Negative feedback and performance: The moderating effect of emotion regulation

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Abstract

Whereas prior research has shown that individual differences in emotion regulation have important implications for relationships, affect and well-being, we investigated whether such individual differences also impact how people respond to negative feedback. Participants completed an ambiguous test on which they would be unable to gauge their performance. Some participants were told that they performed poorly, while others were told that they performed slightly above average. Participants then completed a second test that ostensibly measured a similar construct. Finally, after taking part in an unrelated task, participants completed the Emotion Regulation Questionnaire (Gross & John, 2003) to assess reappraisal (thinking about a situation to change its emotional impact) and suppression (inhibiting emotion-expressive behavior). Among reappraisers, those who received negative feedback completed the second test more quickly and performed better than did such people who received moderate feedback. No such effects were found among suppressors. These findings suggest that individual differences in reappraisal and suppression are meaningful in terms of how negative feedback affects subsequent cognitive performance.

1. Introduction

People use a variety of strategies to manage or regulate their emotions. According to the process model of emotion regulation (Gross, 1998), emotion response tendencies are coordinated responses that involve changes in expressive behavior, subjective experience and physiological systems (Gross & John, 2003; John & Gross, 2004). Emotion response tendencies are elicited only by situations evaluated as significant, such that they offer rewarding opportunities or aversive threats (Frijda, 1986). Once generated, emotion response tendencies can be modulated (Gross & John, 2003; John & Gross, 2004), which will ultimately shape the observable emotional response. The process model of emotion regulation (Gross, 1998) categorizes emotion regulation strategies according to when they impact this process, whether during the evaluation of potential emotional situations or during the modulation of response tendencies.

1.1. Cognitive reappraisal and expressive suppression

Cognitive reappraisal and expressive suppression are two commonly investigated strategies of emotion regulation that can be differentiated in terms of whether they occur before or after emotion response tendencies have been triggered and have changed.

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cardiovascular, electrodermal responses, and blinking) and lesser arousal (decreased heart rate and somatic activity) were observed. This suggests that while suppression may inhibit expressive behavior, it may actually increase other aspects of the emotion response with changes in subjective experience and physiological systems.

1.2. Consequences of reappraisal and suppression

Cognitive reappraisal requires individuals to reinterpret a potentially emotion-elicitating situation so that it will be perceived as less emotional. Researchers have found that reappraisal decreases the experience of negative emotion. Specifically, Gross (2001) found that participants asked to reappraise an amputation film as though they were medical professionals reported feeling less disgust compared to participants assigned to either a suppression or control condition.

Unlike cognitive reappraisal which occurs before emotion response tendencies have been triggered, expressive suppression requires individuals to manage these rising emotion response tendencies. Such effortful management of response tendencies has been found to require cognitive resources that could otherwise be used for functioning in emotional contexts. Richards and Gross (2000), for example, found that participants asked to suppress while watching a film eliciting negative emotion showed poorer memory of auditory and visual details of the film compared to participants given no such instruction. This suggests that there are cognitive costs to suppression, specifically poorer recognition and recall.

1.3. Individual differences in emotion regulation

There is an extensive literature investigating individual differences in people’s emotional responses. One such area involves emotional intelligence, the ability to perceive, understand, and regulate emotions (cf. Mayer & Salovey, 1997). A wide body of research has shown that the construct predicts a variety of important life outcomes. For example, children higher in emotional intelligence are more productive in the workplace (Ellenbein, Der Foo, White, & Tan, 2007) and perform better academically (O’Connor & Little, 2003), while adults higher in emotional intelligence are more productive in the workplace (Mayer, Caruso, & Salovey, 1999; see Mayer, Bar- sade, & Roberts, 2008, for a review).

Stemming from this body of work, other researchers were interested to learn which specific strategies people use when they attempt to regulate emotions. This interest prompted research on individual differences in emotion regulation. Most significantly, Gross and John (2003) developed the Emotion Regulation Questionnaire (ERQ) to measure the habitual use of suppression and reappraisal. The ERQ includes a six-item reappraisal scale and a four-item suppression scale. For example, two items assessing reappraisal are, “When I want to feel more positive emotion (such as joy or amusement), I change what I’m thinking about,” and, “When I want to feel less negative emotion, I change the way I’m thinking about the situation.” Two items assessing suppression are, “I keep my emotions to myself,” and, “When I am feeling negative emotions, I make sure not to express them.” Gross and John (2003) also assessed the divergent validity of the ERQ by examining associations between these two emotion regulation strategies and the Big Five personality dimensions, as well as impulse control, cognitive ability and social desirability. Correlations between emotion regulation strategy and these four constructs were significant but modest (ls < .41) suggesting that the ERQ converged with these conceptually similar personality dimensions but is not simply an indicator of any of them. Finally, the scale was shown to be reliable both internally (zs > .73) and in terms of test-retest reliability (rs = .69).

