What’s in a word? Linguistic characteristics of Adult Attachment Interviews
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In the Adult Attachment Interview (AAI; George, Kaplan, & Main, 1984), state of mind with respect to attachment is assessed not on the basis of the content of the participant’s narrative, but rather on the basis of the narrative’s linguistic properties. The present study is the first to further explore linguistic characteristics of attachment state of mind in AAI narratives by examining participants’ frequency of word usage within the categories of the Linguistic Inquiry Word Count text analysis program (LIWC; Pennebaker, Booth, & Francis, 2007). LIWC uses an internal dictionary to count words in conceptual categories and creates proportion scores for each category based on the total word count. Results from an examination of the AAI transcripts of 136 first-time mothers of infants indicated that (a) participants with secure, dismissing, and preoccupied AAI classifications significantly differed in their use of 14 of the 44 LIWC categories examined; (b) 10 LIWC categories were significantly correlated with AAI coherence of mind; and (c) AAI group assignment based on LIWC linguistic profiles yielded 71% agreement with AAI coders. We drew from existing AAI and LIWC research to interpret and discuss these intriguing findings.

Keywords: Adult Attachment Interview; attachment; representations; language; LIWC

Introduction

Representations captured with the Adult Attachment Interview (AAI; George, Kaplan, & Main, 1984, 1985, 1996) and labeled state of mind with respect to attachment have been found to be important correlates of a variety of aspects of an individual’s functioning. For instance, AAI state of mind has been linked to individuals’ behavior within relationships with both their romantic partners (Holland & Roisman, 2010; Roisman, Madsen, Hennighausen, Sroufe, & Collins, 2001) and their children (for a meta-analysis, see van IJzendoorn, 1995). Moreover, meta-analyses have revealed that individuals with an insecure state of mind are over-represented in clinical populations (Bakermans-Kranenburg & van IJzendoorn, 2009; van IJzendoorn & Bakermans-Kranenburg, 1996). Even more strikingly, substantial evidence exists demonstrating that adults’ attachment representations are predictors of a variety of important aspects of their children’s psychological functioning. For example, parental AAI classifications have been shown to predict the quality of infant attachment in the Strange Situation (see van IJzendoorn, 1995,
for meta-analysis), a link that holds even when the AAI is administered to mothers prior to their child’s birth (Fonagy, Steele, & Steele, 1991). In addition, parents’ AAI s have been linked prospectively to children’s emotional understanding (Steele, Steele, & Johanson, 2002), internalizing and externalizing behavior (Cowan, Cohn, Cowan, & Pearson, 1996), and empathy and social problems (Kouvo & Silvén, 2010), and concurrently to children’s ego-resilience, sociability, independence, and aggression (van IJzendoorn, Kranenburg, Zwart-Woudstra, van Busschbach, & Lambermon, 1991). Given the compelling predictive power of the AAI for these important outcomes, attempts to understand the underpinnings of the AAI are important to psychological researchers.

The AAI is a semi-structured interview containing 20 questions and additional follow-up probes largely about childhood experiences with parents, with additional questions about past and current loss. The goal of the interview is not to uncover the exact nature of the participant’s childhood experiences, but instead to assess how the participant currently represents those experiences. As such, the coding system used to classify participants into attachment groups is based on examination of the participant’s use of language: the content of the narrative is much less central to classification than are the narrative’s linguistic properties (Main, Goldwyn, & Hesse, 2002). In other words, it is not the story that is told, but how the story is told, that is translated into classification group placement. As Hesse (2008) noted, “differences in the use of language relevant to attachment – and not retrospective inferences about the nature of the person’s actual attachment history – have consistently been the basis of the analysis and the source of the AAI’s predictive power” (p. 553). Participants are placed into one of three principal attachment classification groups based on coders’ linguistic analysis of verbatim interview transcripts: secure-autonomous (“valuing of attachment relationships and experiences, and yet apparently objective regarding any particular relationship experience”); dismissing (“dismissing, devaluing, or cut-off from attachment relationships and experiences”); or preoccupied (“preoccupied with or by early attachments or attachment-related experiences”) (Main & Goldwyn, 1998). After being placed in one of these three principal classification groups, some transcripts are additionally classified as unresolved with regard to loss or trauma, based on “lapses in the monitoring of reasoning or discourse” (Main & Goldwyn, 1998). Because placement in this group typically results from only a few phrases or words, the unresolved group is not further considered in this initial examination of AAI transcripts’ linguistic properties. In addition to these categorical placements, participants’ current state of mind with respect to attachment is also assessed with a continuous scale, coherence of mind, which refers to the degree to which participants discussed and evaluated their attachment-related experiences in a “reasonably consistent, clear, relevant, and succinct [manner]” (Hesse, 2008, p. 566). High coherence is a primary indicator of a secure-autonomous transcript and the scale has been shown to account for much of the interview’s predictive power (Hesse, 2008; Main et al., 2002).

The linguistic foundation of the AAI coding system in both classification and coherence scoring is further evident in the striking extent to which the coding system draws upon Grice’s (1975, 1989) four maxims of coherent discourse: quality (“Be truthful and have evidence for what you say”), quantity (“Be succinct, and yet complete”), relevance (“Be relevant to the topic as presented”), and manner (“Be clear and orderly”). Given the extent to which language usage contributes to AAI coding, further examination of the linguistic properties of the AAI may provide additional
important insight into the nature of the representational world of the individuals placed within each AAI category.

