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How badly will I feel if you don't like me?:

Social anxiety and predictions of future affect

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Abstract

The current study investigated whether high and low socially anxious individuals would show differences in affective forecasting accuracy (i.e., the prediction of emotional states in response to future events) to positive versus negative social evaluation. High (n=94) and low (n=98) socially anxious participants gave a speech and were randomly assigned to receive a positive or negative evaluation. For affective forecasts made proximally (moments before the speech), those low in social anxiety overpredicted their affect to a greater extent to a negative evaluation versus a positive evaluation. In contrast, those high in social anxiety overpredicted their affect to positive and negative evaluations comparably, and failed to adjust their prediction for a future hypothetical negative evaluation – in effect, not learning from their prior forecasting error. Results suggest that affective forecasting biases deserve further study as a maintaining factor for social anxiety symptoms.

Keywords

affective forecasting; social cognition; emotion regulation; social anxiety

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Social anxiety (SA) is a disorder marked by negative self-perceptions and avoidance of social situations, which can greatly impair quality of life and relationships. Cognitive theories and research demonstrate that SA is associated with a number of cognitive processing biases (Clark, 2001; Heimberg, Brozovich, Rapee, Hofmann, & DiBartolo, 2010), such as exaggerating the likelihood of anticipated negative outcomes (e.g., Gilboa-Schechtman, Franklin, & Foa, 2000) and interpreting ambiguous situations negatively (e.g., Beard & Amir, 2010). However, what remains largely unknown is how errors in affective forecasting (i.e., predictions about affective reactions to future events) may be associated

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with SA. Understanding these errors may help explain why individuals high in SA persist in avoiding social situations. Using an experimental design, the current study is the first to investigate whether high and low levels of SA are associated with how individuals forecast their affective reactions to positive versus negative social performance outcomes. We also investigate whether high and low SA is associated with difficulties learning from prior affective experiences to improve future forecasts.

Normative Affective Forecasting Biases and Interpersonal Contexts

Affective forecasting refers to people's predictions of how they will experience emotions (Wilson & Gilbert, 2005), usually the intensity of positive or negative affective states. A consistent finding in the affective forecasting literature is that, in general, people overestimate the intensity and duration of their affective reactions to both positive and negative future events, a phenomenon known as *impact bias* (Gilbert & Wilson, 2007). For instance, we might overestimate both our happiness following a win by our favorite football team (Wilson, Wheatley, Meyers, Gilbert, & Axsom, 2000) and our distress following a breakup (Gilbert, Pinel, Wilson, Blumberg, & Wheatley, 1998). Importantly, forecasting biases are normative and may actually be adaptive (e.g., Boyer, 2008; Miloyan & Suddendorf, 2015). Overestimating the emotional impact of future events may increase motivation to pursue positive outcomes given their potential to bring pleasure (Loewenstein, O'Donoghue, & Rabin, 2003), and, likewise, may increase avoidance of negative future events given their potential to cause pain (Wenze, Gunthert, & German, 2012).

Research has found that individuals normatively show greater impact bias for negative than positive events (i.e., overpredicting the intensity of negative affect to a greater degree than positive affect; Coteţ & David, 2016), which is due in part to people's high motivation to interpret negative events in ways that minimize their psychological impact (Wilson & Gilbert, 2003). For example, when thinking about how they would feel after receiving a negative evaluation, people generally fail to anticipate the ease with which they will rationalize their failure, such as by blaming an unfair evaluator. Along these lines, it is also known that people tend to weight potential losses more heavily than gains when making affective predictions (e.g., loss-aversion forecasting; Kermer, Driver-Linn, Wilson, & Gilbert, 2006). For example, research finds that participants expect a gambling loss to impact their mood more strongly than a win, when in fact the impact of losing or winning equally impacts their mood (Kermer et al., 2006).

Social Anxiety and Affective Forecasting

Given fear and avoidance of social evaluation are at the core of social anxiety disorder, we focused on forecasting accuracy of affective intensity for positive and negative social evaluation. We considered two competing predictions for affective forecasting accuracy in SA. On the one hand, those high in SA may consistently overestimate to a *greater* extent how negative they will feel following a negative social interaction, relative to how positive they will feel following a positive social interaction. This hypothesis follows from cognitive models of SA noting that individuals high in SA develop pervasive negative biases about their past, current, and future social performance, that contribute to fear and avoidance of social situations (Clark, 2001; Heimberg et al., 2010). For example, studies on *expectancy bias* typically present participants with scenarios describing a future social event for which the outcome is uncertain, and then ask them to rate the likelihood that the event will go poorly, finding that SA is associated with an inflated estimate of the likelihood of social events turning out badly (Foa, Franklin, Perry, & Herbert, 1996; Gilboa-Schechtman et al., 2000; Lucock & Salkovskis, 1988; Reiss, 1991). This same expectancy bias for negative (but not positive) experiences may contribute to overpredicting how badly one will feel in social contexts, though little research has examined *accuracy* of affective predictions.

On the other hand, those high in SA may equally overestimate the intensity of their affective reactions to positive versus negative social evaluations, meaning they would not experience the relief that follows the typical experience of having a greater impact bias for negative than positive events (i.e., the chance to see that one is overpredicting negative reactions to a greater extent than positive reactions). This could occur because those high in SA may not possess the typical psychological defenses (e.g., blaming others, rationalizing rejection) that protect people from suffering when bad social outcomes occur. The propensity to overpredict negative and positive affect equally may contribute to fear and avoidance of social interactions if the gap between (over)predicted versus actual affect following positive social interactions is not smaller than the equivalent gap following negative interactions. This fits with work showing the lack of a normative positivity bias among those high in SA (e.g., persons low in SA recollected their past performance feedback as better than it actually was, but this positive bias was not evident for those high in SA; Cody & Teachman, 2010), which could lead to interpreting one's social "success" in a less positive light. Such a pattern would also fit with previous work showing a fear of positive evaluations among individuals with social anxiety (Weeks, Heimberg, Rodebaugh, & Norton, 2008), which could also lead to less positive affect following social success.

Although some research has examined affective forecasting tied to psychopathology (e.g., Marroquín & Nolen-Hoeksema, 2015; Wenze et al., 2012; Yuan & Kring, 2009), only two studies have examined affective forecasting *biases* (i.e., accuracy of predictions) in SA. Martin and Quirk (2015) used experience sampling to examine predicted (in mid-January) and experienced pleasurable emotions on Valentine's Day and St. Patrick's Day, finding that high SA was associated with worse accuracy than low SA for negative affect for St. Patrick's Day, but not Valentine's Day, perhaps because of the social threat of large gatherings specific to St. Patrick's Day. Arditte Hall et al. (2018) utilized an experimental design and found partial support that severity of SA was associated with the tendency to overestimate negative affect; the study did not examine comparable impact biases for positive outcomes. To our knowledge the present study is the first to experimentally manipulate feedback and examine forecasting biases for unambiguously positive *versus* negative interpersonal events using an experimental laboratory design. This is also the first study to examine affective forecasting biases in SA using both near and far temporal distance from the target event (i.e., the time between the prediction and the experience).

