

Negative Affect Links Negative Feedback to Cognitive and Motivational Engagement

Loreen Hennemann

loreen.hennemann@uni-kassel.de

University of Kassel

Silja Kotte

Aschaffenburg University of Applied Sciences

Florian Scharf

University of Kassel

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Abstract

Negative feedback is essential for improvement but often elicits withdrawal instead of change. Adopting a micro-process perspective, this study examines the immediate affective, cognitive, and motivational responses that shape recipients' engagement. Drawing on PSI theory, we challenge the predominantly negative view of negative affect and rumination by proposing immediate negative affect as catalyst for engagement and task-focused rumination as functional cognitive engagement. We also explored mindfulness as potential moderator. In a 2 x 2 online experiment ($N = 422$), participants received personalized feedback using an innovative vignette paradigm. Moderated mediation analyses revealed a dual-pathway mechanism: Negative feedback directly reduced engagement while simultaneously promoting engagement indirectly. The mindfulness induction did not moderate affect or feedback responses (task-focused rumination, intention to adapt behavior). These findings highlight negative feedback's complexity, demonstrating that it can evoke both withdrawal and engagement. Future longitudinal research should examine the full improvement process and longer mindfulness interventions.

Introduction

Continuous learning and adaption are essential for organizations and employees in dynamic work environments [1,2]. To stimulate learning and improve performance, feedback – that is, communicated information about past performance intended to guide future change [3] – is a key instrument [4,5]. While meta-analyses confirm its effectiveness on average, they also reveal considerable heterogeneous effects, including impaired motivation, learning, or performance [6–8]. These mixed findings underscore the need to understand *when* and *how* feedback leads to constructive responses rather than disengagement.

This challenge is particularly salient for negative feedback which is frequently associated with resistance and disengagement [3,7] although its content is essential for later performance improvement. Previous research may have oversimplified negative feedback's effects by treating the feedback valence as sufficient predictor (positive feedback fosters improvement, while negative feedback triggers dysfunctional outcomes) and disengagement as the final outcome [3,9]. Rather, research should explore processes setting the stage for engagement. While affect is considered essential in this, it remains poorly understood how it influences the motivation to act on feedback [3,9].

The present study adopts a *micro-process perspective* on receiving negative feedback by focusing on immediate affective reactions and proximal indicators of engagement, namely task-focused rumination and intention to adapt behavior. These early responses can influence whether feedback results in constructive engagement or defensive dismissal, thereby paving the way for subsequent improvement [10,11]. While behavior intention is widely regarded as one strong predictor of behavior [12,13], rumination is discussed ambivalently. Although mostly conceptualized as dysfunctional and distinguished from more adaptive cognitive processing, such as meta-cognition [14], prior research suggests that task-focused rumination following failure can facilitate improvement [15]. Task-focused rumination may therefore represent an indicator of cognitive engagement rather than merely reflect resistance.

Indeed, problem focus and processing of discrepancies (task-focused rumination) have been considered as key determinants in self-growth processes. Drawing on Personality Systems Interaction (PSI) theory [16,17], self-growth is a dialectical process in which negative affect supports ruminative processing, while subsequent affect regulation enables the transformation of this problem focus into volitional intentions and adaptive change. From this perspective, negative affect and temporary rumination are not inherently dysfunctional but potentially functional to initiate engagement with feedback, provided that subsequent regulation occurs that prevent individuals from 'getting stuck' in problem paralysis.

Considering the relevance of affect regulation, we explore mindfulness as potential facilitator for regulatory processes, resulting in a process model of responding to negative feedback (see Fig. 1). In this model, we propose that affective reactions mediate the effect of negative feedback on proximal feedback responses (task-focused rumination, intention to adapt behavior), while mindfulness functions as moderator by supporting a constructive processing by attenuating the initial negative affective reaction to the feedback itself, and/or by altering the subsequent relationship of these affective reactions to the feedback response. Integrating PSI theory with complementary assumptions from Monitor and Acceptance Theory (MAT) [18,19], we argue that mindfulness may enable a sustained problem focus, without the risk of becoming overwhelmed by intense affect, especially, since mindfulness demonstrated beneficial effects on affect regulation [20] and feedback processing [21–23].

In this study, we tested this process model in an online experiment that combined a mindfulness induction (MI) with a personalized feedback vignette design. This approach balances experimental control with ecological validity to examine the immediate affective, cognitive, and motivational micro-processes following negative feedback.

Negative Feedback: Engagement or Withdrawal?

Studies report both beneficial effects of negative feedback on distal, performance-related outcomes [24, 25], and increased resistance and withdrawal [3, 10]. A common notion in theoretical accounts of feedback processing is that it does not directly influence performance; but rather triggers a chain of evaluative and affective reactions that shape how recipients respond [10, 11]. A better understanding of these internal processes may help to reconcile the seemingly contradictory findings [3, 9].

At its core, negative feedback creates a motivational dilemma between engagement and withdrawal [10, 26]. While essential for self-growth, it also threatens recipients' personal or social self-esteem by evoking perceptions of personal deficiencies and lack of appreciation [27, 28], thereby increasing negative affect [11, 29, 30]. Recipients therefore face the dilemma to engage with the feedback despite immediate discomfort to support long-term improvement, or to withdraw to protect one's self-image and avoid negative affect [10, 26].

Whether recipients respond with engagement (approach the issue) or withdrawal (avoid the issue) is largely determined by their affective reactions [31, 32]. While positive affect is reliably linked to approach motivation, the role of negative affect remains ambiguous, suggesting a relationship more complex than a simple valence-based view implies [32, 33]. For example, motivational consequences of negative affect may depend on specific discrete states (e.g., anger vs. fear, [34]) or affective intensity [35]. Such a more differentiated view on positive and negative arousal may help understand how engagement can arise from negative feedback.

A Micro-Process Perspective on Immediate Feedback Responses

We adopt a *micro-process perspective* on immediate feedback responses (see Fig. 1), thereby moving beyond distal outcomes (e.g., performance) by zooming in on the starting point of feedback processing: affective reactions and their relationship to task-focused rumination and intention to adapt behavior as indicators of cognitive and motivational engagement. Drawing on PSI theory [16, 17], we propose that negative feedback, despite its affectively challenging nature, may not only lead to disengagement but also trigger engagement.

The Ambiguous Role of Negative Affect

It is well-established that negative feedback elicits strong negative affect [36–38] and decreases positive affect [29, 39, 40]. In contrast, positive-negative mixed feedback elicits weaker negative affect [41]. We expect to replicate this effect (cf. Figure 1, left half).

Hypothesis 1

More negative feedback is associated with increased negative and decreased positive arousal.

