Learning from Failure with Self vs Task Focused Feedback

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Abstract

Decades of feedback research have suggested that feedback is more effective in correcting errors than confirming the right responses. A study conducted by Eskreis-Winkler and Fishbach (2019) challenged this notion by showing that people learn less from feedback that indicates their answer is incorrect *(failure feedback)* than feedback that indicates their answer is correct *(success feedback)* even after incentivizing learning, manipulating response correctness, and controlling for background knowledge and mental inferences required for learning across conditions. Across two randomized experiments, we extended this work to investigate whether changing the focus of feedback from the self ("You answered this question correct/incorrect!") to the task ("The answer was correct/incorrect!") would reduce the difference between success and failure feedback. We replicated the previous study's main finding that people learn less from failure feedback than success feedback. However, the *focus* of feedback message (*task* vs *self*) did not have the hypothesized effect. We suggest future research further investigate the impact of *feedback focus* using in-person experimental settings with more powerful designs and we recommend a set of motivational factors to investigate to determine how learning from failure feedback can be optimized.

Keywords: learning; education; feedback; motivation; ego threat; replication

Introduction

How does one respond to information that points out that they made an error? On the one hand, some might expect that the person is likely to allocate more cognitive resources to this information than if they, instead, had been affirmed, because people have *negativity bias*. That is, people process negative information at deeper levels than positive information (Kanouse, 1984). A broad range of evidence suggests that negative information is more attention grabbing, recognized and remembered better, and assigned more weight than positive information (for review, see Unkelbach et al., 2020). Based on this account, some researchers suggested that exposing people to errors is particularly helpful for their learning (Barbieri & Booth, 2020).

On the other hand, others might expect that the person is likely to ignore the information because people have a *self-serving bias.* That is, people are more likely to minimize, avoid, and, even erase negative input for protection of self-worth; seek positive feedback that confirms their self-conceptions; and assimilate negative information in a way that fits their preexisting positive schemata about themselves and the world with little processing (Taylor & Brown, 1988; Taylor, 1991).

These two different accounts of negative information processing bear important questions for the design of learning environments. What is the best way of giving feedback when the learner makes an error? Feedback researchers have been preoccupied with this question for the last century. In the early behaviorist paradigm, feedback was viewed as a motivator of behavior (for a review, see Greeno et al., 1996). According to this view, positive feedback would strengthen particular responses while negative feedback would weaken them. Negative feedback was seen to be harmful to learning as it discouraged people from participating. Accordingly, behaviorists advocated for an *errorless learning* environment in which students kept responding to heavily prompted questions until they found the correct answer. By the 1970s, however, much of behaviorist ideas had not lived up to empirical evidence. Feedback was found more helpful to correct errors than to reinforce correct responses; and accordingly, feedback was reconceptualized as information that facilitated the correction of errors without considering motivation (for a review, see Butler & Woodward, 2018). In more recent work, however, Eskreis-Winkler and Fishbach (2019) conducted a series of experiments which challenged the view that feedback is most helpful for correcting errors. They found that people learn less when given *failure feedback* (that is, feedback that indicates the response is incorrect) than *success feedback* (that is, feedback that indicates the response is correct), even after manipulating response correctness, controlling for informational value of the feedback, background knowledge about the task, and the number of mental inferences required for learning across feedback conditions. The authors concluded that *failure feedback* is *ego-threatening* which causes people to *tune out* from the task.

However, receiving feedback indicating one's errors at some point in life is, of course, inevitable; especially when learning something new. Therefore, the current work aimed to identify features of feedback that increase people's learning from errors. In the current work, we replicated two experiments by Eskreis-Winkler and Fishbach's aforementioned study. We posited that their participants might not have learned from *failure feedback* as much because the language in the feedback messages was *self-focused* ("You answered this question correct/incorrect").

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We hypothesized that a *task-focused* language ("The answer was correct/incorrect") would make the learning difference between *success* and *failure* feedback smaller.

Self vs Task Focused Feedback

The effects of feedback interventions on learning show great variability from one study to another (for a review, see Hattie & Clarke, 2018). To explain some of the variability, some theorists argued that feedback that directs the attention to the self can diminish the intended effect of feedback (Kluger & DeNisi, 1998) as attention to the self can deplete cognitive resources necessary for task performance (Kanfer & Ackerman, 1989). A large meta-analysis supported this notion as it found that feedback effectiveness decreased as the attention moved away from the task and closer to the self (Kluger & DeNisi, 1996). Further, studies done in classrooms suggested that feedback is unlikely to be engaged with if the wording is perceived as unmotivating, insensitive, or deconstructive (for a review, see Winstone, 2017). Accordingly, it was suggested that feedback focused on self rather than the task can lead to poor quality of feedback engagement (Schartel, 2012; Winstone, 2017).