One method of further examining the linguistic characteristics of the AAI that may provide useful information is the Linguistic Inquiry Word Count (LIWC) text analysis program (Pennebaker, Booth, et al., 2007), a computer program that counts words in psychologically meaningful categories. Using LIWC categories to analyze AAI transcripts is, by design, a crude analysis technique. Scores for LIWC categories do not tell us how words were used, simply how frequently those words were used relative to each person’s total word count (see Tausczik & Pennebaker, 2010, for a review). Nonetheless, two sets of previous research speak to the usefulness of this approach. First, LIWC has revealed a capacity to identify linguistic patterns associated with a variety of dimensions that are also linked to AAI classifications (Hesse, 1999, 2008), including social relationships (Gonzales, Hancock, & Pennebaker, 2010; Simmons, Chambless, & Gordon, 2008), emotionality (Alpers, Winzelberg, Classen, Dev, Koopman, Roberts, et al., 2005; Kahn, Tobin, Massey, & Anderson, 2007; Pennebaker, Chung, Ireland, Gonzales, & Booth, 2007), attentional focus (e.g., self- vs. other-focus; Gunsch, Brownlow, Haynes, & Mabe, 2000; Pennebaker & Stone, 2003; Rude, Gottner, & Pennebaker, 2004), and cognitive styles (Pennebaker, Chung, et al., 2007; Pennebaker & Francis, 1996). Second, LIWC has been used to discriminate certain groups of people from others based on word usage (e.g., liars from truth-tellers [Newman, Pennebaker, Berry, & Richards, 2003] and high-status individuals from lower-status individuals [Pennebaker, 2011]). Given the ability of the LIWC categories to identify these meaningful linguistic patterns associated with individual differences, we wanted to use the LIWC categories to learn whether they could distinguish the AAI attachment groups. To our knowledge, no previously published study has used the LIWC categories to examine linguistic properties of the AAI (yet see Appelman, 2000, and Buchheim & Mergenthaler, 2000, who used computerized text analysis to examine AAI transcripts in other ways). Although there is much theory and research related to attachment group differences in discourse and linguistic style (e.g., Hesse, 2008; Main, Hesse, & Goldwyn, 2008; Steele & Steele, 2008a), there is no basis for speculating about how these attachment groups would differ in the frequencies of specific types of words. It is possible that AAI attachment groups will differ along this dimension, and any differences we find will give us insight into characteristics of AAI patterns.

The goal of the present study was to identify additional linguistic characteristics that typify the AAI classification groups and that relate to coherence of mind. To this end, we first used the LIWC program to count and classify words into the psychologically meaningful categories existing within the LIWC dictionary. Next, we conducted multiple groups profile analysis (sometimes termed repeated-measures MANOVA) to determine the linguistic categories that differentiated among the attachment groups and the linguistic profile for each attachment group. We then conducted post-hoc analyses on the categories identified by the profile analysis to determine the magnitude and direction of differences among the groups. Additionally, we examined correlations between the linguistic categories and attachment coherence of mind. Finally, we conducted a discriminant function analysis to determine whether the linguistic categories identified in the profile could be used to accurately classify AAI transcripts into their assigned secure, dismissing, and preoccupied classifications. Although we expected that the AAI groups would differ in their word usage across the profile, there is little theoretical or empirical
work to suggest which linguistic categories would differentiate the AAI groups. As such, we took an exploratory approach to data analysis and interpretation. Following the analytic procedures described above, we then, in a post-hoc fashion, turned to previous attachment research and previous LIWC research to understand and interpret the patterns that emerged.

**Method**

**Participants**
Participants were 220 economically stressed first-time mothers of irritable infants from the greater Washington, DC, area enrolled in a two-year randomized controlled study designed to reduce the risk of insecure attachment (see Cassidy, Woodhouse, Sherman, Stupica, & Lejuez, 2011). Because of participant attrition or technical difficulties, the present sample consisted of the 165 mothers for whom Adult Attachment Interviews were available. The ethnic/racial distribution of these 165 mothers was 43% Black/African American, 28% White/Caucasian, 19% Hispanic, 4% Asian, 4% mixed ethnicity, and 2% other ethnicity. Mean age of the mothers was 24.11 years ($SD = 5.22$).

Of the 165 available AAIs, 75 were classified dismissing (Ds), 54 secure (F), seven preoccupied (E), 22 unresolved (U), and seven insecure/cannot classify (CC). For the purposes of this study focusing on linguistic analysis, we excluded U and CC transcripts because placement in these groups typically rests on properties of a few words or phrases; the remaining 136 transcripts yielded a distribution of 55% dismissing, 40% secure, and 5% preoccupied.

**Measures**

*Adult Attachment Interview (AAI; George et al., 1984, 1985, 1996)*
The AAI is a widely-used and psychometrically sound semi-structured interview designed to elicit thoughts, feelings, and memories related to early experiences with caregivers and to assess adults’ current state of mind with respect to attachment. During the interview, which lasts approximately one hour, 20 questions and follow-up probes principally ask participants to discuss early attachment-related experiences; additional questions focus on the quality of the current relationship with their parents, the perceived impact of early experiences on their adult personality, and their relationships with their own children (see Hesse, 2008, for a detailed description of the AAI protocol and a summary of its psychometric properties). Interviews were audio recorded and transcribed verbatim for coding using the two systems described below.

*Main and Goldwyn (1998) attachment classification system*
The transcripts were coded following Main and Goldwyn’s (1998) attachment classification system and coherence of mind scale by five trained reliable AAI coders who were blind to all the information about the mothers and their infants. Coders assigned one of three principal classifications to the transcripts: secure-autonomous, insecure-dismissing, or insecure-preoccupied. Secure-autonomous mothers coherently described attachment-related childhood experiences, expressed value for
attachment, and acknowledged the importance of attachment relationships in their development. Insecure-dismissing mothers lacked coherence when discussing attachment-related childhood experiences; they derogated or idealized attachment figures and minimized the impact of negative attachment-related experiences on their development. Insecure-preoccupied mothers, like insecure-dismissing mothers, lacked coherence; they differed by demonstrating an excessive, confused/passive, and non-objective preoccupation with attachment relationships and/or experiences. In addition to using these principal classifications, coders classified mothers as insecure-unresolved if they showed evidence of lack of resolution when discussing loss or trauma (e.g., through lapses in the monitoring of reasoning or discourse) or as insecure-cannot classify when no other category placement was appropriate. Additionally, coders rated the participants’ overall coherence of mind on a nine-point scale. Higher scores, which represent greater coherence of mind, are given when there are few violations of the maxims of coherent discourse described earlier (Grice, 1975, 1989; Main et al., 2002). Interrater reliability among these coders was assessed continuously throughout the coding period; a randomly selected 21% of cases (n = 34) were coded by at least two coders (classifications: 79% agreement, \( \kappa = .70 \), 95% CI [.50, .90]; coherence of mind scale: ICC = .79). All disagreements on the AAI coding were resolved by a sixth independent coder who coded no additional data.

