Implicit Self-Esteem in Adolescents with Parental History of Depression

By

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Abstract

Although low explicit self-esteem has been strongly linked to Major

Depressive Disorder (MDD) as both a symptom of and vulnerability for the disorder,

little is known about the relation between implicit self-esteem and MDD. Prior

research suggests that individuals with MDD or a history thereof display positive

implicit self-esteem similar to or higher than that of controls. The present study

examined the relation between implicit self-worth, as measured with an Implicit

Association Test (IAT), parental bonding, and explicit self-esteem before and after a

negative mood induction in individuals with (n=26) and without (n=21) a family

history of MDD. Individuals with a family history of MDD displayed significantly

higher implicit self-worth than controls following but not prior to the negative mood

induction. Parental bonding and explicit self-esteem were unrelated to the implicit

self-worth of either participant group. These findings suggest that increased implicit

self-worth may characterize individuals vulnerable to developing MDD. Implications

for future research are discussed.

1

Introduction

The identification of risk factors which confer vulnerability to major

depressive disorder (MDD) has yielded several groups of individuals considered to be

at-risk for the disorder. Given their significantly greater risk for developing MDD and

other psychological disorders (Downey & Coyne, 1990; Klein, Lewinsohn, Rohde,

Seeley, & Olino, 2005; Lieb, Isensee, Hofler, Pfister, & Wittchen, 2002; Weissman,

Wickramaratne, Nomura, Warner, Pilowsky, & Verdeli, 2006; Williamson, Birmaher,

Aselson, Ryan, & Dahl, 2004), children of parents with depression have become the

focus of a number of studies,. Individuals with parental history of MDD experience

earlier onset of MDD, with peak prevalence around late adolescence (Lieb et al.;

Weissman et al., 2006; Williamson et al., 2004) and greater symptom severity and

recurrence (Lieb et al., Rohde, Lewinsohn, Klein, & Seeley, 2005) than do

individuals without a parental history of MDD. Several developmental models have

attempted to explain the relationship between parental history of and cognitive

vulnerability for MDD in their children.

Developmental Models of Depression

One model, proposed by Rose and Abramson (1992), suggests that negative

experiences in childhood, especially maltreatment, contribute to the development of

negative cognitive styles as the child attempts to understand the reasons behind the

occurrence of events. With repeated negative events over time, the child may become

frustrated and helpless, internalizing supposed causes for the events and, in the

process, developing negative cognitive styles. Similarly, the model for maternal

transmission of risk proposed by Goodman and Gotlib (1999) suggests that exposure to stressful events and the negative thoughts and behaviors of mothers may combine with genetic vulnerabilities and dysfunctional neuroregulatory mechanisms to increase risk for MDD. Both models share the common feature of negative childhood experiences as factors for vulnerability to MDD with Beck's model (1967). His model suggests that children develop dysfunctional attitudes from poor relationships with parents. Negative feedback from parents about the child's ability to cope with events and solve problems may instill a sense of incompetence and self-doubt in the child, leading to negative schemas. Further reinforcing these cognitive styles, negative events during childhood also sensitize individuals to similar future events. Such sensitization may trigger and reinforce the dysfunctional attitudes and negative core schemas, thus leading to MDD. The shared component of these theories has received support from research on childhood traumatic events and parental relationships and on the cognitive consequences of parental MDD.

Among the types of childhood traumatic events, those which are primarily emotional in nature (e.g., emotional maltreatment) appear to affect the formation and type of cognitive styles found in children and adolescents (see Gibb, 2002 for a review; also Gibb et al., 2001; Lumley & Harkness, 2007; Uhrlass & Gibb, 2007). More specifically, emotional maltreatment has been associated with negative schemas of loss and worthlessness (Lumley & Harkness, 2007), increased negative inferential styles (Gibb & Abela, 2007), and more severe depressive symptoms (Hankin, 2005; Uhrlass & Gibb, 2007). Parents, and particularly mothers, with MDD may be

emotionally reserved, distant from and irritable with their children (Lovejoy, Graczyk, O'Hare, & Neuman, 2000); such negative parenting relationships may be associated with emotional maltreatment. Research suggests that the quality of parent-child interactions affects the type of cognitive styles developed by children (Alloy, Abramson, Smith, Gibb, & Neeren, 2006), with relationships high in neglect and low in care associated with more negative cognitive styles (McGinn, Cukor, & Sanderson, 2005), and increased depressive symptomatology (Rekart, Mineka, Zinbarg, & Griffith, 2007). Posited to serve as a mediating factor between negative parenting and later depressive symptoms (Hankin, 2005; McGinn et al, 2005), these negative cognitive styles and related dysfunctional attitudes have been studied in relation to parental bonding, a component of parent-child interaction which appears to directly impact childrens' cognitive styles.

Among adolescents, those who report poor parental bonding have been found to be at higher risk for developing depressive symptoms when experiencing stress, particularly when using negative cognitive coping strategies, such as self-blame or rumination (Kraaij et al., 2003). Moreover, poor parental bonding, as assessed by measures of perfectionistic expectations, criticalness, overprotection, and lack of care, is associated with increased levels of dysfunctional attitudes and depressive symptoms (Randolph & Dykman, 1998). Additionally, adolescents with poor maternal bonding report fewer positive and more negative automatic thoughts than do those with better bonding (Ingram, Overbey, & Fortier, 2001). Besides affecting cognitive styles, low levels of maternal care are associated with increased attention to

negative stimuli when formerly depressed individuals are in a negative mood state (Ingram & Ritter, 2000). In contrast to a cohort with never depressed mothers, who selectively attend to positive stimuli, children of depressed mothers display attentional biases for negative facial stimuli, (Joorman, Talbot, & Gotlib, 2007). Taken together, these findings suggest that poor parental bonding, particularly with mothers, is associated with increased negative cognitive styles and attentional biases.