The Current Study

Two broad themes emerge from the reviewed literature. First, even though feedback indicating one's errors can be attention-grabbing, people might avoid processing it to protect their *self-worth*. Second, the focus (self vs task) of the feedback may impact people's engagement with it.

To investigate how to best provide feedback to correct errors, the current study aimed to replicate and extend the aforementioned study by Eskreis-Winkler and Fishbach (for convenience, we refer to this study as 'the EW-F study' for the rest of the paper).

The EW-F study consisted of a set of experiments that showed, at worst, people do not learn from *failure feedback* at all, and at best, they learn, but significantly less from *success feedback* with medium to large effect sizes. We replicated studies 2a (our Experiment 1) and 4 (our Experiment 2). In an attempt to improve learning from errors, our extension mainly focused on the effects of changing the focus of the feedback message from self to the task. We pre-registered both experiments on OSF including all materials, analysis plans, and scripts.

Experiment 1

In Experiment 1, we replicated and extended the experiment 2a in the EW-F study. Our extension included a new variable; namely, *feedback focus*. In the EW-F study, the participants had received, what we call, *self-focused* feedback ("You answered this question correct! /incorrect!"). We added two new conditions with *task-focused* feedback ("The answer is correct! /incorrect!"). Thus, our experiment consisted of four conditions with two independent variables: *achievement feedback* (*success* vs *failure*) and *feedback focus* (*self-* vs *task-focused*).

We randomly assigned the participants to one of the four conditions. An immediate posttest measured participants' learning. We expected that the effect of *achievement* would be smaller for conditions with *task-focused* feedback.

Participants

Participants were 203 undergraduate students from the researchers' university who received credit in their psychology course. Their average age was 19.0 years (SD = 1.8). Most students reported their gender as female (73%), ethnicity as White (65%) and their year in college as Freshman (53%).

Design

The study had a 2 (*achievement feedback: success* or *failure*) × 2 (*feedback focus: task-* or *self-focused*) between-subjects design. 203 students were randomly assigned to each of the four conditions (self-focused success feedback: n = 53, each of the remaining groups: n = 50). There were no significant differences between the four conditions in terms of percent of female students, percent of white students, age, and years in college.

Procedures

The study took place as a single online session on Qualtrics. The study started with an open-ended question that aimed to eliminate the participants who were not willing to invest effort. The open-ended question was followed by the training phase which consisted of three multiple-choice questions. The questions asked about the meaning of researcher-invented scripts (*e.g., "Which of the following characters in an ancient script represents an animal?"*). The made-up scripts allowed controlling for participants' background knowledge and manipulating achievement by randomly assigning success vs failure feedback as there were no objectively correct answers. Accordingly, each question was followed by a new screen that displayed a stand-alone feedback message, which was manipulated based on two factors: *achievement* and *feedback focus*. The conditions consisted of *self-focused success feedback* ("You answered this question correct!"), *self-focused failure feedback* ("You answered this question incorrect!"), *task-focused success feedback* ("The answer was correct!"), and *task-focused failure feedback* ("The answer was incorrect!") to which participants were randomly assigned to. After the training, the participants responded to a brief distraction task. The distraction task was followed by the post-test that consisted of three multiple-choice questions. The post-test questions were identical to training questions except that they were worded in the reverse with superordinate categories. For example, if the training question asked which symbol represents an animal, then the posttest question asked which symbol represents a stationary, non-living object with the same two symbol choices (See Figure 1).