**Linguistic Inquiry Word Count (LIWC; Pennebaker, Booth, et al., 2007)**

LIWC is a computerized text analysis program that uses an internal dictionary to search for approximately 4500 words or word stems in text files and categorizes the words into 80 linguistic categories. These categories include basic language components (e.g., pronouns, prepositions), psychological processes (e.g., emotions, cognitive processes), and non-psychological constructs (e.g., work, money), among others. After counting the number of words in each category, LIWC calculates a proportion score for each category by converting the raw word counts into a percentage based on total words used in the text. Thus, for example, an unstandardized score of 6.80 on prepositions would indicate that 6.80% of words spoken during the interview were in the prepositions category. As noted above, individuals’ scores on these standard LIWC categories have been used to discriminate certain groups of people from others based on word usage (Pennebaker, 2011; Newman et al., 2003; Newman, Groom, Handelman, & Pennebaker, 2008). In addition, LIWC categories have demonstrated good reliability as well as external, construct, and predictive validity (Pennebaker, Chung, et al., 2007; Pennebaker, Francis, & Booth, 2001; Pennebaker & King, 1999).

**Procedure**

Mothers provided demographic information during a home visit within a month of their infant’s birth. Next, mothers visited our laboratory and completed the AAI when their infants were five months old (before participants were randomized into treatment groups for the intervention study). For LIWC analysis, AAI transcripts were prepared to include only the linguistic information provided by the participants (i.e., the interviewers’ prompts and non-spoken information, such as “subject coughs” were removed).
Results

Data preparation

Attachment groups differed in their total word count during the interview, \(F(2,133) = 14.21, \ p < .001\). Preoccupied adults used the most words during the interview (\(M = 8585.00, \ SD = 4896.45\)), followed by secure adults (\(M = 6309.31, \ SD = 2435.69\)), and dismissing adults used the fewest words (\(M = 4556.04, \ SD = 2115.00\)). Each group mean was significantly different from the mean of each other group (Cohen’s \(d\) ranged from .59 to 1.07). Given that LIWC categories are expressed as proportion scores of each participant’s total word count (i.e., each category controls for differences in word count), word count was not included in the principal analysis.

For this study, 36 of the 80 LIWC categories were excluded from analyses a priori because they were: (a) descriptive of the text files (\(n = 4\); e.g., proportion of words in LIWC dictionary), (b) umbrella categories formed by clustering individual categories (\(n = 11\); e.g., the category perception contains all the words in hear, see, and feel), (c) non-psychological constructs (\(n = 7\); e.g., work, leisure activities), (d) differences in transcription rather than spoken language by the participant (\(n = 14\); e.g., periods, commas), and (e) non-word categories (e.g., fillers, nonfluencies). The resulting 44 categories were used for analysis: 18 standard linguistic dimensions (e.g., conjunctions, prepositions), 25 word categories tapping psychological processes, such as categories that capture affect (e.g., positive emotion, anger), cognition (e.g., insight, causation), and biological processes (e.g., see, body, sexual), and one paralinguistic dimension (assents); the complete list of the 44 categories is available from the first author. LIWC category scores were standardized for analysis.

Compiling the linguistic profiles of the Adult Attachment Interview groups

In order to identify whether the AAI classification groups differed on linguistic markers, we conducted multiple groups profile analysis (sometimes termed repeated-measures MANOVA). Given the exploratory nature of our investigation, we entered participants’ scores on the 44 LIWC categories as the within-subjects factor and AAI classification as the between-subjects factor. Mauchly’s test indicated that the assumption of sphericity had been violated, \(\chi^2(945) = 2564.46, \ p < .001\); therefore, degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity (\(\varepsilon = .49\)).

The results revealed a main effect of AAI, \(F(2, 133) = 6.54, \ p = .002\), and a significant AAI × LIWC interaction, \(F(41.97, 2791.22) = 1.61 \ p = .008\). This set of 44 linguistic categories significantly explained differences among the AAI groups at a multivariate level (\(R^2 = .38\)). The interaction indicated that the attachment groups have significantly different, non-parallel linguistic profiles. Following Harris (2001), we compared the groups separately on each linguistic category because the interaction implies that “the magnitude and/or direction of the difference between the groups varies, depending on which variable is considered” (p. 175). We probed the interaction by testing the differences between the groups using Least Significant Differences (LSD) pairwise comparisons. Due to unequal subgroup sizes that would make detecting mean differences difficult with the preoccupied group (i.e., seven in the preoccupied group, 75 in dismissing, and 54 in secure), we set our decision criteria, \(\alpha\), at .05 for comparisons between secure and dismissing groups and at .10
(only) for comparisons involving the preoccupied group. We did this for two important reasons. First, our study is exploratory in nature. Second, the unequal cell sizes of our sample could mask effects that may be present in the population. Under these circumstances, the risk of having a Type II error is too great to proceed with conventional significance levels.

Many of the linguistic categories revealed no significant differences between attachment groups according to pairwise comparisons ($n = 30$), and therefore, were subsequently excluded from the profile. For the remaining 14 categories (inclusive, feel, conjunctions, negations, assent, numbers, certainty, swear words, time, anger, space, hear, inhibition, and causation), we conducted a second profile analysis to test whether the reduced set of categories could also significantly explain differences among the AAI groups. Results revealed a significant main effect of AAI, $F(2, 133) = 7.07, p = .001$, and a significant AAI x LIWC interaction, $F(19.58, 1301.83) = 3.74, p < .001$ (Greenhouse-Geisser corrected, $\varepsilon = .75$; $R^2 = .25$). Although we lost 13% of our explanatory power from the full model to this reduced model, it was a nonsignificant decrease in explanatory power because a model with the 30 excluded categories was not significant, AAI x LIWC interaction, $F(32.42, 2155.87) = .59, p = .97$ (Greenhouse-Geisser corrected; $\varepsilon = .56$). As such, the profile containing these 14 categories was considered the profile that best characterizes differences among the AAI groups and was the basis for further exploration.

Results of the post-hoc tests revealed that a set of categories could distinguish the transcripts of dismissing adults from those of secure adults: dismissing adults used inclusive, feel, and conjunctions category words less frequently than secure adults, whereas dismissing adults used negations, assent, numbers, and hear category words more frequently than secure adults. A different set of linguistic categories distinguished the transcripts of preoccupied adults from those of adults with other attachment classifications: preoccupied adults used causation words more frequently than secure adults, used hear and inhibition category words more frequently than secure and dismissing adults, and used certainty, swear words, anger, space, and time category words more frequently than dismissing adults, but used assent words less frequently than dismissing adults. Table 1 presents examples of words included in each of the 14 LIWC categories as well as the unstandardized means, standard deviations, results of the pairwise comparisons, and associated effect sizes.