Parental bonding may be particularly related to the development of self-related schemas, including self-esteem. Research suggests that a maternal history of MDD is associated with low self-worth in adolescents, a finding mediated by low maternal acceptance (Garber & Flynn, 2001). Further supporting the relation between self-esteem and parental MDD, Taylor and Ingram (1999) examined information processing following a negative mood induction among children of either depressed or nondepressed mothers. Children of depressed mothers displayed increased recall of negative information and decreased positive self-concept, findings in line with prior research which found that children of depressed parents reported decreased positive self-concept and less positive self-relevant schemas (Jaenicke et al., 1987). Moreover, in a prospective study of young adolescents, low self-worth was associated both with low parental care and with high parental indifference (Liu, 2003), two common features found among depressed parents. Additionally, perceived self-worth was found to mediate the relation between parental care and depressive symptoms, as well as partially mediate the relation between parental indifference and depressive symptoms (Liu, 2003). Self-worth was also found to partially mediate the relation

between maternal acceptance and control (Garber, Robinson, & Valentiner, 1997).

Taken together, these studies suggest that self-worth is both affected by, and

contributes to, the interpretation of parenting styles

In sum, these findings suggest that parental relationships play an important

role in the development of self-related schemas, particularly self-esteem. Prior

research has primarily examined self-esteem using explicit measures, which tap

conscious cognitions towards the self. However, schemas are posited to operate

automatically, often outside of conscious awareness (Beck, 1967). Although schemas

are thought to underlie cognitive styles, they are presumed to be separate from those

more explicit, consciously processed beliefs. Explicit measures, which ask

participants to consider their thoughts and beliefs, indirectly measure schemas by

assessing the more conscious cognitive styles. In order to more directly measure

schemas, and by extension evaluate components of Beck's theory, indirect measures

of the core processes underlying attitudes and beliefs are required. Implicit measures

may provide one way to assess schemas' relation to MDD.

Implicit Measures of Self-Esteem in Depression

Presumed to measure individuals' automatic, less conscious thoughts which

underlie decisions, implicit measures may be useful in assessing schemas

(Greenwald, McGhee, & Schwartz, 1998). According to dual process models (e.g.,

Beevers, 2005; Haeffel et al., 2007), implicit cognitions result from the integration of

overlearned processes into everyday use; they are used when individuals have to

make quick decisions and either do not have the time or resources necessary to

engage in explicit, conscious deliberation. Explicit cognitions consist of the conscious re-appraisal of implicit thoughts and related decisions. Whereas explicit measures directly inquire about individuals' conscious thoughts, implicit measures ask individuals to complete tasks which do not require conscious thought about the target of interest. For example, an explicit measure of self-esteem asks individuals to report how they perceive themselves. In contrast, an implicit measure of self-esteem asks participants to rate letters according to their likeability, with the assumption that higher levels of implicit self-esteem are indicated by greater liking for letters which are the individual's initials. Assumed to reflect more automatic, unconscious thoughts, implicit measures may be more accurate measures of schemas; they may also be useful to assess the relation between schemas and MDD.

Two prior studies of currently depressed individuals have examined the presence of implicit biases towards the self. A recent study which used three different measures of implicit self-esteem – the Implicit Association Test, the Name Letter Preference Test, and the Extrinsic Affective Simon Task – found positive implicit self-esteem in currently depressed individuals (De Raedt, Schact, Franck, & De Houwer, 2006). However, levels of implicit self-esteem in depressed individuals were similar to or greater than those of nondepressed controls. Despite the lack of differences, a similar study by the same researchers found that the combination of high positive implicit self-esteem and low explicit self-esteem was more predictive of suicidal ideation in currently depressed individuals than was the combination of low implicit and low explicit self-esteem (Franck, De Raedt, Dereu, & Van den Abbeele,

2007b). Further investigating the presence of implicit self-esteem, research on remitted depressed individuals, another population at risk for future depressive episodes (Gotlib & Hammen, 2002), has also found positive biases.

In one of the first studies of implicit self-esteem in remitted depressed individuals, Gemar and colleagues (2001) found that both remitted depressed and nondepressed controls displayed positive implicit self-esteem; only remitted depressed individuals showed a decrease in implicit self-esteem following a negative mood induction. However, as noted by De Raedt and colleagues (2006), the reported decrease in remitted depressed individuals' implicit self-esteem was driven by greater levels of self-esteem than controls prior to the mood induction; following the mood induction, no differences in implicit self-esteem were found between groups (Gemar et al., 2001). Another study, which also reported equivalent levels of implicit self-esteem among currently depressed, remitted depressed and never depressed individuals, found that implicit, but not explicit, self-esteem predicted the level of depressive symptoms after six months (Franck, De Raedt, & De Houwer, 2007a). Similarly, a recent study found that low implicit self-esteem interacted with life stress to predict depressive symptomatology in undergraduates at high cognitive risk for MDD (Steinberg, Karpinski, & Alloy, 2007). Moreover, levels of implicit self-esteem predicted immediate reactions to a lab stressor in a sample of never depressed undergraduates (Haeffel et al., 2007). These findings suggest that implicit self-esteem may interact with stress to increase vulnerability to, and severity of, depressive symptoms in both currently depressed and at-risk individuals. Exploring the potential

relation between these biases and parental bonding may provide insight into their formation and role as risk factors for MDD.

To date, one study has examined the relation between parental bonding and implicit self-esteem. Parental interactions, as measured by the PBI and a childhood experiences questionnaire, were found to be related to levels of implicit self-esteem, as assessed by the Name-Letter Preference Task (DeHart, Pelham, & Tennen, 2006). Measures of parental bonding were averaged between mothers and fathers to produce a combined score for analysis. Specifically, low levels of nurturance and high levels of overprotection were associated with decreased implicit self-esteem in children. Analyses of maternal care and protection yielded similar findings. Although conceptually intriguing, this study investigated young children of nondepressed parents, limiting its generalizability to children of depressed parents.

Further exploration of the levels of implicit self-esteem might require the use of a negative mood induction, as suggested by research on explicit cognitive styles. Although explicit negative cognitive styles may require the presence of a negative mood stressor to be activated and detected among at-risk but not currently depressed individuals (see Ingram & Ritter, 2000; Miranda, Pearsons, & Byers, 1990; Scher et al., 2005), research on the detection of implicit self-esteem is mixed. Whereas some studies have found different levels of implicit self-esteem between at-risk and control participant groups without a mood induction (Gemar et al., 2001; Steinberg et al., 2007), others have failed to find differences between groups (De Raedt et al., 2006; Franck et al., 2007a), even following a mood induction (Gemar et al., 2001). The lack

of differences between participant groups in these studies may be due to the lack of a mood stressor; however few studies have examined the effects of a mood induction on levels of implicit self-esteem, suggesting that additional investigation is warranted.

