

COGNITIVE TRAININGS REDUCE IMPLICIT SOCIAL REJECTION ASSOCIATIONS

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A Single Target Implicit Association Test (ST-IAT) was used in three internet studies in order to assess the malleability of automatic rejection associations in socially anxious participants. Study 1 and Study 2 explored whether automatic rejection associations could be reduced by an evaluative conditioning task that combined social situations with acceptance. Results showed that the conditioning task reduced rejection associations in the group that completed the ST-IAT shortly after the conditioning task. In contrast, rejection associations were not significantly different from a control group when the ST-IAT was assessed with a one week interval after the conditioning task. Explicit social rejection measures were not, or only marginally, affected by the conditioning task. Study 3 used an attentional training task that fosters sensitivity to positive social feedback (Dandeneau, Baldwin, Baccus, Sakellaropoulo, & Pruessner, 2007). After one week of daily training, implicit but not explicit social rejection associations were reduced by the attentional training task even if they were assessed after an additional one-week interval without any training. The results show that cognitive trainings can affect implicit social rejection associations and that the effects are visible even after a period without training.

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Many people experience discomfort and embarrassment in social situations. When they meet new people, deliver a public speech, have a job interview, or a private date they feel uneasy and anxious. This paper argues that social rejection concerns can be separated into two different components and that the treatment of these concerns should consider the use of different approaches for each component. In line with current dual process models in social cognition research (e.g., Gawronski & Bodenhausen, 2007; Strack & Deutsch, 2004) more spontaneous and automatic processes when experiencing social rejection can be separated from more reflective and controlled processes. In the following sections we first give a brief overview of the differences between automatic and controlled information processes according to dual process models. Second, we relate these processes to social rejection concerns. Finally, we discuss approaches attempting to change dysfunctional automatic associations that are the core of social rejection concerns.

DIFFERENCES BETWEEN SPONTANEOUS AND CONTROLLED INFORMATION PROCESSES

Dual process models, for instance Strack and Deutsch's (2004) Reflective-Impulsive Model, propose that perception, thinking, and behavior are the function of two different systems of information processing. In the Reflective System, behavior is the result of a reasoning process that is based on propositions. Propositions consist of concepts (e.g., I and anxious) that are linked by a relation (e.g., am). Propositions are generated through introspection and may be considered as either true or false. In contrast, in the Impulsive System information is processed by spread of activation processes between concepts that are linked through associations (e.g., I - happy). Associations between concepts are activated spontaneously and are only indirectly accessible by introspection. Associations can vary in strength but they cannot be considered as true or false.

Together with the conceptualization of associative and propositional information processes in dual process models on a theoretical level, new measurement procedures were developed that allow for the assessment of spontaneous associations. Propositional information can be assessed through self-report and questionnaire measures. Explicit measures typically ask participants to indicate

their agreement with a propositional statement and thus represent the outcome of propositional validation processes that is based on principles of logical consistency. In contrast, automatic associations can be assessed by the relatively new class of implicit measurement procedures (for an overview, see Gawronski & Payne, 2010). Most implicit measures assess automatic associations between concepts by the assessment of response latencies. The most common implicit measure is the Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998) that assesses the speed with which participants can map different concepts on the same response key. Such implicit measures represent a proxy for the activation of automatic associations in memory. The main advantages of implicit measures are that they are less susceptible to self-presentational biases and less bound to introspective limits than traditional questionnaire measures (Greenwald & Banaji, 1995).

EXPLICIT AND IMPLICIT SOCIAL REJECTION CONCERNS

Self-focused attention and social rejection concerns or the fear that scrutiny and negative evaluation from others will cause feelings of embarrassment, humiliation, and shame are core characteristics of conceptual models of social anxiety (Bernstein et al., 2010; Hirsch & Clark, 2004; Kemper, Lutz, Bähr, Rüdell, & Hock, 2012; Leary, 1983a; Rapee & Heimberg, 1997; Tanay, Lotan, & Bernstein, 2012; Taylor et al., 2007; Watson & Friend, 1969; Wheaton, Deacon, McGrath, Berman, & Abramowitz, 2012). Social rejection concerns are associated with fear of criticism, low self-esteem, and shyness, and socially anxious people often avoid social situations and thereby strengthen their dysfunctional fears (Croizier & Alden, 2001). Several studies have explored the relationship between social anxiety and the tendency to interpret ambiguous social information in a negative and threatening manner (i.e., negative interpretation bias). Negative interpretation bias was shown to mediate the effects of social anxiety on self-reported state anxiety during an impromptu speech (Beard & Amir, 2010). Studies by Mathews and Mackintosh (2000) revealed that threatening or benign interpretation of ambiguous social information could be induced by systematic exposure to congruent exemplars. Induced interpretation biases were shown to persist over 24 hours and to generalize over different environ-

mental settings (Mackintosh, Mathews, Yiend, Ridgeway, & Cook, 2006). A modification program to reduce negative interpretation bias in socially-anxious individuals over four weeks decreased social anxiety symptoms and showed that changes in social anxiety were mediated by changes in interpretation bias (Beard & Amir, 2008). Similarly, a benign interpretation training in a study by Murphy, Hirsch, Mathews, Smith, and Clark (2007) resulted in participants generating more positive and less negative interpretations of new ambiguous social situations and anticipating less anxiety during an upcoming short conversation with two strangers. Finally, a study by Mathews, Ridgeway, Cook, and Yiend (2007) showed that trait anxiety can be reduced by a two-week intervention that trained participants to interpret ambiguous social information in an increasingly positive manner.