While this affective reaction is often viewed as an undesirable effect hindering improvement, negative affect may not automatically mean feedback failure but rather be functional to stimulate subsequent engagement [42, 43]. This can be better understood through PSI theory which is frequently applied to describe affective responses in improvement processes (e.g., coaching [44]), particularly after failure [42, 45]. PSI theory posits that the intensity of affective reactions acts as critical regulator of cognitive and motivational processing as positive and negative affect serve distinct, beneficial regulatory functions. Increased negative affect is functional during *early* stages of engagement processes because it signals a discrepancy between current performance and desired ideal standards, thereby shifting attention towards details and initiating corrective cognitive processing [16, 17]. Accordingly, negative affect functions as an activation signal that encourages individuals to confront and analyze the discrepancy (problem focus). As complementary function, positive affect facilitates integrative cognitive processing and enables individuals to translate intentions into goal-directed action, thereby empowering successful implementation of change.

Applying this reasoning to negative feedback offers a new perspective on feedback processing: Rather than asking *if* participants feel bad initially, the question is how they *utilize* this negative affect.

Engagement Following Negative Feedback

To better understand why recipients either engage with feedback or withdraw from it, we propose that the critical difference lies in their immediate cognitive and motivational responses (see right side of Fig. 1). As one form of cognitive engagement, we focus on *task-focused rumination*. Rumination generally refers to repetitive, self-focused thinking about perceived failures or shortcomings [46]; and is often conceptualized as maladaptive and associated with negative outcomes such as impaired well-being and performance [47, 48].

Drawing on PSI theory, however, we propose that task-focused rumination in the immediate aftermath of negative feedback can also be functional, reflecting the cognitive processing of criticism and discrepancies, specifically, a problem focus. Task-focused rumination therefore may indicate that recipients actively engage with negative information rather than disengage from it. However, this temporary state must be distinguished from prolonged rumination, which can become maladaptive and lead to problem paralysis [16]. Because our study captures rumination immediately after feedback, we conceptualize it as an early, transient, and potentially functional form of cognitive engagement.

Research consistently links negative feedback and negative affect to rumination [49–51]. Despite investigations into rumination's potential benefits being limited, evidence supports our proposed view: Ruminative states can promote problem solving via increased attentional resources and effort [52]; repetitive thoughts on negative experiences can support rebounding from negative events, promoting adaptive preparation and anticipatory planning [53]. Task-focused rumination following failure may therefore facilitate improvement by encouraging

reflection and problem-solving [15, 54]. We thus expect the following (cf. Figure 1, full mediation for task-focused rumination):

Hypothesis 2

More negative Feedback is associated with higher levels of rumination. This effect is mediated by affective reactions (higher negative and lower positive arousal).

Beyond cognitive engagement, recipients may also respond with motivational engagement in form of *intention to adapt their behavior* – that is, the extent to which individuals plan to invest effort in changing their behavior [31]. Referring to PSI theory, intention formation depends on the interplay of negative and positive affect [16, 17]. Negative affect signals a discrepancy and stresses the need for change, whereas positive affect facilitates goal commitment and the translation of intentions into action. Previous research supports this perspective by linking positive affect to behavior intentions and goal commitment [31, 55].

In contrast, findings on negative affect are more mixed: While it has been associated with reduced goals and increased constraint recognition [55, 56], it may also promote adaptive responses by signaling performance discrepancies and facilitating behavioral adjustment [57, 58]. Moreover, discrete emotions such as anger or shame may foster approach motivation [34, 59]. Accordingly, PSI theory suggests that both affective states contribute to change intentions through different mechanisms: negative affect by signaling a problem and positive affect by supporting volitional implementation. We thus expect that both affective reactions are positively associated with behavior intention (cf. Figure 1, right half).

Hypothesis 3

Negative and positive arousal are positively associated with behavior intention.

Additionally, we expect that the effect of negative feedback on motivational engagement is mediated via affective responses (cf. Figure 1, full mediation for intention).

Hypothesis 4

More negative feedback influences behavior intention, mediated by affective reactions (higher negative and lower positive arousal).

Can Mindfulness Support Feedback Processes?

Given the importance of affect in constructive feedback processing, it is important to consider how affective processing can be influenced. As mindfulness has been consistently linked to enhanced self-regulation, it may promote engagement with challenging experiences rather than withdrawal [20]. *Mindfulness* – defined as “the awareness that emerges through paying attention on purpose, in the present moment, and nonjudgmentally to the unfolding of experience moment by moment” [60] (p. 145) – involves regulation of attention and a mindful attitude toward one’s experiences characterized by curiosity, compassion, acceptance, and self-distancing [61–63]. MAT [18, 19] proposes that mindfulness enhances self-regulation by enabling individuals to remain aware of internal experiences without avoidance or overidentification. Mindfulness may therefore increase tolerance for negative affect through heightened awareness, while it also reduces emotional reactivity [64–66] and supports the downregulation of negative affect through acceptance-based strategies [67–69] and decentering [70, 71].

Our conceptual model combines the process model based on PSI theory with the potential influence of an induced mindfulness state based on MAT (cf. Figure 1, lower half). Mindfulness may facilitate constructive feedback responses at multiple levels. First, it may reduce the impact of negative feedback on affective reactions, thereby limiting affective arousal to a manageable level without triggering avoidance. Second, mindfulness may buffer maladaptive consequences of negative affect while preserving its functional aspects (problem focus through task-focused rumination). Thus, we do not expect mindfulness to eliminate negative affect but rather to help individuals remain engaged with negative feedback instead of shifting into withdrawal. Accordingly, we propose that mindfulness functions as a regulatory buffer by attenuating pathways toward withdrawal reactions.

Initial evidence indeed suggests that mindfulness can attenuate maladaptive reactions to negative feedback and promote more constructive responses [21–23]. Even brief inductions have been shown to effectively stimulate mindfulness states [72, 73]. Implementing these short exercises in organizations appear also beneficial since mindfulness interventions have demonstrated effectiveness [74–76], are well established in workplace settings [77, 78], and can be easily implemented via digital settings [79].

Hypothesis 5

The mindfulness intervention moderates the effect of negative feedback on feedback response (rumination, behavior intention) via affective reaction, in the sense that each pathway is attenuated in its impact.

Methods

To test our conceptual model (see Fig. 1), we conducted an online experiment utilizing a 2 (mindfulness induction (MI) vs. no treatment (NT)) by 2 (negative vs. positive-negative-mixed feedback) between-subjects factorial design. Participants were randomly assigned to the experimental conditions.

To realistically simulate negative feedback while maintaining experimental control, we employed personalized feedback vignettes. Participants first recalled a past or current work project to which they felt personally committed and reported the corresponding job position and project objective. They were then asked to imagine receiving hypothetical feedback on this project. Participants' details (job position and project objective) were dynamically embedded into a standardized feedback template, allowing the feedback to be personalized while keeping its valence and core content constant across conditions.

We chose this approach to address a critical methodological trade-off in feedback research: While experimental vignette designs are well established [80, 81] and particularly suitable when field settings offer limited control or access [82–84], previous laboratory and vignette paradigms often rely on artificial performance tasks (e.g., feedback on brainstorming tasks [29]) or purely fictitious scenarios [80]. Despite their high internal validity, such paradigms often lack the emotional relevance and contextual realism of workplace feedback [3]. In contrast, field studies capture naturalistic feedback experiences but often lack experimental control and causal interpretability [3]. To balance these strengths and limitations, our personalized vignette design combined experimental control over feedback valence with ecological validity through personalization. Because feedback was embedded in participants' own occupational experiences, realism and immersion were increased, allowing us to examine more realistic responses to negative feedback [82, 85].