In sum, children of depressed parents have been found to be at increased risk for developing MDD. Research suggests that poor parental bonding contributes to the development of dysfunctional attitudes and negative cognitive styles, both of which predispose individuals to developing MDD. Although research suggests that poor parental bonding is associated with decreased implicit self-esteem in their children, the effects of maternal MDD on implicit self-esteem are not yet known. Given that research indicates that individuals at-risk for MDD display decreased implicit self-esteem and that implicit self-esteem may be guide individuals' reactions to events, further investigation is warranted to clarify both the relation between parental MDD and implicit self-esteem and the effects of negative stressors on implicit self-esteem.

Present Study

As the relation between parental bonding and implicit self-esteem has not been explored among individuals at high risk for MDD, the present study sought to assess 1) levels of implicit self-esteem in individuals with formerly depressed mothers or fathers, as well as healthy controls, 2) the effects of a negative mood induction on implicit self-esteem, and 3) the relation between parental bonding and implicit self-esteem.

Given the inconsistent evidence of implicit self-esteem in individuals at-risk for and remitted from MDD (De Raedt et al., 2006; Franck et al., 2007; Gemar et al.,

2001; Steinberg et al., 2007), individuals at high risk for MDD were expected to display smaller levels of positive implicit self-esteem as compared to healthy controls both prior to and following the mood induction. No differences in mood state between participant groups were expected either before or after the mood induction, since prior research suggests that participant groups are equally affected (e.g., Gemar et al., 2001). As suggested by prior research (DeHart et al., 2006), individuals who report low levels of care and high levels of overprotection were expected to display lower implicit self-esteem than individuals who report other bonding experiences. Finally, implicit and explicit measures of self-esteem were not expected to be correlated, since prior research suggests that implicit and explicit measures are independent and assess different aspects of the same construct (e.g. Bosson, Swann, & Pennebaker, 2000; Devine, 1989; Gemar et al., 2001; Greenwald & Farnham, 2000; Haeffel et al., 2007)

Method

Participants

One hundred and twenty one participants ages 18 – 23 were recruited from the introductory psychology study pool at the University of Kansas. Participants were recruited who had either no history of MDD and no family history of MDD or who had a self-reported history of maternal or paternal history of MDD. These dimensions were assessed by questions from the Family History Screen (FHS; Weissman, Wickramaratne, Adams, Wolk, Verdeli, & Olfson, 2000) included on the psychology study pool prescreen. All participants were fluent English speakers, with no children,

neurological conditions, serious physical illnesses, or current Axis I disorders as assessed using the Structured Clinical Interview for the DSM-IV-TR Axis I Disorders - Non-patient Edition (SCID-I/NP; First, Spitzer, Gibbon, & Williams, 2002).

Of those initially recruited, 38 healthy controls (Controls; 20 women, 18 men; $M = 18.92$, $SD = 1.32$) and 28 participants with family history of MDD (At-Risk; 18 women, 10 men; $M = 19.14$, $SD = 0.97$) met criteria for and participated in the study. Four controls and two participants with family history of MDD were excluded from analyses as they met criteria for a current or prior history of either alcohol abuse or an eating disorder, as assessed by the SCID. Five participants with family history of MDD reported BDI-II scores > 14 on the day of testing and no longer met study criteria. Finally, eight controls made greater than 30% errors on one or more trials on the IAT, a standard exclusionary criterion for this measure (Greenwald et al., 1998). Data from 47 participants (n = 26 controls, n = 21 participants with family history of MDD) were included in all analyses.

Eight of the participants with family history of MDD also met criteria for remitted MDD according to the guidelines suggested by the National Institute of Mental Health, (Birmaher, Ryan, & Williamson, 1996). For remitted participants, the mean age of onset and mean number of episodes were 15.44 ($SD = 1.51$) and 1.33 ($SD = 0.50$), respectively. Remitted participants were not taking psychotropic medications and were not receiving psychotherapy at the time of testing. Data from these participants were included with that of other at-risk participants for all analyses.

Measures

   Clinical Interview Measures.

   In order to select participants eligible for the study, the Structured Clinical

Interview for the DSM-IV-TR Axis I Disorders - Non-patient Edition (SCID-I/NP;

First, et al., 2002) and the Family History Screen (FHS; Weissman, et al., 2000) were

used. The SCID-I/NP is a semi-structured clinical interview that includes questions

about all symptoms for each Axis I disorder and guides the interviewer through the

evaluation process of determining whether a participant has meet criteria for a

disorder. Symptoms are rated on a three point scale, with "1" indicating the absence

of a symptom and "3" indicating the threshold presence of a symptom. A participant

is considered to have met criteria for a disorder when he or she endorses the requisite

number of symptoms for that disorder. Participants completed all modules of the

SCID-I/NP except for those assessing Adjustment, Dissociative, and Somatoform

Disorders. The SCID-I/NP was used to assess for the presence of current or prior

disorders.

   To assess family history of MDD, the FHS was used. A 31-question

interview, the FHS includes items about all DSM-IV-TR Axis I disorders, except for

Adjustment, Dissociative, and Somatoform Disorders. Additionally, there are

questions which assess Attention Deficit/Hyperactivity Disorder, Attachment

Disorder, Conduct Disorder, suicide attempts, and general mental health. Information

is collected about participants' biological family, including their siblings and

children, and rated on a three point scale, with "0" indicating the absence of the

disorder, "1" suggesting its presence, and "9" indicating a lack of information to determine whether the disorder was present or absent. The FHS has shown acceptable specificity and reliability of diagnosis (Weissman et al., 2000).

Implicit Association Test.