Affective Predictions and Temporal Distance from a Social Outcome

In social psychology, construal level theory contends that how people think about events depends on how distant those events are in the future (Trope & Liberman, 2003, 2010). Events far in the future are likely to be thought of in more abstract terms than are events in the near future. Applied to social situations, this suggests affective forecasts of distant future events might focus more on the general outcome of a social event rather than on specific details about that event. One might expect this more general focus to reduce the likelihood of considering contextual details, such as other factors that may influence emotions at that time, resulting in larger impact biases. That is, a positive social evaluation may be represented more positively, and a negative social evaluation represented more negatively, in the distant (vs. near) future. However, the associations between SA, temporal distance, and impact bias have yet to be fully examined. To address this issue, the current study examines two versions of affective forecasts differing in temporal distance from the target event: distal predictions made early in the semester, and proximal predictions made just prior to an anticipated social outcome.

Learning from Past Affective Reactions to Social Experiences

A vexing question is why individuals high in SA avoid social situations even after *successful* social outcomes. As Baumeister and colleagues (2007) have argued, one function of conscious emotion during an experience is to create emotional ‘residues’ that trigger automatic affective reactions when faced with similar situations in the future. It is possible that SA inhibits the development or application of these residues in a normative way, preventing individuals from implementing what they learned affectively from a given experience to make optimal decisions about the future. Regarding affective forecasting specifically, although there is some evidence to suggest that prior experience in healthy populations can lead to greater forecasting accuracy for negative events (Wilson, Meyers, & Gilbert, 2001), people generally have difficulty learning from their own emotional reactions (Ayton, Pott, & Elwakili, 2007), likely in part due to memory errors (e.g., Meyvis, Ratner, & Levav, 2010). Given research showing that SA is associated with poorer memory for positive aspects of past social performance (Cody & Teachman, 2010), it could be that high SA individuals are especially poor at adjusting their forecasts due to memory biases. To our knowledge, however, no studies have examined individual differences in psychopathology symptoms in forecasts made directly after an affective experience. Thus, the current study will test whether and to what extent those high and low in SA draw upon their affective reactions to social evaluations when making affective predictions for essentially identical future evaluations.

Overview and Study Hypotheses

The present research tested hypotheses about whether patterns of affective forecasting accuracy following positive versus negative evaluations differ for high and low SA individuals and, if so, whether these differences vary depending on valence of, and temporal distance from, the social outcome. For those low in SA, we hypothesized that, based on evidence from normative forecasting biases, for both distal and proximal forecasts, there would be a greater discrepancy (i.e., greater inaccuracy) between forecasts and actual affect following a negative evaluation than a positive evaluation. We tested competing hypotheses for those high in SA. Based on research showing that SA is associated with selective biases for negative stimuli, these individuals may show a greater discrepancy between predicted and actual affect for a negative versus positive evaluation. Alternatively, based on theorizing that those high in SA may lack normative (typically self-serving) biases, it may be that these individuals show equal discrepancies in forecasting accuracy for positive versus negative events. Finally, we tested whether participants adjusted their hypothetical predictions for future evaluations based on previous affective experiences.

The present research extends existing research in a number of important ways. If differences in positive and negative affective prediction accuracy are indeed a marker of SA, and SA is associated with difficulty learning from past successful experiences, it could help explain why SA individuals desperately and repeatedly avoid future social situations. For example, your decision about whether to go to a party may hinge on (exaggerated) beliefs about how badly you will feel if no one wants to talk to you at the party.

Method

Participants

In total, 192 participants (94 High SA, 98 Low SA) completed the study in exchange for course credit or payment. Participants were selected based on answers to a screening survey at the start of the semester that included the 20-item Social Interaction Anxiety Scale (SIAS) and a single item from the Social Phobia Scale (SPS) specifically assessing anxiety about public speaking ("I get tense when I speak in front of other people"; Mattick & Clarke, 1998). The SIAS has demonstrated good internal consistency (αs=0.88–0.93) and test-retest reliability (r=0.92), and has been shown strong ability to discriminate between individuals with social anxiety disorder and those with other clinical disorders or in normal samples (Heimberg, Mueller, Holt, Hope, & Liebowitz, 1992; Mattick & Clarke, 1998). Although only a single item from the SPS was used as a means to increase the likelihood that participants would respond to the experimental manipulation (i.e., videotaped speech), this scale also has shown strong reliability and validity in prior studies. The internal consistency of the SIAS and SPS items in the current sample was high (α=0.97). Those with SIAS scores less than or equal to one-quarter of a standard deviation (17 or under) below the mean of a previous undergraduate sample (M=19.0, SD=10.1; Mattick & Clarke, 1998) and who rated the public-speaking item as 0 (*not at all*), 1 (*slightly*), or 2 (*moderately*) were eligible for the Low SA group. Those scoring greater than or equal to one standard deviation (30 or greater) above the previous undergraduate mean on the SIAS and who rated the public-speaking item as 3 (*very*) or 4 (*extremely*) were eligible for the High SA group. This sample selection method is very similar to prior research (e.g., Clerkin & Teachman, 2010; Cody & Teachman, 2010, 2011) except the low SA group threshold was adjusted to be closer to the mean to allow for adequate recruitment and to reflect a relatively normative sample with respect to social anxiety. The mean SIAS score for the high SA group (45.9, SD=10.6) was close to the mean reported for a socially phobic sample (Heimberg et al., 1992), suggesting a strong analog sample.

Five participants, all in the high SA group, were excluded from analyses: three participants declined to give consent for use of their data after being told during debriefing of the study's use of deception; two additional participants elected not to complete the speech and therefore were not given evaluations. Thus, the final sample used for analyses consisted of 187 (70.4% female) participants. Participants ranged in age between 17–38 years (*M*=19.24, *SD*=1.84) and self-reported their race as 73.8% White, 13.4% Asian, 6.4% Black, 3.7% multiple races, 2.1% other, and 0.5% declined. The sample reported their ethnicity as 90.9% Non-Hispanic/Latino, 7.0% Hispanic/Latino, and 2.1% declined to answer. See Table 1 for additional participant characteristics by condition.

Measures and Tasks

Speech task.—Participants were told researchers are interested in learning how people perceive and predict their own speaking ability, utilizing a set of guidelines for effective speaking that the researchers are developing. Social anxiety was not mentioned and participants did not know why they were invited to participate. Participants were then instructed to give a 4-minute speech to the best of their ability on things they liked and disliked about college or their hometown in front of a cassette video camera, with a web camera, which was used for actual recording, mounted on top. They were told the speech was being videotaped so that another researcher in an adjacent room would be able to watch and evaluate their performance. Videotaping was done to make the cover story as believable as possible and to heighten the participant's anxiety (following Dickerson & Kemeny, 2004). Participants were told they would receive feedback from the experimenter immediately following the speech on how well they did on the speech compared to other people. If a participant paused for a significant period of time during the speech, the experimenter reminded the person to continue talking for the full time.

