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Influence of sad mood induction on implicit self-esteem and its relationship with symptoms of depression and anxiety

Lonneke A. van Tuijl[a,b,*], Johan R.L. Verwoerd[a], Peter J. de Jong[a]

[a] Department of Clinical Psychology and Experimental Psychopathology, University of Groningen, The Netherlands
[b] Institute of Psychology, Psychiatry & Neuroscience, King's College London, United Kingdom

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ABSTRACT

Background and objectives: Implicit self-esteem (ISE) refers to the valence of triggered associations when the self is activated. Despite theories, previous studies often fail to observe low ISE in depression and anxiety. It is feasible that sad mood is required to activate dysfunctional self-associations. The present study tested the following hypotheses: i) ISE is lower following a sad mood induction (SMI); ii) the relationship between ISE and level of depression/anxiety symptoms is relatively strong when ISE is measured during sad mood; iii) individuals with higher levels of depression/anxiety symptoms will show a relatively large decrease in ISE following a SMI.
Methods: In this mixed-designed study, university students completed the self-esteem implicit association test (IAT) either at baseline (control condition; n = 46) or following a SMI (experimental condition; n = 49). To test the third hypothesis, a SMI and IAT were also given in the control condition. Both conditions completed self-report measures of explicit self-esteem (ESE), and symptoms of depression and anxiety.
Results: There was no support for the first two hypotheses, but some support that symptoms of anxiety correlated with larger decreases in ISE following a SMI which partly supported the third hypothesis. This disappeared when controlling for multiple testing.
Limitations: Results are limited to non-clinical participants.
Conclusions: While ISE was robust against increases in sad mood, there was some tentative support that symptoms of anxiety were related to larger decreases in ISE following a SMI.

1. Introduction

Depression and anxiety disorders remain some of the most prevalent lifetime disorders (e.g., 20.8% and 28.8% reported, respectively, Kessler et al., 2005), with inadequate rates of remittance (e.g., 35% for social anxiety disorder, Keller, 2006) and worrying levels of relapse and recurrence rates (e.g., 42% for major depressive disorder, Hardeveld, Spijker, Graaf, Nolen, & Beekman, 2013). It is therefore unsurprising that much research has been dedicated to understanding how symptoms of depression and anxiety develop. One construct that has received much attention in this area of research is self-esteem. In one meta-analysis, low self-esteem was found to precede increases in symptoms of depression and anxiety (Sowislo & Orth, 2013). Support for a causal relationship between self-esteem and psychopathology comes from observations that therapy targeting low self-esteem appears to improve depressive and anxious symptomatology too (e.g., Korrelboom, Maarsingh, & Huijbrechts, 2012; Waite, McManus, & Shafran, 2012). However, the self-reported self-esteem questionnaires

adopted in observational and intervention studies may fail to capture the automatic and more implicit levels of self-esteem that escape introspection.

Implicit associations refer to the link between constructs in memory which can vary in strength. When associations are strong, the activation of one construct can automatically trigger another construct (Greenwald et al., 2002). Associations between constructs are thought to be strengthened by being simultaneously active (Greenwald et al., 2002), and through consistent and repetitive explicit associations that become default and automatic over time (Beevers, 2005). Explicit associations refer to the validation of the associations between constructs (Gawronski & Bodenhausen, 2014), for instance, by applying knowledge, memory, and even novel rules (Strack & Deutsch, 2004). However, relative to implicit associations, explicit associations take time, motivation and cognitive resources. When these are available, explicit associations can overrule implicit associations (Beevers, 2005). Associations between the self and other constructs can also be imbedded and retrieved implicitly, and consequent explicit associations concerning

the self can overrule or exacerbate the outcome. For example, after having failed several exams, failure and self may become implicitly associated so that when you are informed that you will have to sit another exam in three months, feelings of failure are triggered (i.e., implicit associations). However, after you think back to the times you have done well in the classes, you start to feel hopeful and determined (i.e., explicit associations).