A computerized categorization task, the Implicit Association Test is a measure of the relative strength of the associations between constructs (e.g., Me/Other) and evaluative judgments (e.g., Competent/Worthless), (IAT; Greenwald, McGhee, & Schwartz, 1998). Each construct is paired with an evaluative judgment during the task (e.g., Me/Competent and Other/Worthless), with the pairings switched halfway through the task (e.g., Me/Worthless and Other/Competent). Exemplars of each category are presented, and participants are asked to classify the exemplars into the appropriate categories. Shorter response times to classifying exemplars are presumed to reflect stronger associations between the paired categories. Internal consistency, reliability, and construct validity have been acceptably demonstrated for the IAT (Greenwald, et al., 1998; Nosek, Greenwald, & Banaji, 2005).

Self-Worth IAT Design. In the present study, the standard seven block design was used, with the first three blocks, as well as the fifth and sixth blocks, designated as practice blocks of 20 trials each; the fourth and seventh blocks contained 40 trials each. Category pairings were constant through the first four trial blocks and switched at the beginning of the fifth; the order of category pairings and response keys were counterbalanced between participants but held constant for each participant. The stimuli used in the present study were taken from a prior study by Franck and

colleagues (2007) with some modifications. For the Self/Other construct categories, each participant provided a list of five self-descriptive words (elicited by the prompts: first name, last name, hometown, birth date, gender) and five words that did not describe the self (two names, a city, a date, and the opposite gender). The evaluation categories were Valuable and Worthless, with the following stimuli: capable, competent, successful, smart, valuable, stupid, incompetent, failure, worthless, despised.

Mood Induction Measures.

To assess the effectiveness of the mood induction, participants completed Visual Analogue Scales (VAS) prior to and following the mood induction, a measure successfully used in prior research (Gemar et al., 2001). Each VAS consisted of a 200 mm line with the adjective "happy" on one end and "sad" on the other. Participants were instructed to mark their current mood state on this measure. Further assessing change in participants' level of affect following the negative mood induction, the Multiple Affect Adjective Checklist was administered (MAACL; Zuckerman & Lubin, 1965). The MAACL is comprised of three subscales, which measure depressed mood, anxiety, and hostility. Participants are presented with the list of adjectives and instructed to check those adjectives which are descriptive of their current mood. Scores are determined by summing the number of mood-congruent adjectives selected with the number of mood-incongruent adjectives not selected by participants. Research suggests that this 132-item scale is both a reliable and valid measure (Lubin, Zuckerman, & Woodward, 1985).

Parental Bonding Instrument.

Used to assess parental bonding, the Parental Bonding Instrument is a retrospective self-report measure which assesses the recall of parental behaviors through age 16 (PBI; Parker, Tupling, & Brown, 1979). Two subscales of the measure assess the general constructs of parental care (12 items) and protection (13 items). Participants assess these dimensions on separate scales for their mother and father. Items are rated on a four point Likert scale, with the endpoints of "Very Like" and "Very Unlike." Scores are calculated by summing the point value of the items on each subscale and range from 0 – 36 and 0 – 39 for the care and protection scales, respectively. The PBI has been found to have adequate reliability, validity (Parker 1989) and temporal stability (Wilhelm, Niven, Parker, & Hadzi-Pavlovic, 2005). In the present study, it was used to assess the quality of parental bonding and interaction.

Rosenberg Self-Esteem Scale.

A widely used 10-item measure, the Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965) assesses global constructs of explicit self-esteem on a four point scale. Participants are asked to rate whether they strongly agree to strongly disagree with the 10 statements as descriptive of themselves. Responses are summed for a total ranging from 0 – 30. For the purposes of the present study, the RSES was used to assess explicit levels of self-esteem for comparison with the IAT and the PBI.

Beck Depression Inventory – II.

A 21-item self-report measure, the Beck Depression Inventory-II (BDI-II) is a revised version of the BDI and is used to assess the presence and severity of

depressive symptoms during the previous two weeks (Beck, Steer, & Ball, 1996).

Participants are asked to consider each of the symptoms and report the degree to

which those symptoms have been present during the prior two weeks. Items are

scored on a four point scale, with higher ratings indicating greater severity and

presence of symptoms (range 0 – 63). Given the acceptable test-retest reliability of

the BDI-II (Beck et al.), it was used both to determine eligibility of participants and to

confirm their non-depressed status at enrollment into the study.

Beck Anxiety Inventory.

Used to measure the level of anxious symptoms among participants, the Beck

Anxiety Inventory is a 21-item scale which assesses the presence and severity of

anxious symptoms (Beck, Epstein, Brown, & Steer, 1988). Participants are asked to

review each of the symptoms and rank the degree to which each has been present

during the prior week on a five point scale (scores range from 0 – 84).It has high

internal consistency and acceptable reliability (Beck et al., 1988).

Procedure

All procedures were approved by the University of Kansas Human Subjects

Committee. Participants were recruited via the psychology study pool pre-screening,

which included questions from the BDI-II, BAI, and FHS, as well as questions about

participants' psychological history. Following a study description and informed

consent, participants were interviewed by a trained graduate student in clinical

psychology using the SCID-I/NP and the FHS; additionally, participants completed

the IAT stimuli prompts. Participants who met study criteria were invited to return

for a separate session, where they completed the remaining study measures. In this second session, participants completed the first self-worth IAT, followed by initial mood rating questionnaires (VAS, MAACL). As prior research suggests that remitted depressed individuals and never depressed individuals at risk for MDD do not display cognitive biases when in a nonnegative mood state (Ingram & Ritter, 2000; Miranda, et al., 1990), a negative mood induction was used prior to the second administration of the self-worth IAT. Participants were instructed to recall in detail a negative memory while they listened to music from the "Field of Dreams" soundtrack for approximately 8 minutes. This mood induction has been successfully used in populations at risk for MDD (Ingram & Ritter, 2000). Following the mood induction, participants rated their mood again on VAS and MAACL. Finally, participants completed the self-worth IAT again, followed by the remainder of the self-report questionnaires. Participants were then debriefed and awarded study credits for their participation.