Data and Sample

Participants were recruited in Germany via direct mailings of the first author, targeting professional associations (e.g., mindfulness and business psychology associations) and social networks (e.g., LinkedIn, Xing). Data were collected from 482 participants approximately balanced across experimental groups ($N_{MI} = 256$, $N_{NT} = 226$). During data screening, multiple participants had to be excluded because they fulfilled one or more of the following exclusion criteria: a lack of working experience ($n = 17$), conspicuous response behavior ($n = 14$; e.g., comment that shows a lack of interest in the survey), failed attention checks and control items for the negative feedback group ($n = 19$), and too-short completion time ($n = 4$). In addition, we excluded some participants based on statistical criteria, specifically, extreme outliers via boxplot diagrams ($n = 5$) and one participant due to an extreme multivariate outlier, as indicated by a Mahalanobis distance exceeding the χ^2 cutoff ($df = 3$, $p < .001$). After data screening, 194 participants remained in the negative feedback condition ($n_{MI} = 96$; $n_{NT} = 98$) and 228 participants in the positive-negative-mixed feedback condition ($n_{MI} = 118$; $n_{NT} = 110$).

For the entire remaining sample of $N = 422$, participants' age ranged from 19 to 71 years ($M = 34.64$; $SD = 13.57$); 64.70% identified as women, 34.10% as men, and 1.20% as diverse or unspecified. Participants had diverse highest education levels (e.g., vocational diploma/high school diploma: 27.70%, bachelor's degree: 27.90%, master's degree: 30.00%) and occupational backgrounds (e.g., employed without management responsibility: 34.40%, student employment: 22.70%, management responsibility: 14.20%). Participants indicated their working experience with $M = 11.17$ years ($SD = 12.32$).

Procedure

The study took 15–30 minutes to complete. After providing informed consent and accepting the privacy policy, participants completed questionnaires administered before, between, and after the two experimental manipulations. Only measures relevant to the present research questions are reported here (see supplementary Fig. A.1 and Table A.1 to A.3 online for a full list of administered scales). First, participants completed initial measures (e.g., sociodemographic), followed by the mindfulness condition (MI vs. NT) and an immediate manipulation check, measuring mindfulness state. Next, participants received the feedback manipulation (negative vs. mixed feedback), after which perceived feedback valence was assessed as second manipulation check. Following the feedback manipulation, affective reaction and feedback response (task-focused rumination, behavioral intention) were surveyed in the same questionnaire to capture participants' immediate response to feedback. At the end of the survey participants were fully debriefed about the study's objective and experimental conditions. To ensure ethical fairness, participants in the no-treatment condition were offered the opportunity to attend a MI session after completing the study.

Experimental Manipulations

Mindfulness Induction vs. No Treatment

The MI consisted of a 10-minute educational video and audio exercise. The audio exercise was based on previous mindfulness inductions [86, 87] and shown to be effective in prior research [88–91]. It combined concentrative elements (focus on breath) with open monitoring (observing emerging thoughts and emotions). Because concentrative meditations are considered particularly suitable for individuals with limited mindfulness experience [92–94], we considered this induction appropriate for the present study. The intervention was piloted separately to ensure the effectiveness of the video and audio format.

Negative vs. Positive-Negative Personalized Feedback Vignettes

The feedback manipulation consisted of a negative versus positive-mixed 360-degree workplace feedback scenario delivered via a personalized vignette combining autobiographical recall with a hypothetical performance report. Participants were first instructed to recall a past or current work project to which they felt personally committed and to report their job position and project objective. They were then asked to imagine receiving performance feedback on this project. To personalize the vignette while maintaining experimental control, participants' details were dynamically embedded into standardized feedback text (see supplementary Section B online). Each vignette contained standardized instructions and a fictitious feedback report evaluating four performance dimensions: result orientation, project management, communication, and teamwork. Feedback was presented both textually and graphically by comparing self- and other-ratings from coworkers, supervisors, and collaboration partners [95]. For example, a participant recalling a project manager role for “developing new software” would receive the following negative feedback:

Your project was about *developing a new software*. The result is therefore of great importance. Unfortunately, your contribution to the project result is below expectations and your goal and result orientation as *project manager* are rated as poor. The project could have been implemented much more efficiently and quickly if you had prioritized more clearly.

To create the experimental conditions, participants received either purely negative feedback or a mixed positive-negative feedback control condition. Consistent with previous research, the mixed feedback condition was chosen over a purely positive one to better isolate responses to negative criticism within a more ecologically valid feedback context [6]. Because both conditions included negative feedback, the contrast reflects variations in overall feedback valence rather than the mere presence versus absence of criticism.

The effectiveness of this personalized manipulation was also confirmed in a pilot test. The results indicated that the feedback valence was correctly perceived, the vignette successfully stimulated cognitive, affective, and motivational responses, as well as that personalization enhanced participants' identification with the scenario compared to a non-personalized version.

Measures

We aimed to ensure the validity of the survey by using measures verified in previous research. Unless indicated otherwise below, items were assessed on a Likert scale from 1 = *does not apply at all* to 7 = *fully applies*.

Manipulation Checks

To evaluate the MI, we assessed mindfulness state post-induction using two scales targeting its key facets: attention and attitude. Attentional mindfulness was measured with the cognitive subscale of the *State Mindfulness Scale* (SMS; 15 items [96], e.g., “I noticed pleasant and unpleasant emotions”). The SMS is sensitive to situational changes and has been validated for use after mindfulness inductions [97], including good internal consistency ($\alpha = .91$ to $.96$; [96]). To measure mindfulness attitude, we additionally employed the subscale “nonjudgemental acceptance” from the *Multidimensional State Mindfulness Questionnaire* (MSMQ; 3 items [98]) with Cronbach's $\alpha = .64$, e.g., “I think some of my thoughts/feelings were a bit inappropriate”.

To test the valence of the feedback vignette, we used a self-constructed single item: “My performance was evaluated ...” with 1 = *very negatively* to 7 = *very positively*).

Affective Reaction

We measured affective reaction with the short form of the *Positive Activation Negative Activation Valence* (PANAVA-KS; [99]) which comprised of 10 items with a bipolar 7-point Likert scale (e.g., 1 = “listless” to 7 = “highly motivated”). PANAVA-KS is based on the circumplex model of affective states and captures both arousal (high vs. low) and valence (positive vs. negative). The subscales (positive activation, negative activation, valence) are sensitive to intraindividual and situation-specific fluctuations with good internal consistency ($\alpha = .77$ for positive activation, .70 for valence, and .76 for negative activation).

Task-Focused Rumination

Task-focused rumination was assessed by the *Brief State Rumination Inventory* (BSRI [100]). The BSRI assesses self-focused thoughts via eight items (e.g., “Right now, I’m wondering, ‘Why can’t I do a better job with the tasks at work for which I was criticized in my feedback?’”) with good internal consistency ($\alpha = .89$).