Performance evaluation.—The speech performance evaluation form was supposedly being completed by the researcher in an adjacent room to assign each participant to one of three percentile rankings: *Above Average (top 33%)*, *Average (middle 33%)*, or *Below Average (bottom 33%)*. In fact, participants were randomly assigned beforehand to receive either a positive (*Above Average*) or negative (*Below Average*) rating. Participants were told that the percentile ratings were relative to a standardized sample of university students of similar ages and abilities. Participants were given a preview of how each evaluation would look beforehand so there was no confusion about their assigned rating upon receiving the evaluation (see Appendix)[1]. The use of a standardized performance evaluation parallels existing social psychological research on affective forecasting in which outcomes are unambiguously positive or negative (Wilson & Gilbert, 2005). By explicitly defining the valence of the target social event (i.e., providing an unambiguous outcome), we aimed to minimize variance from differences in interpretation of the event.

[1]Note, the first 23 participants received a slightly different version of the evaluation in which rankings were split into five, instead of three, percentile rankings, each purportedly containing 20% of the standardized sample. Among these participants, those in the positive evaluation condition received a *Far Above Average (top 20%)* rating and those in the negative evaluation condition received a *Far Below Average (bottom 20%)*. Researchers made the decision to reduce the number of ranking tiers from five to three after a large proportion of these early participants reported suspicion about the validity given the perception that they were overly extreme. The primary analyses were rerun excluding these participants. The overall pattern of results did not change.

Affective intensity ratings—General affect and specific emotion ratings (which, for simplicity, will now be collectively referred to as affect ratings) were administered and recorded using Qualtrics (2009), a web-based survey data collection tool. Participants were asked to provide scale ratings for four affective domains: positive/negative feelings, happy/sad, calm/anxious, and self-assured/ashamed. Each affective scale utilized a visual analog scale (VAS) in which participants used a mouse to indicate their level of affect intensity (e.g., from *Extremely calm* to *Extremely anxious*). The middle of the scale was labeled as neutral (e.g., *Neither calm nor anxious*). Each scale was coded on a 200-point range (−100 to +100); however, only the three labels were visible. The goal of using a VAS for emotion ratings was to minimize any influence that knowledge of one's specific previous ratings could have on subsequent ratings, and the VAS has demonstrated good reliability and validity as a measure of state mood (Abend, Dan, Maoz, Raz, & Bar-Haim, 2014). Participants gave affect ratings at two different times during the study: prior to the speech task and following the speech task. After the speech task, participants were again asked to predict their future affect but for the same task hypothetically occurring in the future.

Expectations and reactions to the speech.—Participants were asked several questions to better understand their expectations about and reactions to the speech task and evaluation. Immediately following the speech, participants were asked to rate the extent to which their performance reflected their true public speaking ability on a 5-point Likert scale (*Not at all* to *Extremely*). After receiving their speech evaluation, participants were asked to use 5-point Likert scales to rate the importance of public speaking ability on their self-image (*Not at all* to *Extremely*).

Subjective distress.—Participants were asked to rate their level of anxiety on a scale between 0 (no anxiety) and 100 (highest anxiety imaginable) at the start and end of the study, as well as after receiving and reporting their affect ratings in response to the speech evaluation. If a participant's score was greater than 20 points above his or her baseline score after the speech ratings and evaluation and/or at the end of the study, relaxation exercises were performed until the participant's anxiety was reduced to within at least 20 points of baseline anxiety. This single-item distress scale was solely used to assess whether it was necessary to reduce participants' distress as a result of the speech task manipulation. Note that the relaxation exercises were administered only after participants reported their affect in response to the speech evaluation, meaning such exercises were not intended to influence key affect ratings in this study. Only one participant required relaxation exercises at the end of the study due to mild distress (score of 30 out of 100).

Procedure

Screening at start of semester.—Participants in Introductory Psychology and other lecture-based psychology classes were invited to complete an online screening battery to determine their eligibility for psychology studies to be completed during the semester. Specific to this study, in addition to completing the SIAS and SPS, participants were asked to complete intensity ratings of their current affect. They were then provided the following instructions: "Imagine that you have come to the Psychology Dept. to participate in a study in which researchers want to learn more about how people perceive their public speaking ability. The experimenter tells you that you will give a brief 4-minute speech on a topic that will require you to talk about yourself. During your speech, a video camera will record you so that a trained researcher in an adjacent room can watch and evaluate your speech performance using a set of established criteria. Following the speech, you will be handed an evaluation that tells you how well you did relative to other college students, assigning you one of three possible ratings." They were then presented with a template of the supposed evaluation form (see Appendix) and then asked to: "Indicate how you think you would feel if you received an [Above Average; Average; Below Average] rating on your performance." Comparable levels of detail about the speech task and evaluation process were provided during screening and during the actual lab visit. The average time between taking the screening survey and completing the actual lab study was 66 days (range: 9 to 92 days) [2].

Laboratory visit.—Following informed consent, participants were asked to complete intensity ratings of their current affect to establish a baseline measure prior to learning more about the speech task. The experimenter then described the speech task and showed the participant a blank speech evaluation sheet. Participants completed affect predictions for intensity to measure predicted affect if they received an average, above average, or below average evaluation. They then completed the speech task.

Following the speech, participants were told it would take the evaluator five minutes to finish their scoring, and the experimenter left the room to allow the participant to rate the peak intensity they actually felt during the speech, and to complete several more questionnaires. Once participants were finished with the next set of questionnaires, the experimenter re-entered the room and handed the participant his or her folded speech evaluation sheet with the performance rating circled in red. Participants were again asked to rate their current affect after receiving the evaluation, which represented their actual affect. Participants were then asked to make the same set of affective intensity predictions for a future hypothetical scenario in which they completed the identical speech task in the future and received various possible evaluations (positive, negative, and average). Specifically, they were instructed to: "Imagine the situation in which you were scheduled to come back to the lab two months from now to give a speech similar to the one you did today. The setup would be the same. You would be asked to speak for 4 minutes and a researcher in another room would give you an evaluation of your speaking performance. Indicate how you think you would feel if you received an [Above Average; Average; Below Average] rating on your performance."

Prior to the final study debriefing, participants received a funnel debriefing interview (adapted from Aronson, Ellsworth, Carlsmith, & Gonzales, 1990) designed to assess awareness of the deception used in the speech evaluation in a non-leading manner. After the speech and at the conclusion of the study, participants were assessed for subjective distress and, if distress was still elevated relative to baseline, guided through a relaxation exercise.

[2]The variability between baseline survey and lab experiment was due to the fact that all participants were recruited based on their answers to a preselection survey uniformly administered at the beginning of the academic semester, whereas participants were scheduled and run in the lab study throughout the semester. Study conditions did not significantly differ in terms of mean time between preselection and lab study, and results did not change when days since preselection survey was entered as an additional covariate in the main analyses

Experimenters were blind to participants' evaluation condition and SA group status throughout the study.