<div align="center">Results</div>

Statistical Analyses

Group differences on demographic data were evaluated by chi square tests. Unpaired T-tests were used to examine group differences in age, education, and self-report questionnaires. Changes in participants' mood state were evaluated using a 2 x 2 analysis of variance (ANOVA), *with risk status* as the between-subjects factor and *pre and post* mood induction as the within-subjects factor. As the MAACL is

comprised of three subscales (depression, hostility, and anxiety), 2 x 2 ANOVAs were performed on each subscale.

In order to evaluate implicit self-esteem, for each IAT, a D value, or size of the effect of the relative association between categories, was calculated according to the revised scoring paradigm (Nosek, Greenwald, & Banaji, 2005). These D values were entered into a 2 x 2 ANOVA. Further, an unpaired T-test was conducted on the change in implicit self-esteem following the mood induction, as measured by the difference between post MI and pre MI IAT D values. Where appropriate, the Greenhouse Geiser correction was used; significant ANOVAs were followed up with post-hoc t-tests.

In order to evaluate the relation between parental bonding and implicit self-esteem for each group, Pearson Product Moment correlations were calculated between each of the two PBI scales and pre and post MI IAT D values, as well as with the IAT difference score. Similarly, Pearson product moment correlations between the RSES and each of the PBI scales and IAT D values were calculated for each group to evaluate the relation between explicit self-esteem, parental bonding, and implicit self-esteem. Overall, two-tailed *p* values are reported.

Sociodemographic Data

Participants did not significantly differ with respect to age, sex, ethnicity, or education (see Table 1). However, at-risk participants reported significantly higher scores on the BDI-II, BAI, and PBI-Maternal Care than did controls (all *t*'s > 2.07

and *p*'s <.05). No significant differences in explicit self-esteem or the other parental

bonding measures were found between groups (all *t*'s <.63 and *p*'s > .50).

Table 1**:** Summary of sociodemographic and self-report measures.

	Control	At-Risk	Statistic	*p*-value
	Mean (SD)	Mean (SD)		
n	26	21		
Age	19.04 (1.37)	19.14 (0.85)	$t(45) = -0.31$	> 0.75
Sex (M/F)	11/25	8/13	$\chi2(1) = 0.08$	> 0.77
Ethnicity			$\chi2(1) = 0.39$	> 0.50
Education	12.92 (1.04)	12.67 (0.71)	$t(45) = 0.96$	> 0.34
BDI-II	3.35 (2.98)	5.86 (4.02)	$t(45) = 2.38$	< 0.03
BAI	5.50 (5.40)	9.50 (7.82)	$t(45) = -2.07$	< 0.05
PBI-MC	32.50 (3.14)	28.52 (8.08)	$t(45) = 2.31$	< 0.03
PBI-MP	11.58 (6.32)	11.62 (6.32)	$t(45) = -0.02$	> 0.98
PBI-PC	27.80 (8.95)	26.19 (8.50)	$t(45) = 0.63$	> 0.53
PBI-PP	9.27 (5.60)	8.24 (6.16)	$t(45) = 0.60$	> 0.55
RSES	24.12 (4.30)	24.67 (3.45)	$t(45) = -0.48$	> 0.63
IAT1	0.54 (0.07)	0.73 (0.07)	$t(45) = -1.94$	< 0.06
IAT2	0.37 (0.07)	0.67 (0.08)	$t(45) = -2.73$	< 0.01

BDI-II: Beck Depression Inventory – II; BAI: Beck Anxiety Inventory; PBI-MC: Parental Bonding Instrument – Maternal Care; PBI-MP: Parental Bonding Instrument – Maternal Protection; PBI-PC: Parental Bonding Instrument – Paternal Care; PBI-PP: Parental Bonding Instrument – Paternal Protection; RSES: Rosenberg Self-Esteem Scale; IAT1: Implicit Association Test pre MI; IAT2: Implicit Association Test post MI.

Mood manipulation

VAS mood. The ANOVA on the VAS scores revealed a significant effect of *Time*, $F(1,45) = 107.15$, $p < .01$, partial $\eta^2 = .70$, such that participants reported less positive mood following the mood induction than prior to it (see Figure 1). No effect of *Group* or *Group x Time* was found (*p*'s >.20), suggesting that participant groups were equally affected by the mood induction.

Figure 1. Mean VAS mood percentile scores. Higher values indicate greater levels of sadness. VAS: Visual Analogue Scale. Error bars indicate standard errors.
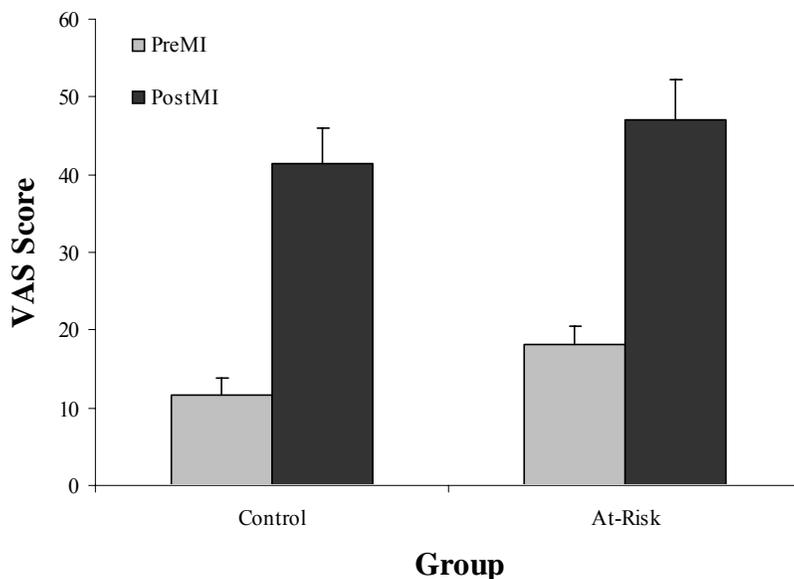

MAACL mood. The ANOVA for the depression subscale revealed a significant effect of *Time*, $F(1,45) = 114.58$, $p < .01$, partial $\eta^2 = .72$, such that participants endorsed higher levels of depressed mood following the mood induction compared to before the mood induction (see Figure 2). As no effect of *Group* or *Group x Time* was significant (*p*'s > .51), participant groups appear to have been

similarly affected by the mood induction, consistent with hypotheses. Similarly, no effects for *Group* or *Group x Time* were found for the hostility subscale (p's > .40), although the effect of *Time* was significant, $F(1,45) = 85.68$, $p < .01$, partial $\eta^2 = .32$; participants reported increased hostility following the mood induction. Additionally, participants reported higher levels of anxiety following the mood induction, $F(1,45) = 37.63$, $p < .01$, partial $\eta^2 = .45$, although neither the effect of *Group* nor *Group x Time* were significant (p's > .32).

