Brief Report

Emotion generation and emotion regulation: The role of emotion beliefs

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1. Introduction

Negative or positive emotions are generated when people appraise stimuli as being meaningful for their goals (Gross, 2015), and important individual differences exist in how *easily activated,* how *intense,* and how *persistent* people's emotions tend to be (i.e., three key dimensions of emotion generation or the time-course of an emotional response; Davidson, 1998). Such emotions play an important role in driving adaptive interactions with the world (Panksepp, 2005). However, if emotions occur at the wrong times, at the wrong intensities, or for the wrong durations, this can also be problematic. Moreover, there may be instances where emotions are not causing problems, but adjustments to their occurrence, intensity, or duration may nonetheless be desirable (Gross, 2015). In such instances, people need to regulate their emotions; that is, use strategies to modify how emotions are being experienced or expressed (Gross, 1998). Emotion regulation attempts can focus on either down- or up-regulating negative and positive emotions, with hedonistic motivations often driving common attempts to up-regulate positive emotions and down-regulate negative emotions (Preece et al., 2018). Over the past few decades, a large body of literature has supported the importance of emotion regulation in facilitating desirable life outcomes, such as increased wellbeing and reduced levels of affective disorder symptoms (e.g., Gross and John, 2003; Hasking et al., 2017; Preece et al., 2020). Indeed, difficulties in emotion regulation (i.e., generated emotions not being managed effectively) are a central feature of many contemporary models of psychopathology (Sheppes et al., 2015).

In this context, attention has recently turned to understanding what factors facilitate (or hinder) effective emotion regulation (Ford and Gross, 2019). The process model of emotion regulation (Gross, 2015) specifies that a central factor here is people's beliefs about emotions. However, to date, these hypothesised links between emotion beliefs and emotion generation/regulation remain underexplored empirically. Such understanding is crucial, because treatments for affective disorders often focus on trying to normalize emotion generation patterns by increasing emotion regulation ability; hence, a better understanding of the potential role emotion beliefs play in these emotion patterns may help to further optimize affective disorder case conceptualisations and treatments. The purpose of the present study was therefore to help address this empirical gap, by examining the direct and indirect effects between emotion generation, emotion beliefs, and emotion regulation.

1.1. Process model

The process model (Gross, 2015) is the most widely used model of emotion regulation, and it describes the processes by which emotions are generated and regulated over time. Within this framework, all emotions are generated and regulated via valuation systems, which are four-stage (situation-attention-appraisal-response) sequences through which people evaluate what stimuli mean for their goals (see

Supplementary Figure S1). Emotions are generated when an emotion-inducing stimulus is present (situation stage), the individual notices the stimulus (attention stage), they appraise the stimulus in terms of what it is and whether it is meaningful for their goals (appraisal stage), and based on that appraisal an emotional response may occur (response stage). Individual differences can occur within this process in terms of the typical frequency of occurrence, intensity, and persistence of the emotional response. The emotion generated can then be regulated via a second valuation system, where the emotion itself becomes the target of evaluation (situation stage); the individual focuses attention on the emotion (attention stage), appraises it in terms of what it means for their goals (appraisal stage), and based on that appraisal might decide to try to regulate the emotion (response stage). Thus, in this framework, emotion regulation decisions hinge crucially on how the emotion is appraised (Gross, 2015).

One important determinant of how emotions are appraised (i.e., performance at the appraisal stage of the process model) is a person's beliefs about emotions (Gross, 2015). Ford and Gross (2019) posit two categories of beliefs about emotions that may exert an important influence at this appraisal stage: beliefs about how *controllable* emotions are and how *useful* emotions are. People who believe emotions are generally uncontrollable might be expected to put less effort into emotion regulation, or be less likely to activate emotion regulation goals (because they doubt that any efforts will be rewarded), and people who believe emotions are generally useless might be expected to try to reduce such emotions, perhaps excessively or inappropriately (Ford and Gross, 2019).