Data Preparation and Plan for Analysis

Prior to testing the primary questions about affective forecasting, a principal components analysis (PCA) with oblique rotation (promax) was conducted to determine to what extent the four affect ratings (i.e., happy/sad, positive/negative, calm/anxious, self-assured/ ashamed) should be examined separately or combined. (See Table 2 for raw affect ratings by condition, group, time point, and affect type, with between-group significant differences noted.) When examining affect ratings separately at multiple time points, only one component had an eigenvalue over Kaiser's criterion of 1 in each instance (explaining between 64.01% and 85.53% of the variance at each time point). Further, zero-order correlations between affect types at each phase were very high, indicating a large amount of shared variance between them (e.g., *r*s=.50, .80, and .75, at baseline, proximal prediction, and actual affect after the feedback induction, respectively). Based on these analyses, all ratings of affect dimensions were combined into a single composite positive/negative affect score (i.e., mean of 4 specific affect types).

To test accuracy of affective ratings following the speech evaluation, a 2 (SA Group: high, low) × 2 (Evaluation Condition: positive, negative) two-way independent Analysis of Covariance (ANCOVA) was conducted separately for both distal and proximal forecasts. These analyses allowed for comparisons of affective biases *across* feedback conditions, as a direct test of whether forecasting biases for those high and low in SA differ for positive and negative events. For each ANCOVA, SA Group, Evaluation Condition, and their interaction served as between-subjects factors, and difference scores between predicted and actual affect (i.e., affective forecasting bias) served as the dependent variable. Note, we focused on the difference scores for these tests so we could have a direct measure of bias, but we first conducted repeated-measures ANOVAs to confirm the previously-established finding that predicted affect was greater than actual affect in all cases. Also, difference scores between predicted and actual affect were chosen as the outcome variable, as opposed to controlling for actual affect and then predicting predicted affect. The reason for this is actual affect was associated with SA group, which meant the covariance between these variables would have obscured results had they been entered into an ANCOVA model as a covariate and predictor, respectively (Miller & Chapman, 2001). Affect scores in the negative evaluation condition were reverse-coded from those in the positive evaluation condition so that evaluation condition could be examined as a between-subjects factor. To increase confidence that our effects for accuracy were not merely due to differences in baseline affect at the time the predictions were made, baseline affect when distal predictions were made was entered as a covariate in the ANCOVA examining distal forecasting accuracy, and baseline affect when proximal predictions were made was entered as a covariate in the ANCOVA examining proximal accuracy. Partial r^2 values (η_p^2) were used to estimate effect sizes for the regression models, and 90% confidence intervals for the effect sizes were provided (which are conceptually equivalent to 95% confidence intervals for traditional tests of significance).

To better characterize any significant Group × Evaluation Condition interactions, follow-up one-way ANCOVAs were conducted, first with SA Group predicting affective forecasting bias for each Evaluation Condition separately, and second with Condition predicting forecasting bias for each SA Group separately. Each one-way ANCOVA had either proximal or distal baseline affect entered as a covariate. In addition to homogeneity of regression slopes, a key assumption of ANCOVA is that predictors and covariates are independent, which, if violated, can obscure results (Miller & Chapman, 2001). Given concerns that SA group and baseline affect were moderately correlated (r=.36, p<.01), ANOVAs were rerun without including baseline affect as a covariate. Results did not substantially change when not controlling for baseline affect.

To examine group differences in learning (i.e., the effect that the speech evaluation feedback had on future hypothetical predictions), a 2 (SA Group: high, low) × 2 (Evaluation Condition: positive, negative) two-way independent ANCOVA was performed. Difference scores between the proximal predictions made for the original speech and the hypothetical future predictions served as the dependent variable, SA Group and Condition served as between-subjects factors, and Actual Affect (centered) entered as a moderator. Actual affect was included to test the extent to which participants took into account their actual affective reactions (and presumably any difference between predicted and actual affect) to adjust future hypothetical predictions. Baseline affect at the time of proximal prediction was also included to ensure any observed effects were not due to any baseline affect differences. Proximal predictions, as opposed to distal predictions, were chosen as the comparison precisely because these were made in very close temporal proximity to the hypothetical predictions. This minimized the possibility that any observed discrepancy between the two could be attributed to memory effects, instead reflecting unwillingness or inability of participants to draw from their very recent experience to inform their next prediction.

Results

Sample Characteristics

As determined during screening, participants in the high SA group had significantly higher SIAS scores (M=46.31, SD=10.66) than the low SA group (M=10.32, SD=5.40), t(186)=29.44, p<.001, d=4.31, and also endorsed greater anxiety about public speaking (i.e., SPS item; M=3.48, SD=0.50) than did the low SA group (M=0.69, SD=0.70), t(186)=31.13, p<.001, d=4.56. SIAS and SPS scores did not significantly differ between the positive and negative speech evaluation conditions within either the high SA, t(87)=0.08–0.99, p=.327-.933, d=0.02–0.21, or low SA, t(96)=0.20–0.74, p=.461-.841, d=0.04–0.15, groups, suggesting random assignment was successful. Further, as presented in Table 1, there were no significant differences across the four cells (i.e., high SA-positive, high SA-negative, low SA-positive, low SA-negative) in age, F(3, 183)=0.27, p=.847, η^2=.01; gender, χ^2(3, N=187)=3.89, p=.273, φ=.14, ethnicity, χ^2(3, N=187)=1.32, p=.726, φ=.08; or race (comparing White to non-White participants), χ^2(3, N=186)=2.68, p=.443, φ=.12.

Deception Check and Validity of Social Stressor Task

To identify participants who did not believe the deception involving the speech evaluation, four research assistants served as independent raters who reviewed each participant's funnel debriefing interview and were blind to participants' SA group status and condition. Raters were instructed to make a dichotomous decision for each participant regarding whether suspicion about the speech evaluation was substantive enough to compromise the validity of his/her affect ratings. Overall, inter-rater reliability was strong (ICC=.867). Cases that had perfect (91.4%) or majority (i.e., 3 out of 4) agreement (7.0%) were coded with the more strongly endorsed decision; a fifth rater served as the tiebreak vote in the three cases (1.6%) in which rater agreement was split (i.e., 2 yes/2 no). Among the 187 total participants who completed the speech and affect ratings, raters identified 39 participants whose suspicion about the speech evaluation may have significantly impacted the validity of their affect ratings. Therefore, the deception was concluded to be successful for 79.1% of participants. No notable differences were found between analyses including vs. excluding suspicious participants (i.e., effect sizes were commensurate), so results are reported for the full sample.

The *Expectations and reactions to the speech* items were examined to confirm validity of the speech task and subsequent performance evaluation as a meaningful social stressor, and to test for SA group differences. On average, participants reported that the speech they gave was moderately representative of their true speaking ability (M=3.16, SD=0.81 on 1 to 5 scale), and there was no significant difference between SA groups on this rating, $t(185)=1.61$, $p=.110$, $d=0.24$. Further, on average, participants reported that public speaking ability had a moderately important impact on their self-image (M=3.31, SD=1.05 on 1 to 5 scale), suggesting it was a personally significant task. Taken together, these results indicate that the speech and its evaluation likely served as an appropriate and personally relevant social stressor, given that participants felt their speeches reflected their actual ability fairly well and that the task assessed an ability to which they assigned importance.