The ERQ has been used to predict meaningful outcomes. For example, Gross and John (2002) administered the ERQ and asked participants to complete self-ratings of their emotion experience. Gross and John (2003) found that cognitive reappraisal was related to more positive emotion experience and less negative emotion experience. Further, in a study attesting to the ERQ’s ability to predict meaningful cognitive consequences, Richards and Gross (2000) assessed participants’ memory using two measures: by asking participants how well they generally remember conversations and by asking participants to complete a free-recall test of their own emotion regulation episodes (that they had been reporting to the experimenter for two weeks). Participants who habitually used suppression had worse self-reported memory and had poorer memory of the emotion regulation episodes. Therefore, there appear to be cognitive costs for expressive suppression but not for cognitive reappraisal.

Clearly, then, a person’s chronic style of emotion regulation plays a role in a variety of situations. One situation which has yet to be investigated in the context of emotion regulation, however, is a situation in which a person receives negative feedback after performing a task. Such situations are common in everyday life, whether it be a student learning that he or she performed poorly on an examination or a salesperson learning that he or she was not successful in “closing” a contract. How might a person’s dispositional style of emotion regulation impact his or her response to negative feedback? To gain insight into this question, we turn to research on how personality moderates the effects of negative feedback.

1.4. Negative feedback and personality

In an early study on negative feedback, Waterhouse and Child (1953) assessed whether the effects of such feedback on subsequent performance would differ as a function of personality. These researchers found that the effect of negative feedback on ongoing performance varies with participants’ dispositional habits of responding to frustration. Waterhouse and Child (1953) asked participants to respond to a personality questionnaire that included six scales measuring the participants’ tendency to respond to frustration, “defendance,” aggression, pessimism, self-aggression or distractibility. Scores on these six scales were combined to form an overall measure of the tendency to habitually respond to frustration with disruptive reactions. Participants who scored above the median of the overall measure formed the “high-interference” group, while participants who scored below the median formed the “low-interference” group. Results showed that negative feedback produced poorer performance among participants in the high-interference group, whereas negative feedback produced enhanced performance among low-interference participants. In a similar vein, Shrauger and Rosenberg (1970) showed that participants high in self esteem reported exerting more effort in a future task following negative feedback. Also, Idson and Higgins (2000) found that promotion-effective participants performed better on a task after receiving success feedback, while prevention-effective participants performed better on the task after receiving failure feedback.
1.5. The present study

As prior research has shown, it appears that there are cognitive costs of expressive suppression but not of cognitive reappraisal (Richards & Gross, 2000). Other research has suggested that negative feedback produces a decrease in performance if tendencies of responding to frustration are interfering. We conducted an experiment to examine how individual differences in the use of emotion regulation strategies moderate the effect of negative feedback on performance. In the study, participants completed what was ostensibly an important cognitive test. After receiving either negative or moderate false feedback, participants completed a second similar test. We propose two potential hypotheses.

One hypothesis is that the feedback manipulation will impact suppressors. This hypothesis rests upon the notion that because suppression consumes cognitive resources that otherwise would be available for other tasks, it will serve as an interfering response. Thus, for participants who habitually use suppression, negative feedback may produce poorer performance on a subsequent task. If this is the case, suppressors who receive negative feedback will show poorer performance as evidenced by fewer correct answers and slower response times on the second examination relative to suppressors who receive moderate feedback.

An alternative hypothesis is that feedback will affect reappraisers. This hypothesis rests upon the notion that reappraisers may experience decreased negative emotion and increased positive emotion when receiving negative feedback. Indeed, Gross and John (2003) found that participants who frequently reappraise experience less negative emotion and greater positive emotion. In addition, individuals with more positive affect have been shown to perform better on cognitive tasks than individuals with less positive affect (Hill, von Boxtel, Ponds, Houx, & Jolles, 2005). Thus, reappraisers who receive failure feedback might reframe the negativity in a positive light, enhancing their subsequent cognitive performance. Consequently, reappraisers who receive negative feedback may show better performance as evidenced by more correct answers and faster response times on the second exam relative to reappraisers who receive moderate feedback.

