

The development and preliminary psychometric evaluation of an attachment Implicit Association Task

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The importance of measuring attachment insecurity is underscored by a vast literature tying attachment insecurity to numerous psychological disorders. Self-report measures assess explicit attachment beliefs and experiences, while interview measures, like the Adult Attachment Interview, assess implicit internal working models about the self as worthy of care and others as reliable sources of care. The present study is a preliminary psychometric evaluation of a potentially cost-effective method of assessing implicit internal working models of attachment through the development of an Implicit Association Test (IAT). A racially diverse sample of 104 college females was administered Internet-based versions of three IATs (assessing views of the self, mother, and father) as well as self-report measures of attachment and interpersonal problems. Analyses were conducted to evaluate the (a) internal consistency of each task, (b) correlations among the tasks, (c) concurrent validity, and (d) convergent validity. Adequate internal consistency was noted and correlations among the three IATs were significant. No significant associations were observed between the explicit self-report measures of attachment and the IATs. Two primary areas for future research are discussed. First, future research should utilize an implicit attachment measure alongside an IAT. Second, future research should reevaluate the IAT stimuli used. (Bulletin of the Menninger Clinic, 80[3], 255–280)

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Attachment theory, developed by Bowlby (1969, 1973) and Ainsworth (1989), posits that early caregiving experiences create internal working models (or schemas; Dykas & Cassidy, 2011) of the self and others. Attachment security is a schematic view of the self as worthy of care and others as reliable and available caregivers (Bretherton & Munholland, 2008). Attachment insecurity refers to a view of the self as unworthy of care and others as unreliable caregivers. Accumulating evidence indicates that attachment insecurity is important to measure in both clinical and research settings, due to relations with varied psychological outcomes. For instance, attachment insecurity in adults has been associated with both internalizing (Deklyen & Greenberg, 2008; Mikulincer & Shaver, 2007; Safford, Alloy, Crossfield, Morocco, & Wang, 2004) and externalizing (Bowlby, 1944; Cooper, Shaver, & Collins, 1998; Schindler et al., 2005) problems, as well as borderline (Barone, 2003; Fonagy et al., 1996) and antisocial (Levinson & Fonagy, 2004; Shi, Bureau, Easterbrooks, Zhao, & Lyons-Ruth, 2012) personality disorders. Moreover, attachment relates to psychological processes such as emotion regulation (Guttman-Steinmetz & Crowell, 2006), aggression (Babcock, Jacobson, Gottman, & Yerington, 2000; Fournier, Brassard, & Shaver, 2011; Hare, Miga, & Allen, 2009), attention (Atkinson et al., 2009; Dewitte, 2011; Edelstein & Gillath, 2008), motivation (Elliot & Reis, 2003; Martin, Paetzold, & Rholes, 2010; Schwartz, Lindley, & Buboltz, 2007), social cognition (Dykas & Cassidy, 2011; Sharp & Fonagy, 2008), and interpersonal effectiveness in relationships (Berlin, Cassidy, & Appleyard, 2008).

Despite the importance of attachment security for emotional, psychological, and interpersonal functioning, the construct of attachment security has proven difficult to measure. The Adult Attachment Interview (AAI; George, Kaplan, & Main, 1985) is considered the gold-standard measure for assessing attachment security in adults. However, the AAI requires extensive training, time, and personnel because the aim of the interview is to assess a participant's *implicit* view of him- or herself as worthy of care and of early attachment figures as reliable sources of care. For these reasons, researchers have developed and evaluated

several self-report measures of attachment (e.g., Experiences in Close Relationships Questionnaire; Relationship Questionnaire) which are much less time consuming and require virtually no training or personnel resources.

However, there are several key differences between self-report measures of attachment and the AAI. For instance, self-report measures target a variety of present-day attachment relationships, which may include parents (Armsden & Greenberg, 1987), peers (Armsden & Greenberg, 1987), romantic partners (Fraley, Waller, & Brennan, 2000; Hazan & Shaver, 1987), or “close relationships” without any further qualification (Bartholomew & Horowitz, 1991). In contrast, the AAI specifically inquires about past childhood experiences with parental attachment figures (Main & Goldwyn, 1998). Extant empirical research indicates that these measures are not interchangeable (Fraley, 2002), with meta-analytic data showing little overlap between the AAI and these self-report measures (Roisman et al., 2007). This relatively low concordance may be due to the different relationships targeted by the AAI and self-report measures, although early attachment experiences are thought to provide a general template that is later applied to relationships with peers and romantic partners (Bowlby, 1969, 1973; Hazan & Shaver, 1987), and thus one would expect some concordance between measures. Another potential explanation for low concordance is that self-report questionnaires measure *explicit*, or conscious, attachment beliefs (Ren, Wang, Yang, Li, & Higgins, 2011), whereas the AAI measures an *implicit*, or nonconscious, internal working model of attachment. There are currently no strongly psychometrically supported alternatives to the AAI for empirical work seeking to assess *implicit* attachment internal working models. Therefore, the development of an implicit measure of attachment that utilizes a more cost-effective methodology is needed.

The Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998) may represent a methodologically compelling way to capture the implicit nature of attachment representations. The IAT is a computer-based task designed to assess implicit attitudes, stereotypes, and other constructs. During the

task, participants classify verbal stimuli (attributes) into target categories (concepts). The task operates under the assumption that word categorization processing speeds are faster when the concept and attribute pairings align with the participant's implicit cognitive associations, as opposed to when the concept and attribute category pairings are misaligned. After seven trials, an estimation of the relative strength between the concepts and attributes is provided. Over the past decade, a wealth of research concerning the psychometric properties of IAT measures has been conducted (Cunningham, Preacher, & Banaji, 2001; Egloff & Schmukle, 2002; Greenwald, Poehlman, Uhlmann, & Banaji, 2009). These studies provide evidence for the incremental (Greenwald et al., 2009) and predictive validity (Egloff & Schmukle, 2002; McConnell & Leibold, 2001; Ziegert & Hanges, 2005), as well as good internal consistency (De Houwer, Teige-Mocigemba, Spruyt, & Moors, 2009; Nosek, Greenwald, & Banaji, 2005), of IAT measures. In addition, IAT measures are particularly resistant to participants' attempts to present themselves in an inauthentic manner (Greenwald et al., 2009).

IAT methodology was first applied to the study of attachment security by Zayas and Shoda (2005), who demonstrated correlations between an IAT of romantic partner attachment and self-report questionnaires in a sample of college students. Similar findings were reported in international studies conducted by Bpanse and Kowalick (2007) and Dewitte, De Houwer, and Buysse (2008). However, these IATs do little to capture attachment as it is measured by the AAI, which focuses heavily on adults' state of mind with regard to their mothers and fathers, with only one question about romantic partners. Only one prior study (Zayas & Shoda, 2005) has evaluated a caregiver IAT in the United States, demonstrating some correlations between a mother-IAT and self-report measures of attachment. Zayas and Shoda's (2005) mother-IAT used the concepts supportive and rejecting. Attributes categorized into supportive included caring, giving, and loving; attributes categorized into rejecting included cold, distant, and critical. This mother-IAT was used alongside a self-IAT in which pleasant and unpleasant were used

as concepts. However, use of supportive/rejecting and pleasant/unpleasant as the concepts in this IAT represents a departure from how attachment security is typically defined in attachment theory. More specifically, Bowlby (1969, 1973) conceptualized attachment security as an internal working model of the self as deserving of care and others as reliable caregivers, a definition that remains common (Bretherton & Munholland, 2008). More closely approximating traditional attachment theory, Ren et al. (2011) created a self-IAT and a caregiver-IAT, which together were intended to capture attachment in terms of self-worthiness of care and other reliability of caregiving. Specifically, the self-IAT used the categories lovable/unlovable and the other IAT used the categories reliable/unreliable. By using these categories, Ren et al. (2011) capture traditional attachment theory's view that attachment has both self and other components and assesses self-worthiness and other-reliability specifically. In a sample of Chinese adults, Ren et al. (2011) found significant correlations between these IAT tasks and self-report measures.

The present study aimed to add to a growing body of research on the IAT as a measure of adult attachment to caregivers by conducting a psychometric evaluation of an English version of Ren et al.'s (2011) IATs for the first time in the United States. Therefore, this study represents the first use of an IAT assessing self-worthiness of care and other-reliability of care in English. Moreover, the present study builds upon previous research by, for the first time, developing a father-IAT and administering three tasks (i.e., self, mother, and father) in order to assess views of self and other with regard to both primary caregivers. In this way, the present study evaluated the only IAT that approximates the structure of the AAI (which asks questions about both mothers and fathers). Specifically, the present study evaluated (a) internal consistency of self-, mother-, and father-IATs; (b) correlations between these three tasks; (c) concurrent validity with a self-report measure of attachment security; and (d) convergent validity with a self-report measure of romantic attachment and a self-report measure of interpersonal problems. It was hypothesized that (a) the IATs would demonstrate adequate internal consistency; (b) all three tasks would be