Proximal Affective Forecasting Bias Following Speech Evaluation

When testing the accuracy of affective ratings following the speech evaluation for proximal predictions, analyses revealed no main effects of SA Group, $F(1, 182)<0.01$, $p=.97$, $\eta_p^2<.01$, 90% CI [.000; .002], or Evaluation Condition, $F(1, 182)=1.19$, $p=.28$, $\eta_p^2=.01$, 90% CI [.000; .039], but there was a significant Group × Condition interaction, $F(1, 182)=4.99$, $p=.027$, $\eta_p^2=.03$, 90% CI [.002; .076], suggesting that the high and low SA groups differed in their accuracy depending on the evaluation condition. As seen in Figure 1A and confirmed by follow-up tests controlling for baseline affect, the low SA group showed the normative larger negative forecasting bias (in the negative evaluation condition; M=16.60, SE=3.30) than positive forecasting bias (in the positive evaluation condition; M=5.81, SE=3.24), $F(1, 95)=6.42$, $p=.013$, $\eta_p^2=.06$, 90% CI [.007; .152]. However, magnitude of proximal bias for the high SA group did not differ between the negative evaluation (M=9.55, SE=3.63) and positive evaluation (M=13.15, SE=3.27) conditions, $F(1, 86)=0.60$, $p=.187$, $\eta_p^2<.01$, 90% CI [.000; .062], and means were actually in the opposite direction. There were no significant differences by SA group when examining negative condition, $F(1, 85)=0.49$, $p=.488$, $\eta_p^2<.01$, 90% CI [.000; .059], and positive condition, $F(1, 96)=0.86$, $p=.356$, $\eta_p^2=.01$, 90% CI [.000; .063], separately. These results suggest that, consistent with previous research, those low in SA were more inaccurate in predicting how badly they would feel in the negative evaluation condition than how good they would feel in the positive evaluation condition. In contrast, the high SA group did not demonstrate the normative bias of overpredicting negative affect to a greater extent than positive affect, a finding consistent with one of our competing hypotheses, though we recognize the limitations of predicting a null finding.

Distal Affective Forecasting Bias Following Speech Evaluation

Analyses for distal bias revealed no effect of Group, $F(1, 171)<0.01$, $p=.95$, $\eta_p^2<.01$, 90% CI [.000; .003], but a significant main effect of Condition, $F(1, 171)=5.19$, $p=.02$, $\eta_p^2=.03$, 90% CI [.002; .082], such that forecasting bias was larger for the negative (vs. positive) evaluation condition. There was not a significant Group × Condition interaction at $F(1, 171)=3.60$, $p=.06$, $\eta_p^2=.02$, 90% CI [.000; .068], though the result indicated a non-significant trend.

We elected to evaluate the pattern of the interaction given the small to medium effect size and our interest in understanding the pattern to inform future trials, but these analyses should be interpreted with considerable caution. As illustrated in Figure 1B, results for distal bias followed a remarkably similar pattern to that of proximal bias. Specifically, when controlling for baseline affect, the low SA group had a larger distal bias for the negative ($M=34.29$, $SE=4.27$) compared to the positive ($M=14.92$, $SE=4.13$) evaluation condition, $F(1, 88)=10.58$, $p<.01$, $\eta_p^2=.11$, 90% CI [.026; .213], while distal forecasting biases for the high SA group did not differ between the negative ($M=28.75$, $SE=5.08$) and positive ($M=27.05$, $SE=4.57$) evaluation conditions, $F(1, 82)=0.06$, $p=.80$, $\eta_p^2<.01$, 90% CI [.000; .030]. Again, there were no significant differences by SA group when examining the negative condition, $F(1, 79)=1.61$, $p=.21$, $\eta_p^2=.02$, 90% CI [.000; .095], and positive condition, $F(1, 91)=1.45$, $p=.23$, $\eta_p^2=.02$, 90% CI [.000; .080], separately.

Taken together, a pattern emerged such that for proximal forecasts, those low in SA were worse at predicting their reactions to negative versus positive feedback, whereas those high in SA did not show more bias in one evaluation condition over another. (The same pattern was evident for distal forecasts but it did not reach significance.)

Evidence of Learning: Effect of Speech Evaluation on Future Hypothetical Predictions

Recall that near the end of the study (after receiving their bogus speech evaluation and rating their actual affect), participants again predicted their affect based on how they expected they would feel if they did the speech again and received the same evaluation. When testing whether participants ‘learned’ from their immediately-prior affective experience, analyses revealed no main effects of SA Group, $F(1, 179)=1.27$, $p=.26$, $\eta_p^2=.01$, 90% CI [.000; .041], or Condition, $F(1, 179)=1.06$, $p=.31$, $\eta_p^2=.01$, 90% CI [.000; .038], but a significant main effect of Actual Affect, $F(1, 179)=4.91$, $p=.03$, $\eta_p^2=.03$, 90% CI [.002; .076], indicating that how participants felt following the speech evaluation influenced the extent to which they adjusted their hypothetical future prediction. Importantly, there was a significant Group × Condition × Actual Affect interaction, $F(3, 179)=11.28$, $p<.01$, $\eta_p^2=.16$, 90% CI [.076; .229]. To examine this interaction, one-way ANCOVAs were performed within each evaluation condition, with SA Group as the between-subjects factor and Actual Affect entered as a moderator. There were main effects of Actual Affect in both conditions (in line with the main effect reported above) as well as a significant Group × Actual Affect interaction in the negative condition, $F(1, 84)=8.09$, $p=.006$, $\eta_p^2=.09$, 90% CI [.015; .192], but not in the positive condition, $F(1,84)=0.31$, $p=.577$, $\eta_p^2<.01$, 90% CI [.000; .052]. Because actual affect was a continuous variable, to break down this interaction, linear regressions were performed for each group for the negative condition, with Actual Affect (uncentered) as the predictor and the proximal-hypothetical future difference score as the criterion. Actual Affect was a significant predictor for the low SA group in the negative condition, $B=0.76$, $SE=0.15$, $p<.001$, $R^2=.37$, 90% CI [.186; .509], but not the high SA group, $B=0.17$, $SE=0.15$, $p=.244$, $R^2=.04$, 90% CI [.000; .167], indicating that the actual affective experience influenced subsequent predictions in the negative speech condition (indicating learning) only for the low SA group.

Taken together, these results suggest that the low SA group adjusted their hypothetical predictions using what they learned from previously receiving a negative evaluation (i.e., using prior experience to decrease expected negative affect for a future situation), while the high SA group did not appear to ‘learn’ from the feedback (Figure 2 is provided to illustrate this difference). Notably, the apparent difference in learning from prior experience was only evident for the negative evaluation condition, suggesting it is not a general learning deficit, but is a bias specific to (likely feared) negative evaluations.