Intention to Adapt Behavior

We measured the *intention to adapt behavior* in response to the feedback with three items [101], for example: “I plan to follow up on the recommendations from the feedback”. Internal consistency is good ($\alpha = .84$).

Data Analysis

General Modeling Strategy

To investigate our proposed process model, we used Structural Equation Modeling (SEM) in R (version 4.3.1) [102] and lavaan (version 0.6–16) [103]. All models were fitted using the robust maximum likelihood method (MLR) [104–106]. All questionnaire measures were modeled as latent variables. Following standard recommendations in the SEM literature [107], we first evaluated the measurement models in confirmatory factor analyses (CFAs) [108], before estimating the full structural model. Several CFAs showed substantial signs of model misfit, which is common when confirmatory models impose overly restrictive zero cross-loadings [109–112]. To address this issue, we used Exploratory Structural Equation Modeling (ESEM) [109], which integrates exploratory factor analytic measurement models within the SEM framework [113]. Compared to traditional CFA, ESEM can reduce artificial model misfit caused by overly restrictive factor structures while accounting for uncertainty introduced by factor rotation [109].

Detailed procedures and results of the measurement evaluation are reported in the corresponding Methods subsection and the supplementary Section E online, while the Results subsection provide detailed information on the manipulation checks and the hierarchical testing of the structural models.

Assessment of Measurement Models

We specified a separate CFA for each latent construct, that is, affective reactions with three dimensions (valence, negative and positive activation), task-focused rumination and behavioral intention as a single factor. Model fit was evaluated using established global fit indices [111]: Comparative fit index (CFI) and Tucker-Lewis Index (TLI) with values $> .90$ were deemed sufficient [114], root mean square error of approximation (RMSEA) $< .06$, and standardized root mean square residuals (SRMR) $< .08$ were rated as good [115]. In addition, we inspected the models for local misfit using modification indices, considering values larger than 10 as potentially indicative of local strain.

When substantial global or local misfit was identified, we conducted an EFA to better understand the underlying factor structure. Parallel analysis was used to determine the appropriate number of factors [116], followed by an EFA with oblique geomin rotation ($\epsilon = 0.001$) and robust ML estimation [112, 117]. The measurement models for these constructs were then specified as exploratory in the ESEM for structural analyses.

Specifically, this was the case for affective reactions and task-focused rumination as the evaluation of both measurement models indicated substantial misfit, indicating a two-factor structure for both. For affective reactions, the originally assumed valence factor showed substantial cross-loadings and high correlations with the remaining factors, suggesting that a simpler two-factor solution provided a better representation of the data. Accordingly, the follow-up EFA identified two affective reaction factors reflecting negative (NEG) and positive arousal (POS). For task-focused rumination, the originally assumed single-factor structure split into two distinct factors. The first reflected reflection (REF), characterized by a more neutral contemplation of one's mood, reactions, and emotions (e.g., "Right now, I'm wondering why I feel the way I do"), whereas the second reflected task-focused rumination in a narrower sense (RUM), characterized by a negative focus on perceived mistakes and shortcomings (e.g., "Right now, I'm reflecting on the things I've said or done wrong"). Based on these results, affect and rumination were modeled with 2-factorial exploratory measurement models (POS and NEG for affective reactions; REF and RUM for task-focused rumination), whereas all remaining constructs were modeled using CFA-based latent factors in subsequent analyses. Further details regarding the measurement models are reported in the supplementary Section E online.

Manipulation Checks

As a manipulation check for the MI, we assessed its effect on mindfulness state. Because two mindfulness state measures were combined, we estimated an ESEM with mindfulness factors as dependent variables with oblique geomin rotation ($\epsilon = 0.001$) and robust ML estimation [112, 117]. Experimental condition was used as predictor for all factors. The factor number was determined via parallel analysis, suggesting a four-factor solution for mindfulness state (curious and present-centered attention, valence-independent attention, self-awareness, and non-judgmental acceptance) with adequate model fit, CFI = .940, TLI = .899, RMSEA = .061, SRMR = .034, $\chi^2(101) = 286.47$, $p < .001$. While curious and present-centered attention emphasizes the present moment (e.g., "I feel like I'm fully experiencing the present moment"), self-awareness focuses on the state of being present and aware (e.g., "There are times when I feel alert and aware"). To survey mindfulness' attitudinal facet, non-judgmental acceptance measures the non-judgmental perspective via the opposite (e.g., "I think some of my thoughts and feelings were a bit inappropriate"), while valence-independent attention focuses more on openness and curiosity toward all internal experiences, regardless of their valence (e.g., "I notice both pleasant and unpleasant feelings").

To evaluate the effectiveness of the feedback condition, we tested group differences in the perceived feedback valence via Welch's t tests for independent samples. We evaluated effect sizes of Cohen's $d > .80$ as strong, $d > .50$ as medium, and $d > .20$ as small [118].

Assessment of Structural Model

Analyses followed a two-stage approach (see Fig. 2). First, we estimated the hypothesized micro-process mediation model across both mindfulness conditions to examine immediate processes triggered by negative feedback (cf. Figure 1, upper half). Second, we tested whether model coefficients differed between the mindfulness and control groups using multigroup SEM (cf. Figure 1, lower half). We sequentially compared increasingly complex models using the scaled chi-square difference test [119–121], with Akaike's information criterion (AIC) and Bayesian

information criterion (BIC) as supplementary fit indices [122]. By this, we identified the best fitting model and thus examined *if*, *where* and *how* mindfulness exerted an influence on feedback responses.

Stage 1: Micro-Process Model of Immediate Feedback Response. We estimated the baseline mediation model (Model 1) across the full sample to examine immediate feedback responses independent of mindfulness condition. Specifically, this *full-sample model* tested whether affective reactions (POS and NEG) mediated the effects of negative feedback on cognitive and motivational engagement (REF, RUM, and intention to adapt behavior, INT). This model served as the baseline for subsequent moderation analyses.

Stage 2: The Role of Mindfulness. We investigated the role of mindfulness using hierarchical *multi-group SEM* comparing the MI- and NT-groups [114]. Specifically, we tested the impact of mindfulness at four locations within the process model (Models 2–5; see Fig. 2): immediate affective reactions (Model 2; feedback → affect), immediate engagement responses (Model 3; affect → cognitive and motivational engagement), indirect effects across both stages (Model 4), and direct effects of feedback on engagement responses (Model 5; feedback → cognitive and motivational engagement). At each location, we conducted sequential model comparisons between a fully constrained model (intercepts and path coefficients equal across groups), a main-effect model (group differences in intercepts), and an interaction-effect model (group differences in intercepts and path coefficients). This sequential model comparison allowed us to distinguish between different theoretically plausible locations of mindfulness effects within the feedback process and to differentiate whether mindfulness only changed the mean levels of outcome variables (e.g., reduced negative affect) or also altered the relationships between variables (e.g., buffering the impact of negative feedback on affect).