Considering explicit and implicit aspects of social anxiety, there is now convincing empirical evidence that—at least at the broader level of neuroticism and in terms of shyness—implicit social anxiety shows discriminant validity from explicit social anxiety. Together with the other Big Five dimensions, Back, Schmukle, and Egloff (2009) explored the predictive validity of a neuroticism IAT for behavioral indicators of neuroticism. The results showed that the neuroticism IAT predicted impulsive behavioral tendencies (e.g., gaze aversion, tense body and leg posture, silence) during a self-introduction in front of a camera over and above explicit anxiety measures, and behavior predictions for the anxiety IAT remained significant even after controlling for explicit measures. In a similar vein, studies by Egloff and Schmukle (2002) and by Schnabel, Banse, and Asendorpf (2006a) showed incremental validity of an anxiety IAT over explicit anxiety measures for the prediction of anxious behavior during a short speech. Using a shyness IAT, results by Asendorpf, Banse, and Mücke (2002) showed a double dissociation pattern with the explicit shyness measures uniquely predicting indicators of controlled but not spontaneous shy behavior and the implicit shyness measure uniquely predicting indicators of spontaneous but not controlled shy behavior. Generally, results for double dissociation models of implicit and explicit measures are rather scarce, most probably due to the difficulty of finding adequate behavioral indicators for spontaneous and controlled behavior. More often evidence was found for additive models that conceptualize implicit and explicit measures as explaining unique portions of

variance of a relevant behavioral criterion (Greenwald, Poehlman, Uhlmann, & Banaji, 2009). Accordingly, Schnabel, Banse, and Asendorpf (2006b) found that a shyness IAT and a parallel implicit procedure, the shyness Implicit Association Procedure (IAP), added incremental validity over explicit measures for the prediction of shy behavior during a simulated job interview. Together, the results made evident that implicit and explicit aspects of social anxiety can be separated from each other. In several studies, implicit measures significantly and independently from explicit measures, predicted relevant behavioral criteria.

MALLEABILITY OF IMPLICIT SOCIAL ANXIETY

Whereas early theoretical thinking often conceptualized implicit representations as highly robust and stable memory structures (e.g., Wilson, Lindsey, & Schooler, 2000), recent empirical evidence demonstrated that implicit representations can be modified by suitable interventions. In a study by Grumm, Nestler, and von Collani (2009) implicit but not explicit self-esteem was strengthened by a subliminal evaluative conditioning task, that combined "I" words with positive adjectives. However, effects of the evaluative conditioning task also emerged on explicit measures when participants were instructed to introspect on their feelings before they answered the self-report measure. Gawronski and LeBel (2008) received a similar result for attitudes toward different continents. A subliminal evaluative conditioning task influenced implicit attitudes regardless of whether participants were asked to introspect on their feelings or their knowledge. In contrast, explicit attitudes were only affected by the conditioning when participants were subsequently asked to introspect on their feelings. Generally, effects of evaluative conditioning tasks were typically found on implicit but not on explicit measures (see Gawronski & Sritharan, 2010, for a more complete overview).

With regard to more clinical interventions, results by Teachman and Woody (2003) showed that cognitive-behavioral therapy effectively reduced explicit anxiety and implicit fear associations in spider phobics, and the reductions were modestly associated with changes of phobic avoidance at the behavioral level. In a similar vein, Gamer, Schmukle, Luka-Krausgrill, and Egloff (2008) found

that both implicit anxiety, measured by an IAT, and explicit anxiety, measured by a social phobia inventory, were reduced through cognitive behavioral therapy. Similar results were obtained by Grumm, Erbe, von Collani, and Nestler (2008) who studied effects of cognitive behavioral therapy on explicit pain measures and implicit pain associations in patients suffering from chronic pain (see also Teachman, Cody, & Clerkin, 2010, for a more complete overview over clinical applications of implicit measures). A recent study by Clerkin and Teachman (2010) showed that a conditioning task was able to reduce implicit rejection associations in a group of highly socially anxious participants. Rejection associations were measured with an IAT that assessed associations between the self-concept and negative versus positive social feedback. The conditioning task repeatedly paired self-relevant stimuli showing the participant giving a speech with faces indicating positive social feedback. Participants in the positive feedback conditioning group did not only show smaller implicit rejection associations but were also more likely to complete an impromptu speech. In contrast, they did not show less explicit state anxiety than a control group.

AIMS OF THE PRESENT RESEARCH

The main target of the current research was to explore whether implicit social anxiety can be reduced by cognitive training tasks. Given that the validity of implicit anxiety measures has been shown in several studies, we wanted to directly influence the automatic associations that play an important role in socially-anxious behavior. Thereby our main targets were the modification of the dysfunctional cognitions of socially anxious people (i.e., that they are rejected and disregarded by others in social situations) and the strengthening of their associations between social situations and acceptance by others. As cognitive trainings we used an evaluative conditioning task in Study 1 and Study 2 and an attentional training task in Study 3. Additionally, the present studies not only examined the immediate short-term effects of the training task on implicit and explicit social rejection associations, but also the long term effects over an interval of one week without any training. Study 3 explored whether training effects can be stabilized by daily repetitions of the training over eight consecutive days.