Discussion

The aim of the current study was to examine whether high and low socially anxious individuals differ in their accuracy of predicted positive versus negative affect in response to social evaluation, and if these were influenced by the temporal proximity of the event. Further, we examined whether SA is characterized by a decreased ability to learn from prior affective experiences and forecasting inaccuracies. Results indicated that, for proximal forecasts, those low in SA were worse at predicting their reactions to negative versus positive feedback, whereas those high in SA did not significantly differ in their overpredictions of negative versus positive affect. The fact that the high SA group did not show this normative pattern and failed to adjust their hypothetical predictions for future negative evaluations based on their affective experiences suggests a potential lack of a protective factor among high SA individuals in predicting affect to negative versus positive social situations.

Pattern of Affective Forecasting Biases for High vs. Low Social Anxiety Groups

The finding that both groups overestimated their future positive and negative affect is consistent with prior affective forecasting literature among healthy populations (Wilson & Gilbert, 2005). However, a novel finding was that, for proximal forecasts, only those low in SA demonstrated the normative pattern of overpredicting negative versus positive feedback. (The same pattern was observed for distal forecasts but it did not reach significance.) This finding may reflect the relative inexperience and/or lack of attention paid among low SA individuals to negative (relative to positive) social conditions. In other words, overpredictions of their reactions to negative social outcomes may persist due to having fewer experiences to 'test' and subsequently improve the accuracy of their expectations.

In contrast, those high in SA showed no difference in their ability to forecast how good versus bad they would feel in positive versus negative evaluation conditions, respectively (though we do not want to overinterpret this null finding given there are inevitably multiple reasons a null finding can occur). Whereas we expect most people seek out positive (vs. negative) social interactions because they know they will experience a level of pleasure that is relatively close to their expectations, individuals who are equally accurate in predicting their affective reactions to positive and negative situations may come to develop a lack of approach bias for positive interactions (because such interactions are no more pleasurable than negative interactions are distressing). Such outcomes could be related to a fear of positive evaluations, which has been shown to be tied to social anxiety (Weeks et al., 2008). For example, high SA individuals may experience less positive affect than they expect to experience due to attributing their success to outside factors (e.g., inaccurate evaluator), which may dampen their motivation to pursue positive social experiences in the future. Further, from looking at raw scores (see Table 2), those high in SA both predicted and felt high levels of negative affect in the negative social context. Perhaps anticipating *and* actually feeling high levels of negative affect may result in not receiving sufficient corrective feedback that one was simply overpredicting the consequences of a negative event, despite there being a forecasting bias.

Also, social anxiety-linked patterns of forecasting accuracy were similar whether predictions were made far in advance or just before the social evaluation, suggesting little influence of the temporal distance of predictions (though it should be noted that a comparison between distal and proximal forecasting biases was not formally tested in our analyses). Consistent with construal level theory, which suggests impact biases may increase with temporal distance from the outcome, the effect size for distal accuracy was slightly larger than the effect size for proximal accuracy. That the pattern of effects for positive versus negative conditions (for low and high SA groups) was similar for both distal and proximal predictions makes us more confident in our findings, though we recognize the distal bias was a nonsignificant trend and should not be over interpreted.

Effect of Affective Experience on Learning and Future Hypothetical Predictions

One intriguing possibility of why socially anxious people persist in avoiding social situations is that SA involves deficits in learning from affective experiences, leading to a pattern of inaccurate predictions about the future. Indeed, unlike those low in SA, individuals high in SA did not appear to integrate their affective reactions to negative evaluation when making their future predictions. In other words, they did not utilize the discrepancy between predicted and actual affect when anticipating how they would feel after a similar negative outcome in the future. This is noteworthy given that participants made future predictions for an identical event to the one they experienced no more than 15 minutes prior. Thus, it seems unlikely that this deficit in experiential learning was due to differences in memory for the task, and the fact that this lack of learning was not a factor for the positive evaluation condition suggests it is not a general deficit.

One possibility is that individuals low in SA made a greater mental effort than did those high in SA to consult their earlier experiences when forecasting about future ones (Wilson & Gilbert, 2003). It is possible the high SA group experienced a higher cognitive load as a result of being in a potentially evaluative situation, resulting in fewer mental resources available to consult prior experiences. Another possibility is that because SA is marked by increased social threat perception, individuals high in SA place great value on those emotions they think are most helpful in detecting threat and preparing for worst-case scenarios. As a result, they may be (consciously or unconsciously) reticent to reduce their negative emotional forecasts due to the perceived usefulness of the negative prediction. This account is consistent with motivational accounts in affective forecasting which theorize that individuals make forecasting errors for functional reasons (e.g., to prepare for threat; Boyer, 2008; Miloyan & Suddendorf, 2015). It is also worth considering that the 'learning' difference between the high and low SA groups may be the result of the high SA group anticipating a second negative evaluation as adding "insult to injury" after the first evaluation, rather than merely as a negative evaluation happening "for the first time again." Future work may wish to obtain participants' qualitative descriptions of the reasons for their ratings (to the extent these are available to conscious introspection) to help researchers interpret the ratings.

Regardless of the mechanisms involved, findings from the current research extend those of existing research (Ayton et al., 2007) by suggesting that individuals high in SA are especially poor at learning from affective forecasting errors for negative social situations, leading to forecasting errors that are resistant to modification. The fact that this occurs in the negative evaluation condition likely has especially insidious consequences for persons high in SA because it suggests that even when a negative event was not as upsetting as predicted, high SA individuals are not learning from that experience and still expect the next time to be just as upsetting.

Clinical Implications

Though it will be important to replicate these results before drawing strong conclusions about their clinical utility, we believe the present research has potential implications for clinical interventions and provides promising directions for future research. The finding that individuals high in SA have trouble learning from negative affective experiences in making future predictions suggests that it may be useful to bring increased attention to the discrepancy between the predicted and actual impact of negative evaluations on well-being, which may decrease future avoidance. Ensuring adequate resources are available to recognize and consolidate corrective emotional experiences (i.e., that a negative forecast was biased) may also be helpful. For example, if individuals high (vs. low) in SA experience greater cognitive load following a negative evaluation, this may impair processing of past emotion episodes, so decreasing arousal during post-event processing (e.g., through acceptance-based approaches, like mindfulness) may help individuals absorb information that is inconsistent with their prior beliefs.

One challenge to determining the appropriate target for treatment is whether the null effect between positive and negative forecasting accuracies for those high in SA is due to especially exaggerated predictions (poorer accuracy) for positive events, less exaggerated predictions (better accuracy) for negative events, or both. When looking at raw affect ratings in Table 2, the high SA group appears to exaggerate their positive predictions, relative to their baseline ratings, to a greater extent than the low SA group, perhaps leading to the experience of being 'let down' even when positive social events occur. (This larger difference between baseline and positive prediction for the high SA group may also be due to anticipatory anxiety experienced in advance of the social situation.) This suggests that perhaps socially anxious individuals can be trained to make more accurate predictions about how *good* they will feel in the case of a social *success* in order to mitigate the dejection that occurs when lofty expectations are not met, even though this means making less positive affective predictions. Reducing positive forecast bias could target either the affective predictions (e.g., making less extremely optimistic interpretations about what social success will feel like) and/or affective experiences (e.g., learning to appreciate and make internal attributions for personal social success so that it actually feels better).