**Further examination of the linguistic profiles**

Once we identified the LIWC categories on which the AAI groups differed, we considered whether any of these categories might be difficult to interpret because the nature of the component words was particularly broad. As a result of this consideration, we further explored two categories (i.e., feel and hear) in order to bolster confidence in our interpretation of the results.

**Feel**

Different types of words make up the feel category: one group consists of the actual word “feel” and its derivations (e.g., feel, feeling, felt), whereas the other consists of tactile feeling words (e.g., hot, sharp, rough). In order to better interpret the finding that secure adults used more feel category words than dismissing adults, we created a custom LIWC dictionary that separated these two groups of words and processed all
Table 1. Linguistic categories associated with Adult Attachment state of mind.

<table>
<thead>
<tr>
<th>LIWC Linguistic Category</th>
<th>Examples</th>
<th>Dismissing M (SD)</th>
<th>Secure M (SD)</th>
<th>Preoccupied M (SD)</th>
<th>Pairwise Comparisons [Cohen’s d]</th>
<th>Correlation with Coherence of Mind</th>
</tr>
</thead>
<tbody>
<tr>
<td>inclusive</td>
<td>both, close, with, we</td>
<td>6.10 (.02)</td>
<td>6.68 (.95)</td>
<td>6.50 (.74)</td>
<td>F &gt; Ds [0.59]</td>
<td>0.35***</td>
</tr>
<tr>
<td>feel</td>
<td>feel, feeling, touch</td>
<td>0.44 (.22)</td>
<td>0.56 (.26)</td>
<td>0.42 (.13)</td>
<td>F &gt; Ds [0.50]</td>
<td>0.24**</td>
</tr>
<tr>
<td>conjunctions</td>
<td>and, but, though</td>
<td>8.71 (1.29)</td>
<td>9.23 (.78)</td>
<td>9.29 (.95)</td>
<td>F &gt; Ds [0.49]</td>
<td>0.26**</td>
</tr>
<tr>
<td>negations</td>
<td>can’t, don’t, no</td>
<td>3.30 (1.01)</td>
<td>2.67 (.59)</td>
<td>2.78 (.43)</td>
<td>Ds &gt; F [0.75]</td>
<td>0.43***</td>
</tr>
<tr>
<td>assert</td>
<td>okay, yes, agree</td>
<td>2.12 (1.22)</td>
<td>1.50 (.75)</td>
<td>1.36 (.51)</td>
<td>Ds &gt; F, E [0.61, 0.80]</td>
<td>-0.30***</td>
</tr>
<tr>
<td>numbers</td>
<td>first, hundred, zero</td>
<td>1.82 (.47)</td>
<td>1.66 (.37)</td>
<td>1.58 (.36)</td>
<td>Ds &gt; F [0.38]</td>
<td>-0.17*</td>
</tr>
<tr>
<td>certainty</td>
<td>absolute, always, never</td>
<td>1.41 (.44)</td>
<td>1.57 (.48)</td>
<td>1.74 (.32)</td>
<td>E &gt; Ds [0.85]</td>
<td>0.05</td>
</tr>
<tr>
<td>swear words</td>
<td>crap, damn, suck</td>
<td>0.01 (.03)</td>
<td>0.02 (.05)</td>
<td>0.05 (.04)</td>
<td>E &gt; Ds [1.12]</td>
<td>0.09</td>
</tr>
<tr>
<td>time</td>
<td>early, hour, today</td>
<td>6.74 (1.23)</td>
<td>7.17 (1.48)</td>
<td>7.81 (1.29)</td>
<td>E &gt; Ds [0.85]</td>
<td>0.01</td>
</tr>
<tr>
<td>anger</td>
<td>angry, obnoxious, nag</td>
<td>0.34 (.17)</td>
<td>0.39 (.18)</td>
<td>0.48 (.36)</td>
<td>E &gt; Ds [0.51]</td>
<td>0.05</td>
</tr>
<tr>
<td>space</td>
<td>among, near, under</td>
<td>3.98 (.86)</td>
<td>4.21 (.76)</td>
<td>4.53 (.80)</td>
<td>E &gt; Ds [0.66]</td>
<td>0.20*</td>
</tr>
<tr>
<td>hear</td>
<td>say, listen, noisy, yell</td>
<td>0.61 (.27)</td>
<td>0.52 (.19)</td>
<td>0.80 (.16)</td>
<td>E &gt; Ds &gt; F [0.37 – 1.61]</td>
<td>-0.23**</td>
</tr>
<tr>
<td>inhibition</td>
<td>ban, keep, stop</td>
<td>0.27 (.12)</td>
<td>0.28 (.11)</td>
<td>0.38 (.12)</td>
<td>E &gt; Ds, F [0.95, 0.89]</td>
<td>-0.03</td>
</tr>
<tr>
<td>causation</td>
<td>justify, reason, why</td>
<td>1.72 (.44)</td>
<td>1.62 (.44)</td>
<td>1.91 (.31)</td>
<td>E &gt; F [0.78]</td>
<td>-0.15</td>
</tr>
<tr>
<td>prepositions</td>
<td>beside, on, since, to</td>
<td>8.94 (1.13)</td>
<td>9.20 (1.20)</td>
<td>8.53 (.92)</td>
<td>–</td>
<td>0.20*</td>
</tr>
<tr>
<td>present tense</td>
<td>(present tense verbs)</td>
<td>8.70 (1.97)</td>
<td>8.40 (1.67)</td>
<td>8.28 (1.70)</td>
<td>–</td>
<td>-0.19*</td>
</tr>
</tbody>
</table>

Notes: Ds = Dismissing; F = Secure; E = Preoccupied.
*p < .05; **p < .01; ***p < .001.
the transcripts through LIWC with this custom dictionary. The results revealed that derivations of the word “feel” accounted for 49% of all the feel words used across transcripts. To further explore this finding, we performed two ANOVAs to examine differences in (a) the usage of the word “feel” and its derivations and (b) the usage of tactile feeling words across the three attachment groups. Consistent with the findings from the entire feel category, secure adults used the “feel” words significantly more than dismissing adults ($M_{diff} = .12$, $d = .58$). In addition, secure adults used the “feel” words significantly more than preoccupied adults ($M_{diff} = .14$, $d = .83$). None of the AAI groups was significantly different from any other AAI group on their use of tactile feeling words ($d$ ranged from .01 to .08).