STUDY 1

Study 1 used an evaluative conditioning task that was designed to strengthen associations between social situations and acceptance and was compared with two control conditions, one condition using a conditioning task with neutral stimuli that were related with social situations, and another condition using no conditioning task. Additionally, long term effects of the cognitive training over one week without any training were examined.

METHODS

Overview of Procedure and Design. Data were collected online on www.psytests.de, the internet portal for online studies of the Psychology Department of Humboldt University. Participants were informed that the study explored the effects of cognitive training tasks on self-confidence in social situations and that it contained questionnaire measures and sorting tasks. All participants first completed an explicit social rejection questionnaire together with other questionnaires not relevant for the current study and were then randomly assigned to one of three experimental conditions of the conditioning task (acceptance conditioning, neutral conditioning, or no-conditioning). In order to explore effects of the conditioning task on explicit and implicit measures, the conditioning task was followed by a retest of the explicit social rejection questionnaire and by the social rejection Single Target Implicit Association Test (ST-IAT). Please note that the order of the explicit and the implicit measure was kept constant for all participants. Even though some studies showed that the order of implicit and explicit measures might have an effect (e.g., Bosson, Swann, & Pennebaker, 2000) a meta-analysis could not show any effects of implicit-explicit order at least on the size of implicit-explicit correlations (Hofmann, Gawronski, Gschwendner, Le, & Schmitt, 2005).

In order to examine both short-term and long-term effects of the conditioning task the measures were completed either immediately after the conditioning task or with a one-week interval. When the measures were completed one week after the conditioning task, participants received an email that reminded them to participate and that contained a personalized link that led them to the question-

naire and the ST-IAT. Half of the participants in the acceptance and the neutral conditioning group completed the implicit and explicit measure either immediately or one week after the conditioning task. However, all participants in the no-conditioning group completed the retest of the explicit measure and the implicit measure immediately in the same session, because we did not expect different short-term and long-term effects in the group without any intervention. Finally all participants were thanked and received feedback on their results in the questionnaire and their mean response latencies in the ST-IAT blocks. Thus, the overall design compared five different groups. In the acceptance conditioning and the neutral conditioning groups both long-term and short-term effects of the conditioning task were examined. Additionally a baseline was examined in the no-conditioning group. Effects on the ST-IAT were studied in a between-participants rather than in a within-participants design because a pilot study showed strong retest effects on the implicit measure (i.e., a reduction of the overall test scores) that obscured any intervention effects (cf., Huijding & de Jong, 2007).

Participants. A total of 219 participants started the study by completing the first set of explicit measures. Data from participants who did not complete the final implicit and explicit measures or refrained from coming back to the study after one week could not be used. There were no significant differences on demographic variables or explicit self-ratings between participants who did not complete the final implicit and explicit measures and participants who completed the whole study. The final sample consisted of 181 (121 females) participants with a mean age of 32.61 ($SD = 12.57$) years. A majority of the participants (45%) had a university degree or were currently students, an additional 26% had a high school degree (German Abitur), and 29% lacked a high school degree. Participants came across the study by browsing the experiments on www.psytests.de or they were invited via the www.psytests.de mailing list. Data of nine participants could not be saved for the second explicit social rejection self-rating due to technical failure.

Explicit Social Rejection Self-Ratings. Explicit self-ratings were based on the word material of the ST-IAT. Participants rated on a scale ranging from 1–5 the extent to which they associated themselves in public situations with either acceptance or rejection. Six words were used as examples representing public situations (party, meeting, seminar, gathering, speech, conference). These situation

words were combined with six acceptance (acceptance, appreciation, sympathy, friendly, appreciating, accepting) and six rejection words (rejection, disrespect, antipathy, neglecting, disrespecting, rejecting) in a fixed random order such that each situation word was combined with one acceptance and one rejection word. These explicit self-ratings rather than an established social anxiety scale were used in order to maximize comparability between the explicit measure and the social anxiety ST-IAT. Because the word material of the explicit self-ratings was based on stimulus material of the ST-IAT we avoided confounding method variance with content-specific variance. (For information on convergent validity of the explicit social rejection self-ratings with the Fear of Negative Evaluation Scale see Study 2 and Study 3.) The explicit social rejection self-ratings resulted in a scale with 12 items that showed satisfactory internal consistency, Cronbach's $\alpha = .93$ and $.95$ for the first and second explicit social rejection self-rating, respectively. The mean across the 12 items was used as explicit social rejection score.