Initial support for these hypotheses comes from a recent cross-sectional study which showed that beliefs that negative and positive emotions are uncontrollable and useless were associated with poorer emotion regulation ability and more severe affective disorder symptoms (Becerra et al., 2020). Earlier work, which has focused only on controllability beliefs and has typically not taken emotional valence (positive vs. negative emotions) into account, has also reported broadly similar patterns (e.g., De Castella et al., 2013; Tamir et al., 2007). Tamir et al. (2007), for example, found that beliefs that emotions were uncontrollable were associated with a greater intensity of negative emotions. However, the nature of the direct and indirect effects among emotion beliefs, emotion generation, and emotion regulation has (to the best of our knowledge) not yet been modelled empirically, and thus the precise nature of these relationships are still not yet well understood. Furthermore, there is also a pressing need to account for valence in this area, given that emotional constructs can operate differently across positive and negative emotional valence domains (Gruber et al., 2012). Indeed, as the process model specifies that emotion regulation decisions are made based on how an emotion is appraised (i.e., judged as desirable or undesirable for one's goals; Gross, 2015), and given that people often view positive emotions as more desirable than negative emotions (Becerra et al., 2020), some valence-specific differences might be expected here.

1.2. The present study

Our aim was to examine the direct and indirect effects between emotion beliefs, generation, and regulation, and do so across both negative and positive emotions. Emotion regulation attempts are most often motivated by hedonistic goals (i.e., to feel more positive emotions and less negative emotions; Gross, 2015), so we also anticipated that high levels of negative emotion, and low levels of positive emotion (i.e., levels of reactivity, intensity, and perseveration), would be associated with emotion regulation difficulties. Based on the process model, we anticipated significant indirect effects between emotion generation and regulation, via beliefs about emotions. Specifically, we expected that high levels of negative emotion, and low levels of positive emotion, would be associated with more problematic beliefs about emotions (i.e., that emotions are uncontrollable or useless), and that in turn these

beliefs would be associated with poorer ability to regulate negative or positive emotions. We examined these relationships for the three dimensions of emotion generation (reactivity, intensity, perseveration; Becerra et al., 2019; Ripper et al., 2019).

2. Method

2.1. Participants, materials, and procedure

Our sample comprised 590 Australian university students (female=76.8%, male=22.2%, non-binary=1.0%) who received course credit for study participation. The mean age was 22.31 years (*SD*=6.17, range=17–56). The majority of participants were born in Australia (68.1%), with the next highest proportions being from the United Kingdom (5.3%), South Africa (2.9%), or the Philippines (2.4%). Around half the sample were employed casually (48.0%), 25.6% part-time, 5.3% full-time, and 21.2% were unemployed. 210 participants (35.6%) reported that they had been diagnosed with a mental disorder at some point in their life; of those, 60.5% reported an anxiety disorder, 58.1% a depressive disorder, and 2.9% a bipolar disorder (non-exclusive).

Participants completed a battery of questionnaires in an online survey.[1] There were no missing data. The survey was administered using Qualtrics software, and participants accessed the survey via a weblink displayed on the university's online SONA portal (a research software management system). The Emotion Reactivity, Intensity, and Perseveration Scale (ERIPS; Ripper et al., 2018) was used to measure emotion generation, the Emotion Beliefs Questionnaire (EBQ; Becerra et al., 2020) was used to measure beliefs about emotions, and the Perth Emotion Regulation Competency Inventory (PERCI; Preece et al., 2018) was used to measure emotion regulation ability.

2.1.1. Emotion reactivity, intensity, and perseveration scale

The ERIPS (Ripper et al., 2018) is a 60-item self-report measure of trait emotional reactivity, intensity, and perseveration. The ERIPS lists the same 20 emotions as the Positive and Negative Affect Schedule (Watson et al., 1988) and asks people to indicate the typical *reactivity* ("When exposed to a situation that would make the average person experience this feeling, how likely is it that you will experience this particular feeling?"), *intensity* ("When you are experiencing a situation that does make you feel this way, how intense is the feeling compared to how other people feel?"), and *perseveration* ("When you are experiencing a situation that does make you feel this way, how long is this feeling likely to persist?") of these emotions for them. Six subscales can be derived, half for each valence domain: *Negative-Reactivity, Negative-Intensity, Negative-Perseveration, Positive-Reactivity, Positive-Intensity, Positive-Perseveration*. All items are answered on a 5-point Likert scale, with higher scores indicating higher reactivity, intensity, or perseveration. The ERIPS has demonstrated good psychometrics (Ripper et al., 2018), and all subscales had good internal consistency in our sample (α=0.91–0.92).