Implicit self-esteem (ISE) refers to the extent of overall positivity or negativity of associated constructs that are triggered when the self-construct is triggered either by external stimuli or by the activation of other associated constructs (Greenwald et al., 2002). It is pivotal to differentiate between implicit and explicit self-esteem (ESE), as they can influence different types of behaviour (e.g., Rudolph, Schröder-Abé, Riketta, & Schütz, 2010). Given the presence of low ESE in both depression and anxiety (Sowislo & Orth, 2013), and the theoretical assumption that persistent explicit associations become more ingrained and implicit with time (Beevers, 2005), it has been theorised that low ISE would also be present in depression and anxiety. At the cross-sectional level, support for the presence of low ISE in depression is tentative at best with many studies failing to observe a difference with a never-depressed or anxious group (e.g., van Tuijl, Glashouwer, Bockting, Tendeiro, Penninx, & de Jong, 2016; but see Phillips, Hine, & Thorsteinsson, 2010; Risch et al., 2010). Longitudinal studies, although fewer in number, do seem to support a role for ISE predicting depression symptoms at follow-up (Franck, De Raedt, & De Houwer, 2007; Steinberg, Karpinski, & Alloy, 2007; but see van Tuijl, de Jong, Sportel, de Hullu, & Nauta, 2014). Furthermore, van Tuijl et al. (2016) observed low ISE in those with comorbid depression and anxiety, but not in those with relatively pure forms of depression or anxiety. As such, it remains difficult to draw overall conclusions concerning ISE in depression and anxiety given the mixed findings. One explanation for the mixed findings may be related to the conditions under which ISE is measured.

Increased levels of sad mood[1] are typical in depression and anxiety disorders (Watson, 2005) and may have a mood-congruent influence on self-esteem. Research would suggest that negative content in the memory is more likely to be recalled during dysphoric moods (Blaney, 1986), and that sad mood increases self-focused attention (Sedikides, 1992). In a non-selected sample, increased reactivity (a greater decrease in ESE following self-reported sad mood) was observed to be related to higher levels of rumination at baseline, and more depressive symptoms at the end of the study (Clasen, Fisher, & Beevers, 2015). Surprisingly little research has been done to look at the influence of sad mood on ISE within the context of depression and anxiety. One study found that remitted depressed participants had lower levels of ISE following a sad-mood induction than never-depressed participants (Gemar, Segal, Sagrati, & Kennedy, 2001). However, in a replication of the study, this effect disappeared when taking baseline differences in ISE into account (Franck, De Raedt, & De Houwer, 2008). While sad mood and ISE have not been researched in anxiety previously, one study does suggest that following social threat invoking feelings of (state) anxiety, those with a social anxiety disorder reported lower ISE than those without (Ritter, Ertel, Beil, Steffens, & Stangier, 2013). Currently it is unknown whether increases in sad mood influences ISE regardless of the presence of (previous) anxiety or depression. Influences of state mood on ISE may explain previous mixed findings concerning the role of ISE in depression and anxiety. In the present study, it was hypothesized that: i) sad mood would lead to lower ISE; ii) symptoms of depression and anxiety would be related, more so, to ISE following a sad-mood induction than in the absence of a sad-mood induction.

Somewhat paradoxically, studies from social psychology have

suggested that threats to the self and one's identity actually increases ISE, which has been argued to provide protection against daily threats to the self ("Implicit self-esteem compensation", Rudman, Dohn, & Fairchild, 2007). It might therefore not be levels of ISE following a sad-mood induction that are related to symptoms of depression and anxiety, but rather a defective compensatory mechanism. Therefore, the third and final hypothesis in the present study is that symptoms of depression and anxiety are related to relatively less increase in implicit self-esteem following a sad-mood induction. To test for potential test-retest effects, only half the participants completed measures of ISE both before and after the sad-mood induction. The other half of the participants completed a measure of ISE only after the sad-mood induction.