**Hear**

The proportion scores for the hear category seemed to be driven by usage of derivations of the word “say” (e.g., saying, said). In order to better interpret the finding that preoccupied adults used more hear category words than dismissing and secure adults and that dismissing adults used hear category words more than secure adults, we created a custom LIWC dictionary that separated “say” words from the remaining words in the hear category (e.g., noisy, loud, listen) and processed all the transcripts through LIWC with this custom dictionary. The results revealed that derivations of the word “say” accounted for 74% of all the hear words used across the transcripts. Once again, we performed two ANOVAs to further explore group differences on these custom sub-categories. Consistent with the findings from the overall hear category, preoccupied adults used “say” words more than secure adults ($M_{diff} = .22$, $d = 1.22$) and dismissing adults used “say” words more than secure adults ($M_{diff} = .09$, $d = .41$). Although preoccupied adults and dismissing adults did not significantly differ ($p = .12$) on their use of the “say” words, the effect size of this difference was moderate ($M_{diff} = .13$, $d = .62$). None of the AAI groups significantly differed from any other AAI group on the use of the set of other words in the hear category ($d$ ranged from .01 to .57), although we observed moderate effect sizes (.53 and .57) for comparisons involving the preoccupied group, which may indicate a greater tendency for this group to use words other than “say” in the hear category relative to dismissing and secure participants.

**Linguistic characteristics and attachment coherence of mind**

Of the 44 LIWC categories, 10 were significantly correlated with attachment coherence of mind. These significant correlations as well as each correlation between the LIWC categories identified by the profile and coherence of mind are presented in Table 1.1

**Classifying AAI transcripts based on linguistic categories**

Finally, we conducted a discriminant function analysis (DFA) to determine whether the identified linguistic categories could be used to accurately predict AAI classification group membership. When conducting DFA, the smallest group (i.e., the preoccupied group, $n = 7$) should have at least one more observation than the number of variables (Hair, Black, Babin, Anderson, & Tatham, 2005); we therefore entered the six categories with the highest F-ratios as the discriminating variables
(negations, assent, inclusive, hear, feel, and conjunctions). The prior probabilities for the classification groups were computed from group sizes. Results revealed two significant discriminant functions that accurately classified 71% of transcripts with a leave-out-one cross-validation rate of 67%. Leave-out-one cross validation is an approach to assess the internal validity of the functions by leaving out each case, one at a time, and then classifying that case on the basis of the discriminant functions (Hair et al., 2005).

Discussion

It has been nearly 30 years since Main and her colleagues first proposed attachment-related individual differences in “patterns of language and structures of mind” (Main, Kaplan, & Cassidy, 1985, p. 67). Developmental and clinical researchers have learned much from examining how individuals’ discourse and language use within the Adult Attachment Interview relate to a variety of socioemotional constructs in both the interviewees and their children (see Cassidy & Shaver, 2008, for reviews). The present study extends previous research on patterns of language within AAI transcripts by reporting attachment-related differences in the simple frequency of specific types of words rather than other aspects of language. We took an exploratory data-driven approach to identifying attachment group differences, and we now turn to attachment theory and research, as well as to previous research using the linguistic categories of the LIWC program, to interpret these findings in a post-hoc manner. To aid in interpretation, we provide hypothetical examples of AAI transcript segments to illustrate how LIWC category words could be used in the interview (relevant words will be underlined). As we will discuss later in greater detail, the exploratory nature of this study means that replication is crucial; we present our discussion of these findings with an eagerness to learn the extent to which similar patterns emerge in AAI transcripts from other samples.

Findings that participants classified as preoccupied on the AAI used more words than secure participants, who in turn used more words than dismissing participants, converge with previous research (Buchheim & Mergenthaler, 2000). These findings underscore Hesse’s (2008) characterizations of the ways in which insecure individuals violate Grice’s maxims. Hesse noted that preoccupied individuals violate the maxims of quantity (“Be succinct, and yet complete”) and relevance (“Be relevant to the topic as presented”) in ways that lead to lengthy transcripts, and we found that indeed these individuals used more words than other individuals. Dismissing individuals, in contrast, violate the maxim of quantity by curtailing discourse, and we found that these individuals use fewer words than other individuals. Moreover, these findings also converge with theory describing the dismissing and preoccupied patterns as strategies for minimizing or maximizing (respectively) attention to attachment-relevant information in the service of reducing psychological pain (Bowlby, 1980; Cassidy, 1994; Dykas & Cassidy, 2011; Mikulincer & Shaver, 2008).

Dismissing vs. secure individuals

Transcripts of dismissing individuals are typically characterized by an attempt to restrict attention to attachment relationships and experiences in an attempt to “keep untoward [attachment-related] emotions at bay” (Main et al., 2002, p. 162). In doing so, dismissing transcripts score low on coherence by violating the maxims of quality
and quantity (Hesse, 2008). There are several ways in which the differences in word use observed in the present study between dismissing individuals and secure individuals converge with previous AAI research and/or research using the LIWC program.

**Negation (e.g., can’t, don’t, no)**

The high rate of *negations* present in the transcripts of dismissing individuals may reflect their inability to remember or unwillingness to discuss the attachment-related experiences that they are asked to consider. In fact, one of the principal considerations for classification of an interview as dismissing is what is termed the participant’s *lack of recall*, most commonly displayed as “I can’t remember” or “I don’t know”.