Taken together, these findings suggest that participants experienced more negative mood following the mood induction than prior to it, indicating that the mood induction achieved the desired effects. Negative mood was generally increased, as suggested by increases in reported hostility and anxiety, as well as depressed mood. Importantly, participant groups responded similarly to the mood induction

Figure 2: Mean MAACL-D mood scores. Higher values indicate greater levels of sadness. MAACL-D: Multiple Affect Adjective Checklist-Depression subscale. Error bars indicate standard errors.
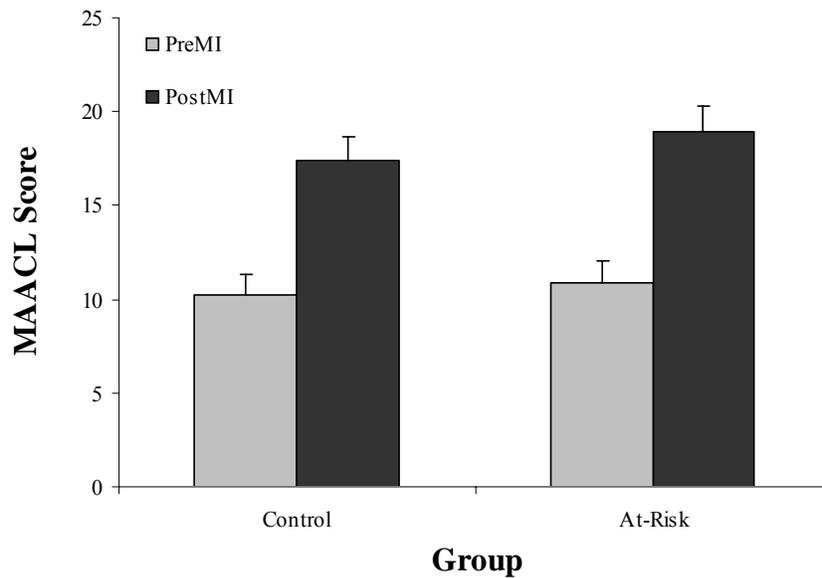

Implicit Self-Worth

A significant effect of *Time* was found for the self-worth IAT, $F(1,45) = 5.14$, $p < .03$, partial $\eta^2 = .10$, whereby participants' implicit self-worth decreased following the mood induction. Further, although a significant effect of *Group x Time* was not found ($p > .30$), an effect of *Group* was significant, $F(1,45) = 7.42$, $p < .01$, partial $\eta^2 = .14$ (see Figure 3). Contrary to the hypotheses, a post hoc t-test revealed a trend for at-risk participants to display higher levels of implicit self-worth than controls, $t(45) = -1.94$, $p = .059$, prior to the mood induction; following the mood induction, at-risk participants reported significantly higher levels of implicit self-worth than did controls ($t(45) = -2.73$, $p = .009$). Participant groups did not

significantly differ with respect to the size of the change in implicit self-worth

following the mood induction, $t(45) = -.99$, $p = .33$.

Figure 3: Mean Self-Worth IAT D values. Higher values indicate greater levels of implicit self-worth. IAT: Implicit Association Test. Error bars indicate standard errors.
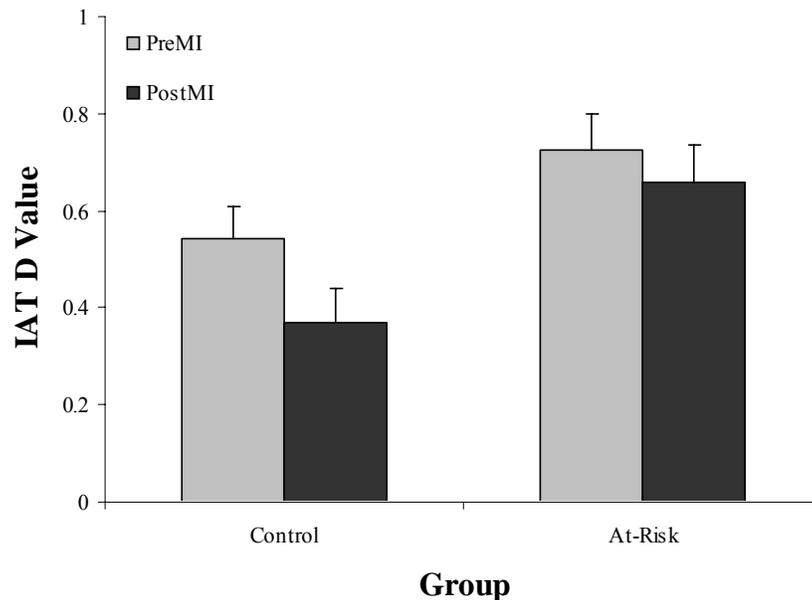
Although at risk-participants reported depressive and anxious symptoms at a

nonclinical level, they reported significantly more of these symptoms than did

controls (see Table 1); additionally, at-risk participants reported lower levels of

maternal care than did controls (Table 1). Accordingly, two hierarchical linear

regression analyses were conducted to evaluate whether group differences on the pre

MI and post MI IAT D values could be accounted for solely by these symptoms or

maternal care. BDI-II and BAI scores were entered in the first step of each analysis,

followed by maternal care in the second step, and participant group in the third step,

with the IAT D values used as the outcome variable. Neither the self-report measures nor group status significantly predicted pre MI implicit self-worth (all $|\beta| < .21$; all $|ts|$ < 1.24, all p's $> .20$). However, participant group significantly predicted post MI IAT D values, $\beta = .44$; $t = 2.83$, $p < .007$, even after accounting for differences in baseline symptoms and maternal care ($\Delta R^2 = .15$, $\Delta F (1,45) = 8.02$, $p < .007$).