ST-IATs. The social rejection ST-IAT closely followed the standard single category IAT procedures (for an overview, see Teige-Mocigemba, Klauer, & Sherman, 2010). The identical stimuli as for the explicit self-rating were used for the ST-IAT. A single target procedure (i.e., only the target category public situation without the contrast category private situation) was used because the standard IAT of a pilot study seemed to be dominated by strong associations between acceptance and private situation whereas our aim was to assess associations with public situations. The ST-IAT started with a 24 trial block that trained participants to discriminate rejection and acceptance stimuli. Participants had to press the left response key for rejection stimuli and the right response key acceptance stimuli. In the second block, participants had to map public situation and rejection stimuli on the left response key and acceptance stimuli on the right response key. In the third and last block, response key assignment for public situation stimuli was reversed and participants had to map public situation and acceptance stimuli on the right response key and rejection stimuli on the left response key. Block 2 and Block 3 consisted of 96 trials each. When participants made a wrong response, a red X appeared and they had to press the correct response key. Latency of error trials included the time of the incorrect response plus the time required to produce the correct response as built-in error penalty (cf., Greenwald, Nosek, & Banaji,

2003). ST-IAT scores were based on the difference of mean response latencies in Block 3 minus Block 2 and were calculated as improved D scores (Greenwald et al., 2003). Following Greenwald and colleagues (2003), D scores were computed as unweighted means over the difference scores for the first third (Trial 1–32) and the two last thirds (Trial 33–96) of trials in Block 2 and Block 3. Internal consistency of the ST-IAT was also calculated as Cronbach's alpha over these two difference scores and was satisfactory, $\alpha = .72$, and did not differ significantly across the five conditions.

Evaluative Conditioning Task. Trials started by showing a word representing a public situation in the center of the screen. These public situation words were identical to the stimuli that were used for the explicit self-ratings and the ST-IAT. After two seconds an acceptance word (acceptance conditioning group) or a neutral word (neutral conditioning group) was added below the public situation word. Acceptance words were identical to the stimuli that were used for the explicit self-ratings and the ST-IAT. Neutral words were woman, man, partner, female, male, and attentive. Participants' task was to categorize the "acceptance" or "neutral" word as fast as possible as a noun or as an adjective by pressing the left or the right response key, respectively. If their answer was incorrect a red X was displayed on the lower screen line until the correct answer was given. After correct responses there was an intertrial interval of one second until the next public situation or neutral stimulus appeared. Altogether, the conditioning task consisted of 8 blocks of 6 trials and each block used a different random pairing of the 6 public situation words with the 6 acceptance (acceptance conditioning group) or the 6 neutral (neutral conditioning group) words. The conditioning task was omitted in the no conditioning group.

RESULTS AND DISCUSSION

Effects of the five experimental conditions were examined in a one-way ANOVA and showed unexpected marginal group differences already on the first explicit social rejection self-rating that was completed before the conditioning task, $F(4,176) = 2.01$, $p = .094$. Therefore, the first social rejection self-rating was included as a covariate in the following analyses. An ANCOVA with experimental condition as the independent variable, the first explicit social rejection

TABLE 1. Descriptive Statistics of Explicit and Implicit Measures for the Five Experimental Conditions in Study 1

Variable (range of scale)	Conditioning														
	Acceptance (n = 44)			Neutral (n = 41)			No (n = 42)			Acceptance + 1 week (n = 31)			Neutral + 1 week (n = 23)		
	M	SD		M	SD		M	SD		M	SD		M	SD	
First explicit social rejection self-rating (1–5)	2.42	0.57		2.52	0.61		2.24	0.44		2.27	0.41		2.29	0.58	
Second explicit social rejection self-rating (1–5)	2.44	0.33		2.37	0.32		2.30	0.29		2.29	0.26		2.39	0.36	
Social rejection ST-IAT (D scores)	-0.47	0.28		-0.26	0.29		-0.36	0.28		-0.40	0.27		-0.40	0.27	

Note. Scores for the second explicit social anxiety self-rating and the ST-IAT were controlled for differences on the first explicit social anxiety self-rating.

self-rating as the covariate, and the social rejection ST-IAT as the dependent variable showed the expected significant main effect, $F(4,175) = 3.14, p = .016$. Means and standard deviations for the different experimental conditions are reported in Table 1. Post hoc single comparisons revealed that when the social rejection ST-IAT was completed immediately after conditioning task, participants had smaller scores in the acceptance conditioning group than in both the no-conditioning group and the neutral conditioning group, $t(84) = 1.86, p = .033, d = 0.41$ and $t(83) = 3.64, p < .001, d = 0.75$, respectively. In contrast, when the social rejection IAT was completed one week after the conditioning task, there were no significant differences between the acceptance conditioning group and the neutral conditioning group and both did not differ significantly from the no-conditioning group. Interestingly, the highest implicit social rejection scores were reached by participants in the neutral conditioning group that completed the ST-IAT directly after the conditioning task. Most probably, this may be explained by an activation of social rejection associations in the neutral conditioning group through the processing of virtually neutral stimuli that only were related to social situations.

In contrast, there were no significant group differences on the second explicit social rejection self-rating that was completed after the conditioning task. An ANCOVA with experimental condition as the independent variable, the first explicit social rejection self-rating as the covariate, and the second explicit social rejection self-rating as the dependent variable only showed a nonsignificant main effect, $F(4,166) = 1.37, p = .245$. In sum, the results showed significant effects of the conditioning task on the implicit but not on the explicit measure. Importantly, this was the case even though the explicit measure was always completed before the implicit measure. The effects of the conditioning task on the more spontaneous associations that were assessed with the ST-IAT seemed to endure the more controlled self-ratings even though the self-ratings were themselves unaffected by the conditioning task. However, effects on implicit measures were visible only when conditioning task and implicit measure were completed within one session, whereas no effects were evident when the implicit measure was completed with a one-week delay after the conditioning task. It should be noted that in Study 1 the manipulation effect on the social rejection ST-IAT was found as an overall effect without selecting an extreme group of participants with high social rejection concerns. This was different

from the following studies where an intervention effect was found only in a group of participants with high social rejection concerns.