moderately, but significantly, correlated with one another; (c) all three tasks would be positively associated with a self-report measure of global attachment security; (d) all three tasks would be positively correlated with a self-report measure of romantic partner attachment; and (e) all three tasks would be negatively correlated with interpersonal problems. Support for these hypotheses comes from aforementioned research documenting relations between IATs and self-report measures of romantic partner attachment (e.g., Ren et al., 2011) as well as studies showing relations between attachment security across different targets (e.g., mother and father, parent and peer; Berlin et al., 2008). Likewise, prior research has demonstrated relations between attachment insecurity and interpersonal problems, as measured by the Inventory of Interpersonal Problems-32 (used in this study; Horowitz, Alden, Wiggins, & Pincus, 2000). Continuing to examine the validity of an attachment IAT, and creating the first version of this task in English with mother and father modules, will contribute to a growing body of research about the use of IATs for collecting implicit information about an adult's attachment to both early caregivers using a rapid, cost-effective, and resource-effective method.

Methods

Participants

A total of 120 college students from a large, diverse, public university in the southwestern United States were enrolled in this study. Inclusion criteria were ages between 18 and 25, English proficiency, and enrollment in a psychology course at the university. Exclusion criteria included age older than 25 and failure to meet inclusion criteria. Two participants were excluded from data analysis based on the process of cleaning IAT data (see Preliminary Analyses). Data were missing about four participants on all questionnaires and they were therefore excluded from analyses. Data from two participants were deleted because questionnaires were responded to with the same response option throughout. Because of the small number of males who enrolled in the study ($n = 10$), they were excluded from final data analy-

ses. The final sample was 104 college students; 33.7% were Hispanic, and the racial breakdown was as follows: 14.4% African American, 26.0% Asian, 7.7% Biracial, 31.7% White, 9.7% other, and 10.6% stated that they wished not to answer. The average age in this sample was 21.30 years ($SD = 2.40$).

Procedures

Participants were invited to participate in the study through an online study management system at the university and via an email through the Department of Psychology. Participants received this email if they were currently or previously enrolled in a psychology course. Participants were informed, in the aforementioned communications, that the study was Internet-based. If interested, participants followed a hyperlink to an external survey system. A cover letter explained inclusion and exclusion criteria and contained information about the study's purpose and time frame.

Participants who elected to participate then answered a demographic questionnaire (i.e., sex, age, and race), followed by the three IATs (self, mother, and father) in random order. After completion of the third IAT, participants completed a series of questionnaires in random order.

Measures

The Implicit Association Tasks (IATs) used in this study were adapted from the tasks used by Ren et al. (2011). The tasks were administered in a series of three IATs: self, mother, and father. It is important to note that these tasks therefore evaluate attachment with regard to the self and others. In this way, the series of IATs evaluated attachment security fully, assessing both the implicit view of the self as worthy of care and the implicit view of others as reliable and available caregivers (Bretherton & Munholland, 2008). These tasks were administered in random order. In each task, the participant was presented with words and categories and asked to categorize them as quickly as possible without making errors. The self-IAT presented words for self (e.g., I, me, self), others (e.g., others, they, their), lovable (e.g., lovable, liked), and unlovable (e.g., terrible, unpleas-

ant). The mother-IAT used the categories mother (e.g., mama, mother, mom), others (e.g., others, they, their), available (e.g., dependable, available), and unavailable (e.g., unavailable, insecure). The father-IAT was identical except for the father words (e.g., papa, father, dad). All categories and stimuli for each of these IATs are presented in the Appendix.

All three IATs were administered in the seven standard test blocks with 20 trials in each (Lane, Banaji, Nosek, & Greenwald, 2007). For each IAT, Blocks 1, 2, and 5 were training blocks, and Blocks 4 and 7 and Blocks 3 and 6 were data collection pairs. Blocks 3 and 4 ask the participant to pair the self, mother, or father with available (i.e., for mother and father) or lovable (i.e., for self), while others was paired with either unavailable or unlovable. Blocks 6 and 7 were reversed, such that self, mother, or father was paired with unavailable or unlovable and others with available or lovable. The order of blocks was random. In each data collection pair, participants were asked to pair, for example, “mother” with “available” in one block, and in the other they were asked to pair “mother” with “unavailable.” Conceptually, a participant with an implicit view of the mother as available will pair “mother” with “available” words more quickly than pairing mother with “unavailable” words, and thus the difference between these two data collection blocks (once standardized and averaged across both data collection block pairs) represents the difference in response time for pairing “mother” with “available” and “mother” with “unavailable.” This difference is referred to as the *D* score. Higher *D* scores are indicative of greater endorsement of the implicit view that mother is available. Unlike traditional attachment interviews, like the AAI, which assign individuals to attachment categories (i.e., autonomous-secure, preoccupied, dismissing, unresolved-disorganized), IAT methodology produces dimensional *D* scores, thereby providing dimensional ratings of attachment security much like several questionnaire-based measures described below.