Relation Between Implicit and Explicit Measures

Consistent with prior studies (e.g., Gemar et al., 2001; Greenwald & Farnham, 2000; Haeffel et al., 2007), explicit self-esteem was not significantly correlated with implicit self-worth for either participant group (see Table 2). However, explicit self-esteem was positively associated with maternal care for control, $r = .63$, $p < .01$, but not for at-risk participants, $r = -.34$, $p > .10$, as higher levels of explicit self-esteem were associated with higher levels of maternal care. Additionally, maternal and paternal protection were positively associated for at-risk participants, $r = .51$, $p < .02$. No other correlations were significant (see Table 2).

Table 2: Summary of Pearson's correlations between implicit and explicit measures for control (n = 26) and at-risk (n=21) participants.

		PBI-MC	PBI-MP	PBI-PC	PBI-PP	IAT-Pre	IAT-Post
PBI-MP	Controls	-0.32					
	At-Risk	-0.39					
PBI-PC	Controls	0.25	0.08				
	At-Risk	-0.16	0.10				
PBI-PP	Controls	-0.25	0.19	-0.35			
	At-Risk	0.09	0.51*	-0.37			
IAT-Pre	Controls	-0.23	0.10	-0.18	0.07		
	At-Risk	0.09	0.22	0.14	0.11		
IAT-Post	Controls	-0.24	0.18	-0.22	0.20	0.50**	
	At-Risk	0.37	0.32	0.19	0.27	0.36	
RSES	Controls	0.63**	-0.38	0.02	-0.33	-0.08	-0.07
	At-Risk	-0.34	0.40	0.32	-0.23	-0.20	0.19

Note: PBI-MC: Parental Bonding Instrument – Maternal Care; PBI-MP: Parental Bonding Instrument – Maternal Protection; PBI-PC: Parental Bonding Instrument – Paternal Care; PBI-PP: Parental Bonding Instrument – Paternal Protection; IAT-Pre: Implicit Association Test Pre Mood Induction; IAT-Post: Implicit Association Test Post Mood Induction; RSES: Rosenberg Self-Esteem Scale. * indicates $p < 0.05$; ** indicates $p < 0.01$.

Discussion

The present study sought to examine implicit self-worth in relation to parental bonding in a sample of individuals at risk for developing MDD. This is likely the first study to assess implicit self-worth in individuals with a family history of MDD. Contrary to hypotheses, although both participant groups reported similar levels of change in implicit self-worth following the mood induction, at-risk participants had significantly higher levels of implicit self-worth than did controls following the mood induction. Further, at-risk participants displayed a trend for higher levels of implicit

self-worth prior to the mood induction, suggesting that higher levels of implicit self-worth may characterize this vulnerable population. Differences in participants' implicit self-worth were unrelated to depressive or anxious symptoms, or to parental bonding.

The finding of higher levels of positive implicit self-worth in participants at risk for MDD is consistent with prior findings with currently depressed participants (e.g., De Raedt et al., 2006; Franck et al., 2007), as well as with remitted depressed participants in a euthymic mood state (Franck, De Raedt, & De Houwer, 2008; Gemar et al., 2001). The present research extends prior findings to include an additional at-risk population; participants with a family history of MDD appear to display the increased levels of implicit self-esteem found among some currently depressed individuals. These findings contrast with those found by Steinberg and colleagues (2007), who found decreased implicit self-esteem in individuals at risk for MDD. However Steinberg and colleagues' at-risk sample consisted of participants identified as at-risk from answers on a cognitive styles questionnaire; accordingly, their sample and that of the present study may be assessing different types of vulnerability to MDD and may not be comparable.

Further, although controls' implicit self-worth did not significantly differ from that of at-risk participants prior to the mood induction in the present study, they differed after the induction. This finding suggests that differences in implicit biases between participant groups became apparent only after the induction of a mild negative mood, consistent with prior research exploring differences between remitted

participants and healthy controls on other measures (Ingram & Ritter, 2000; Miranda, et al., 1990). Together these findings suggest that increased implicit self-worth may be characteristic of populations at risk for developing MDD.

Findings of increased implicit self-worth in this population may stem in part from increased emotional disengagement from threatening stimuli. Individuals at-risk for, or those with a prior history of, MDD have been found to display cognitive blunting, or decreased emotional reactivity to emotional stimuli, driven in part by avoidance of those stimuli (e.g., Rottenberg, Gross & Gotlib, 2005). In the present study, such disengagement may have taken the form of longer reaction times to "worthlessness" stimuli. Longer reaction times to these stimuli would have increased the overall reaction times for category pairings with worthlessness relative to pairings with valuable, leading to increased D values and accordingly, increased implicit self-worth.

However, disengagement is posited to affect both positive and negative stimuli (Rottenberg et al., 2005); accordingly the at-risk participants should have been equally affected by the different stimuli categories and would not have displayed significantly different reaction times from controls for the category pairings. As the present data suggest that at-risk participants report longer reaction times for pairings with "worthless" as a category, it seems unlikely that emotional disengagement occurred for both stimuli categories. Instead, at-risk participants may have been selectively disengaging from negative stimuli in the IAT. Such selective

disengagement may be reflective of a more general avoidance of negative self-relevant stimuli in populations vulnerable for MDD.

Alternatively, at-risk participants may produce larger association networks from the worthless stimuli than do controls. With greater activation of these association networks produced by negative stimuli, at-risk individuals would require additional time to process and categorize stimuli, again leading to increased implicit self-esteem. Finally, at-risk participants may be engaging in avoidance of negative stimuli as a result of the increased elaborative processes associated with those stimuli. Further research is needed to explore these processes which may underlie the increased implicit self-worth reported by at-risk participants.