We first report the results of the model comparisons for all nested models to document the model selection process. Subsequently, the ultimately chosen model is reported in detail, including direct and indirect effects regarding their unstandardized (*b*) and standardized path coefficients (β), latent constructs' correlations, and the coefficient of determination (R^2) for each latent construct. We classified $R^2 = .02$ as small, $R^2 = .13$ as moderate, and $R^2 = .26$ as strong effect [123].

Ethical Considerations

All procedures performed in studies involving human participants were conducted in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The study was approved by the Ethics Committee of the University of Kassel (Ethic Approval Number 202127). Participation was voluntary, and informed consent was obtained electronically from all participants prior to their inclusion in the study.

Transparency and Use of Artificial Intelligence

Generative artificial intelligence (AI) tools were used solely to support manuscript preparation and R code development and review. For translation of individual text passages and terms between German and English, we used DeepL Translator (DeepL SE). ChatGPT (OpenAI) and scienceOS were used to support the linguistic and stylistic refinement of author-written manuscript text with respect to grammar, English-language expression, style, conciseness, clarity, paragraph structure, and redundancies. ChatGPT was also used to support the development, refinement, and review of R code through an iterative exchange in which code was generated or modified and critically evaluated by the authors. No research data were provided to or accessed by the AI tools. All AI-assisted suggestions, translations, and code modifications were critically reviewed, verified, and revised by the authors, who

retain full responsibility for the content, accuracy, integrity, cited references, and final analyses. All theoretical decisions, hypotheses, interpretations, and final manuscript content were developed and approved by the authors.

Results

Manipulation Check

The MI significantly increased curious and present-centered attention ($b = 0.518, \beta = .251, p = .001$) and non-judgmental acceptance ($b = 0.336, \beta = .166, p = .002$), but not valence-independent attention ($b = -0.068, \beta = -.034, p = .543$) or self-awareness ($b = 0.030, \beta = .015, p = .840$). The feedback manipulation was successful as the negative feedback group ($n = 194$) rated the vignette as substantially more negative ($n = 194; M = 2.18, SD = 0.771$) than the mixed feedback group ($n = 228, M = 4.08, SD = 0.846$), $t(422) = 24.10, p < .001, d = 2.337$.

Main Analyses

Global Fit and Model Selection

Indicators of model fit were adequate for all reported ESEMs (see Supplementary Table F.1 online). In Table 1, we report the zero-correlations of all latent factors across participants.

Table 1
Correlations Among Latent Constructs (N = 420)

FB	FB	MF1	MF2	MF3	MF4	POS	NEG	REF	RUM	INT
	-	-.018	-.030	-.001	.016	-.080**	.147***	.015	.053*	-.154***
MF1		-	.140	.311	-.123	.202	-.289	.098	-.097	.304*
MF2			-	.582***	.176	.240***	-.247***	.006	-.128	.116
MF3				-	-.266	.332***	-.353***	-.243**	-.287***	.249**
MF4					-	-.231**	.271***	.451***	.478***	-.051
POS						-	-.631***	-.266***	-.397***	.464***
NEG							-	.399***	.724***	-.163*
REF								-	.634***	.021
RUM									-	.224
INT										-

Pearson correlations of latent constructs via ESEM with full sample ($N = 420$). Item-level correlation matrices for the full sample by condition (the mindfulness induction vs. no-treatment) are provided in the online supplement (see Section D). FB = Feedback vignette (mFB for mixed feedback vs. nFB for negative feedback); MF 1 = curious, present centered attention; MF2 = valence-independent attention; MF3 = self-awareness; MF4 = non-judgmental acceptance; POS = positive arousal; NEG = negative arousal; REF = neutral reflection; RUM = rumination; INT = intention to adapt behavior.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Full-Sample Model as Baseline Model. Model 1 evaluated affective reactions as a mediator of negative feedback on feedback response (REF, RUM, and INT), representing the micro-process model of immediate feedback response. The model fit was adequate: CFI = .947; TLI = .932; RMSEA = .061; SRMR = .055; $\chi^2 = 441.225$, $df = 181$, $p < .001$.

Model Selection via Multi-Group Analyses. To determine mindfulness' impact, we conducted a series of multi-group ESEMs (see Fig. 2, Model 2–5). Table 2 displays the model comparisons' results.

Table 2
Scaled Chi-Square Test to Evaluate Mindfulness as Moderator

Model	Comparison	Model fit						
		<i>df</i>	AIC/ BIC	Δ AIC/ Δ BIC	χ^2	$\Delta\chi^2$	Δdf	<i>p</i>
Model 1: Full-Sample Model	base model	450	29329/ 29733		846.44			
Model 2: First-Stage Moderation	base vs. main	448		4/13		0.0032	2	.9984
	main vs. int	446		1/8		3.3091	2	.1912
Model 3: Second-Stage Moderation	base vs. main	447		6/ 19		0.0042	3	
	main vs. int	441		7/30		5.2948	6	.5066
Model 4: First- and Second-Stage Moderation	base vs. main	445		10/29		0.014	5	1.000
	main vs. int	437		7/38		8.929	8	.3483
Model 5: Moderation of Direct Effect	base vs. main	447		6/19		0.0040	3	.9999
	main vs. int	444		1/11		6.7701	3	.0796

The whole sample ($N = 420$) is grouped by the mindfulness experimental condition: the no-treatment group with $N_{NT} = 207$; mindfulness induction group with $N_{MI} = 213$. Each multi-group model is subdivided into three levels of variation: base = model that is constrained, main = main-effect model that allows varying intercepts, int = moderated-effect model that allows varying intercepts and path coefficients. The models were compared with ascending variation. This means that positive values indicate a better fit of the simpler model. AIC = Akaike's information criterion, BIC = Bayesian information criterion; df = degrees of freedom.

Although all models showed acceptable fit (see Supplementary Table F.1 online), model comparisons consistently favored the fully constrained models (Model 1). No significant improvements in model fit emerged when intercepts or path coefficients were freely estimated across groups. Thus, there was no evidence that mindfulness altered either the outcomes' mean levels or the relationships within the feedback process, making mindfulness *not* a moderator (no support for Hypothesis 5).

Micro-Process Model of Immediate Feedback Response

Given the model comparison results, we report only Model 1 in detail. Figure 3 visualizes the structural model, and Table 2 displays all relevant parameters. This model explained substantial variance in RUM ($R^2 = .465$) and

moderate variance in INT ($R^2 = .192$) and REF ($R^2 = .170$) but only comparatively low variance for NEG ($R^2 = .087$) and POS ($R^2 = .026$).

Compared to mixed feedback, highly negative feedback reduced POS and increased NEG, supporting Hypothesis 1. Both NEG and POS were positively associated with INT, supporting Hypothesis 3.

For the mediation analyses, Table 3 reports the individual paths from feedback to affective reactions and from affective reactions to feedback responses.