The Relationship Questionnaire (RQ; Bartholomew & Horowitz, 1991) is a self-report measure assessing the way in which adults perceive their own behavior in close relationships.

The questionnaire is made up of four short paragraphs, which describe a particular attachment style: secure, fearful, preoccupied, and dismissing. The RQ produces both categorical and continuous data. First, each respondent is asked to choose the style that is “closest to the way you generally are in your close relationships.” The RQ does not specify a relationship (e.g., mother or boyfriend) that the participant should be thinking of when responding. The respondent self-selects to one of four categories, yielding a categorical attachment classification. Second, the respondent is asked to rate his or her degree of similarity to each style on a 7-point Likert-type scale. The RQ therefore also yields a continuous rating from 1, (*not at all*) to 7 (*very much like me*) for each of the four attachment styles. The RQ has been administered in previous attachment IAT studies (e.g., Zayas & Shoda, 2005) as a concurrent validity, self-report measure. Criterion validity for this measure was established via correlations with measures of self-concept, self-image, and sociability (Bartholomew & Horowitz, 1991). Additionally, the RQ was validated using two interview-based assessments of attachment with family (Bartholomew & Horowitz, 1991) and with peers (Bartholomew & Horowitz, 1991), as well as friend-report and romantic-partner-report questionnaires (Griffin & Bartholomew, 1994). The RQ dimensions have been supported through factor analytic studies (Griffin & Bartholomew, 1994), and adequate reliability has been demonstrated for this measure. Cronbach’s alpha for this measure was not calculated in the present study because the four items are not intended to be used together.

Experiences in Close Relationships-Revised (ECRR; Fraley et al., 2000) is a 36-item questionnaire-based measure of romantic attachment. The instructions for this measure instruct participants to respond to items concerning how they feel in “emotionally intimate relationships.” The ECRR therefore assesses attachment globally for intimate relationships, rather than assessing a specific relationship. Eighteen items relate to romantic attachment anxiety and 18 relate to romantic attachment avoidance. An example of an attachment anxiety item is “I’m afraid I will lose my partner’s love,” and an example of an attachment

avoidance item is “I find it difficult to allow myself to depend on romantic partners.” Items are rated on a 7-point Likert scale ranging from 0 (*strongly disagree*) to 6 (*strongly agree*). Participants are asked to think about overall experiences in love and romantic relationships, including current and previous relationships. The original Experiences in Close Relationships questionnaire was revised by Fraley and colleagues (2000) using item response theory. The resulting ECRR showed good precision in measuring insecurity in both the Avoidance and Anxiety scales; however, it showed less discrimination in assessing high levels of security (Fraley et al., 2000). The ECRR exhibited divergent validity by discriminating between relationships with romantic partners compared with family members and platonic friendships (Sibley, Fischer, & Lui, 2005). Moreover, principal components analysis and confirmatory factor analysis both supported a two-factor model of the ECRR, and both the Anxiety ($\alpha = .91$ to $.93$) and Avoidance ($\alpha = .94$) subscales showed excellent internal reliability (Sibley et al., 2005). Because attachment to romantic partners is known to relate to caregiver attachments (Berlin et al., 2008), the ECRR was used in this study as a concurrent validity measure. It has been used in several other attachment IAT studies (e.g., Zayas & Shoda, 2005). In the current study, Cronbach’s alpha for the anxiety subscale was 0.93 and for the avoidance subscale was 0.95.

The Inventory of Interpersonal Problems-32 (IIP; Horowitz et al., 2000) is a 32-item self-report measure containing eight subscales: (1) domineering/controlling, (2) vindictive/self-centered, (3) cold/distant, (4) socially inhibited, (5) nonassertive, (6) overly accommodating, (7) self-sacrificing, and (8) intrusive/needy. Each subscale has four items. Each item is rated on a 5-point scale (*Not at all*, *A little bit*, *Moderately*, *Quite a bit*, and *Extremely*). The instructions of the IIP indicate that participants should “Please select the answer choice that describes you best.” The IIP is widely used in both clinical and research settings to measure treatment outcomes (Woodward, Murrell, & Bettler, 2005), personality pathology (Dawood, Thomas, Wright, & Hopwood, 2013; Eng & Heimberg, 2006), and nor-

