not autonomous (61%) and primary type of attachment states of mind (53%) was statistically significant. We examined whether possible discrepancies could be attributed to borderline cases (e.g., Ds3/F1). Roughly half (45%) of the discordant pairs contained one sibling classified as “somewhat setting aside of attachment (F1)” or “somewhat dismissing or restricting of attachment (F2)” and the other sibling classified as dismissing. A third consisted of dismissing (Ds1 or Ds3) with clear autonomous (F3) and about 20% paired dismissing with autonomous classifications having preoccupied-like qualities (F4/F5). We also examined whether adoptive status showed a predictive pattern in discordance (e.g., adoptee was consistently dismissing whereas natural offspring was autonomous). No predictable pattern was attributable to adoptive status. The borderline discordant cases can be due to unreliability or some characteristic of the individual or parent – child relationship that allowed one sibling to more coherently discuss their experiences. Unfortunately, the data does not allow us to disentangle these two effects.

Concordance for unresolved loss or trauma in siblings was similar to concordance for disorganized attachment in infants and toddlers. As found in studies using infant and preschool samples (Bokhorst et al., 2003; van IJzendoorn et al., 2000), sibling concordance for unresolved loss or trauma was not statistically significant. Interpretation of the lack of statistically significant concordance for unresolved loss and trauma between siblings is complicated by the difference between organized working models of attachment which are hypothesized to result from early experiences with caregivers and unresolved state of mind which is viewed as a response to an attachment-related loss or trauma (Hughes, Turton, Hopper, McGauley, & Fonagy, 2004; Lyons-Ruth & Jacobvitz, 1999; Main, 1996). An unresolved state of mind may result from frightening or abusive experiences with parental figures during childhood or the loss of either a parental or a non-parental figure at any time in development (Lyons-Ruth & Jacobvitz, 1999; Main, 1996). The use of an adult sample increases the likelihood for lack of concordance for unresolved state of mind due to unique experiences by siblings in adulthood. Support for the potential role of differential experiences is supported by the findings of Crowell et al. (2002) who found that over a period of 2 years, primary AAI classification was more stable (78%) than the stability of the unresolved classification (46%). Alternatively, the lack of statistically significant sibling concordance for unresolved loss or trauma may be due to a greater influence of genetic factors on unresolved status or a complex interplay between experience and vulnerability (Madigan, Bakermans-Kranenburg, van IJzendoorn, Moran, Pederson, & Benoit, 2006; van IJzendoorn & Bakermans-Kranenburg, 2006).

Finally, examination of sibling differences on the continuous scale scores showed slight discrepancies in sibling agreement (or disagreement) for inferred experience as compared to states of mind scales. As expected, inferred experience scores were not significantly associated among discordant sibling pairs whereas significant, albeit modest, agreement was found among concordant sibling pairs. The pattern of significance was markedly different for scales reflecting states of mind with highly significant negative agreement among discordant siblings and highly significant positive correlations among concordant siblings. We examined whether the difference in sibling agreement on scale scores was due to systematic differences in rater agreement between concordant and discordant sibling pairs. The average difference in agreement between raters (i.e., intra-class correlations, exact agreement) was minimal (mean difference = .04) and no difference in rater agreement for inferred experiences compared to states of mind scales (mean difference = .01). Furthermore, agreement was higher among the discordant sibling pairs in 70% of the comparisons. Therefore, the differences in magnitude and significance between discordant and concordant sibling pairs on the scale scores can not be solely attributed to rater effects. We interpret these findings as further supporting the role of coherence of mind (i.e., attachment representations) as a major contributor to the continued sibling concordance for attachment into adulthood (Roisman, Fortuna, & Holland, 2006; Roisman, Padron, Sroufe, & Egelend, 2002; Steele, Steele, & Johansson, 2002).