Limitations and Conclusions

The current findings should be interpreted in light of several limitations. First, the use of an undiagnosed analogue sample raises the possibility that these findings would not generalize to a clinical population; however, it is noteworthy that the high SA group's mean severity score was close to the clinical cutoff score for a diagnosed sample (Heimberg et al., 1992). Second, we elected to give standardized social performance feedback to provide participants with a clearly positive or negative social outcome. This experimental manipulation, however, may not represent real-world situations, which often lack definitive, "objective" evaluations or outcomes, and may actually downplay the SA affective forecasting effects by reducing the opportunities for interpretative biases to impact forecasting. Future studies that utilize experience sampling techniques to examine bias for naturally occurring social situations would be a nice complement to this experimental approach. Third, it is possible the SA groups interpreted the same evaluation differently, which might have then influenced the evaluations' impact on affect differently. For instance, if the high SA group believed the positive evaluation but, relative to the low SA group, felt they were less deserving of it, this perhaps would have caused their positive reaction to the evaluation to be blunted, thus increasing the forecasting bias for the high SA group in particular. Related to this point, we do not know whether participants' interpretation of the positive speech evaluation was as positive as their interpretation of the negative speech evaluation was negative. Fourth, we did not include an alternate (non-social) high anxiety or other psychopathology group to evaluate the specificity of the observed effects to SA. Examining generalizability of these effects to other clinical populations, especially depression, will be an interesting direction for future research.

In conclusion, the current study is one of the first to examine affective forecasting in the context of social anxiety, and builds on existing research by experimentally manipulating the temporal distance of forecasts, providing unambiguously good or bad outcomes, and examining how these factors influence forecasting accuracy and ability to adjust forecasts based on recent experiences. Although more research is necessary to establish whether changing affective forecasting biases has clinical benefits, the present study highlights the

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value of studying not just current and past experiences of emotion dysregulation in psychopathology, but also predictions about future emotions.

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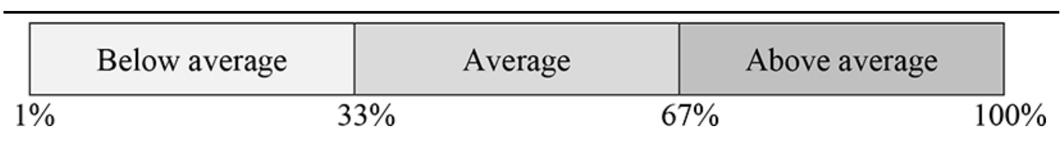
Appendix: Sample Speech Evaluation Form

BRIEF PROFILE RANKING REPORT

The following evaluation is based on the *Speaker Competency Evaluation*, a scoring tool designed to objectively assess public speaking performance across a variety of domains. This tool is intended to measure performance on a specific speech task only, not knowledge or motivation for public speaking in general. The formula used to determine the final overall ranking below is based on assessment of the following competencies weighted in specific ways:

1. Appropriateness of content
2. Organization of ideas
3. Clarity of information
4. Language use
5. Persuasiveness
6. Fluidity of delivery
7. Timing/pausing
8. Eye contact and posture

Compared to a standardized sample of college students (similar to those at the University of Virginia), your speech performance was assigned the following ranking:



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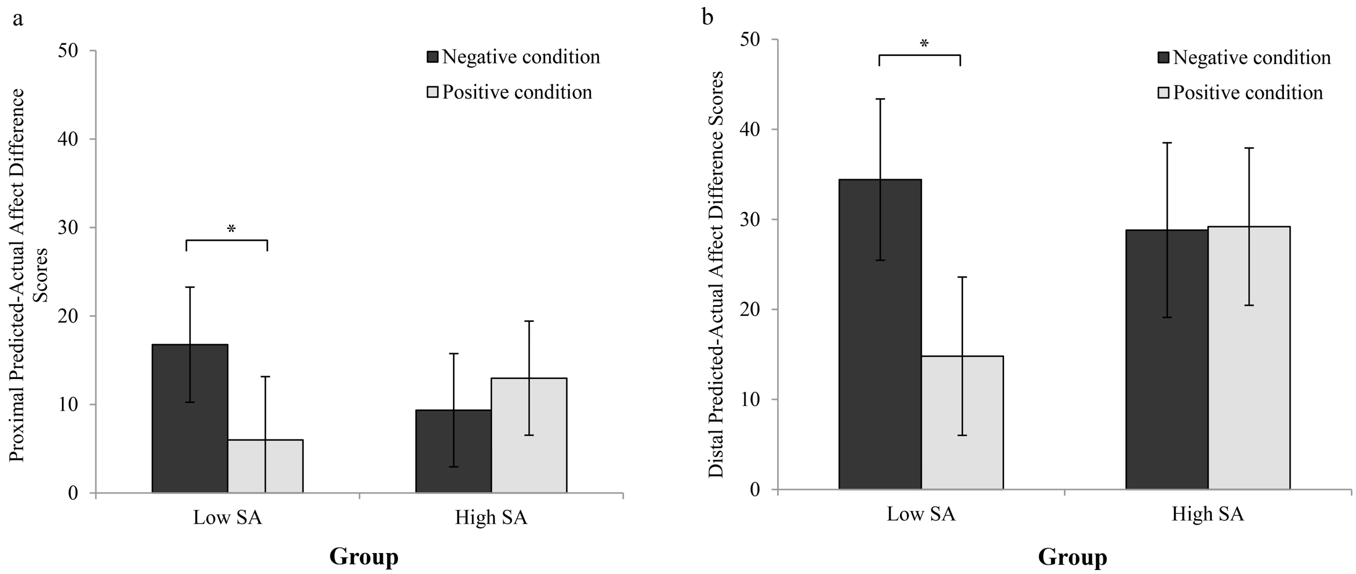

Figure 1.

a. Proximal affective forecasting bias by condition and SA group, adjusted for lab baseline affect. b. Distal affective forecasting bias by condition and SA group, adjusted for preselection baseline affect. Note: Error bars represent 95% confidence interval; * $p < .05$.