STUDY 2

Study 1 used the identical stimulus material for the evaluative conditioning task and the implicit measure. Therefore, it was unclear whether effects on the implicit measures appeared because participants really processed the stimuli at the semantic level or only at the stimulus level. In order to ensure semantic effects of the conditioning task on the implicit measure we used a different ST-IAT in Study 2 that included parallel stimuli for social situations that were different from the conditioning task.

METHODS

Overview of Procedure and Design. The procedure closely followed Study 1, except that the social rejection ST-IAT used stimuli that were different from the conditioning task. Additionally, participants did not only complete the explicit social self-ratings before the conditioning task but also the Brief Fear of Negative Evaluation Scale (BFNE; Leary, 1983b; German version by Fydrich, 2000). Because group differences were most evident between the acceptance conditioning group and the neutral conditioning group and when the ST-IAT was assessed immediately after the conditioning task, only these two conditions were realized in the current study. Thus, all participants completed the social rejection self-rating, the BFNE, the conditioning task, a retest of the social rejection self-rating, and finally the ST-IAT that was a parallel version to the one used in Study 1. In Study 2, internal consistency Cronbach's α s were .93 and .95 for the first and second explicit self-rating. Below we describe the measures that differed from the previous study.

Participants. A total of 116 (82 females) volunteers with a mean age of 30.21 ($SD = 12.43$) years participated in this study. A majority of the participants (52%) had a university degree or were current students, an additional 25% had a high school degree (German Abitur), and 23% lacked a high school degree. Again, participants came across the study by browsing the experiments on www.psytests.de

or they were invited via the www.psytests.de mailing list. None of the participants had also participated in Study 1.

Brief Fear of Negative Evaluation Scale (BFNE). The BFNE (Leary, 1983b; German version by Fydrich, 2000) is a twelve-item scale that asks participants to rate the extent to which they expect negative and disapproving reactions of others in social situations (e.g., I am afraid others will not approve of me.). Items are rated on a scale from 1 (not at all characteristic of me) to 5 (extremely characteristic of me). The internal consistency of the scale was satisfactory, Cronbach's $\alpha = .90$.

ST-IATs. The same procedure as for Study 1 was used with the only difference that parallel stimuli for "public situation" category were used (i.e., celebration, reunion, course, session, talk, discussion). The internal consistency of this IAT was somewhat lower than in Study 1, Cronbach's $\alpha = .65$.

RESULTS AND DISCUSSION

Differences between the two experimental conditions were examined with *t*-tests. Even though the explicit social rejection self-rating was completed before as well as after the conditioning task whereas the ST-IAT was completed only after the conditioning task, we used between subjects analyses for both measures in order to increase comparability of the results. Differently from Study 1, there were no significant differences in the explicit measures that were completed before the conditioning task. However, also the ST-IAT scores and the explicit self-rating that were completed after the conditioning task did not differ between the two groups. The nonsignificant effect of the conditioning task in Study 2 might be attributed to the fact that the conditioning task and the ST-IAT used parallel stimuli in Study 2, whereas identical stimuli were used in Study 1. Using identical stimuli in the conditioning task and the ST-IAT might have strengthened the effects of the conditioning task in Study 1. Differences between the two studies should not have been caused by differences in social rejection concerns between the two samples. A *t*-test on differences in the first social rejection self-rating revealed nonsignificant differences between the two studies, $t(295) = 1.54$, $p = .126$.

Considering that the conditioning task may have an effect only on participants with high social rejection concerns and no effect on participants without these concerns, we examined whether it specifically affected participants with high fear of negative social evaluation. Looking at extreme groups, we compared the upper quartile (highest 25%) with the two lower quartiles (lowest 50%) on the BFNE. We used the lower half of the sample instead the lowest quartile as a comparison group in order to avoid an excessive reduction of the sample. Analyses resulted in 2 (extreme group: high versus low BFNE scores) \times 2 (experimental condition: acceptance versus neutral conditioning) ANOVAs. There were no significant differences between the two extreme groups with respect to demographic variables (age, proportion of males and females, and proportion of different educational levels).

Results for the ST-IAT showed nonsignificant main effects for experimental condition and extreme group, but a significant interaction effect, $F(1,86) = 13.52, p < .001$. A post hoc single comparison for participants with high BFNE scores showed that they had lower implicit social rejection scores when they had completed the acceptance conditioning rather than the neutral conditioning, $t(28) = 2.71, p = .011, d = 1.02$. Means and standard deviations for the different extreme groups and experimental conditions are reported in Table 2. Unexpectedly, participants with low BFNE scores showed the opposite pattern and had higher implicit social rejection scores when they had completed the acceptance conditioning rather than the neutral conditioning, $t(58) = 2.99, p = .04, d = 0.79$. Thus, the group with low BFNE scores showed a contrast effect (i.e., an effect that was opposite from the expected direction), whereas the group with high BFNE scores showed the expected assimilation effect (i.e., an effect in the direction of the intervention). Assimilation and contrast effects were most frequently explored in priming studies and were shown to affect both explicit judgments and implicit measurement procedures (e.g., Dijksterhuis, Spears, & Lépinasse, 2001; Glaser & Banaji, 1999; Mussweiler, 2003; Scherer & Lambert, 2009). Because the main target of the current studies was to change implicit rejection associations in participants high in social evaluation concerns, a detailed discussion of the contrast effect that we found only in Study 2 and only for participants low in social evaluation concerns is beyond the scope of this article. Contrast effects are usually found as a consequence of automatic correction effects following evaluatively extreme primes (Glaser & Banaji, 1999) or when ma-