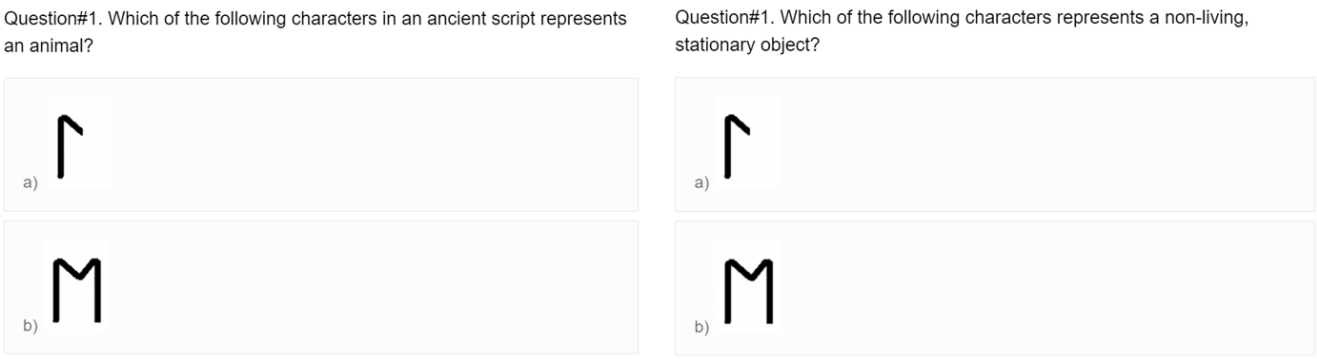


Figure 1. Experiment 1: Example training item (on the left) and corresponding posttest question (on the right)

Thus, our study replicated the procedures of the previous EW&F study (study 2a) with the following variations. First, the current study recruited participants from the undergraduate subject pool while the EW&F study recruited participants from Amazon Mechanical Turk (MTurk). Second, the current study rewarded all participants with partial course credit regardless of their performance while the EW&F study rewarded bonus payments for each correct answer at the posttest. Third, the current study included two additional conditions to introduce the variable *feedback focus (self* vs *task focused)*.

Results

We operationalized learning as the percentage of posttest questions the participant answered correctly as in the EW&F study. First, we replicated the analyses in the EW&F study. The conditions *self-focused success feedback* and *self-focused failure feedback* at the current study corresponded to *success* and *failure* conditions at the EW&F study. We replicated the finding that *self-focused failure* group learned (M = 69.3%, SD = 29.2%) significantly less than the *self-focused success* group (M = 93.0%, SD = 18.8%), $t(83.0)$ = 4.86, p < .001, 95% CI = [.14, .33], r = .47. We also compared the learning performance of each group to the chance level (50%). We failed to replicate the previous study's finding that failure group performed at chance level. In our study, all groups performed better than chance level; *self- focused failure:* $t(49)$ = 4.67, p <.001, 95% CI = [61%, 77%]; *task- focused failure:* $t(49)$ = 6.13, p <.001, 95% CI = [67%, 83%]; *self-focused success:* $t(52)$ = 16.59, p <.001, 95% CI = [87%, 98%]; and *task-focused success feedback*: $t(49)$ = 17.97, p <.001, 95% CI = [90%, 100%] (See Figure 2 for group mean scores).

Second, we tested our extension with the new variable *feedback focus.* A 2 (*feedback focus: task* vs *self focused*) x 2 (*achievement: success* vs *failure*) analysis of variance[1] revealed a significant main effect of achievement. The *success* feedback (M = 94%, SD = 18%) resulted in better learning than *failure* feedback (M = 72%, SD = 29%); $F(1, 199)$ = 40.98, p < .001. The mean score for the *task-focused* feedback (M = 85%, SD = 26%) was also higher than *self-focused* feedback (M = 81%, %, SD = 27%), but this difference did not reach statistical significance, $F(1, 199)$ = 1.45, p = .22; and, contrary to our hypothesis, there was no significant interaction effect between *achievement* and *feedback focus* $F(1, 199)$ = .30, p = .58.

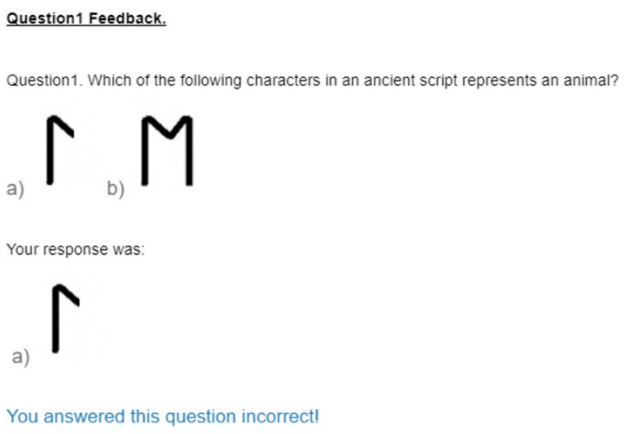
Figure 2. Experiment 1 posttest performance by conditions

Experiment 2

In the first experiment, we replicated the original study's main finding that people learn less from *failure* feedback than *success* feedback. Contrary to our hypothesis, the effect of achievement was not smaller for task-focused feedback. That is, changing from self-focused feedback to task-focused feedback did not reduce the discrepancy between success and failure conditions. However, there was a small, but statistically non-significant, benefit of task-focused feedback relative to self-focused feedback, so we decided to investigate

[1] Additionally, we conducted robust ANOVAs on trimmed means as alternative analyses for each ANOVA at both experiments. The results were the same.

this feedback focus factor in a second experiment with a larger sample size.