This study addresses several potential caveats discussed by O'Connor and Croft (2001) in interpreting previous findings of significant concordance for attachment among siblings. First, developmental changes in genetic and environmental influences suggest shared environmental influences will be more important in childhood. The concordance for type of organized attachment state of mind in adult, genetically unrelated siblings demonstrates continued importance of shared environment well after individuals have left the home and experienced major life transitions (e.g., childbirth, marriage). Second, O'Connor and Croft (2001) note the potential for effects that are primary to a particular type of assessment and the need to use caution when extending findings to other measures of attachment. Most of the published studies used the Strange Situation Procedure, or some adaptation thereof, where attachment is measured at the behavioral level. In contrast, our study employed the Adult Attachment Interview which assesses models of attachment at the representational level. Our demonstration of similar concordance rates as those studies examining sibling concordance in infancy and preschool suggest the impact of shared environment is not methodology specific. Finally, O'Connor and Croft (2001) discuss the potential that the observed effects may be specific to similarities in rearing for twin-sibling pairs and may not transfer to non-twin siblings. Our study, in concert with additional non-twin sibling studies, removes potential twin-specific confounds that might inflate estimates of shared environment.

Although our study further confirms shared environment as an important influence on attachment in adulthood, several limitations exist that deserve mentioning. Our hypothesis of sibling concordance for adult attachment relied heavily on the assumption that working models of attachment demonstrate at least modest stability across the lifespan. It is typically accepted that adoptive parents often have low rates of psychopathology and a higher socioeconomic status (Beckwith et al., 1999, Belsky et al., 1996, Weinfield et al., 2000). It is possible that our sample is not representative of the general population thereby inflating stability of attachment and adult sibling concordance (Allen, McElhaney, Kuperminc, & Jodl, 2004; Bar-Haim, Sutton, Fox, & Marvin, 2000; Belsky & Fearon, 2002; Hamilton, 2000; Lewis, Feiring, & Rosenthal, 2000; Sroufe, 2005; Waters et al., 2000; Weinfield, Whaley, & Egeland, 2004). The distribution of primary attachment classifications differed significantly from what would be expected from estimates derived from meta-analyses. Our frequency for preoccupied state of mind was lower than expected whereas dismissing state of mind was higher than expected for both adoptees and non-adopted siblings. This deviation in the expected distribution is consistent with those reported by Dozier, Stovall, Albus, and Bates (2001) suggesting a unique quality of interaction within adoptive families. Our sample consisted solely of biologically unrelated sibling pairs. The lack of variation in genetic relatedness within sibling pairs (e.g., MZ or DZ twins, biologically related siblings) and between sibling pairs and the parent generation limit our conclusions regarding possible genetic influences on sources of environmental influence (e.g., shared, nonshared) (Reiss et al., 1994; Turkheimer & Waldron, 2000). The untested possibility remains that genetic differences between siblings influenced or were differentially influenced by qualities of the parent – child relationship (e.g., parental sensitivity) and/or impacted potential intervening influences on attachment in adulthood (e.g., romantic relationships) (Fearon, van IJzendoorn, Fonagy, Bakermans-Kranenburg, Schuengel, & Bokhorst, 2006; Torgerson, Grova, & Sommerstad, 2007). Unfortunately, our sample size and study design preclude examination of these processes with our data.

In conclusion, our results lend additional fuel to the importance of shared environment in organized attachment. We extend previous research by demonstrating equivalent concordance rates for attachment independent of developmental stage, family composition, and methodology. Although our study was not longitudinal, our findings provide support for the influence of internal working models of attachment across the lifespan. Without the concept of working models of attachment, our findings would be difficult to explain. Future research should continue to utilize variable methodological designs (e.g., offspring studies) and refine measurement of relevant constructs (e.g., script representations) to further our understanding of the genetic and experiential underpinnings of attachment throughout the lifespan (Thompson & Raikes, 2003).

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Table I

Distribution of AAI classifications.

	Attachment classifications			
	F (%)	**Ds (%)**	**E (%)**	**Totals**
Adoptee	66 (52%)	49 (39%)	8 (6%)	123
Non-adopted sibling	74 (59%)	44 (35%)	5 (4%)	123
Totals	140	93	13	246

χ^2 (2) = 1.42, p = .49.