TABLE 2. Descriptive Statistics of Explicit and Implicit Measures for Participants with High and Low BFNE Scores and for the Two Experimental Conditions in Study 2

Variable (range of scale)	High BFNE scores				Low BFNE scores			
	Acceptance conditioning (<i>n</i> = 13)		Neutral conditioning (<i>n</i> = 17)		Acceptance conditioning (<i>n</i> = 28)		Neutral conditioning (<i>n</i> = 32)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
BFNE (1–5)	4.07	0.28	4.09	0.36	2.53	0.38	2.43	0.41
First explicit social rejection self-rating (1–5)	2.46	0.51	2.67	0.52	2.18	0.62	2.00	0.42
Second explicit social rejection self-rating (1–5)	2.36	0.60	2.68	0.56	2.16	0.72	1.98	0.38
Social rejection ST-IAT (D scores)	-0.47	0.20	-0.24	0.24	-0.26	0.31	-0.48	0.27

Note. Extreme groups were formed based on the highest 25% and lowest 50% on the BFNE. BFNE = Brief Fear of Negative Evaluation Scale.

nipulations are experienced to be different from a pertinent norm or standard (Mussweiler, 2003). Both aspects are rather implausible as an explanation for the contrast effect that we found, because the link between public situations and acceptance should be neither extreme nor strange for participants without social evaluation concerns. Consequently, we have to refrain from over-interpreting this unexpected result that also did not replicate in the other two studies.

With respect to explicit measures, a significant main effect on the second explicit social rejection self-rating showed obviously that participants with high BFNE scores also had higher explicit social rejection scores than participants with low BFNE scores, $F(1,86) = 12.24, p < .001$. However, there was no significant main effect of experimental condition, $F(1,86) = .30, p = .588$, and only a marginal interaction effect, $F(1,86) = 3.70, p = .058$. A one-sided post hoc single comparison showed that participants with high BFNE scores tended to have lower explicit social rejection scores when they had completed the acceptance conditioning rather than the neutral conditioning, $t(28) = 1.48, p = .075, d = 0.56$. In the group of participants with low BFNE scores there was no significant effect of the conditioning task, $t(58) = 1.21, p = .023, d = 0.32$. Thus, the conditioning task had a marginal and small effect on the explicit self-ratings of participants with high BFNE scores. In contrast, the conditioning task had a significant and large effect on implicit social rejection associations in participants with high BFNE scores. It should be noted that the neutral conditioning group might not be the ideal control group because the public situation words might have activated social rejection associations in participants with social evaluation concerns. However, effects of the acceptance conditioning task were evident in Study 1 not only as compared to the neutral conditioning but also as compared to the no conditioning group.

Because Study 2 also contained the BFNE that assessed fear of negative social evaluation as a core characteristic of social anxiety concerns, we were able to study its convergent validity with the social rejection ST-IAT and the explicit social rejection self-rating. As there were no significant differences between the experimental conditions and extreme groups, we only report the overall correlations. The explicit self-rating showed good convergent validity with the BFNE, $r = .51, p < .001$ for the first and $r = .46, p < .001$ for the second explicit self-rating. In contrast the ST-IAT did not correlate significantly with the BFNE, $r = .10, p = .278$. The ST-IAT was also

uncorrelated with the first and second explicit self-rating, $r = .13$, $p = .175$ and $r = .10$, $p = .238$, respectively. The lack of implicit-explicit consistency in the domain of social rejection and anxiety measures replicated the effects of other studies that also showed only small or nonsignificant correlations between explicit and implicit anxiety measures (e.g., Egloff & Schmukle, 2002).

STUDY 3

Whereas Study 1 did not find any training effects on implicit social rejection after a one-week interval without training, Study 3 finally explored whether training effects can be stabilized by daily repetitions of the cognitive training. Additionally, Study 3 used a different training that more directly tried to reduce dysfunctional attention behavior of socially anxious participants away from attention to negative social feedback and towards attention to positive social feedback. While the conditioning task in Study 1 and Study 2 might leave unclear whether it strengthened associations of social situations with positive feedback or might have made originally positive feedback words less positive, the attentional training task directly aims at changing attention behavior. The attention training was completed over eight consecutive days and its effects on implicit and explicit measures were examined after an additional week without any training.

METHODS

Overview of Procedure and Design. The procedure was similar to Study 1 and Study 2, except that a different cognitive training task—the Attentional Training Task (ATT) by Dandeneau and colleagues (2007)—was used. Additionally, participants completed eight repetitions of the ATT over eight consecutive days and long term effects on implicit and explicit measures were assessed after an additional week without any training. As in the previous study, the BFNE was assessed before the first training, and explicit social rejection ratings and the social rejection ST-IAT were assessed one week after the last training. The ST-IAT used the same word stimuli that were used for the ST-IAT in Study 1. Internal consistencies were Cronbach's $\alpha = .93$ for the BFNE and the explicit self-rating, $.69$ for the ST-IAT.