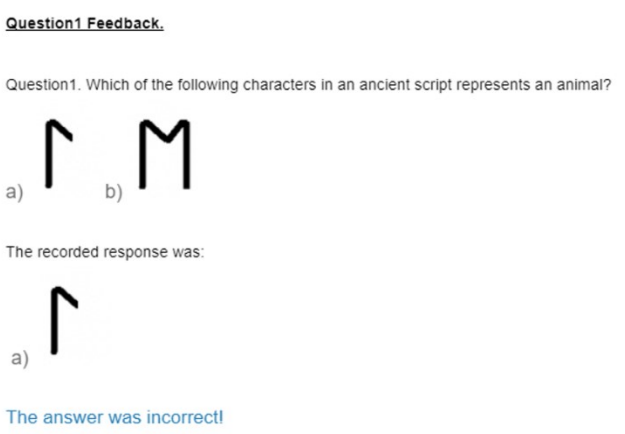


Figure 3. Experiment 2: A sample question from the training session for self-focused failure (on the right) and task-focused failure (on the left). The success conditions had the identical setup with only wording change from 'incorrect' to 'correct'

In the second experiment, we extended the context of the study by recruiting participants using Amazon Mechanical Turk. We also introduced several variations to the treatment to incentivize learning from errors. We rewarded $.10 bonus payment for each question answered correctly at the posttest. Further, we showed the questions and responses along with feedback messages for participants' review (See Figure 3). We also measured ego-threat as was done in EW&F Study 4 to investigate whether ego-threat mediates the relationship between the independent variables (that is, *feedback focus* and *achievement*) and learning.

Participants

Participants were 324 MTurk workers from the United States whose approval rating was at or above 50%. Most reported their gender as male (66%), ethnicity as white (75%), and the highest educational degree they obtained as bachelor's or above (82%). Their reported average age was 38 (*SD* = 10.27).

Design

The study had a 2 (*achievement: success or failure*) × 2 (*feedback focus: task-focused or self-focused*) between-subjects design. 324 participants were randomly assigned to each of the four conditions (*self-focused success: n* = 81, *self-focused failure: n* = 80, *task-focused success: n* = 82, *task-focused failure: n* = 81).

Procedure

The procedures were identical to Experiment 1 except the following revisions. During the feedback, the question, options, and the participant's response also appeared on the screen for their review (See Figure 3). After completing the training round, the participants were presented with a 5-point Likert scale question "To what extent would you say that completing Round 1 undermined your self-esteem?". As at EW&F Study 4, the participants' response to this question was treated as their level of ego-threat.

Results

First, we compared the learning performance of each group to the chance level (50%). As in Experiment 1, all groups performed significantly better than chance level, p <.001 (See Figure 4).

Next, we compared the *success* vs *failure* self-focused feedback conditions to replicate the main analysis in EW&F study. We failed to replicate the finding that self-focused failure group learned (M = 69.0%, SD = 34.0%) significantly less than the self-focused success group (M = 76.0%, SD = 14.0%), $t(158.2) = 1.22$, $p = 0.22$, 95% CI = [.04, .18].

Figure 4. Experiment 2 posttest performance by conditions

However, a 2 x 2 analysis of variance revealed a significant main effect of *achievement*. The *success* feedback (M = 73%, SD = 38%) resulted in better learning than *failure* feedback (M = 65%, SD = 37%); $F(1, 320) = 3.96$, p = .004. Opposite

to Experiment 1, the mean score for the *self-focused feedback* (M = 72.6%, SD = 36%) was higher than *task-focused feedback* (M = 66.6%, SD = 39%), however, as in Experiment 1, *feedback focus* factor did not reach to significance, $F(1, 320) = 2.03$, $p = .15$; and there was no significant interaction effect between achievement and feedback focus $F(1, 320) = 0.11$, $p = .73$.