Table II

Adoptee biological parent background and adoptee attachment state of mind.

		Biological risk			
		Alcohol problems		Antisocial behaviors	
	Row totals	**Absent (*n* = 89)**	**Present (*n* = 37)**	**Absent (*n* = 93)**	**Present (*n* = 33)**
Specific classifications[a]					
Dismissing	49	30 (61%)	19 (39%)	34 (69%)	15 (31%)
Preoccupied	8	6 (75%)	2 (25%)	7 (88%)	1 (12%)
CC	3	3 (100%)	0 (0%)	2 (67%)	1 (33%)
Autonomous	66	50 (92%)	16 (8%)	50 (92%)	16 (8%)
Autonomous versus non-autonomous					
Non-autonomous	60	39 (65%)	21 (35%)	43 (72%)	17 (28%)
Autonomous	66	50 (76%)	16 (24%)	50 (76%)	16 (24%)
Unresolved versus not unresolved					
Not unresolved	90	65 (72%)	25 (28%)	68 (76%)	22 (24%)
Unresolved	28	19 (68%)	9 (32%)	21 (75%)	7 (25%)

Note: Values in parentheses represent row percentages.

Table III

Cross-tabulation of autonomous versus non-autonomous sibling states of mind.

	Non-adopted sibling		
Adopted sibling	**Non-autonomous**	**Autonomous**	**Totals**
Non-autonomous	31 (2.3)	29 (−2.3)	60
Autonomous	21 (−2.3)	45 (2.3)	66
Totals	52	74	126

Note: Cannot classify coded as non-autonomous. Values in parentheses represent adjusted standardized residuals.

Table IV

Cross-tabulation of sibling AAI states of mind.

	Non-adopted sibling				
Adoptee	**Dismissing**	**Preoccupied**	**Cannot classify**	**Autonomous**	**Total**
Dismissing	19 (0.70)	2 (0.10)	1 (−0.20)	27 (−0.2)	49
Preoccupied	4 (0.90)	**2 (3.10)**	1 (1.90)	1 (−2.70)	8
Cannot classify	1 (−0.10)	0	**1 (3.60)**	1 (−0.90)	3
Autonomous	20 (−1.10)	1 (−1.50)	0 (−1.80)	45 (2.30)	66
Total	44	5	3	74	126

Note: Values in parentheses represent adjusted standardized residuals. An absolute value of 3.0 or above denotes a Bonferroni-corrected significant adjusted standardized residual. Bolded values are statistically significant after correction.

Table V

Unresolved versus not unresolved cross-classification.

	Non-adopted sibling		
Adoptee	**Not unresolved**	**Unresolved**	**Totals**
Not unresolved	69 (0.40)	15 (−0.40)	84
Unresolved	22 (−0.40)	6 (0.40)	28
Totals	91	21	112

Note: Fourteen sibling pairs were omitted from analyses because at least one sibling failed to report a codable loss or trauma.

Table VI

Summary of published sibling autonomous versus non-autonomous concordance.

Study	Sample	Subjects	Concordance
Caspers et al. (2007)	**126**	**Biologically unrelated siblings**	**61**
Bokhorst et al. (2003)	57	MZ twins	56
Bokhorst et al. (2003)	81	DZ twins	60
Constantino et al. (2006)	33	MZ twins	70
O'Connor & Croft (2001)	57	MZ twins	70
O'Connor & Croft (2001)	53	DZ twins	64
van IJzendoorn et al. (2000)	138	Biologically related siblings	62
Ward et al. (1988)	65	Biologically related siblings	61
Total MZ twins	**147**		
Total DZ twins	**134**		
Total biologically-related sibling pairs	**203**		
Total Caspers et al. (2007)	**126**		

Note: Bolded numbers reflect newly collected or newly collapsed data included in the pooled comparison.

Table VII

Means and standard deviations for sibling differences on scale scores by attachment concordance.