In sum, then, although prior research has investigated how dispositional emotion regulation strategies impact a variety of cognitive processes, it remains unclear how such strategies impact performance in the face of negative feedback. Prior research suggests that negative feedback may hinder suppressors’ performance, enhance reappraisers’ performance, or possibly yield both effects. We conducted a laboratory experiment to explore these possibilities.

2. Method

One hundred forty-four undergraduates participated either for course credit or $8. Participants were told that they would be completing two separate visual-spatial tests. Participants first completed a test that resembled the Culture Fair Intelligence Test (Cattell, 1949). Participants were told that this test was designed to test intelligence and that it predicted future academic success. In this test, participants were presented with a sequence of three ambiguous patterns of shapes and lines. The participant’s task was to identify which of four options successfully completed the sequence (see Fig. 1 for a sample item). The test was designed to be ambiguous so that participants could not accurately judge their performance (cf. Hirt, McCrea, & Kimble, 2000).

Participants were then randomly assigned to one of two conditions. Participants assigned to the “negative feedback” condition were told that they had answered three of the 12 questions correctly, placing them in the 14th percentile, while participants assigned to the “moderate feedback” control condition were told that they had answered seven items correctly, placing them in the 65th percentile. All participants then completed what was ostensibly the “Visual Spatial Intelligence Test.” These items were taken from the Perceptual Ability Test of the Dental Admissions Test. The test is a good predictor of students’ future academic performance (multiple-Rs > .37) and manifests good reliability (αs > .80; Graham, 1972; Kramer, Kubiak, & Smith, 1989).

For each item in this test, participants are shown a square that represents a single sheet of paper. In a series of images, the paper is shown to be “folded” several times. The final image represents a hole being punched through all layers of the now-folded sheet of paper. Participants are then asked to identify which of five images best represents the paper were it to be unfolded (see Fig. 2 for a sample item). Participants were told that this test measured similar constructs to the Culture Fair Intelligence Test and that it too predicted future academic success. After taking part in an unrelated task, participants then completed a 40-item inventory, in which the 10 questions of the Emotion Regulation Questionnaire (Gross & John, 2003) were randomly interspersed. The ERQ items were interspersed to reduce the chances that the participants would perceive a connection between the negative feedback and the emotion regulation scales and thus respond untruthfully. Participants were then thanked and debriefed.

3. Results

Participants were removed from analysis (total N = 7; 4.9%) if they did not take the task seriously as evidenced by taking an unreasonably short amount of time (Z < –1.5) to solve any of the 12 test items.
3.1. Traditional analysis

We first assessed whether the total amount of time participants needed to complete the second task differed as a function of emotion regulation and feedback. As shown in Table 1, exam duration and correct responses were entered into a series of regression analyses in which the outcome variables were predicted by emotion regulation scores, a variable representing the feedback condition (1 = moderate feedback, 2 = negative feedback), and the interaction term. The reappraisal x feedback interaction approached significance when predicting time ($\beta = -1.10, p = .07$) and number of correct answers ($\beta = 1.04, p = .08$), but the suppression x feedback interaction was a weaker predictor of time ($\beta = .55, p = .12$) and number of correct answers ($\beta = -.43, p = .23$). Although the scores did not reach traditional levels of significance, the valence of the interaction terms are consistent with the notion that reappraisers performed better after negative feedback (more correct answers and more efficient processing), while suppressors performed worse after negative feedback.

3.2. Global emotion regulation score

Scores from the six reappraisal items and the four suppression items were submitted to an exploratory factor analysis utilizing oblique promax rotation. The reappraisal and suppression items loaded on two separate factors accounting for 60.69% of the variance, suggesting that each set of items reflected an underlying factor. Table 2 presents the factor loadings. The two factors showed a weak but significant negative correlation, $r = -19, p = .02$, suggesting that information about the use of one strategy provides little information about the use of the other strategy. Therefore, we subtracted the mean of the scores on the ERQ suppression subscale from the mean of the scores on the ERQ reappraisal subscale to form a global emotion regulation score. Higher scores indicate more frequent use of reappraisal relative to suppression (we refer to such participants as relative reappraisers), while lower scores indicate more frequent use of suppression relative to reappraisal (we refer to such participants as relative suppressors).