mative personality (Bartholomew & Horowitz, 1991). Subscale raw scores were converted to t scores in accordance with previous research (Eng & Heimberg, 2006; Horowitz et al., 2000). Internal reliability for the IIP ranges from acceptable (intrusive/ needy: $\alpha = .68$) to good (cold/distant: $\alpha = .87$) among the eight subscales (Horowitz et al., 2000). Moreover, the IIP has shown a moderate correlation with the Beck Depression Inventory II, the Beck Anxiety Inventory, the Brief Symptom Inventory, and the Symptom Checklist-90-R, suggesting that the interpersonal problems measured by the IIP are related to, but are not directly predictive of, internalizing and psychological distress (Horowitz et al., 2000). In the current study, Cronbach's alpha for each of the IIP subscales was comparable to previous estimates, as follows: domineering, 0.73; vindictive, 0.92; cold, 0.84; socially inhibited, 0.89; nonassertive, 0.86; overly accommodating, 0.78; self-sacrificing, 0.79; and intrusive, 0.73.

Results

Preliminary analyses

Based upon the recommendations for use of the IAT provided by Greenwald, Nosek, and Banaji (2003), IAT data were cleaned prior to statistical analyses and two participants were excluded. First, trials with a latency longer than 10,000 ms were deleted, as were participants for whom more than 10% of trials had latency of less than 300 ms. The difference in average response latency between the IAT's two data collection blocks was then computed (and divided by the pooled standard deviation) in order to give an IAT D effect to be used in analyses (Greenwald et al., 2003). In this study, a larger D indicated greater implicit endorsement of attachment security, specifically belief that self is lovable, belief that mother is available, and belief that father is available.

Descriptive data for each IAT and each self-report measure are presented in Table 1. Mean reaction times in milliseconds for data collection Blocks 3 and 6 were $M_3 = 1008.34$, $SD_3 = 225.87$ and $M_6 = 1287.76$, $SD_6 = 302.24$ for the self-IAT; $M_3 =$

Table 1. Descriptive data for each key study variable

	<i>Mean</i>	<i>SD</i>
IAT D Mother	0.44	0.35
IAT D Father	0.31	0.33
IAT D Self	0.60	0.34
RQ Secure	4.32	1.92
RQ Fearful	4.34	2.01
RQ Preoccupied	3.39	1.86
RQ Dismissing	3.93	1.87
ECRR Anxiety	3.02	1.31
ECRR Avoidance	2.93	1.20
IIP Domineering	54.33	13.12
IIP Vindictive	53.30	14.93
IIP Cold	55.52	12.22
IIP Socially Inhibited	59.37	13.72
IIP Nonassertive	59.14	13.01
IIP Overly Accommodating	57.85	13.57
IIP Self Sacrificing	57.24	11.57
IIP Intrusive	54.88	12.38

Notes. IAT = Implicit Association Task; RQ = Relationship Questionnaire; ECRR = Experiences in Close Relationships; IIP = Inventory of Interpersonal Problems; SD = standard deviation.

968.21, $SD_3 = 199.23$ and $M_6 = 1141.00$, $SD_6 = 246.79$ for the mother -IAT; and $M_3 = 910.96$, $SD_3 = 228.60$ and $M_6 = 1011.00$, $SD_6 = 229.05$ for the father-IAT. The mean reaction times in milliseconds for data collection Blocks 4 and 7 were $M_4 = 842.47$, $SD_4 = 145.15$ and $M_7 = 1060.89$, $SD_7 = 222.20$ for the self-IAT; $M_4 = 899.56$, $SD_4 = 187.97$ and $M_7 = 1093.48$, $SD_7 = 321.37$ for the mother-IAT; and $M_4 = 858.39$, $SD_4 = 181.26$ and $M_7 = 974.21$, $SD_7 = 262.92$ for the father-IAT. Outlier analyses were conducted on all measures and no outliers were detected after the aforementioned data cleaning. No evidence of problematic skew or kurtosis was noted. Means on the ECRR (anxiety = 3.02, avoidance = 2.93) were comparable to those previously reported among college students (anxiety = 3.01, avoidance =

2.70 [Kelley, Cash, Grant, Miles, & Santos, 2004]; anxiety = 3.22, avoidance = 2.75 [Mack, Hackney, & Pyle, 2011]). Mean IIP scores generally mirrored patterns found in previous studies (e.g., domineering = 50.96; vindictive = 50.40; cold = 50.43; socially inhibited = 52.25; nonassertive = 51.26; overly accommodating = 47.21; self-sacrificing = 47.08; intrusive = 49.58 [Eng & Heimberg, 2006]), although they were, overall, somewhat higher in the current study.