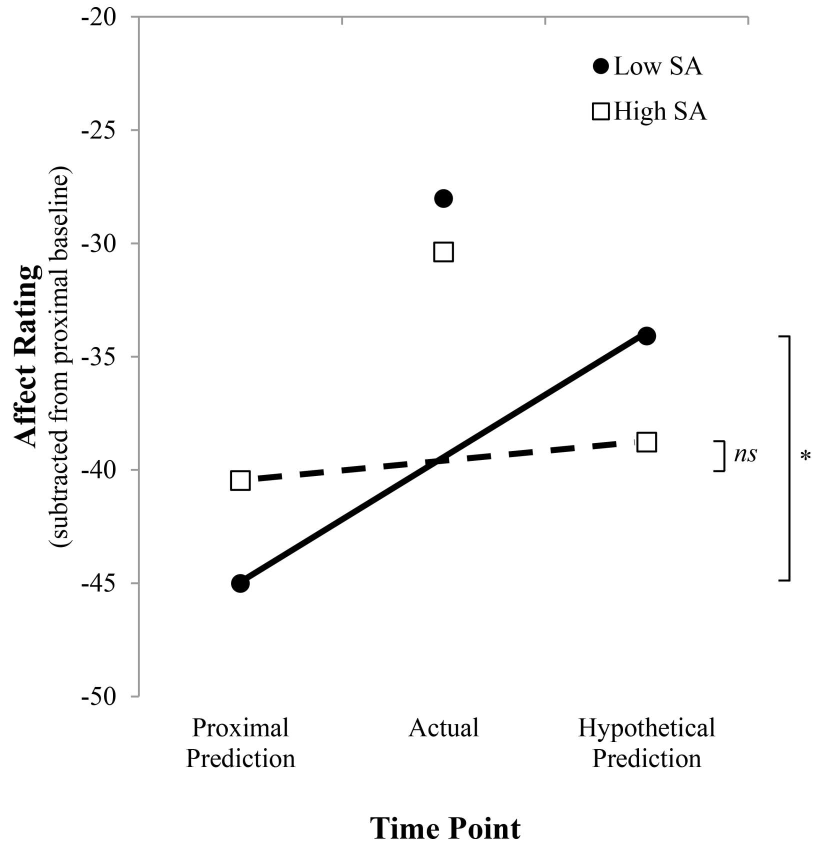

Figure 2.

Effect of predicted-actual discrepancy on future hypothetical predictions by SA group for the negative evaluation condition. Actual rating (middle point) represents affect experienced after the speech evaluation, which should theoretically influence any adjustments made to hypothetical prediction. Note: * $p < .05$.

Table 1

Participant Characteristics

Conditions	Positive Evaluation		Negative Evaluation		Statistic
	Low SA (n = 50)	High SA (n = 49)	Low SA (n = 48)	High SA (n = 40)	
Mean (*SD*) age in years	19.16 (1.27)	19.08 (0.95)	19.40 (1.54)	19.35 (3.18)	$F(3)=0.31$, p=.818, η^2=.005
Sex (% female)	64.0	69.4	68.8	82.5	$\chi^2(3, N=187)=3.89$, p=.273, φ=.144
Ethnicity (%)					$\chi^2(3, N=183)=1.23$, p=.746, φ=.176
Non-Hispanic	6.0	10.2	6.3	5.0	
Hispanic	94.0	85.7	93.8	90.0	
Did not report	0.0	4.1	0.0	5.0	
Race (%)					$\chi^2(3, N=186)=3.13$, p=.372, φ=.275
White	74.0	65.3	81.3	75.0	
Asian	14.0	16.3	6.3	17.5	
Black	8.0	8.2	4.2	5.0	
Multiracial	4.0	2.0	6.3	2.5	
Other	0.0	6.1	2.1	0.0	
Did not report	0.0	2.0	0.0	0.0	
Anxiety Measures - Mean (*SD*)					
SIAS	10.72 (6.62)	46.40 (10.39)	9.91 (3.77)	46.20 (11.12)	$F(3, 183)=287.56$, p<.001, η^2=.825
SPS public speaking item	0.68 (0.74)	3.53 (0.50)	0.71 (0.65)	3.43 (0.50)	$F(3, 183)=121.05$, p<.001, η^2=.841

Note. SIAS = Social Interaction Anxiety Scale; SPS = Social Phobia Scale.

Table 2

Affect Ratings for Positive and Negative Evaluation Conditions

Affect Types	Positive Evaluation: Low SA (n = 50)	Positive Evaluation: High SA (n = 49)	Negative Evaluation: Low SA (n = 48)	Negative Evaluation: High SA (n = 40)
Baseline - Distal (at preselection)	31.59[a] (29.47)	7.03[b] (37.57)	28.25[a] (25.98)	6.74[b] (35.22)
Positive/Negative	30.77 (32.50)	11.18 (37.88)	27.26 (29.42)	5.12 (36.95)
Calm/Anxious	27.09 (43.96)	−1.09 (48.87)	26.38 (38.77)	15.28 (38.98)
Self-Assured/Ashamed	41.27 (31.44)	14.45 (34.33)	37.50 (37.95)	8.38 (39.67)
Baseline – Proximal (start of lab study)	31.81[a] (25.80)	12.35[b] (21.95)	31.60[a] (24.03)	11.27[b] (28.07)
Positive/Negative	28.35 (23.58)	14.43 (30.62)	26.09 (24.83)	11.61 (26.07)
Calm/Anxious	29.16 (37.97)	8.94 (37.01)	33.67 (32.15)	3.88 (41.84)
Self-Assured/Ashamed	37.92 (32.19)	13.67 (27.09)	35.04 (30.64)	18.33 (32.33)
Distal Prediction	57.67[a] (24.24)	54.41[a] (26.38)	−30.36[b] (25.55)	−48.71[c] (25.09)
Positive/Negative	64.98 (27.33)	64.13 (28.92)	−37.55 (23.53)	−50.89 (24.74)
Calm/Anxious	38.78 (35.42)	29.25 (44.50)	−16.85 (31.56)	−40.79 (30.49)
Self-Assured/Ashamed	66.00 (27.35)	65.45 (31.53)	−33.89 (31.10)	−52.81 (31.03)
Proximal Prediction	50.23[a] (24.47)	37.77[b] (25.18)	−13.41[c] (20.62)	−29.20[d] (23.41)
Positive/Negative	52.92 (27.85)	47.75 (28.13)	−18.72 (23.16)	−29.55 (23.32)
Calm/Anxious	41.24 (29.26)	17.47 (32.79)	−7.81 (28.97)	−27.40 (28.18)
Self-Assured/Ashamed	56.54 (28.09)	48.08 (32.04)	−13.69 (26.70)	−30.65 (29.30)
Actual	45.01[a] (25.81)	25.61[b] (25.08)	3.58[c] (21.49)	−19.11[d] (25.53)
Positive/Negative	44.66 (27.13)	32.33 (26.17)	−2.65 (20.68)	−22.41 (22.20)
Calm/Anxious	39.92 (34.17)	13.37 (31.35)	12.69 (31.54)	−7.25 (31.56)
Self-Assured/Ashamed	50.44 (28.90)	31.12 (30.89)	0.71 (28.05)	−27.68 (31.05)

Note. The shaded rows indicate ratings that have been aggregated across affect type in order to illustrate time effects across SA group and condition. Superscript letters indicates a significant difference ($p < .05$) between group/condition cells at the given aggregated affect time point; numbers with the same letter do not differ.