2.1.2. Emotion beliefs questionnaire

The EBQ (Becerra et al., 2020) is a 16-item self-report measure of people's beliefs about the controllability and usefulness emotions in general. Four subscale scores can be derived, half for each valence domain: *Negative-Controllability* (e.g., "Once people are experiencing negative emotion, there is nothing they can do about modifying them"), *Positive-Controllability* (e.g., "People cannot control their positive

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emotions"), *Negative-Usefulness* (e.g., "There is very little use for negative emotions"), *Positive-Usefulness* (e.g., "Positive emotions are very unhelpful for people"). All items are answered on a 7-point Likert scale, with higher scores indicating stronger beliefs that emotions are uncontrollable and useless. The EBQ has demonstrated good psychometrics (Becerra et al., 2020), and all subscales had good internal consistency in our sample (α=0.81–0.88).

2.1.3. Perth emotion regulation competency inventory

The PERCI (Preece et al., 2018) is a 32-item self-report measure of people's emotion regulation ability; that is, the extent to which people typically have difficulty regulating their emotions successfully. Several scores can be derived, including separate composite scores for ability to regulate negative emotions (e.g., "When I'm feeling bad, I don't know what to do to feel better") or positive emotions (e.g., "When I'm feeling good, I have no control over whether that feeling stays or goes"). All items are answered on a 7-point Likert scale, with higher scores indicating more difficulties regulating emotions. The PERCI has demonstrated good psychometrics (Preece et al., 2018, 2021) and had good internal consistency in our sample (α=0.93).

2.2. Analytic strategy

Pearson correlations were calculated in SPSS 27. Direct and indirect effects between emotion generation, beliefs, and regulation were modelled in AMOS 27 (maximum likelihood estimation), with 5000 bootstrapped samples and 95% confidence intervals. In line with commonly used modeling approaches (e.g., Hasking et al., 2020), an initial model was tested with all possible direct/indirect paths included (with the directionality of these paths informed by the process model's specifications; Gross, 2015), and then iteratively refined over two steps: (1) by removing all parameters where α > 0.10, rerunning the model, and then (2) removing all parameters where α > 0.05 (note: within each step, all parameters not meeting the specified statistical threshold were removed simultaneously rather than one at a time). We report the results of the final model in this paper (see Fig. 1 for the final model). Model fit was evaluated using χ^2, CFI, TLI, and RMSEA. A non-significant (p>.05) χ^2 value suggests a good fitting model. CFI and TLI values ≥.90 were acceptable and ≥.95 excellent. RMSEA values ≤.08 were acceptable and ≤.06 excellent (Marsh et al., 2004).

3. Results

Descriptive statistics and Pearson correlations are displayed in Supplementary Tables S1 and S2. High negative reactivity, intensity, and perseveration were significantly (p<.05; see Table S2 for exact r and p values for all associations) associated with higher difficulties regulating both negative and positive emotions (r= 0.12 to 0.49). High positive reactivity and perseveration were significantly associated with less difficulties regulating both negative and positive emotions ($r = -0.12$ to -0.33). Emotion beliefs were also associated with emotion generation and emotion regulation. Specifically, stronger beliefs that negative and positive emotions were uncontrollable were associated with higher difficulties regulating negative and positive emotions (r= 0.25 to 0.45), higher negative intensity and perseveration (r=0.14 to 0.21), and lower positive reactivity, intensity, and perseveration ($r = -0.09$ to -0.27). Similarly, stronger beliefs that negative and positive emotions were useless were associated with higher difficulties regulating negative and positive emotions (r= 0.13 to 0.49), higher negative perseveration (r= 0.13; though only for beliefs about negative emotions), and lower positive reactivity ($r = -0.18$ to -0.25).

3.1. Direct and indirect effects

Removing non-significant paths from the model testing all possible direct and indirect effects resulted in the final model displayed in Fig. 1.

Overall model fit for this model was excellent: χ^2=33.403 (p=.184), CFI=0.999, TLI=0.996, and RMSEA=0.020 (90% CI=0.00–0.040).

In terms of direct effects (see Table 1 and Fig. 1), high negative intensity and perseveration, and low positive reactivity, were associated with negative emotion regulation difficulties. Low positive reactivity, and high positive intensity and negative reactivity, were associated with positive emotion regulation difficulties.