Table 3 Results of Model 1

Path		DV	Effect	<i>b</i>	β	<i>p</i>	95% CI
IV	Mediator						
FB	→ NEG			.621***	.296***	<.001	[0.408, 0.835]
FB	→ POS			-.328**	-.161**	.006	[-0.566, -0.091]
	NEG	→ REF		.439***	.418**	<.001	[0.233, 0.654]
	NEG	→ RUM		1.216***	.841***	<.001	[0.853, 1.580]
	NEG	→ INT		.300**	.241**	.009	[0.046, 0.553]
FB	→ NEG	→ REF	indirect	.273***	.124***	<.001	[0.119, 0.426]
FB	→ NEG	→ RUM	indirect	.756***	.249***	<.001	[0.427, 1.085]
FB	→ NEG	→ INT	indirect	.186*	.071*	.014	[0.026, 0.347]
	POS	→ REF		-.020	-.019	.855	[-0.249, 0.209]
	POS	→ RUM		.158	.106	.317	[-0.170, 0.486]
	POS	→ INT		.605***	.470***	<.001	[0.352, 0.858]
FB	→ POS	→ REF	indirect	.007	.003	.855	[-0.068, 0.081]
FB	→ POS	→ RUM	indirect	-.052	-.017	.356	[-0.170, 0.067]
FB	→ POS	→ INT	indirect	-.199*	-.076	.012	[-0.367, -0.031]
FB		→ REF	direct	-.210	-.095	.094	[-0.455, 0.036]
FB		→ RUM	direct	-.372**	-.122**	.006	[-0.638, -0.106]
FB		→ INT	direct	-.608***	-.232***	<.001	[-0.901, -0.314]
FB		→ REF	total	-.285	-.151	.150	[-0.675, 0.104]
FB		→ RUM	total	.213	.070	.426	[-0.312, 0.738]
FB		→ INT	total	-.145	.148	.504	[-0.568, 0.279]

This table displays the mediation analyses within the full-sample mediation model ($N = 420$). IV = independent variable, DV = dependent variable, CI = confidence interval, FB = Feedback (mFB vs. nFB, with increasing negative valence), NEG = negative arousal, POS = positive arousal, REF = reflection, RUM = rumination, INT = intention to adapt behavior.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Mediation analyses showed that NEG – but not POS – mediated the relationship between negative feedback and REF and RUM. The indirect effects via NEG were significant for REF and RUM, supporting Hypothesis 2. Controlling for affect, negative feedback directly reduced RUM, whereas no significant direct effect emerged for REF. Regarding INT, both NEG and POS acted as mediators. The indirect effect via NEG was significantly positive, whereas the indirect effect via POS was significantly negative. Controlling for affect, negative feedback *directly* reduced INT. Together, these findings supported Hypothesis 4.

Discussion

This study adopted a micro-process perspective on immediate responses to negative feedback. Drawing on PSI theory, we proposed that immediate negative affect may be beneficial for cognitive and motivational engagement, re-conceptualizing task-focused rumination as potentially functional. Our findings suggest that negative feedback is directly associated with reduced cognitive and motivational engagement but simultaneously promotes engagement indirectly via increased NEG. Contrary to expectations, however, MI was no moderator and did not alter the feedback process.

The Withdrawal Pathway

Interestingly, negative feedback simultaneously triggered opposing processes that partially counteracted each other at the total-effect level: While NEG promoted cognitive and motivational engagement indirectly, negative feedback directly negatively influenced RUM and INT when controlling for affect. We interpret this direct pathway as a rapid withdrawal that bypasses further feedback engagement. Because negative feedback often threatens the self [7, 124], recipients may protect themselves by invalidating the feedback or dismissing its relevance [125]. Short-term goals such as avoiding unpleasant affect or confronting one's own fallibility thus may override longer-term improvement goals [10, 126, 127], hindering feedback's learning potential [128]. We therefore interpret the reduced RUM and INT in the direct pathway as a tendency toward withdrawal from the feedback.

The Engagement Pathway

In contrast to the direct withdrawal pathway, our findings also revealed an indirect, affect-driven pathway toward engagement. Consistent with PSI theory, NEG and POS appeared to play different roles: Whereas NEG was linked to both cognitive and motivational engagement, POS was associated only with INT.

Our findings support PSI theory's assumption that *immediate* negative affect is not merely dysfunctional but can facilitate self-growth: NEG mediated the association between negative feedback and cognitive (REF, RUM) and motivational engagement (INT). This challenges the predominant view that negative affect primarily promotes withdrawal [129]. Instead, it may signal a discrepancy that promotes problem-focused processing and motivate change [130–132]. This aligns with research linking negative affect to increased self-focused attention on deficits and performance-relevant processing [50, 133, 134], or identifying it as mediator between negative feedback and performance [25]. Our findings thus add to emerging literature highlighting that negative affect can serve functional purposes rather than being merely dysfunctional.

POS was unrelated to cognitive engagement but strongly associated with INT. At the same time, however, negative feedback reduced POS, resulting in an overall negative indirect effect on INT. Consistent with PSI theory, this suggests that positive affect may be less relevant for initiating problem-focused processing and more relevant for supporting commitment to change. Its full beneficial potential, such as helping to translate intentions into action and overcome procrastination [135], may therefore not have been realized in our study since it focuses on immediate responses. This aligns with diary studies showing that shifts from negative to positive affect are associated with improved performance-related outcomes over time [45, 136].

Overall, our findings suggest that immediate feedback responses cannot be understood based on feedback valence alone but require a closer consideration of affect. Whereas negative feedback itself was linked to reduced engagement, NEG appeared to promote both cognitive and motivational engagement. In contrast, POS was associated only with INT and may become more relevant at later processing stages.

Mindfulness: Lack of Effect or Lack of Effectiveness?

Contrary to our expectations, our MI neither altered affective reactions nor feedback responses. However, rather than indicating that mindfulness is generally ineffective in dealing with negative feedback, this finding may suggest that a 10-minute induction may have been insufficient to activate mindfulness strongly enough to exert an influence [22, 23].

Our manipulation check already suggested that the induction affected only two out of four mindfulness aspects: curious, present-centered attention and non-judgmental acceptance but not affect valence-independent attention or self-awareness. Prior research also shows that brief exercises often influence only specific mindfulness facets, such as decentering [86, 89] or present-centered awareness [137]. Brief inductions may therefore fail to activate mindfulness comprehensively enough to alter affect regulation and feedback processing. Although, in another study, a 15-minute induction has been found effective in altering feedback processing [23], we cannot exclude that mindfulness effects may emerge slower than what can be captured in short-term designs; especially, since longer inductions or sustained mindfulness practice appear more effective [73, 138].

Drawing on MAT and PSI theory, mindfulness may still support more constructive feedback responses. Rather than questioning the relevance of mindfulness itself, our findings point to boundary conditions regarding the intensity and duration of mindfulness exercises required to influence feedback processes.

Limitations and Future Directions

While this study contributes to a micro-process understanding of immediate responses to negative feedback, its experimental cross-sectional design captures only a “snapshot” of the process. Although the personalized vignettes combined experimental control and causal inference with enhanced ecological validity, later stages of the self-growth process conceptualized by PSI theory, such as shifts in affect [45] and the transition from intention to actual behavior [17, 139], remain unexamined. We cannot determine whether REF and RUM would ultimately resolve into adaptive change or develop into maladaptive problem paralysis.