Evidence of a significant correlation between the IATs and age ($r = -.005$ to $.066$, $p = .52$ to $.96$) was not detected. Based on the categorical RQ, 36.5% of participants endorsed a Secure attachment style, 34.6% endorsed a Fearful style, 11.5% endorsed a Preoccupied style, 16.3% endorsed a Dismissing style, and 1.0% did not endorse any style. These proportions generally mirror rates typically identified in college samples (37.2% Secure, 28.3% Fearful, 18.7% Preoccupied, 15.5% Dismissing [Sprecher, 2013]; 46.7% Secure, 25.4% Fearful, 14.8% Preoccupied, 14.1% Dismissing [Schwartz et al., 2007]).

Internal consistency of IATs

Internal consistency of each IAT task (i.e. self, mother, father) was calculated based on Greenwald et al. (2003). For each IAT task, this was calculated by computing the correlation between the *D* score computed from Blocks 3 and 6 and the *D* score from Blocks 4 and 7. For all three tasks in this study, internal consistency was adequate, with significant correlations between measures based on Blocks 3 and 6 and Blocks 4 and 7 in all cases (self-IAT: $r = .33$, $p = .001$; mother-IAT: $r = .27$, $p = .008$; father-IAT: $r = .29$, $p = .003$).

Main effect of IATs

To establish evidence of implicit attachment representations, it was necessary to determine if IAT effects differed from zero, the value associated with no implicit attachment representation. A one-sample *t* test confirmed that *D* scores in all three tasks were significantly different from zero: $t(103) = 17.68$, $p < .001$ (self-IAT); $t(103) = 12.62$, $p < .001$ (mother-IAT); and $t(103) = 9.59$, $p < .001$ (father-IAT). *D* scores in all three cases were positive

Table 2. Correlations between IATs and explicit measures of attachment

	<i>D</i> Mother	<i>D</i> Father	<i>D</i> Self
<i>D</i> Mother	1		
<i>D</i> Father	.468***	1	
<i>D</i> Self	.385***	.328**	1
RQ Secure	-.018	.018	.109
RQ Fearful	.126	-.010	-.008
RQ Preoccupied	.077	-.119	-.089
RQ Dismissing	.149	.043	.152
ECRR Anxiety	-.066	-.144	-.157
ECRR Avoidance	.041	-.099	-.098

Notes. IAT = Implicit Association Task; RQ = Relationship Questionnaire; ECRR = Experiences in Close Relationships. ** $p < .01$. *** $p < .001$.

(Table 1), which suggests that participants implicitly associated the self as lovable and their mothers and fathers as available.

Correlations among IATs

Correlations among all three IATs are presented in Table 2. All three were significantly correlated with one another (all $ps < .01$), with Pearson correlations ranging between .33 and .47.

Concurrent validity

Relations between the IAT and an explicit, self-report measure of attachment, the RQ, were computed in order to evaluate concurrent validity. The RQ provides both dimensional and categorical attachment data (see Measures). From a dimensional perspective, Pearson correlations were used to examine relations between the IAT *D* scores for the self-, mother-, and father-IATs and the RQ. These correlations are reported in Table 2 and reveal no significant associations between the IATs and the RQ when used dimensionally.

Additionally, univariate analyses of variance were used to compare mean *D* scores across the four attachment categories of the RQ. With regard to the self-IAT, no significant differences in the *D* score were noted between groups, $F = 0.64$, $p = .592$, $df = 3$. Likewise, no significant differences were noted for the

mother-IAT, $F = 0.81$, $p = .489$, $df = 3$, or for the father-IAT, $F = .90$, $p = .443$, $df = 3$.

Convergent validity

Relations between the IATs and an explicit, self-report measure of romantic partner attachment, the ECRR, were computed in order to evaluate concurrent validity. Pearson correlations are reported in Table 2 and reveal no significant associations between the IATs and the ECRR.

Relations between the IATs and a self-report measure of interpersonal problems, the IIP, were computed in order to further evaluate concurrent validity. Out of the eight IIP subscales, Pearson correlations indicated that the self-IAT was negatively correlated with only the IIP nonassertive ($r = -.20$, $p = .041$) and intrusive subscales ($r = -.22$, $p = .0254$). The mother-IAT was negatively correlated with only the IIP self-sacrificing subscale ($r = -.26$, $p = .008$). No IIP subscales were significantly correlated with the father-IAT.

Discussion

The aim of this study was to collect preliminary data on an English version of Ren et al.'s (2011) caregiver IAT in a sample of college students and expand upon this task by developing a father-IAT as well. The tasks used in the present study built upon existing research in several ways. Specifically, this study used the first English IAT to target both self and other dimensions of attachment via perceptions of worthiness of care (self) and reliability of care, and it is thus theoretically consistent with attachment theory. Additionally, this study was the first to examine attitudes toward fathers using IAT methodology, and thereby evaluated IATs that, together, approximated the structure of the AAI. The findings of the present study suggest some promise regarding the psychometric properties of the attachment IATs examined, although limited evidence of concurrent and convergent validity was noted. Additional research is needed in order to more fully examine the validity of these tasks. The IAT stimuli used in the present study are reported in the Appendix

in order to facilitate further evaluation of these tasks by other research groups.