Participants. A total of 520 people started the study by answering the first set of questionnaires. However, for our final sample we only included participants that completed the final implicit and explicit measures and at least five of the eight training sessions. That resulted in a final sample of 224 (160 females) participants with a mean age of 34.47 ($SD = 10.40$) years. There were no significant differences on demographic variables or explicit self-ratings between participants who only started the study and those who were in the final sample. A majority of the participants (61%) had a university degree or were current students, 21% had a high school degree (German Abitur), and 18% lacked a high school degree. Again, participants came across the study by browsing the experiments on www.psytests.de or they were invited via the www.psytests.de mailing list. None of the participants had also participated in Study 1 or Study 2.

The Attentional Training Task (ATT). The ATT was adopted by Dandeneau and colleagues (2007) and had to be completed for eight consecutive days. In the training group, participants had to identify an accepting face in a 4×4 matrix of faces that contained photos of 15 rejecting and 1 accepting face. The participants' task was to click on the accepting face as quickly as possible. The task consisted of 16 different accepting faces that were each randomly presented seven times in a different square of the matrix resulting in a total of 112 trials. When participants clicked on the correct face they received an auditory signal and continued to the next trial. In the control condition, the stimuli consisted of black-and-white drawings of five- and seven-petaled flowers. The procedure was identical to the training condition except that participants had to click as quickly as possible on the five-petaled flower in a 4×4 matrix of seven-petaled flowers.

RESULTS AND DISCUSSION

As in Study 2, we explored the effect of the training task by comparing the upper quartile with the two lower quartiles on the BFNE. Results for the ST-IAT showed nonsignificant main effects for extreme group and experimental condition but a significant interaction effect, $F(1,174) = 4.17, p = .043$. A post hoc single comparison for participants with high scores on the BFNE showed that they had lower implicit social rejection scores when they had completed the faces task rather than the control task, $t(61) = 2.13, p = .038, d = 0.55$.

TABLE 3. Descriptive Statistics of Explicit and Implicit Measures for Participants with High and Low BFNE Scores and for the Two Experimental Conditions in Study 3

Variable (range of scale)	High BFNE scores				Low BFNE scores			
	Acceptance training (<i>n</i> = 31)		Neutral training (<i>n</i> = 32)		Acceptance training (<i>n</i> = 62)		Neutral training (<i>n</i> = 53)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
BFNE (1–5)	4.10	0.25	4.12	0.31	2.65	0.44	2.50	0.45
Explicit social rejection self-rating (1–5)	2.52	0.58	2.53	0.62	2.01	0.46	2.00	0.41
Social rejection ST-IAT (D scores)	-0.36	0.21	-0.25	0.22	-0.33	0.26	-0.37	0.25

Note. Extreme groups were formed based on the highest 25% and lowest 50% on the BFNE. BFNE = Brief Fear of Negative Evaluation Scale.

Means and standard deviations for the different extreme groups and experimental conditions are reported in Table 3. In contrast, a significant main effect on the explicit social rejection self-rating that was completed shortly before the ST-IAT showed obviously that participants with high BFNE scores had higher explicit social rejection scores than participants with low BFNE scores, $F(1,174) = 43.37, p < .001$. However, there was no significant main effect of experimental condition, $F(1,174) = .00, p = .991$, nor a significant interaction effect, $F(1,174) = .03, p = .866$. Thus, the ATT had no significant effect on the explicit self-ratings even if participants with high BFNE scores were explored separately.

Because Study 3 also contained the BFNE, we were again able to study its convergent validity with the social rejection ST-IAT and the explicit social rejection self-rating. As there were no significant differences between the experimental conditions and extreme groups, we only report the overall correlations. Like in Study 2, the explicit self-rating showed good convergent validity with the BFNE, $r = .51, p < .001$. Remember that in Study 3 the BFNE was completed before the first training whereas the explicit social anxiety self-rating was completed after the training and the one-week interval immediately before the ST-IAT. Thus, 15 days passed between the assessment of the BFNE and the explicit self-rating. Similarly to Study 2 the ST-IAT was not significantly correlated with the BFNE, $r = .10, p = .134$, and only marginally correlated with the explicit self-rating, $r = .13, p = .060$.

GENERAL DISCUSSION

Together, the three studies showed that implicit social rejection associations can be modified by cognitive training tasks that combine social situations with acceptance or that train to focus the attention on positive rather than negative social feedback. Whereas short term but not long term effects were obtained after a single training (Study 1 and Study 2), long term effects were evident after a week of daily repetitions of the training and an additional week without training (Study 3). Interestingly, in Study 2 and Study 3 effects of the training tasks on implicit social rejection associations were only evident in participants that judged themselves as clearly above-average in social evaluation concerns, whereas in Study 1 effects were evident also at a general level. Future studies may

use more established procedures (e.g., the Social Phobia Inventory by Connor, Davidson, Churchill, Sherwood, & Weisler, 2000) that also provide clinical cut-off scores in order to identify extreme groups of high socially-anxious participants. It may also be interesting, whether future studies even find larger effects on implicit measures when calculation of extreme groups is based on implicit rather than explicit measures. In the current studies we refrained from using a baseline implicit measure because a pilot study that used a within-participants retest design with an implicit measure before and after the training tasks showed strong re-test effect in the experimental and in the control group on the implicit measure that obscured any intervention effects. Unfortunately, between-subject comparisons are more sensitive to noise due to a priori differences and less powerful in detecting treatment induced changes. Future studies may therefore use alternative implicit measures that enable the identification of baseline social rejection associations but that do not produce retest effects on the dependent implicit measure. Future studies should also use larger samples of participants with high social rejection concerns in order to explore intervention effects on implicit and explicit measures.