One factor which may be related to these processing styles is parental bonding; given their probable exposure to suboptimal parenting, this may be particularly relevant for individuals with a family history of MDD,. At-risk individuals in the present study reported significantly lower levels of maternal care than did control participants but no differences on other measures of parental bonding. The latter finding is surprising, as higher levels of maternal protection have been previously found in an at-risk sample (DeHart et al., 2006); however, the lower levels of maternal care reported by at-risk participants is consistent both with prior research (e.g., DeHart et al., 2006; Ingram & Ritter, 2006) and with the current hypotheses, which stated that at-risk participants would report poorer parental bonding than control participants. The lack of differences between participant groups on paternal parental bonding measures could be expected, given that only four of the

at-risk participants reported having fathers with MDD. Additionally, the differences in maternal care are inconsistent with a response bias pattern, suggesting that lower maternal care was particularly relevant for this sample.

Contrary to hypotheses and previous findings (DeHart et al., 2006), maternal care was not a significant predictor of implicit self-worth, either before or after the mood induction. This failure to replicate DeHart and colleagues' (2006) findings is surprising, although different tasks were used in the two studies. In the prior study, the Name-Letter Preference Task was used, which is a general measure of implicit self-esteem; in contrast, the present study used a more specific measure of implicit self-worth, which is one component of implicit self-esteem. Accordingly different aspects of implicit self-esteem may have been measured by the two studies; maternal care may be related to general self-esteem but not necessarily self-worth. Although an important predictor of vulnerability to MDD, maternal care does not seem to have played a role in implicit self-worth in the present study.

Similarly, explicit self-worth was unrelated to implicit self-worth in the present study, a finding consistent with hypotheses and prior research (e.g., Bosson et al., 2000; Devine, 1989; Gemar et al., 2001; Greenwald & Farnham, 2000; Haeffel et al., 2007). For control but not at risk participants, higher levels of maternal care were associated with higher levels of explicit self-esteem. This finding for controls is consistent with research suggesting that lower maternal care is associated with decreased self-esteem (e.g., Garber & Flynn, 2001). However it is surprising that none of the other parental bonding measures were significantly related to explicit self-

esteem for either participant group, given prior research, which found that low

parental care and high parental indifference were prospectively associated with

decreased feelings of self-worth and competence in adolescents (e.g., Liu, 2003).

Because differences were not found between participant groups on paternal care or

parental protection, it may be that these aspects of parental bonding were not

particularly relevant for explicit self-esteem in the present study. In sum, although

research suggests that parental bonding is important in the development of self-

concept, in the present study, they were not significantly related.

Limitations and Conclusions

Despite the significant findings, the present study was limited in several

respects. First, family history of MDD was assessed by participants' self-reports of

parental observations; interviews with participants parents were not conducted.

Although the FHS is a sensitive measure (Weissman et al., 2000), definitive diagnosis

of family history of MDD is unavailable. Results from the present study may

therefore differ slightly from those where parental history is confirmed by a parental

interview. Additionally, at risk participants with either a maternal or paternal history

of MDD were included in the present study. As at-risk participants with maternal

history of MDD did not significantly differ in implicit self-worth from those with

paternal MDD, it seems unlikely that which parent had MDD affected the results.

Because of the small number of participants with paternal history of MDD, however,

the effect of gendered parental history of MDD could not be assessed. The difference

in vulnerability conferred by maternal instead of paternal MDD should be considered for exploration in future research.

Additionally, the at-risk group included some participants with a personal history of MDD (n=8). Although these individuals did not differ with respect to other self-report measures from at-risk participants without a prior history of MDD, the inclusion of these participants in the at-risk group may have affected the results. However, it seems unlikely that the results were affected, given that the significant differences found between at-risk and control participants' implicit self-worth were consistent with prior research. In the present study, there was insufficient power to assess how these individuals differed from the other at-risk participants. Further research should explore whether participants with a prior history of MDD in conjunction with a family history of MDD report different levels of implicit self-worth compared to individuals with only a family history of MDD. Should different levels of implicit self-worth be reported between participant groups, increased understanding of the lasting cognitive effects of MDD may occur. Increasing the sample size might also help determine whether at risk participants also display significantly higher implicit self-worth than controls when in a euthymic mood, given the trend found in the present study.

While differences in implicit self-worth were found only following the mood induction, the mood produced was a mild negative mood and does not compare to that experienced during a MDE. Although measures indicated that the mood induction worked as intended, the findings reflect a transient negative mood

following a stressor and cannot be generalized to the experience of a MDE. Finally, changes in implicit self-worth following the mood induction may reflect test-retest effects, rather than mood-related changes. As participant groups significantly differed following the mood induction, it seems likely that these differences in implicit self-worth are related to cognitive differences rather than test familiarity.

In sum, the present study extends research on implicit self-esteem in a population vulnerable for developing MDD. Unlike prior research, which has found mixed results for group differences in implicit self-esteem (e.g., De Raedt et al., 2006), individuals with a family history of MDD displayed higher levels of implicit self-worth following a negative mood induction than did control participants. The present study used personalized concept stimuli for the Me/Not-Me categories for each participant, which may have contributed to the findings by making the concept categories more relevant for participants. Future studies should also consider which aspect of implicit self-esteem to assess, as different studies have evaluated the construct using varying sets of stimuli. In the present study, stimuli were targeted to assess implicit self-worth, one possible facet of implicit self-esteem. Although significant differences were found between participant groups, other aspects of self-esteem may not differ between participant groups or may differ differentially depending on which vulnerable population is assessed.

Another consideration for future research should be the control of family history of MDD in populations used for comparison with participants vulnerable to MDD, as the present findings suggest that otherwise healthy individuals whose

parents experienced MDD display different implicit biases to healthy individuals without that family history. Additionally, given the small effect sizes of the differences between groups, a sufficient sample size is required, likely one wherein each group contains more than twenty participants. Finally, given prior research which suggests that implicit self-esteem is predictive of future depressive symptoms (Franck et al., 2007), future studies should explore whether implicit self-worth in individuals with family history of MDD is predictive of future depressive episodes. As well, additional research should compare implicit self-worth in a variety of populations vulnerable to developing MDD to determine if there is a common vulnerability; genetic predispositions could also be explored, along with parental bonding, to determine whether these factors are related to and influence implicit self-esteem. If predictive of depressive symptoms, implicit self-worth could be explored as a common vulnerability, one which may potentially be a measure of Beck's (1967) posited cognitive schemas.

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