It is also possible that dismissing individuals use more *negation* words than secure individuals because, according to research using the LIWC program, there is a link between the use of *negations* and negative emotion. In one study, participants used more *negations* when they were instructed to act as if they were experiencing a negative emotion (i.e., sadness) when instant messaging a naïve partner than when instructed to act as if they were experiencing a positive emotion (i.e., happiness; Hancock, Landrigan, & Silver, 2007). Thus, dismissing individuals’ relatively higher use of *negation* words in the present study may reflect the tendency for dismissing attachment to be associated with negative mood. Specifically, a recent meta-analysis of findings from studies containing the first 10,000 AAIs found that attachment insecurity (i.e., dismissing and preoccupied attachment) was related to depressive symptomatology (Bakermans-Kranenburg & van IJzendoorn, 2009). To the extent that negations may follow from negativity more broadly, rather than exclusively sadness, there is evidence that dismissing attachment is associated with a host of factors reflecting negative emotionality: externalizing behavior (Bakermans-Kranenburg & van IJzendoorn, 2009; Dozier, Chase Stovall-McClough, & Albus, 2008), negative perceptions of one’s own children (e.g., Benoit, Zeanah, Parker, Nicholson, & Coolbear, 1997; Slade, Belsky, Aber, & Phelps, 1999), and displays of hostility, anger, or aggression in parenting, partner, and peer interactions (Dykas, Ziv, & Cassidy, 2008; Kobak & Scerri, 1988; Paley, Cox, Burchinal, & Payne, 1999; Pearson, Cohn, Cowan, & Cowan, 1994; Phelps, Belsky, & Crnic, 1998; Roisman, 2006). Thus, it is possible, that the higher rate of *negation* words used by dismissing participants reflects their underlying negative mood, particularly when pushed to describe attachment-related childhood events.

An additional relevant characteristic of dismissing adults is that they violate the maxim of quality (“Be truthful and have evidence for what you say”). According to Hesse (2008), a dismissing participant may claim that the mother was a saint, yet elsewhere provide information that undermines the truthfulness of this statement (“She only beat us on Thursdays”). This lack of truthfulness may underlie dismissing individuals’ relatively higher use of *negation* words in the present study because, according to previous LIWC research, *negations* were related to lying in an experimental setting (Hancock, Curry, Goorha, & Woodworth, 2008). Hancock et al. asked participants to discuss four specified personal topics (e.g., “Discuss the most significant person in your life”; “Talk about a mistake you made recently”), and instructed them to lie during two discussions and be truthful during two discussions. When instructed to lie, participants used more *negations* than when instructed to tell the truth.
Assent (e.g., okay, yes, agree)

The interviews of dismissing individuals are characterized by brief responses designed to turn attention away from discussion of the attachment-related focus of the questions (Hesse, 2008). The use of *assent* words may facilitate that goal by allowing the speaker to respond to the interviewer’s requests without appropriate detail and in a way that precludes further discussion. For example: “An example for loving? **OK**, yes, she was. She did so much for us. **Yes**, that wraps it up”.

Moreover, the fact that dismissing participants used more *assent* words than secure participants is an additional indication that dismissing individuals use language patterns that are similar to speakers conveying negative emotion. Previous research with the LIWC program revealed that, as was the case with *negations*, negative expressers used more *assents* than positive expressers (Hancock et al., 2007).

Feel (e.g., feel, feeling, touch)

The finding that dismissing individuals use *feel* words (i.e., the word “feel” and its derivatives, including “felt” and “feeling”) less than secure individuals meshes with both theory and research that dismissing individuals tend to minimize attachment-related feelings (for reviews, see Cassidy & Kobak, 1988; Hesse, 2008; Mikulincer & Shaver, 2008). The manual for coding AAI transcripts characterizes the interviews of dismissing individuals as “unemotional” and as “placing limits upon the emergence of attachment-related thoughts and feelings” (Main et al., 2002, p. 162). As such, dismissing individuals are less likely to admit that attachment-related experiences influence their feelings, or even that they have attachment-related feelings, and for these reasons their AAI transcripts would contain fewer words in the *feel* category. Furthermore, these findings mesh with data from two studies in which the physiological responses of dismissing individuals indicated attempts to suppress negative feelings when responding to AAI queries about attachment experiences (Dozier & Kobak, 1992; Roisman, Tsai, & Chiang, 2004).

Two additional factors may help explain the finding that dismissing individuals use fewer *feel* words than secure individuals. First, *feel* words have been associated in previous LIWC research with people’s writing about separation and loss in the context of romantic relationships (Boals & Klein, 2005), and dismissing individuals tend to avoid discussing these topics. Second, to the extent that some of these *feel* words may include references to physical touch, group differences in this category may reflect the possibility that touch is less characteristic of dismissing mothers; Ainsworth (Ainsworth, Blehar, Waters, & Wall, 1978; see also Main, 1990) reported that mothers of avoidant infants (most often classified dismissing on the AAI; van IJzendoorn, 1995) show discomfort with close bodily contact with their infants.

Inclusive (e.g., both, close, with, we) and conjunction (e.g., and, but, though)

The transcripts of dismissing individuals, in contrast to those of secure individuals, are characterized by lower attention to and valuing of connections among people, and greater claims of independence (Hesse, 2008; Main et al., 2002). The fact that both *inclusive* and *conjunction* words reflect a linguistic focus on connections and interdependence may account for their relatively lower usage by dismissing individuals. Furthermore, dismissing individuals are thought to lack attentional flexibility (Hesse, 1996; Main, 2000; Main, Hesse, & Kaplan, 2005), which is viewed
as “fluidly shift[ing] between presenting their attachment-related experiences and responding to the requests to evaluate the influences of these experiences” (Hesse, 2008, p. 556). Lack of flexibility might explain the lower use of conjunctions because conjunctions are used to support flexible shifting between ideas (e.g., talking about the past while also comparing it to the present requires conjunctions: “It drove me crazy as a teenager and I fought hard, but I now realize we were both trying the best we could”). Moreover, Tausczik and Pennebaker (2010) noted that conjunctions, because they join together multiple ideas, are important for creating a coherent narrative. The extent of coherence is important in determining AAI classification, and the transcripts of dismissing individuals receive lower coherence scores than those of secure individuals (Hesse, 2008).

Finally, the relatively lower use of conjunctions is also understandable given the tendency of dismissing individuals to limit discourse. Conjunctions serve to keep the conversation going (e.g., “She was nice and attentive too, but sometimes that crossed over into being a little controlling”), and such full conversation is a key feature lacking in the speech of dismissing individuals. Similarly, conjunctions can be viewed as reflecting metacognitive monitoring and collaborative discourse, both of which are uncharacteristic of dismissing individuals (Main et al., 2002).

**Numbers (e.g., first, hundred, zero)**

Dismissing individuals used more numbers words than secure individuals, a finding which neither previous AAI research nor LIWC research provides a basis for interpreting. An example from Main et al. (2008) may illustrate the use of numbers words in the context of the AAI: “I had three siblings and I’d say it’s likely that all of us found her difficult . . . But like I said, my father left when I was four and she was the sole breadwinner [speaker continues]” (p. 44).