Differently from the results by Dandeneau and colleagues (2007) the Attentional Training Task of Study 3 did not show any effects on explicit measures. However, Dandeneau and colleagues put the focus of their studies on self-esteem rather than on social anxiety. Considering that Gawronski and LeBel (2008) and Grumm and colleagues (2009) found effects of an evaluative conditioning task on implicit and explicit measures when participants were asked to introspect on their feelings, the effects on the explicit self-esteem scale in the studies by Dandeneau and colleagues seem explainable. An explicit self-esteem scale represents an affective self-evaluation that may be more influenced by current feelings than a questionnaire measuring social rejection concerns. Nevertheless it is remarkable that all of the cognitive trainings that were used in the current studies used supraliminal tasks that showed effects on implicit measures whereas effects on explicit measures were nonsignificant in two studies and only marginally significant in one study. When trainings directly focus on dysfunctional automatic associations rather than on complex propositional self-reflections, their effects become primarily visible in implicit measures that assumably assess the respective automatic associations. It should be noted as a limitation of the current studies that the interventions contained relatively few

trials. Future studies should therefore explore whether larger and more robust intervention effects can be obtained with more intense interventions (for an overview of studies using evaluative conditioning procedures, see Hofmann, De Houwer, Perugini, Baeyens, & Crombez, 2010). Future studies may also examine whether there is a time point where the effects of the cognitive trainings become evident not only on the implicit but also on the explicit measures. The lack of implicit-explicit congruency of social rejection measures indicates that they represent two rather independent and different forms of social rejection concerns that also call for different intervention approaches.

Importantly, future studies should also explore the effects of the cognitive training tasks on behavioral indicators of social anxiety. Given that predictive validity of implicit social rejection measures for the prediction of anxious behavior over and above explicit measures was shown in several studies (for an overview, see Schnabel & Asendorpf, 2010) it seems reasonable that intervention effects can be obtained also on behavioral measures. Most importantly, analyses of more spontaneous behavior might indicate effects of the cognitive trainings that are not captured by explicit measures but that are accompanied by effects on the implicit measures. Additionally, future studies may explore effects of cognitive trainings on physiological, including neurophysiological, measures that may serve as an indicator of spontaneous anxiety during social stressor tasks.

Another starting point for future studies may be the development of additional cognitive trainings. Motivation from participants may be improved by offering them more variability in the daily trainings that nevertheless all aim to strengthen the participants' self-confidence and their feelings of acceptance in social situations. Also, effects of the Attentional Training Task in Study 3 may be increased by using only two faces—one photo of a smiling person and one photo of a rejecting person—instead of 15 rejecting and 1 smiling face. Even though Dandeneau and colleagues (2007) could not show any effects by simply watching at the matrices of rejecting and smiling faces in a normal student sample, highly socially-anxious participants might have been made anxious by the amount of rejecting faces in the current training. Thus, a future study should explore whether training effects may be improved by using matrices with only two faces. Two previous studies used an attention modification program with only one threatening face and one neutral face per trial and trained participants to pay attention to the neutral face.

Participants of the attention modification program showed significantly less attention bias to threat, lower levels of anxiety during a public speech, and better observer-rated speech performance (Amir, Weber, Beard, Bomyea, & Taylor, 2008). When the attention modification program was repeated in eight 20-min training sessions over a 4-week period it reduced clinician- and self-reported symptoms of social anxiety and symptom reduction was maintained at a 4-month follow-up assessment (Amir et al., 2009).

With respect to clinical implications, the current results corroborate the crucial role of rejection biases and attention to negative feedback in social anxiety. Whereas Clerkin and Teachman (2010) used a pictorial conditioning task in order to decrease rejection and to foster acceptance associations, Study 1 and Study 2 used a verbal conditioning task that likewise was able to significantly reduce implicit social anxiety. Results are consistent with studies showing the importance of reducing negative interpretation bias of ambiguous information in people high in social anxiety in favor of more positive or at least neutral interpretations (Beard & Amir, 2008; Mathews et al., 2007). Whereas other studies showed positive effects of attention modification programs on explicit social anxiety, Study 3 is the first study to show reduction effects on implicit social anxiety. Social psychology literature is packed by experiments that explore short-term effects of all kinds of situational manipulations on various dependent variables. Studies that examine intervention effects over a longer time frame—even only over the relatively short period of one week—are scarce. When we want to learn more about the long term effects of the manipulations that are elaborately studied in countless experiments we have to put more time and effort in long term studies. These long term studies will permit the exploration of when stable situational conditions transform into stable individual differences. This will effectively result in work carried out at the intersection of social, personality, and clinical psychology.

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