Regarding indirect effects (see Table 1 and Fig. 1), negative perseveration was associated with greater difficulties regulating negative emotions, via stronger beliefs that negative emotions are uncontrollable and useless. Negative perseveration was also associated with difficulties regulating positive emotions, via stronger beliefs that positive emotions are uncontrollable. Negative Intensity was associated with weaker beliefs that negative emotions are useless, which was in turn associated with less difficulties regulating negative emotions. Positive reactivity was associated with less difficulties regulating positive emotions, via less beliefs that positive emotions are uncontrollable and useless. Positive reactivity was also associated with less difficulties regulating negative emotions, via less beliefs that negative emotions are uncontrollable and useless. Positive perseveration was associated higher beliefs that positive emotions are useless, which was in turn associated with more difficulties regulating positive emotions.[2]

4. Discussion

Our aim in this paper was to examine the relationships (direct and indirect effects) between emotion generation, beliefs, and regulation. All facets of emotion generation demonstrated relationships with emotion beliefs and/or the ability to regulate emotions, with some key differences and nuances present. Across the generation facets, of most importance (in breadth and size of associations) was the perseveration of negative emotions and the reactivity of positive emotions. As expected, high negative perseveration was linked with difficulties regulating negative emotions, and this effect operated in part via stronger beliefs that negative emotions were uncontrollable and useless. Similarly, low positive reactivity was linked with difficulties regulating positive emotions, and this effect operated in part via stronger beliefs that positive emotions were uncontrollable and useless. Some cross-valence relationships were also evident, though typically with smaller effect sizes. Our findings, overall, are therefore consistent with the theorizing within the process model (Ford and Gross, 2019) that emotion beliefs have key downstream implications for emotion regulation.

Such findings could have particular clinical relevance given that the perseveration of negative emotions and reactivity of positive emotions feature prominently in contemporary conceptualisations of affective disorders. Models of depression, for instance, emphasize persistent negative emotions and lack of positive emotions, linked to difficulties effectively down-regulating negative emotions and up-regulating positive emotions (Joormann & Siemer, 2014). With respect to beliefs that emotions are uncontrollable, the above patterns might be explained by people (if they strongly hold that belief) being less likely to initiate or put effort into attempts to down-regulate their negative emotions or up-regulate their positive emotions (i.e., as they doubt that such attempts can have any impact). Furthermore, with respect to beliefs that emotions are useless, the above patterns might be explained by people (if they strongly hold that belief) being less likely to try to up-regulate (i.e., obtain) positive emotions, or sit with and tolerate negative emotions when appropriate, as they doubt that these emotions can be valuable (Simons & Gaher, 2005). Indeed, similar patterns have previously been