Regarding basic psychometric performance, the IATs used in this study showed potential for future use. First, all three IATs demonstrated significant correlations between their component partial measures, indicating adequate internal consistency. Although the internal consistency estimates in this study were somewhat lower than what is reported by Greenwald et al. (2003), the estimated internal consistency in this study was statistically significant. Second, correlations among the self-, mother-, and father-IATs were significant and ranged between .328 and .468. These moderate correlations echo the findings of Zayas and Shoda (2005), who found correlations ranging between .23 and .45 for IATs assessing security with regard to partner, mother, and self. The magnitude of these correlations provides preliminary evidence that the tasks are measuring related but distinct constructs.

Regarding concurrent validity, evidence of significant relations between the IATs and explicit measures of attachment (i.e., RQ) was not detected, contrary to study hypotheses. Evidence of convergent validity was also sparse; the IATs did not demonstrate any significant relations to romantic partner attachment (i.e., ECRR) and few relations to the Inventory of Interpersonal Problems (IIP) were noted. Specifically, the self-IAT was negatively correlated with the IIP intrusive and nonassertive subscales, the mother-IAT was negatively correlated with the IIP self-sacrificing subscale, and the father-IAT was not significantly correlated with any subscale. The fact that these correlations are distinct across IATs provides evidence that the three tasks are assessing implicit beliefs about specific targets rather than beliefs about all people, as is suggested by Zayas and Shoda's (2005) similar work. Additionally, the pattern of correlations may preliminarily suggest that the self- and mother-IATs detect attachment anxiety to some degree. Prior research has reported that people with high scores on the intrusive and nonassertive subscales are described as too open and overly self-disclosing, and these subscales are particularly elevated among individuals with preoccupied and fearful attachment styles (Horowitz et al.,

2000). Likewise, the mother-IAT was negatively correlated only with the self-sacrificing subscale—a subscale that indicates perceptions of the self as too eager to serve others, overly generous, and unable to set boundaries. These descriptions mirror characterizations of attachment preoccupation as measured in the AAI (Hesse, 2008). Taken together, these correlations suggest that the attachment IATs may be better equipped to measure attachment anxiety than attachment avoidance. Still, the IATs did not demonstrate significant correlations with the vast majority of IIP domains, and relations were inconsistent with regard to the IAT target. Overall, compelling evidence of convergent validity was not noted.

We present three possible explanations for the absence of strong validity evidence noted in this study: (a) that the IAT underperformed in this study due to its implicit nature, (b) that the IAT stimuli used in the present study require modification for future research, and (c) that the IAT is not a valid test of attachment security. Directions for future research are embedded in discussing each of these possibilities.

First, it is possible that the present study's design was insufficient to detect the concurrent validity of the attachment IATs used because it did not compare the IAT against another implicit measure of attachment like the AAI. In the present study, the IATs were instead administered alongside self-report measures of attachment (which are typically conceptualized as capturing explicit attachment beliefs). Thus, the present study, and all previous attachment IAT studies, cannot speak to whether attachment IATs mirror attachment as captured by other implicit measures. The lack of significant correlations between the IATs and self-report measures of attachment (i.e., ECRR and RQ) in the present study are echoed, to some degree, in all other attachment IAT studies. For instance, Zayas and Shoda (2005) and Ren et al. (2011) demonstrated few significant correlations between the IATs and self-report measures administered. This pattern is duplicated when examining correlations between the (implicit) AAI and self-report measures (Roisman et al., 2007). Future research that concurrently administers the attachment IAT and an implicit measure (like the AAI) is needed in order to

truly speak to the validity of these tasks as implicit measures of attachment. Additionally, comparing the IATs used in this study to AAI scales would allow for more fine-grained analyses of the validity of these IATs. Indeed, the IATs used in this study were target specific (i.e., targeting mother, father, and self individually), whereas the concurrent validity measures assessed attachment globally—asking participants to respond about “intimate relationships” generally (i.e., ECRR) and “close relationships” globally (i.e., RQ). Using the scales of the AAI that specifically capture attachment to mother and father (individually) would allow for more precise assessment of concurrent validity.