Another limitation concerns the correlational nature of the mediation findings. Although mindfulness and feedback conditions were experimentally manipulated, affective reactions were only measured. Consequently, the mediator–outcome associations may be influenced by unobserved third variables, limiting causal interpretations of the indirect effects. Moreover, reciprocal dynamics between affect and feedback responses cannot be ruled out. It also remains unclear whether REF and RUM represent a preliminary step toward INT or whether all constitute parallel outcomes of affect.

Longitudinal approaches such as diary studies appear promising for uncovering how engagement following negative feedback unfolds and translates into subsequent improvement [3], for example, by capturing PSI theory’s dynamic processes more comprehensively and assessing real feedback encounters (e.g., via event sampling).

Finally, our study focused on experimentally induced state mindfulness. Future research may benefit from considering trait mindfulness as it has been linked to greater motivation to learn from criticism [140], or longer interventions, such as Mindfulness-Based Stress Reduction (MBSR) [141].

Practical Implications

Our findings suggest that affective reactions triggered by negative feedback are central for whether recipients engage with or disengage from criticism. *Recipients* should not interpret negative affect and task-focused rumination as signs of failure, but as functional intermediate step. Rather than suppressing these reactions immediately, they may benefit from reflecting on discrepancies they signal. More broadly, recipients can strengthen their capacity to deal with criticism by learning strategies to overcome cognitive and affective barriers [142], for example, by strengthening their affect regulation capacities via programs such MBSR [141].

Feedback providers should aim to minimize perceived self-threat and allow space for NEG to reduce withdrawal tendencies. By separating feedback delivery from immediate discussion of consequences or next steps, providers could explicitly allow recipients time for reflection instead of expecting an instant constructive response.

Conclusion

This study challenges the view that negative feedback is uniformly detrimental. By adopting a micro-process perspective, our findings support negative feedback ambiguity: Whereas negative feedback itself was directly associated with reduced engagement, immediate NEG simultaneously promoted cognitive and motivational engagement. These findings support the assumption of PSI theory that negative affect can serve functional purposes rather than being merely dysfunctional. Contrary to expectations, a brief MI did not alter affective reactions or feedback responses, suggesting important boundary conditions regarding the intensity and duration of MI. Overall, our findings highlight that the critical question is not whether negative feedback elicits negative affect, but how individuals and organizations can productively deal with these affective reactions during the feedback process.

Declarations

Declaration of Interest Statement and Data Availability

The authors report there are no competing interests to declare. No funding was obtained for this work. The data that supports the findings of this study, the research items and analytic code are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions. Research material like experimental manipulations is available in the online supplement (see Section B for feedback vignette and Section C for MI).

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Author Contribution

Loreen Hennemann played a leading role in conceptualization, methodology, data curation, acquisition of data, data analysis, interpretation of data, visualization, project administration, and writing—original draft, while playing an equal role in ethics approval and writing—review and editing. Silja Kotte played a supporting role in conceptualization, a leading role in methodological guidance, and an equal role in ethics approval and writing—review and editing. Florian Scharf played a leading role in formal analysis and validation, while playing an equal role in writing—review and editing.

Data Availability

The data that supports the findings of this study, the research items and analytic code are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions. Research

material like experimental manipulations is available in the online supplement (see Section B for feedback vignette and Section C for MI).

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Figures

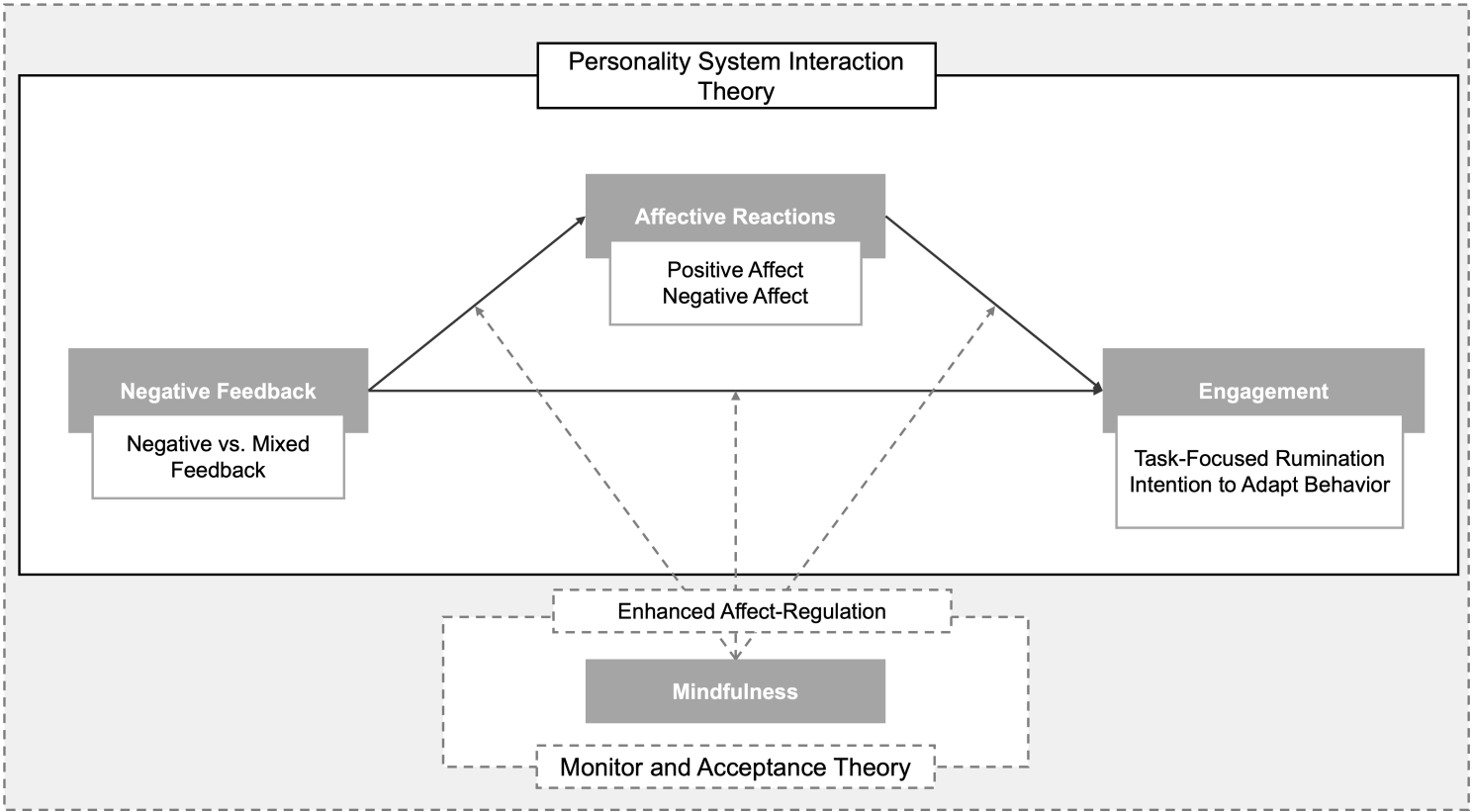
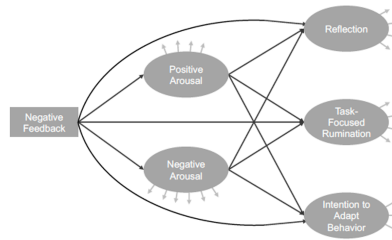


Figure 1

Micro-Process Model of Immediate Responses to Negative Feedback Considering Mindfulness. This micro-process model proposes that affective reactions mediate the association of negative feedback with the feedback response, while mindfulness operates as moderator by influencing the association of negative feedback and/or the subsequent association between affective reactions and feedback responses.