2. Method

2.1. Participants

One hundred and five participants took part in the present study, of which ten were dropped (due to technical errors). Of the final sample (n = 95; 63.2% female), 87 participants were undergraduate psychology students receiving course credit for participation, and the remaining eight were recruited through social contacts of the research assistants. The average age was 20.54 years (SD = 4.59). The study was conducted in Dutch. Participants gave consent before taking part in the study, and were fully debriefed at the end.

2.2. Measures

2.2.1. Brief Fear of Negative Evaluation Scale II (BFNES; Carleton, McCreary, Norton, & Asmundson, 2006)

BFNES is a self-report questionnaire measuring the extent of anxiety regarding (unfavourable) social judgements from others. Twelve items are rated on a scale from 1 ("not at all characteristic of me") to 5 ("extremely characteristic of me"). Higher scores were reflective of more fear of negative evaluation. For four participants, one missing item was replaced with the mean for that individual. Internal consistency was excellent (Cronbach's α = .96).

2.2.2. Liebowitz Social Anxiety Scale (LSAS; Liebowitz, 1987)

The LSAS is a 24-item self-report measure and was used as a measure of social anxiety. For each item, participants rate how much they feel anxious or fearful (from 0 "none" to 3 "severe"), and how much they try to avoid (from 0 "never" to 3 "usually") typical social scenarios (e.g., "making a call in a public place"). A higher total score was indicative of more social anxiety. Subscales were calculated for avoidance and anxious/fear, and where analysed when total scores were significant. In the present sample, excellent internal consistency was observed for the complete scale, and the avoidance and anxious/fear subscales (Cronbach's α = .93, .85, & .90, respectively).

2.2.3. Centre for Epidemiologic Studies Depression Scale (CES-D; Bouma, Ranchor, Sanderman, & van Sonderen, 1995; Radloff, 1977)

Symptoms of depression were measured using the 20-item self-report CES-D. The prevalence of depressive symptoms in the past week was answered on a four-point scale from 0 ("rarely/never [less than one day]") to 3 ("often/always [5-7 days]"). Higher scores were indicative of more depressive symptoms. For five participants, one missing item was replaced with the mean for that individual. The CES-D showed excellent internal consistency (Cronbach's α = .94).

2.2.4. Implicit association test (IAT; Greenwald & Farnham, 2000)

Implicit self-esteem was measured with a computer-based word-sorting task. Per trial, a single word was sorted using a two-buttoned response box that belonged to one of four categories: two target categories (I vs. Other; e.g., "me", "them") or two attribute categories (positive vs negative; e.g., "valuable", "useless"). The IAT has been described

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[1] To clarify, we define mood as being "longer, slower moving" as opposed to affect that refers broadly to valences, and emotion that refers to the valence of the feeling in response to a given stimulus/situation (Rottenberg & Gross, 2007).

in full previously (Greenwald & Farnham, 2000). In short, the premise for the IAT is that those with higher ISE will sort words faster in the block where *I* and *positive* words (and *other* & *negative)* share the same response key than in the block where *I* and *negative* words (and *other* & *positive*) share the same response key. IAT scores were calculated using the D4 measure (Greenwald, Nosek, & Banaji, 2003). IAT scores were voided when more than 10% of trials were faster than 300 ms, more than 20% were answered wrongly, or more than 1% of trials were longer than 10,000 ms (neutral mood IAT: n = 3, sad mood IAT: n = 6). Spearman-Brown corrected correlations between test halves were .80 and .87 for the control condition, and .80 for the experimental condition. Higher scores were indicative of more positive ISE. The IAT given at baseline to approximately half of the participants (control condition) only differed to the IAT given to all participants following the sad-mood induction (both conditions) in the fixed random order of words.[2] Specific words, category labels and order of pairings were the same across all IATs.

2.2.5. Rosenberg Self-Esteem Scale (RSES; Franck, Raedt, Barbez, & Rosseel, 2008; Rosenberg, 1989)

The self-report RSES was used as a measure of explicit self-esteem. Participants answer 10 items on a 4-point Likert scale (from 1 "strongly agree" to 4 "strongly disagree"). Scores were calculated so that higher scores were indicative of higher self-esteem. The present sample showed high internal consistency (Cronbach's α = .88).