A multivariate linear regression, presented in the left column of Table 3, was conducted with feedback condition, global emotion regulation scores, and an interaction term as predictors of total time spent on the post-feedback test. Of most interest, there was a feedback x style interaction, $\beta = -.61, p = .04$. As shown in Fig. 3 and the left columns of Table 4, relative reappraisers who were given negative feedback required less time to complete the second task than were such people who were given moderate feedback ($\tau(133) = 1.72, p = .04$). Conversely, among relative suppressors, time spent on the subsequent task was not influenced by feedback ($\tau(133) = 1.49, p = .07$), though the means trended in the opposite direction as the relative reappraisers. As such, among relative reappraisers, those who received negative feedback spent less time on the follow-up task than those who did not. Conversely, relative suppressors showed no such effect.

The second dependent measure was the number of correct answers on the post-feedback test. Another multivariate linear regression, presented in the right column of Table 3, was conducted with feedback condition, emotion regulation scores, and an interaction term as predictors of the number of correct answers. Again, there was a feedback x style interaction $\beta = .60, p = .04$. As

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Regression analyses for outcome variables.</th>
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</thead>
<tbody>
<tr>
<td>Predictor</td>
<td>Time spent</td>
</tr>
<tr>
<td></td>
<td>Reappraisal</td>
</tr>
<tr>
<td>Style</td>
<td>.99*</td>
</tr>
<tr>
<td>Feedback</td>
<td>.64*</td>
</tr>
<tr>
<td>Style x feedback</td>
<td>-1.10*</td>
</tr>
<tr>
<td>$R^2$</td>
<td>.03</td>
</tr>
<tr>
<td>N</td>
<td>137</td>
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</table>

Note: values are standardized beta weights. * $p < .05$. + $p < .10$.

<table>
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<tr>
<th>Table 2</th>
<th>Factor loadings for Emotion Regulation Questionnaire.</th>
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<tr>
<td>Items</td>
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<td>Reappraisal-1</td>
<td>.72</td>
</tr>
<tr>
<td>Reappraisal-2</td>
<td>.33</td>
</tr>
<tr>
<td>Reappraisal-3</td>
<td>.33</td>
</tr>
<tr>
<td>Reappraisal-4</td>
<td>.91</td>
</tr>
<tr>
<td>Reappraisal-5</td>
<td>.78</td>
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<tr>
<td>Reappraisal-6</td>
<td>.88</td>
</tr>
<tr>
<td>Suppression-1</td>
<td>.07</td>
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<tr>
<td>Suppression-2</td>
<td>-.21</td>
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<tr>
<td>Suppression-3</td>
<td>-.11</td>
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<tr>
<td>Suppression-4</td>
<td>.23</td>
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<tr>
<th>Table 3</th>
<th>Regression analyses for outcome variables (global regulation-score variable).</th>
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<tr>
<td>Predictor</td>
<td>Time spent</td>
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<td>Processing style</td>
<td>.71*</td>
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<tr>
<td>Feedback</td>
<td>.16</td>
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<tr>
<td>Processing Style x feedback</td>
<td>-.61*</td>
</tr>
<tr>
<td>$R^2$</td>
<td>.05</td>
</tr>
<tr>
<td>N</td>
<td>137</td>
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</tbody>
</table>

Note: values are standardized beta weights. * $p < .05$. + $p < .10$.

Fig. 3. Effect of feedback on total time to complete the follow-up examination as a function of regulation style. Processing styles are predicted means at ±1 SD (Aiken & West, 1991).

<table>
<thead>
<tr>
<th>Table 4</th>
<th>Means of outcome variables.</th>
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</thead>
<tbody>
<tr>
<td>Feedback</td>
<td>Time to complete test</td>
</tr>
<tr>
<td></td>
<td>Suppressors</td>
</tr>
<tr>
<td>Negative feedback</td>
<td>411.74</td>
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<tr>
<td>Moderate feedback</td>
<td>363.11</td>
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Note: processing styles are predicted means at ±1 SD (Aiken and West, 1991).
shown in Fig. 4 and the right columns of Table 4, relative reappraisers who were given negative feedback performed better on the subsequent examination than were such people who were given moderate feedback (t(133) = 3.35, p < .001). Conversely, performance among relative suppressors was not influenced by feedback (t(133) = 0.36, ns). As such, among those more likely to reappraise, those who received negative feedback performed better on the follow-up task than those who did not. Those more likely to suppress showed no such effect.