Second, further research is needed in order to determine whether the IAT stimuli and categories selected in this study (and in previous IAT studies) are ideal for detecting attachment insecurity. In Zayas and Shoda’s (2005) first caregiver-IAT, the mother-IAT used categories *supportive* and *rejecting* and their self and partner IATs used categories *pleasant* and *unpleasant*. Although their mother-IAT demonstrated some associations with attachment anxiety (ECRR) and a secure attachment classification (RQ), the IAT items were heavily valenced (strongly positive: e.g., caring, giving, loving; or strongly negative: e.g., cold, distant, critical), indicating that their task could be assessing positive versus negative appraisals of a participant’s mother, rather than addressing key concepts in attachment such as self-worthiness of care and reliability of care. Indeed, a clear distinction is drawn in the AAI between attachment security and positive or negative upbringing experiences. The present study, building upon Ren et al. (2011), sought to address this limitation by choosing stimuli that more closely approximate the conceptual framework of attachment security espoused by Bowlby (1969, 1973) and others (Bretherton & Munholland, 2008) as well as the AAI—that attachment security reflects a view of the self as worthy of care and others as reliable caregivers. Therefore, instead of evaluating maternal attachment as supportive/rejecting and self as pleasant/unpleasant, the present study used categories of available/unavailable for maternal attachment and lovable/unlovable for view of the self.

However, use of these prompts may not have been ideal for detecting attachment *insecurity* because although attachment *security* is characterized by perceptions of others as available, reliable caregivers and of the self as worthy of care (Bretherton & Munholland, 2008), attachment *insecurity* may not be thoroughly assessed by an IAT using these prompts. This may be due to the fact that attachment insecurity can take two dominant forms—preoccupied/fearful or dismissing. A dismissing attachment is characterized by a sense of independence in which close emotional relationships are not perceived to be necessary (Bartholomew & Horowitz, 1991). Thus, an individual with a dismissing attachment style may not possess an implicit view of early caregivers as unreliable. Perhaps words targeting necessity of relationships and/or independence are more appropriate for detecting a dismissing style. This example also highlights a remaining empirical question—is one IAT capable of assessing attachment security overall? Or are current IATs underperforming because no theoretical distinction is made among the insecure classifications (e.g., dismissing versus preoccupied)? Two alternatives should be evaluated in future research. First, an IAT could be developed to assess each attachment style of the AAI and then the pattern of *Ds* could be analyzed to assign a primary classification. Second, two IATs could be developed to mirror the dimensional structure of attachment as conceptualized by Fraley and colleagues (2000)—that is, an IAT of attachment anxiety and an IAT of attachment avoidance could be administered and analyzed together.

Third, it is possible that the IATs used in the present study are not valid measures of attachment. Generally, the IAT technique remains somewhat controversial, and a debate surrounding the use of the IAT raises important questions surrounding its use, including (a) the extent to which IATs capture the true strength between target and attributions rather than mere salience of concepts (Blanton et al., 2009; Rothermund & Wentura, 2001); (b) the malleability of IAT effects, and consequently whether the IAT is suited to measure relatively stable constructs like attachment internal working models (De Houwer, 2002); and (c) the strength of evidence for external validity because few studies

have demonstrated robust links between IAT scores and actual behavior (Blanton et al., 2009). These issues remain unresolved by the current study—as well as within the field—but are important considerations for future research.

Other limitations of the present study should be noted. Specifically, this study made use of a college sample that completed all measures online. Therefore, study conditions may have been highly variable and were neither assessed nor controlled. Additionally, the study successfully recruited only female participants and thus preliminary evaluation of these IATs in males is needed. Despite these limitations, the sample in this study was diverse and the questionnaires used were psychometrically strong and evaluated carefully for outliers and biased data prior to analysis. Moreover, the present study adds to a growing body of literature by developing IAT methods that can be administered with ease online and therefore promote further research.

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Appendix: Attributes and concepts for IATs used in this study

Task	Mother	Father	Self
Concept 1	Available v. Unavailable	Available v. Unavailable	Lovable v. Unlovable
Attributes 1	Dependable	Dependable	Lovable
	Available	Available	Liked
	Safe	Safe	Lovely
	Credible	Credible	Pleasant
	Trustworthy	Trustworthy	Sweet
	Suspicious	Suspicious	Terrible
	Unavailable	Unavailable	Hateful
	Insecure	Insecure	Disgusting
	Skeptical	Skeptical	Obnoxious
	Doubting	Doubting	Unpleasant
Concept 2	Mother v. Other	Father v. Other	Self v. Other
Attributes 2	Mama	Papa	I
	Mama's	Papa's	My
	Mother	Father	Me
	Mother's	Father's	Mine
	Mom	Dad	Self
	Others	Others	Others
	His/her	His/her	His/her
	They	They	They
	Their	Their	Their
She/he	She/he	She/he	

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