2.2.6. Mood induction

For the sad-mood induction, participants were asked to write about a time when they were sad on the paper provided. While they wrote, "Theme from Schindler's List" (composed by John Williams, released 1994) was played through headphones. A similar procedure has been adopted successfully before (Franck, De Raedt, et al., 2008; Gemar et al., 2001). The music was slowed to three quarter speed using Audacity[R] (v 2.0.2) and played for approximately 5 min. Participants were instructed to write for the full duration of the time, and that they could take what they wrote home with them. A similar happy-mood induction was given at the end of the study to reverse any sad mood that had been induced.

2.2.7. Visual analogue mood scales (VAMS)

Sets of four mood scales measuring sad, happy, calm, and irritable on a horizontal line were given throughout the study. Participants clicked on a horizontal line (132 mm) anchored from Not (e.g., "Not happy") to Very (e.g., "Very happy") using the mouse. The nearest hundredth was recorded (possible range 0–100). Scores on the sad VAMS are used in the present analysis to check whether the sad mood induction was effective, and that this effect remained for the duration of the IAT. For the correlational analyses, the influence of the mood manipulation was calculated by subtracting VAMS sad-mood score pre-mood induction from scores post-mood induction, with higher scores indicative of a greater increase in sad mood.

2.2.8. Other measures

The measures reported above are relevant for the analysis presented in this paper. Other questionnaires and measures were included, and information can be provided upon request. The IAT was the first before the sad-mood induction (control condition), and the first measure following the sad-mood induction. VAMS were given directly before the IATs, and the final VAMS was given directly after the (second) IAT.

3. Procedure

Following consent, participants were randomized into the experimental condition (n = 49) or the control condition (n = 46). First, both conditions completed a set of VAMS (baseline mood). Those in the control condition then completed the IAT (i.e., measured during a relatively neutral mood). Both conditions then completed the self-report questionnaires via Qualtrics. Both conditions then completed a set of VAMS (pre-mood induction), the sad-mood induction, and another set of VAMS (post-mood induction). Following the sad-mood induction, both conditions completed the IAT, and then a set of VAMS (final score). As such, the only difference between the control and experimental condition was the inclusion of a baseline IAT in the control condition.

4. Results

4.1. Sad mood manipulation checks

Sad mood scores were square-rooted to correct for skewness. Square-rooted sad mood score at baseline, before the sad mood induction, following the sad mood induction, and following post-mood induction IAT are presented in Table 1 by condition. To see whether the sad-mood induction was effective an independent *t*-test was conducted to compare sad mood before the IAT between the conditions. Supporting the efficacy of the current sad mood manipulation, results showed that those in the experimental condition reported higher scores on the sad mood VAMS before completing the IAT (M = 6.67, SD = 1.83; raw mean score = 47.78, SD = 22.85) than those in the control condition before completing the baseline IAT (M = 3.50, SD = 2.33; raw mean score = 17.52, SD = 20.53), t(93) = 7.41, *p* < .001, *d* = 1.51. A 2 (condition) by 2 (time; pre- and post-sad-induction) ANOVA indicated that while there was an increase in sad mood following the induction, F(1, 93) = 155.86, *p* < .001, this did not differ between conditions, F(1, 93) = .05, *p* = .83. As such, the manipulation was considered equally successful for both conditions.[3] Furthermore, a greater effect of the sad-mood induction (i.e., change scores) was related to lower trait ESE (r = -.33, *p* < .001), and higher scores on the CES-D (ρ = .26, *p* = .01; non-parametric correlation because CES-D scores were skewed), and a similar but nonsignificant relationship between a larger drop in mood and higher scores on the social anxiety measure (LSAS; r = .20, *p* = .051), across all the participants (n = 95). The effect of the mood induction appeared largely independent of trait fear of negative evaluation (BFNES; r = .14, *p* = .18).