Third, we tested whether there was a difference between ego-threat levels of the groups. We did not replicate the EW&F study's result that the failure group had higher levels of ego-threat. A 2x2 ANOVA on *ego-threat* showed that no factor had a significant effect (*task-focused failure:* $M = 3.36$, $SD = 1.22$; *self- focused failure:* $M = 3.18$, $SD = 1.48$; *task-focused success:* $M = 3.03$, $SD = 1.71$; *self-focused success:* $M = 3.12$, $SD = 1.66$).

Fourth, we collapsed the data across feedback focus, and tested whether ego-threat mediated the effect of achievement on learning. The effect of the achievement on the mediator was not significant, $p = .25$. Ego threat did not mediate the indirect effect of achievement on learning, $p = 0.24$. However, ego-threat was a significant predictor of learning, $\beta = -.07$, $r^2 = 0.04$, $p < 0.01$.

Discussion

The current study aimed to replicate and extend previous experiments by Eskreis-Winkler and Fishbach (2019). We randomly assigned participants to *achievement feedback (success* vs *failure)* and *feedback focus (self* vs *task focused)* conditions to test their learning of a researcher-invented script. We replicated the main finding that people learn less from *failure* than *success* feedback. Thus, findings challenge the long-held assumption that feedback is most helpful at correcting errors.

On the other hand, we failed to replicate two findings from the EW-F study. First, the EW-F study demonstrated that people do not perform better than chance level when they are given *failure feedback*. In both of our experiments, people performed significantly better than chance level after *failure feedback.* This finding was true even when learning was not incentivized through bonuses (Experiment 1). Thus, our findings suggest that feedback indicating one's errors can still result in some learning, however, not as much as feedback that confirms a correct response. The findings challenge the previous arguments that feedback is most helpful for correcting errors (Kulhavy, 1996; see a review, Butler & Woodward, 2018).

The second finding we failed to replicate is the mediation effect of *ego-threat.* The previous study's results suggested that *failure feedback* increased people's *ego-threat* levels, and *ego-threat* mediated the relationship between achievement and learning. On the contrary, we found that *ego-threat* levels at all groups were equally high. However, ego-threat still had a small, but significant, negative correlation with learning. It is possible to interpret this finding in several ways. One possibility is that *ego-threat* undermines learning, but it is not influenced by *achievement* factor. However, under this account, it is hard to justify why *success* groups would have as high *ego-threat* levels as of the *failure* groups. Another possibility is that the ego-threat measure failed to capture the construct because of the variation we introduced at Experiment 2. That is, showing the wrong and correct response with the feedback message might have created confusion across the conditions in a way we had not expected (See Figure 3). Specific to task-focused failure condition, which had the lowest scores, we suspect that some participants misinterpreted the statement "the recorded response" as the correct answer rather than the response they provided. Further, learning performance at success conditions (71.5% for task-focused, and 76% for self-focused) at Experiment 2 were lower than all success conditions at the EW&F study (ranging from 80% to 91% across different experiments), which supports our suspicion that showing the question and the two responses along with feedback messages, contradictory to our intentions, rather hindered learning. Therefore, even though the difference between success and failure conditions were smaller at Experiment 2, this does not necessarily mean that the variations at this experiment helped people learn more from failure. Instead, people might have learned less from success at Experiment 2 than they would normally do.

We did not find evidence that the variable we introduced, *feedback focus* (*self-* vs *task-focused feedback*), had significant influence on learning. The results suggest that changing the personal pronoun ('you') in the feedback message to an impersonal noun ('the answer') do not change people's response to feedback. Another possibility is that this null result is contingent upon the current study's online experiment paradigm which did not include a human feedback provider. Here, the change in the tone might have been unnoticeable for the participants. Further, we replicated the original study's power, set to detect a medium effect size, that would be underpowered to detect any potential small effects of wording. Given the robust results from the previous literature regarding the benefits of changing the focus of feedback from self to task (Kluger & DeNisi, 1996b; Schartel, 2012; Winstone, 2017), we suggest future research further investigate this construct with more powerful study designs and at in-person experimental settings.

The current work focused on a specific feedback-related factor, namely, the focus of the feedback message. However, it is likely that feedback engagement is influenced by a multifaceted set of other factors related to the feedback receiver such as their motivations, fears, expectations, perception toward the feedback provider, and their view of their own abilities (Eva et al., 2011). These factors should be tested in experimental settings to extend the current work and to identify conditions under which learning from failure is optimized and potentially just as good as learning from success.