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[2] An alternative model where the directionality of the pathways is reversed (such that emotion regulation is the predictor and emotion generation is the outcome) results in a poor fitting solution (CFI = .462, TLI = .089, RMSEA = .321 [90% CI = .310-.332]); thus reinforcing the validity of the theoretically-informed model solution presented in our results section.
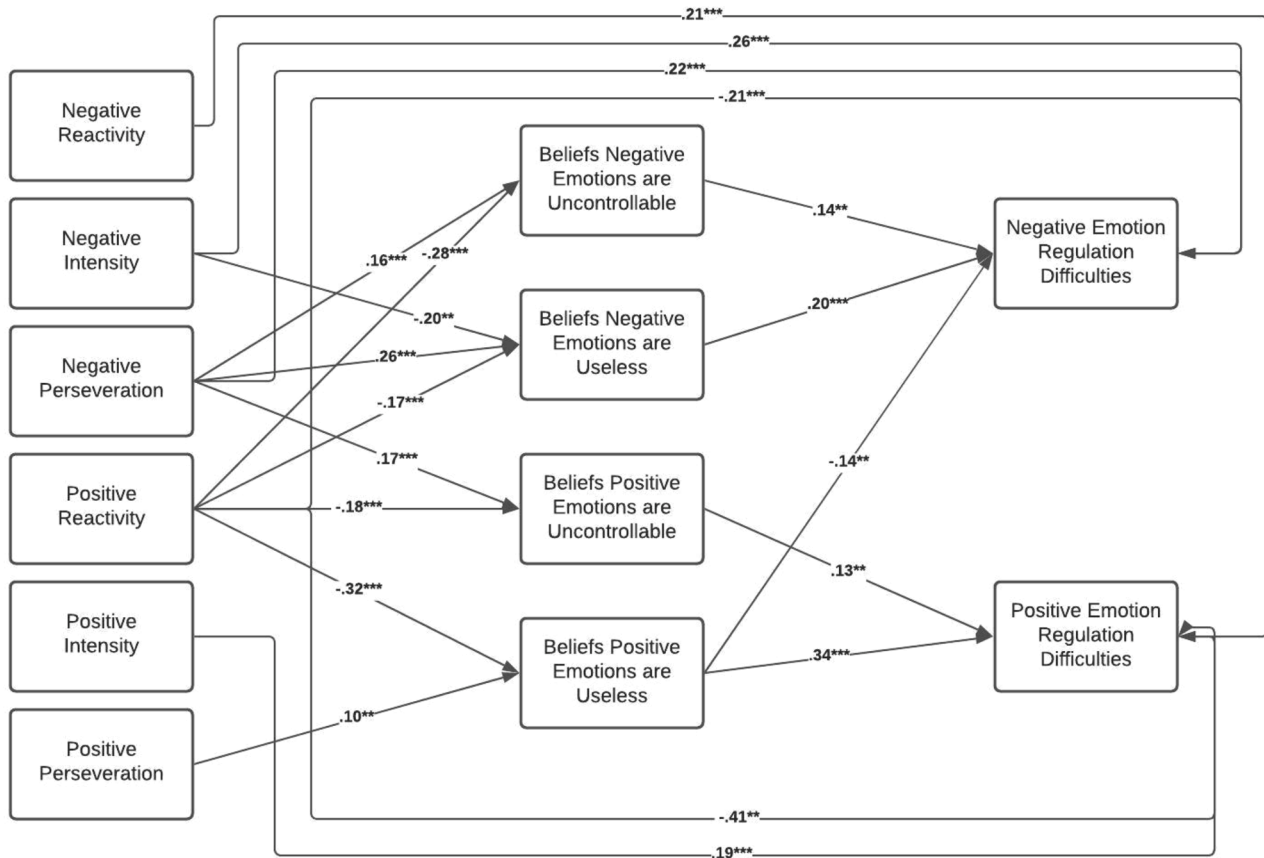
Fig. 1. Direct and indirect effects between emotion generation (reactivity, intensity, perseveration), emotion beliefs (controllability, usefulness), and emotion regulation. Displayed values are standardised estimates. ***p<.001, **p<.01, *p<.05. Correlations (not displayed) were allowed between each of the ERIPS variables, each of the residuals of the EBQ variables, and each of the residuals of the PERCI variables. Note: Presented here is the final model. As described in text, we began with a model that included all potential paths between emotion generation, beliefs, and regulation; removal of the non-significant paths was utilized to form this final model.

observed (though not in the context of direct and indirect effects; e.g., Becerra et al., 2020; Tamir et al., 2007), thus reinforcing the potentially influential role of these emotion beliefs within patterns of emotional responding.

That said, some observed effects in our regression model were counter to our expectations, though still supported the importance of emotion beliefs. Specifically, it was unexpected that: negative intensity was associated with weaker beliefs that negative emotions are useless, positive perseveration was associated with stronger beliefs that positive emotions are useless, beliefs that positive emotions are useless were associated with less difficulties regulating negative emotions, and positive intensity was associated with more difficulties regulating positive emotions. These particular effects (i.e., significant associations within the regression model) were not present in our Pearson bivariate correlations, and have not emerged in past correlational work (e.g., Becerra et al., 2020), so it is possible that once the shared variance was accounted for in our regression model, the remaining unique variance for some predictors produced aberrant associations (Beckstead, 2012). Another possibility is that these patterns reflect the complexity of emotion dynamics, whereby negative emotions are not always undesirable, nor are positive emotions always desirable (i.e., sometimes successful emotion regulation attempts may target the up-regulation of negative emotions and down-regulation of positive emotions, such as when driven by instrumental rather than hedonistic motivations; Gruber et al., 2012). Going forward, future lab-based experimental work would be beneficial to isolate more precisely the impact that emotion beliefs have on different aspects of the emotion system.