4. Discussion

Previous research has examined the cognitive consequences of different emotion regulation strategies. Richards and Gross (2000) found that two of these emotion regulation strategies, reappraisal and suppression, have different cognitive consequences. In another area of literature, research has shown that negative feedback impacts performance differently as a function of personality. Building upon these lines of research, we predicted that individual differences in the use of emotion regulation strategies would moderate the effect of negative feedback on subsequent performance. We proposed two competing hypotheses. First, we suggested that expressive suppression might serve as an interfering response because it consumes cognitive resources. Thus, participants who habitually use suppression might show diminished performance as evidenced by fewer correct answers and slower response times following negative feedback relative to suppressors receiving moderate feedback. We also suggested a second hypothesis, that reappraisers who receive failure feedback might reframe the negativity in a positive light, enhancing their cognitive performance. Thus, reappraisers who receive negative feedback might show enhanced performance as evidenced by more correct answers and faster response times on the second exam relative to reappraisers who receive moderate feedback.

In our experiment, participants received either moderate or negative feedback after taking an examination. After receiving the feedback, participants took a second examination. A traditional analysis employing suppression and reappraisal scores separately failed to demonstrate statistically significant effects. Importantly, however, analyses employing a global measure of emotion regulation provided clear support for our second hypothesis: that negative feedback enhances relative reappraisers’ performance. The finding that negative feedback enhanced these people’s performance is consistent with Gross and John’s (2003) research, which demonstrated that participants who frequently reappraise experience less negative emotion and greater positive emotion. Relative reappraisers who received failure feedback may have indeed re-framed the negative feedback in a positive way, enhancing their subsequent cognitive performance.

4.1. Implications and directions for future research

Most previous research has demonstrated cognitive costs of suppression, suggesting that suppression is consuming cognitive resources that could be used for other tasks (Richards & Gross, 2000). Our research extends this literature by demonstrating that reappraisal also has important, positive, cognitive consequences. We found that cognitive reappraisers who received failure feedback showed faster response times and better performance on the second visual spatial task relative to reappraisers who received moderate feedback. Suppressors, however, did not show this effect. Thus, while previous research has suggested that suppression may be detrimental to an individual’s cognitive performance, our research shows that reappraisal may be similarly beneficial in specific cognitive contexts, particularly situations involving negative feedback.

Our research also speaks to the possibility that, at least in some cases, it may be worthwhile to consider the two emotion regulation strategies not separately but rather as composites of a global construct of emotion regulation. Indeed, research on the two strategies has generally demonstrated adaptive social and emotional consequences for reappraisal, and maladaptive consequences for suppression. As such, it is sensible that people who are both high in reappraisal and low in suppression would show especially adaptive outcomes, while people who are both low in reappraisal and high in suppression would show especially maladaptive outcomes. By no means do we suggest that these constructs should always be conceptualized in this manner. However, our findings do suggest that, at least in some situations, considering the constructs as a global score may be warranted.

Our research also has implications for interventions. Because the academic world, for example, often involves the use of both positive and negative feedback, children may benefit from interventions designed to teach them to increase reliance on cognitive reappraisal. Negative feedback, after all, is a common occurrence in daily life. Such an intervention may help students maintain or even enhance performance in situations in which they receive negative feedback. As some research has suggested that emotion regulation processes can change (e.g., John & Gross, 2004), it is possible that such an intervention could impact a person’s emotion regulation pattern.

An important direction for future research involves gauging the mechanism that underlies the effect we found. One possible mechanism deals with affect. It is possible that relative reappraisers re-framed the negative feedback in a positive way (e.g., as an exciting challenge), and that this reframing led to enhanced positive affect. Indeed, Fredrickson and Branigan (2005) showed that positive affect can broaden the scope of attention. Therefore, it may be that relative reappraisers performed better and faster following negative feedback because a change in affect broadened their scope of attention. Another potential direction for future research deals with the effect’s moderators. In particular, it is possible that the effect may be moderated by the perceived importance of the task. Although the current study employed a task of high relevance (i.e., a task that ostensibly predicted participants’ future academic success), one could envision a study in which the perceived importance of the examination was controlled for in a manipulation orthogonal to the feedback manipulation. If the effect does not appear when participants believe that the examination is unimportant, an important boundary condition would be identified. If, however, reappraisers perform better when given negative feedback regardless of perceived importance of the task, the robustness of the effect would be underscored.
5. Conclusion

People receive feedback on their performance in everyday life, whether it be in academic, business, social, or other environments. Our research shows that while habitual reappraisers may benefit from receiving negative feedback, habitual suppressors may not. Our research therefore adds to the literature by demonstrating that a global measure of emotion regulation style impacts how negative feedback is processed and that these individual differences impact subsequent cognitive performance. Above all, the present research suggests that individual differences in emotion regulation have important implications that extend to the regulators' cognitive performance.

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References