4.2. Descriptives

Means and standard deviations of the measures used, split by group, are presented in Table 2, along with the results of the independent t-tests. Applying a Bonferroni correction (adjusted α = .0125), scores on the RSES, CESD, LSAS and BFNES did not differ between both groups. Scores on the IAT following a sad-mood induction was significantly lower in the control group. Correlations between the IATs, split by the presence or the absence of a sad mood induction beforehand, are presented in Table 3. For BFNES, there was a significant correlation with IAT scores, specifically when measured during a sad mood. Fisher's z

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[2] Previous studies usually present IAT stimuli in a random order (Franck, De Raedt, et al., 2008; Gemar et al., 2001), and as such the order of words is assumed not to influence the IAT effect. Given that the previous studies involving a sad-mood induction did not involve identical order of words in the IATs before and after, the present study also mixed the order of the words across the two IATs.

[3] A repeated-measures ANOVA in the experimental group comparing square-rooted sad mood scores before the sad-mood induction (M = 4.07, SD = 2.43), after the sad mood induction (M = 6.67, SD = 1.83) and after the IAT (M = 4.79, SD = 2.23) revealed a significant difference, F(2, 47) = 40.40, p < .001. Repeated contrasts revealed the sad-mood induction to be effective, F(1,48) = 68.81, p < .001, with evidence of some mood repair during the IAT, F(1,48) = 68.75, p < .001. A repeated measures *t*-test revealed that sad mood following the IAT was still higher than before the sad-mood induction, t (48) = 3.08, p = .003, d = .31.

Table 1
Means and standard deviations of square-rooted sad mood scores across study.

	Experimental (n = 49)	Control (n = 46)
Baseline	3.10 (2.18)	3.50 (2.33)
Pre Sad-Mood Induction	4.07 (2.43)	4.27 (2.46)
Post Sad-Mood Induction	6.67 (1.83)	6.96 (1.98)
Post Sad-Mood IAT	4.79 (2.23)	5.19 (2.62)

Table 2
Means and standard deviations, and independent T-Tests between groups per variable.

	Experimental (n = 49)	Control (n = 46)	t	p	Cohen's d
	M (SD)	M (SD)			
IAT neutral mood	–	.52 (.38)	–	–	–
IAT sad mood	.58 (.33)	.30 (.42)	3.55	< .001	0.76
RSES	20.49 (4.60)	19.65 (5.03)	0.85	.40	0.18
CES-D	11.09 (9.17)	15.11 (11.19)	2.16[a]	.03	0.44
LSAS	31.63 (16.31)	36.74 (19.94)	1.37	.17	0.28
BFNES	32.23 (11.76)	36.60 (13.39)	1.70	.09	0.35

Note: IAT = implicit association test (self-esteem); RSES = Rosenberg's Self-Esteem Scale; CES-D = Centre for Epidemiologic Studies Depression Scale; LSAS = Liebowitz Social Anxiety Scale; BFNES = Brief Fear of Negative Evaluation Scale II.
[a] Analysis based on square-rooted scores.

Table 3
Spearman's Rho (CES-D) and Pearson's Bivariate (LSAS, RSES & BFNES) correlations with IAT scores.

	IAT sad mood (Experimental; n = 48)		IAT neutral mood (Control; n = 43)	
	r/r_s	p	r/r_s	p
RSES	.16	.27	.18	.26
CES-D	-.14	.35	-.10	.53
LSAS	-.07	.62	-.08	.63
BFNES	-.30	.04	-.02	.90

Note: IAT = implicit association test (self-esteem); RSES = Rosenberg's Self-Esteem Scale; CES-D = Centre for Epidemiologic Studies Depression Scale; LSAS = Liebowitz Social Anxiety Scale; BFNES = Brief Fear of Negative Evaluation Scale II.

transformation indicated that correlations between IAT and BFNES did not differ between the two groups (z = -1.33, p = .18). It should be noted that applying a Bonferroni correction (adjusted α = .0125) to the correlation analyses means that the correlation between IAT and BFNES in the experimental group no longer meets statistical significance.