Micro-Process Model of Immediate Feedback Response via Full-Sample Model (Model 1)



Role of Mindfulness via Multi-Group Models (MF vs. NT)

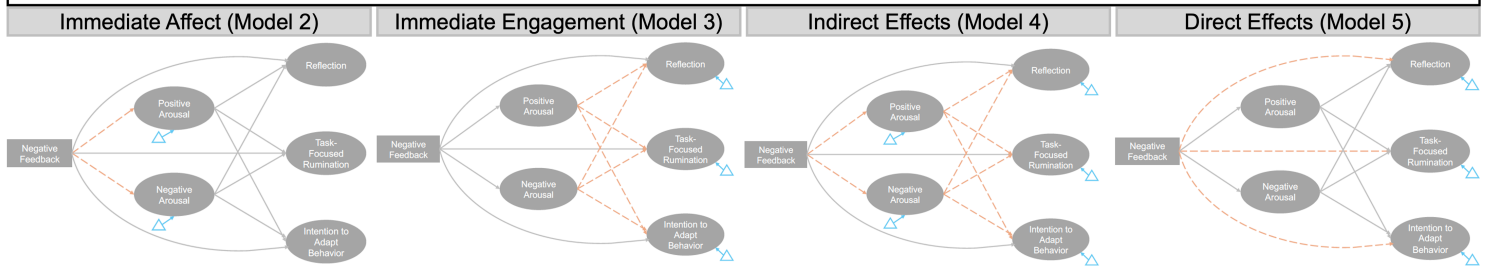


Figure 2

Series of Structural Models. The micro-process model of immediate feedback responses was examined using a mediation model with affective reactions as mediators (Model 1) in the full sample ($N = 420$). The role of mindfulness was examined using a series of multi-group models comparing the mindfulness induction group (MI) and no-treatment control group (NT). Each model tested moderation at a different location of the process model: Model 2 examined moderation of affective reactions, Model 3 moderation of engagement responses, Model 4 moderation of all indirect effects, and Model 5 moderation of direct effects. Within each multigroup model, we conducted a sequential model comparison: a constrained model, in which all parameters were held equal across groups, was compared with a main-effect model, in which the intercepts of the outcome variables were freely estimated across groups (blue triangles). This main-effect model was then compared with an interaction-effect model, in which both the intercepts and the focal path coefficients (orange dashed lines) were freely estimated across groups.

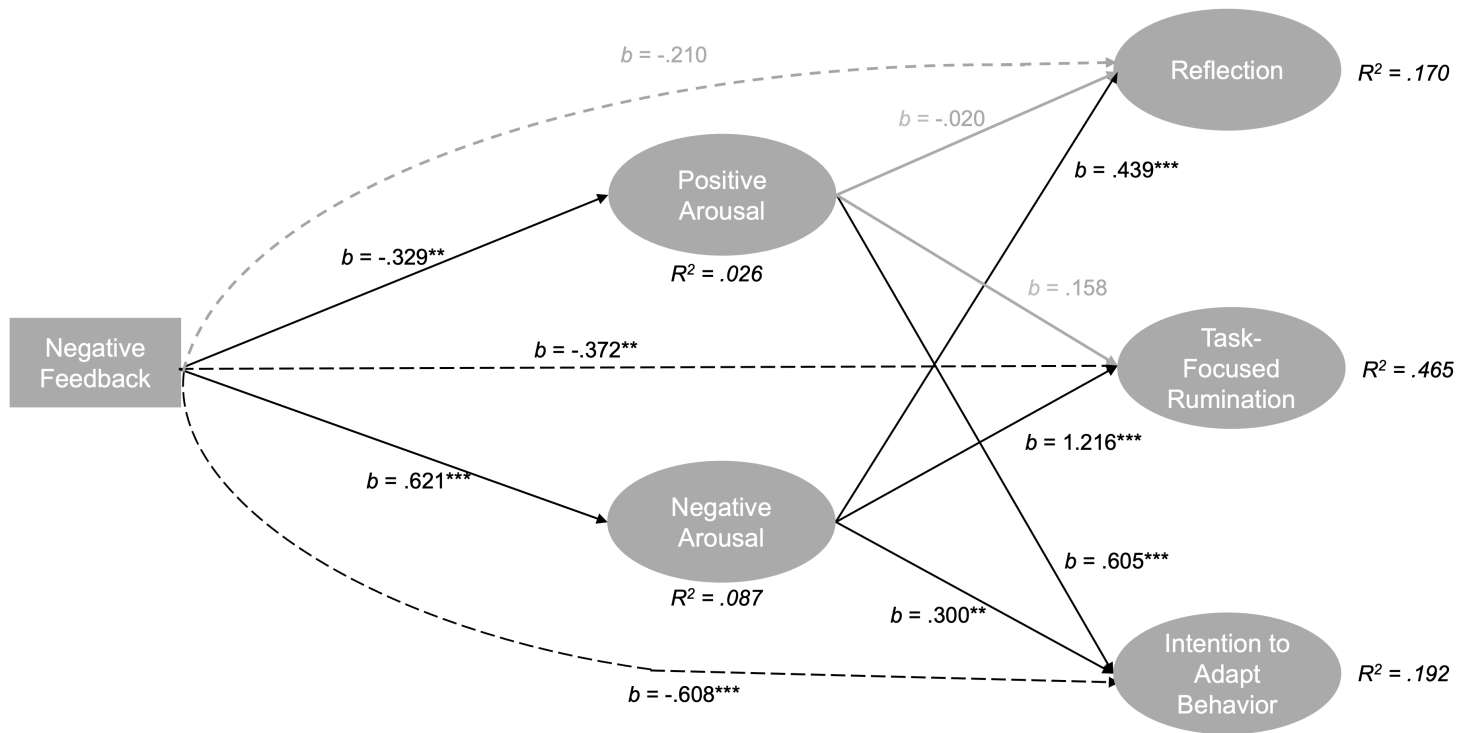


Figure 3

Results of Model 1. The results of the ESEM full-sample mediation model ($N = 420$) are shown: dashed arrows as direct effects of feedback on the feedback response and solid arrows as parts of the mediation, with grayed-out arrows not significant and black arrows significant.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Supplementary Files

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