	Discordant			Concordant				
	n	*M*	*SD*	*n*	*M*	*SD*	*t*	*p*
Scales for experience								
Loving-M	73	2.43	1.65	52	1.54	1.42	3.20	<.01
Loving-F	72	2.16	1.49	51	1.42	1.28	2.96	<.01
Rejection-M	66	2.25	1.58	52	1.52	1.54	2.51	.01
Rejection-F	64	2.59	1.66	50	1.76	1.49	2.81	.01
Involving/reversing-M	64	.95	1.42	51	1.24	1.39	−1.08	.28
Involving/reversing-F	71	.54	1.00	52	.62	1.22	−0.38	.70
Pressure to achieve-M	69	.68	1.31	50	.77	1.34	−0.37	.71
Pressure to achieve-F	68	.65	1.15	51	.67	1.15	−0.10	.92
Neglect-M	66	.91	1.31	50	.85	1.31	0.23	.82
Neglect-F	63	2.01	1.91	50	1.65	2.00	0.94	.35
Scales for states of mind								
Idealizing-M	72	3.68	1.66	53	1.25	1.18	9.57	<.001
Idealizing-F	71	3.16	1.89	53	1.63	1.36	5.24	<.001
Involving anger-M	73	.48	1.15	53	.34	.85	0.03	.98
Involving anger-F	72	.67	1.27	52	.66	1.19	0.79	.43
Derogation-M	72	.41	.88	53	.34	.95	0.41	.68
Derogation-F	71	.28	.78	52	.12	.44	1.40	.17
Scales for overall states of mind								
Overall derogation	72	.64	1.03	53	.50	1.41	0.58	.56
Insistence on lack of recall	73	2.47	1.67	53	1.64	1.73	2.67	.01
Metacognitive processes	73	.46	.69	53	.28	.57	1.60	.11
Passivity of thought processes	73	1.20	.94	53	1.44	1.24	−1.19	.24
Fear of loss	50	.49	.80	40	.28	.55	1.46	.15
Highest score for unresolved loss	63	1.40	1.46	44	1.94	1.52	−1.85	.07
Coherency of transcript	73	3.01	1.18	53	.93	.80	11.51	<.001
Coherence of mind	73	2.97	1.24	53	.89	.81	11.84	<.001

Note: Too few cases (*n* = 6; 3 from discordant sibling pair group and 3 from concordant sibling pair group) for meaningful comparison of highest scores on unresolved trauma. M = mother. F = father.

Table VIII

Correlations between sibling scale scores by attachment concordance.

	Discordant		Concordant	
	n	***r***	***n***	***r***
Scales for experience				
Loving-M	73	−.33*	52	.45***
Loving-F	72	−.08	51	.46***
Rejection-M	66	−.02	52	.45***
Rejection-F	64	−.03	50	.34***
Involving/reversing-M	64	.17	51	.09
Involving/reversing-F	71	−.12	52	.06
Pressure to achieve-M	69	.01	50	.23*
Pressure to achieve-F	68	.38**	51	.27*
Neglect-M	66	.15	50	.34**
Neglect-F	63	.13	50	.15
Scales for states of mind				
Idealizing-M	72	−.74***	53	.65***
Idealizing-F	71	−.60***	53	.65***
Involving anger-M	73	−.07	53	.29**
Involving anger-F	72	−.09	52	.16
Derogation-M	72	−.10	53	.06
Derogation-F	71	−.06	52	.20
Scales for overall states of mind				
Overall derogation	72	−.08	53	.31**
Insistence on lack of recall	73	−.31*	53	.05
Metacognitive processes	73	−.09	53	.16
Passivity of thought processes	73	.05	53	.05
Fear of loss	50	.22	40	.01
Highest score for unresolved loss	63	.46**	44	.23
Coherency of transcript	73	−.74***	53	.76***
Coherence of mind	73	−.75***	53	.76***

Note: Too few cases ($n = 6$; 3 from discordant sibling pair group and 3 from concordant sibling pair group) for meaningful comparison of highest scores on unresolved trauma. M = mother. F = father.