4.3. H1: sad mood will influence ISE

First, an independent *t*-test revealed no significant difference between IAT scores at baseline in the control condition and sad mood IAT scores in the experimental condition, t(89) = 0.85, p = .40, d = 0.17, 95% CI [-0.25, 0.59]. Subsequent correlational analyses within the experimental condition indicated that there was no significant correlation between the influence of the sad-mood induction (based on change scores) and IAT scores, Spearman's rho (47) = -.05, p = .74, nor were sad mood scores directly before the IAT correlated with IAT scores, Spearman's rho (47) = -.19, p = .20. As such, there was no support that (extent of increase in) sad mood is generally related to ISE.

Table 4
Results of regressing IAT, RSES and condition onto CES-D and BFNES.

	CES-D scores			BFNES scores			
	ΔR^2	B	SE	Semi-partial r	ΔR^2	B	SE	Semi-partial r
Step 1	.04				.03			
Constant		3.74	.29			37.27	2.49	
IAT scores		−0.81	.44	-.19		−5.85	3.81	-.16
Step 2	.04				.04			
Constant		3.94	0.38			36.65	3.28	
IAT scores		-.60	.60	-.11		-.72	5.12	-.02
Condition		-.44	.58	-.08		1.76	4.97	.04
IAT x Condition		-.28	.88	-.03		−10.20	7.60	-.14
Step 3	.43*				.29*			
Constant		7.85	.53			64.09	5.20	
IAT scores		-.11	.44	-.02		2.74	4.32	.06
Condition		-.30	.43	-.05		2.69	4.16	.06
IAT x Condition		-.30	.65	-.04		−10.37	6.35	-.14
RSES		-.21	.02	-.66*		−1.47	.24	-.54*

*p < .001.
Note: IAT = implicit association test (self-esteem); RSES = Rosenberg's Self-Esteem Scale; CES-D = Centre for Epidemiologic Studies Depression Scale – square-rooted to correct skew; BFNES = Brief Fear of Negative Evaluation Scale II.

4.4. H2: symptoms of depression and anxiety are more strongly related to ISE following a sad-mood

To limit the number of analysis, we conducted two regression analyses; one with (square-rooted) CES-D scores as the outcome variable, and one with BFNES scores as the outcome variable.[4] For both analyses, ISE scores were included at step one. At step 2, condition and the ISE × condition interaction was included in the model. In step 3, ESE scores were included. Residual analysis for both regression analyses revealed no extreme outlying residuals, and the pattern between residuals and the main effects (IAT scores, RSES scores) were random.

Results of explained variance in CES-D scores and BFNES scores are presented in the left and right hand side of Table 4, respectively. For both, IAT scores did not explain variance in symptom scores, nor when taking condition into account. Only once RSES scores were included did the model become significant. Although scores did go in the hypothesized direction, in the final step, the condition x IAT scores interaction was non-significant for CES-D (p = .65), and BFNES (p = .11). As such, there was no support that ISE is more so related to symptoms of depression and anxiety when measured during sad mood.

4.5. H3: symptoms of depression and anxiety are related to a great decrease in ISE

To test the hypothesis that extent of change in ISE is correlated with symptoms of depression and anxiety, change scores (IAT post-mood induction – IAT baseline) were calculated in the control group only. Lower scores were therefore indicative of a greater decrease in ISE scores (i.e., less ISE compensation; range: -1.33–0.76, M = -0.23, SD = .45). IAT change scores did not significantly correlate with CES-D, Spearman's rho (39) = -.01, p = .56, nor with RSES scores, r (39) = -.25, p = .12. Correlations between IAT change scores on the one hand, and LSAS scores and BFNES scores on the other were both of a medium effect size, r(39) = -.30, p = .06 and r(39) = -.31, p = .045, respectively. As such, the pattern of findings showed a tentative association between less ISE compensation (more decrease in ISE following a sad mood induction) and more fear of negative evaluation. It should

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[4] The analysis was not conducted on LSAS as BFNES was already selected to represent anxiety symptoms more broadly, and the latter already showed a significant correlation with ISE (Table 3).

be noted that applying a Bonferroni correction (adjusted α = .0125) to the correlation analyses means that none of the correlations meets statistical significance.