**Preoccupied individuals vs. others**

In contrast to dismissing or secure individuals, individuals classified as preoccupied demonstrate attentional inflexibility by focusing toward the attachment figure and attachment-related experiences (i.e., these individuals are “preoccupied with or by early attachments or attachment-related experiences”; Main et al., 2002, p. 170). As such, preoccupied transcripts score low on coherence by violating the maxims of manner, relevance, and quantity (Hesse, 2008). There are several ways in which the differences in word use observed in the present study between preoccupied individuals and the other attachment groups converge with previous AAI research and/or research using the LIWC program.

**Hear (e.g., say, listen, noisy, yell)**

As noted in the results section, the most common usage of words in the hear category in the AAI transcripts related to the word “say” (e.g., “Well, I’d say that the first time was when I was six”). Rather than simply responding to a question, speakers often began with an unnecessary linguistic introduction. Such usage can be viewed as a linguistic form of drawing out the response, thereby violating Grice’s maxim of quantity, specifically the notion of succinctness, in the way most characteristic of individuals classified as preoccupied (Hesse, 2008).
The use of the word “say” and its derivatives may also reflect the tendency of preoccupied individuals to become entangled in (and preoccupied by) “extensive discussion of surprisingly small” parental offenses (Hesse, 2008, p. 565). In the course of such discussions, these individuals describe specific conversations as examples of these offenses, and in these conversations words related to “say” are common. Hesse (2008) provided the following example of a preoccupied transcript: “... You know, like, my mother will come over and she’ll say ‘Why are you letting Angela run around like that and make all that noise?’” (p. 562). Main et al. (2002) provided a similar example: “I said to him, you are just a cold-hearted bastard, that’s what you are, and that’s not the half of it, believe me. Just the other day he ... [speaker continues]” (p. 180).

It is also possible that some of the other hear words contributed to the between-group differences that emerged. For instance, another characteristic of preoccupied individuals is that they “may attempt to involve the interviewer in agreement regarding parents’ faults” (Hesse, 2008, p. 568). Thus, in an attempt to ensure that the detailed descriptions of parental offenses are heard (and, by extension, agreed with), they may use “listen”, which falls in this category (e.g., “Oh you want an example? Well, listen to this one, just last night she ...”). This category also includes “yell” and its derivatives, and these words too may be more likely in the transcripts of preoccupied adults. When comparing a transcript of a preoccupied individual with that of a secure individual, Hesse (2008) provided the following examples of how each speaker elaborated when asked about the choice of the adjective “troublesome” in relation to the childhood relationship with the mother. The secure individual noted, “Well, she was troublesome for me when I was young, no questions. She yelled a lot of the time, I remember that ... [speaker continues]”, whereas the preoccupied speaker noted, “That was an understatement. It was yell, yell, yell ... [speaker continues]” (p. 560).

Anger (e.g., angry, obnoxious, nag)

The focus on specific parental offenses in which preoccupied individuals become embroiled typically leads to high scores on the involving/preoccupying anger scale. Such preoccupying anger does not characterize all speakers who report anger toward a parent during childhood and/or currently, but instead reflects an anger that is so preoccupying that it interferes with the speakers coherent discourse (i.e., through violations of Grice’s [1975] maxims of quantity [e.g., run-on sentences about lists of parental offenses], manner [e.g., failure to demark language as part of a previous conversation], and relevance [e.g., describing events of the current week when asked about childhood]). Thus, it is not surprising that individuals in this group used more words in the anger LIWC category. Hesse (2008) provided the following example: “And angry? She’s angry at me, she’s angry at her latest husband – that’s the latest in a series – now she’s angry at a neighbor about a tree that’s supposed to be blocking to her view, and so on and so on” (p. 560).

Certainty (absolute, always, never)

The AAI coding manual characterizes the individuals classified as preoccupied as viewing their life circumstances in black and white terms, with certainty about the causes of the problems (typically blaming others, as when harping on parental offenses), and as remaining closed to the complexities of relationships and to their own potential role in events (Main et al., 2002). Such a tendency would likely
account for the greater use of words in the certainty category. Main et al. (2002) provided an example from a preoccupied individual’s transcript of this violation of the maxim of manner: “Criticizing my dress. He always does that! Just always! He just never, absolutely never, likes the way I dress” (p. 91).

Swear words (e.g., crap, damn, suck)
Preoccupied individuals used swear words more than dismissing individuals, a difference which, to the extent that this usage signifies an emotional intensity, may reflect the tendency of preoccupied individuals to maximize negative emotions, and dismissing individuals to minimize negative emotions (Cassidy, 1994). This finding of the greater use of swear words also meshes with what the AAI coding manual refers to as the “extremities of name-calling” characteristic of preoccupied individuals (Main et al., 2002, p. 180).

Time (e.g., early, hour, today)
Preoccupied individuals used time words more than dismissing individuals, a difference that may relate to the fact that the transcripts of preoccupied individuals are typically characterized by “past-present slips/invasions/confusions” wherein “the present repeatedly invades the past” (Main et al., 2002, pp. 174–175). An example of such an invasions was provided (above) by a speaker asked about childhood: “I said to him, you are just a cold-hearted bastard […] Just the other day he … [speaker continues]” (Main et al., 2002, p. 180). In addition, in the context of providing excessive details to bolster claims of parental transgressions, preoccupied participants may use time words, as in the following example: “It was last December, just before Christmas, and I had slept kind of late that morning, when . . .”

Inhibition (e.g., ban, keep, stop), causation (e.g., justify, reason, why), and space (among, near, under)
Preoccupied individuals used inhibition words more than dismissing and secure individuals. For example, “I wish I had felt able to tell my father he absolutely should not try to control my brother’s life the way he did” (Main et al., 2002, p. 178). Preoccupied individuals also used causation words more than secure individuals and space words more than dismissing individuals. Neither previous AAI research nor LIWC research provides a basis for interpreting these group differences. However, the finding related to causation words is noteworthy in light of previous evidence that the increased use of cognitive mechanism words – especially causation words – is linked to affective coherence (Centerbar, Schnall, Clore, & Garvin, 2008) and the coherence of a narrative (Pennebaker & Francis, 1996). In the present study, however, preoccupied transcripts contained the most causation words and secure transcripts contained the fewest. These inconsistent findings are intriguing, and future research should further examine the connection between causation and coherence in the context of the AAI.