Further, feedback engagement is not a one-time process, but it is iterative. Grundmann et al. (2021) suggest that people use several engagement and disengagement strategies when faced with negative feedback based on their performance goals. Accordingly, even though people can initially

disengage from the feedback to meet their hedonic goals (that is, feeling good at that moment), the salience of hedonic goal decreases once it is satisfied. After this decrease, improvement goals become more salient, which motivates feedback engagement again.

The education literature suggests several ways to re-engage learners with feedback such as giving a confidence boost with positive comments; focusing on what to do in the future rather than what has been done (Winstone et al., 2017); prompting learners to reflect upon the feedback they received to reassess and assimilate the feedback and their emotional responses upon it (Sargeant, 2009). These are studies conducted in authentic learning environments without experimental manipulations. We believe the promising findings from these rich settings can be tested in controlled lab studies to further investigate causal factors involved in processing of feedback and identify strategies to improve engagement with it.

Open Practices Statement

Pre-registration of the experiments can be accessed at https://osf.io/j85ep.

References

Barbieri, C. A., & Booth, J. L. (2020). Mistakes on display: Incorrect examples refine equation solving and algebraic feature knowledge. *Applied Cognitive Psychology*, *34*(4), 862-878.

Butler, A. C., & Woodward, N. R. (2018). Toward consilience in the use of task-level feedback to promote learning. In *Psychology of learning and motivation* (Vol. 69). Academic Press.

Eskreis-Winkler, L., & Fishbach, A. (2019). Not learning from failure—The greatest failure of all. *Psychological Science, 30*(12), 1733-1744.

Eva, K. W., Armson, H., Holmboe, E., Lockyer, J., Loney, E., Mann, K., & Sargeant, J. (2012). Factors influencing responsiveness to feedback: on the interplay between fear, confidence, and reasoning processes. *Advances in Health Sciences Education*, *17*(1), 15-26.

Greeno, J. G., Collins, A. M., & Resnick, L. B. (1996). Cognition and learning. In D. C. Berliner & R. C. Calfee (Eds.) *Handbook of educational psychology* (Vol. *77*). Routledge.

Grundmann, F., Scheibe, S., & Epstude, K. (2021). When ignoring negative feedback is functional: Presenting a model of motivated feedback disengagement. *Current Directions in Psychological Science*, *30*(1), 3-10.

Hattie, J., & Clarke, S. (2018). *Visible learning: Feedback*. Routledge.

Kanouse, D. E. (1984). Explaining negativity biases in evaluation and choice behavior: Theory and research. In T.C. Kinnear (Ed.), *NA - Advances in consumer research* (Vol. 2, pp. 703-708).

Kanfer, R., & Ackerman, P. L. (1989). Motivation and cognitive abilities: An integrative/aptitude-treatment interaction approach to skill acquisition. *Journal of Applied Psychology*, *74*(4), 657-690.

Kluger, A. N., & DeNisi, A. (1996). The effects of feedback interventions on performance: A historical review, a meta-analysis, and a preliminary feedback intervention theory. *Psychological Bulletin*, *119*(2), 254-284.

Kluger, A. N., & DeNisi, A. (1998). Feedback interventions: Toward the understanding of a double-edged sword. *Current Directions in Psychological Science*, *7*(3), 67-72.

Kulhavy, R. W. (1977). Feedback in written instruction. *Review of Educational Research*, *47*(2), 211-232.

Unkelbach, C., Alves, H., & Koch, A. (2020). Negativity bias, positivity bias, and valence asymmetries: Explaining the differential processing of positive and negative information. In *Advances in experimental social psychology* (Vol. 62). Academic Press.

Sargeant, J. M., Mann, K. V., Van der Vleuten, C. P., & Metsemakers, J. F. (2009). Reflection: a link between receiving and using assessment feedback. *Advances in Health Sciences Education*, *14*(3), 399-410.

Schartel, S. A. (2012). Giving feedback–An integral part of education. *Best Practice & Research Clinical Anaesthesiology*, *26*(1), 77-87.

Taylor, S. E., & Brown, J. D. (1988). Illusion and well-being: A social psychological perspective on mental health. *Psychological Bulletin*, *103*(2), 193-210.

Taylor, S. E. (1991). Asymmetrical effects of positive and negative events: The mobilization-minimization hypothesis. *Psychological Bulletin, 110*(1), 67.

Winstone, N. E., Nash, R. A., Parker, M., & Rowntree, J. (2017). Supporting learners' agentic engagement with feedback: A systematic review and a taxonomy of recipience processes. *Educational Psychologist*, *52*(1), 17-37.