5. Discussion

The key findings of the present study can be summed as follows: i) Participants in a sad mood did not show lower ISE than those in a relatively neutral mood; ii) Symptoms of depression and anxiety were not more so related to ISE when measured during a sad mood, than ISE measured in the absence of a sad mood induction; iii) There was tentative support that relatively high symptoms of anxiety were related to less ISE compensation.

In the present study, it was hypothesized that sad mood would lower ISE as one potential explanation of how low ISE develops. The current findings would suggest that lower levels of ISE may not manifest through a decrease in mood. While it is feasible that more persistent and intense sad mood is required before a decrease in ISE is observed, there are other theories as to how low ISE manifests. Beevers (2005) highlighted how repetitive, consistent processing at the explicit level becomes increasingly more ingrained and automatic with time. This would suggest that prolonged low ESE would lead to lower ISE. DeHart, Pelham, and Tennen (2006) argued that those who reported more negative interactions with their parents during their childhood also showed lower ISE currently (i.e., in adulthood), while those who reported more nurturing and caring parents had higher ISE. Indeed, disruptions during childhood may have an important role in how ISE is formed, given that in adults with a current depression, those with childhood-onset had lower ISE than those with adulthood-onset (Rodebaugh, Weeks, Gordon, Langer, & Heimberg, 2012). The present study suggests that sad mood per se does not contribute to an acute decrease of ISE.

Neither prior to, nor after, a sad-mood induction was implicit self-esteem related to symptoms of depression or anxiety. It was hypothesized that ISE would relate stronger to symptoms when measured during sad mood, and absence of this mood induction in previous studies would explain the mixed findings (e.g., Risch et al., 2010; van Tuijl et al., 2016). Yet results may be different in a clinical population, and the influence of sad mood might even be different in those who have a history of psychopathology and are currently symptom-free. While current levels of depression and social anxiety were measured, we did not control for previous depression and social anxiety. This may be pivotal, as in those with a history of depression, specifically, sad mood is thought to trigger dormant depressive processing (Gemar et al., 2001). As allocation to condition was random, we assume that the number with a history of psychopathology was similar across groups. Regardless, repeating the study in a population with more variation in depression and anxiety symptoms may produce different results, and it may be crucial to collect data concerning depression and anxiety history.

In non-selected samples, implicit self-esteem has been observed to be higher in those who received threats to the self. This was argued to indicate "implicit self-esteem compensation" (Rudman et al., 2007). It was hypothesized that symptoms of depression and anxiety are related to a greater drop in ISE following sad mood, indicative of less compensation. Results showed tentative support for an association between implicit self-esteem compensation and fear of negative evaluation. As previous theory suggests that self-esteem acts as a buffer against anxiety (e.g., terror management theory; Solomon, Greenberg, & Pyszczynski, 1991), it can be theorised that self-esteem may act as a buffer by increasing in response to threat, and when this fails, symptoms of anxiety appear. However, it should be noted that when correcting for multiple testing, the association failed to reach statistical significance. It is possible that the association between implicit self-esteem compensation and anxiety was minimized due to test-retest effects of the IAT. Indeed, results suggested that following a sad-mood induction, there were

significant differences in IAT scores in those who had completed a baseline IAT and those who had not. As mean IAT scores in the control group are closer to 0, suggesting relatively small difference between sorting I + positive and I + negative words, the IAT following the sad-mood induction in the control group may have been less sensitive to measuring ISE due to a learning effect. This also poses an issue on previous studies that have used multiple measures of ISE in a single session (Franck, De Raedt, et al., 2008). To test implicit self-esteem compensation, it may be necessary to test ISE before and after a mood induction on separate days, thereby limiting a learning effect.