Linguistic characteristics associated with coherence of mind scale scores
Given that within the AAI coding system coherence of mind scale scores make a substantial contribution to attachment group placement, it is not surprising that the
LIWC categories that were correlated with coherence were in large part the same categories that differentiated attachment groups, particularly those that separated secure transcripts from either dismissing or preoccupied transcripts (i.e., categories that separated the two groups of insecure transcripts, such as *swear words* and *time* were not correlated with coherence). Many researchers are interested in using the coherence scores because they capture the secure/insecure dimension, which is often highly predictive of outcomes (Dykas, Woodhouse, Cassidy, & Waters, 2006; Ehrlich, Cassidy, & Dykas, in press; Roisman et al., 2001; Steele, Phibbs, & Woods, 2004). Here we interpret only categories that were correlated with coherence but did not appear in the group profile because the interpretation for those categories described above fits with the coherence findings.

The finding that *present tense* was negatively correlated with coherence suggests that the attention of insecure adults is more likely than the attention of secure adults to remain in the present. More frequent use of present tense may indicate violations of relevance and manner in both preoccupied and dismissing adults. Both groups of insecure individuals have difficulty collaboratively recounting examples of childhood events as requested by the interviewer. For preoccupied adults, the greater use of present tense may reflect difficulty in keeping childhood events in the past and a tendency instead to link childhood events to current events when asked about childhood (Hesse, 2008). In contrast, dismissing people are unwilling to talk about the past and as such their response to questions probing the past stay in the present (e.g., “I don’t remember”; “I can’t think of anything”). *Prepositions*, on the other hand, were positively correlated with attachment coherence. As with inclusive and conjunction words, prepositions would allow for the more flexible and coherent discourse characteristic of secure adults.

**Attachment classification based on linguistic categories**

In relation to attachment group classification, it is striking that a simple count of usage of words in existing LIWC categories resulted in 71% agreement with human coder classification for the three principal attachment groups. This 71% agreement is particularly notable considering AAI inter-coder agreement among highly trained attachment researchers typically ranges from 78% to 84% (e.g., Bakermans-Kranenburg & van IJzendoorn, 1993; Behrens, Hesse, & Main, 2007; Dykas et al., 2008; Roisman, 2006; Waters, Merrick, Treboux, Crowell, & Albersheim, 2000; Weinfield, Sroufe, & Egeland, 2000). Moreover, this high rate emerged even though the small number of preoccupied participants meant that we could include fewer than half (6/14) of the LIWC categories that produced group differences. The classification rate might have been higher had we been able to use more categories.

**Study limitations and future directions**

Because of limited previous work using LIWC to examine the linguistic properties of the AAI, the extent to which sample characteristics constrain the study findings is unknown. For instance, all participants of the present study were women, and previous research has shown that LIWC identifies different speech patterns in men and women. For example, because men have been found to swear more than women (Mehl & Pennebaker, 2003), it is possible that the present finding that preoccupied participants swear more than dismissing participants may not have emerged in a
sample containing men (for additional discussion of gender differences [e.g., women use more negations than men; Handelman & Lester, 2007], see Newman et al., 2008). In addition, the women in our sample were part of a larger study and had been selected because they were identified as “economically stressed”, and previous research has identified SES- and status-related linguistic patterns (e.g., Ireland & Pennebaker, 2010; Pennebaker, 2011; Pennebaker & King, 1999). As such, future research should include not only replication with samples similar to that in this study, but also with samples differing in their gender, racial, and SES compositions. Samples including more preoccupied individuals would also be useful because larger subsamples would enhance group discrimination (by providing greater power for between group analyses) and group classification (by permitting the inclusion of more LIWC categories in the discriminant function analysis).

Although the focus of this study was to examine word usage patterns during the AAI as a means of better understanding AAI discourse and classification groups, it is also important to consider the extent to which this (or another) computer text analysis program might ease the labor-intensive burden of AAI coding by providing a more feasible classification option. Beijersbergen, Bakermans-Kranenburg, and van IJzendoorn (2006) conducted an AAI coding study that revealed that knowledge of Grice’s maxims alone was insufficient for humans to code attachment coherence; specific knowledge of attachment theory and processes was crucial. Based on these findings, the authors concluded that “the requirements for a computer program capable of coding AAIIs are far beyond the current state of the art in computerized text analysis. […] Counting words … only partially overlaps with analyzing discourse characteristics and their psychological meaning” (Beijersbergen et al., p. 366). We agree with this assessment, while noting that additional research may in fact lead to identification of circumstances in which the computerized coding of transcripts will be useful for researchers. For instance, researchers may want to consider whether there are ways in which analysis with the LIWC system may reasonably serve as a means of preliminary screening. It is, however, particularly important to consider that our data did not include individuals whose transcripts are placed, typically on the basis of a few words or phrases, into the insecure-unresolved or cannot classify categories.

Finally, the core contribution of this study – insight into the ways in which word use is linked to psychological processes within adults’ attachment-related spoken narratives – could also be extended by examination of alternative coding components within the AAI (e.g., additional continuous AAI scales) and of texts, both spoken and written, beyond the AAI. For instance, insight into adults’ representational worlds could be gained by examining connections between LIWC variables and reflective functioning within and beyond the AAI (e.g., Fonagy, Steele, Steele, Moran, & Higgitt, 1991; Slade, 2005; Steele & Steele, 2008b). Furthermore, analysis of the narratives created through the use of measures designed to tap adults’ secure base scripts could provide important information. Moreover, examination of whether parental word use in interactions with their children is linked with parents’ own attachment organization as well as that of their children will be of particular interest. In previous examination of parent–child discourse, mothers of secure children have been found to use more elaborative and descriptive language and make more references to emotions compared to mothers of insecure children (Laible & Thompson, 2000; Ontai & Thompson, 2002; Raikes & Thompson, 2008). Future research could extend these intriguing findings by using LIWC to analyze transcripts...
of parent–child conversations and examine differences in word usage within this context as a function of parent and/or child attachment.

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Note
1. A matrix of correlations between the 44 LIWC categories and all continuous AAI scales is available from the first author.

References


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