Finally, explicit self-esteem was found to explain a significant amount of variance in depression and anxiety scores. This is consistent with previous studies in both clinic samples (e.g., van Tuijl et al., 2016) and non-clinical samples (de Jong, Sportel, de Hullu, & Nauta, 2012). While it is tempting to conclude that ESE might be a better target for treatment than ISE, it should be noted that there are several aspects that may overinflate associations between self-report measures of ESE and psychopathology. First, feelings of worthlessness are one of the optional criteria for those who meet the diagnostic criteria for a depression as per the Diagnostic and Statistical Manual of Mental Disorders (5th ed., American Psychiatric Association, 2013), there is therefore some overlap in the definition of a depression and self-esteem. Although not everyone meeting the clinical diagnosis for a depressive disorder has low self-esteem. Response biases are likely to affect responses to self-report measures about the self to a similar degree. That is, if one is biased to present oneself in a more positive light, then this will result in higher scores of ESE and lower scores of symptoms to a relatively equal degree, thereby strengthening associations. Finally, self-report measures are likely to have common-method variance which may also overinflate associations. While it therefore seems inappropriate to make direct comparisons between ISE and ESE, it should be noted that current theories suggest that consistent ESE influences ISE (e.g., Greenwald et al., 2002). As such, current research cannot compare the relevance of ESE and ISE in psychopathology until better measures of the two have been established, but theory and current findings would suggest that ESE might be the crucial target in depression and anxiety, either directly or indirectly (i.e., by increasing ISE).

6. Limitations

First, while higher sad mood was reported after the sad-mood induction, sad mood did not approach the extreme end of the scale (i.e., 100, "very sad"). Furthermore, given the obvious intention of the sad-mood induction, it is also possible that some participants were inclined to rate their sad mood higher than what they felt due to demand characteristics. While a slight increase in sad mood might be more representative of daily changes in mood in the absence of a specific life event, it is feasible that ISE is relatively robust to daily fluctuations and only decreases in response to more intense or prolonged feelings of sad mood. The sad-mood induction seemed to be particularly effective in those with more symptoms of depression and relatively lower explicit self-esteem. This presents a confounder where those with higher rates of depressive symptoms displaying increased sensitivity to a mood induction procedure. However, this is in keeping with previous studies who have observed differences in emotional reactivity to mood inductions between non-clinical and clinical samples (e.g., Bylsma, Morris, & Rottenberg, 2008).

Previous lack of significant findings concerning ISE as measured by the IAT has led many to criticise the measure (e.g., Remue, De Houwer, Barnes-Holmes, Vanderhasselt, & De Raedt, 2013). Indeed, in the present study, there was some indication of test-retest effects as post-sad mood induction IAT scores differed between the two conditions, suggesting that those who had completed a prior, baseline IAT had scores closer to zero (i.e., the control condition). Test-retest effects have also previously been observed in other versions of the IAT (Robusto, Cristante, & Vianello, 2008). Future studies should consider employing

a four-group design (absence/presence of pre-test IAT x presence/absence of sad-mood induction) for a more accurate analysis of the test-retest effects of the IAT and the potential influence of the sad-mood induction herein.

It should be noted that medium correlations were observed between fear of negative evaluation and ISE during sad mood. Furthermore, relatively less ISE compensation was also related to relatively more fear of negative evaluation. When applying relatively stringent corrections, these associations failed to meet statistical significance. Future studies should endeavour to recruit larger samples in order to have sufficient power to reliably test the presence of small effect sizes. Small effect sizes are particularly anticipated between self-report measures and computer-based measures given the method-specific error variance unique to each type of measure. This non-overlapping error variance may distort genuine associations between constructs.

7. Conclusion

This study is the first study to look at the effect of sad mood state on implicit self-esteem as means to explain previous mixed findings and contribute to the theory of how low implicit self-esteem may arise. The present study did not find support for the influence of sad mood on implicit self-esteem as measured by the IAT, in a student sample. This would suggest that sad mood does not provide a context where certain (negative) associations are more likely to be triggered when the self is activated. There was tentative evidence suggesting that high fear of negative evaluation is associated with less ISE compensation during a sad mood induction. However, it would require replication in a larger sample to test whether this association represented a robust phenomenon.

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Conflicts of interest

The authors declare no conflicting interests.

Appendix A. Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.jbtep.2018.02.003.

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