Whilst we believe our study makes a useful contribution, it must be

interpreted in the context of several limitations. First, our study utilized well-validated psychometric measures, but they capture emotion dynamics at the trait level. Future research might usefully expand on our findings by examining these relationships at the state level (e.g., using ecological momentary assessment; Visser et al., 2018). Additionally, our data were cross-sectional; thus, we cannot determine causality/directionality in our model. Longitudinal and experimental studies are needed. Finally, our sample were all students in a Western country, and were predominantly female and younger in age. Given that emotion dynamics may manifest differently in other population types (e.g., other cultural groups, age groups, or clinical settings; Qu and Telzer, 2017), examining the replicability of our findings in other sample types will be important.

Nonetheless, our present findings highlight important implications for the understanding of emotions and emotional disorders. As aforementioned, diagnostic manuals and psychopathology models specify difficulties in generating and regulating emotion as key features of many disorders (Sheppes et al., 2015). Whilst many treatment programs target alterations in emotion generation and regulation (Barlow et al., 2017), treatment protocols do not always include a focus on emotion beliefs or the positive valence domain. Our results suggest that such a focus might be fruitful, enabling fuller coverage of the complex emotion system underlying healthy or problematic emotional functioning. Cognitive behavioral therapy approaches, for example, often involve examinations of core beliefs about the self and the world, and the alteration of ridged/unhelpful belief patterns via cognitive reappraisal strategies (Beck, 1993). Such approaches might be usefully extended to target beliefs about the controllability and usefulness of emotions.

Table 1
Direct and Indirect Effects for Emotion Generation, Emotion Beliefs, and Emotion Regulation within the Final Tested Model.

	Unstand. Coefficients	Lower 95%	Upper 95%	*p*
Direct effects				
Negative reactivity on				
Positive emotion regulation difficulties	.388	.248	.523	.001
Negative intensity on				
Negative emotion regulation difficulties	.541	.303	.772	.000
Beliefs negative emotions are useless	−0.109	−0.174	−0.041	.001
Negative perseveration on				
Negative emotion regulation difficulties	.471	.242	.699	.000
Beliefs negative emotions are uncontrollable	.082	.051	.112	.000
Beliefs negative emotions are useless	.150	.083	.217	.000
Beliefs positive emotions are uncontrollable	.092	.059	.126	.000
Positive reactivity on				
Negative emotion regulation difficulties	−0.505	−0.686	−0.328	.000
Positive emotion regulation difficulties	−0.902	−1.118	−0.681	.000
Beliefs negative emotions are uncontrollable	−0.162	−0.211	−0.113	.000
Beliefs negative emotions are useless	−0.110	−0.164	−0.054	.000
Beliefs positive emotions are uncontrollable	−0.109	−0.162	−0.059	.000
Beliefs positive emotions are useless	−0.164	−0.217	−0.116	.000
Positive intensity on				
Positive emotion regulation difficulties	.432	.242	.611	.000
Positive perseveration on				
Beliefs positive emotions are useless	.056	.016	.094	.005
Beliefs negative emotions are uncontrollable on				
Negative emotion regulation difficulties	.594	.211	.963	.004
Beliefs negative emotions are useless on				
Negative emotion regulation difficulties	.740	.417	1.041	.000
Beliefs positive emotions are uncontrollable on				
Positive emotion regulation difficulties	.482	.162	.811	.004
Beliefs positive emotions are useless on				
Negative emotion regulation difficulties	−0.651	−1.053	−0.245	.002
Positive emotion regulation difficulties	1.456	1.048	1.860	.000
Indirect effects				
Negative perseveration via				
Beliefs negative emotions are uncontrollable -> negative emotion regulation difficulties	.048	.017	.092	.002
Beliefs negative emotions are useless -> negative emotion regulation difficulties	.111	.055	.191	.000
Beliefs positive emotions are uncontrollable -> positive emotion regulation difficulties	.044	.015	.086	.003
Negative intensity via				
Beliefs negative emotions are useless -> negative emotion regulation difficulties	−0.081	−0.153	−0.030	.001
Positive reactivity via				
	−0.081	−0.144	−0.037	.000

Table 1 (*continued*)

	Unstand. Coefficients	Lower 95%	Upper 95%	*p*
Beliefs negative emotions are useless -> negative emotion regulation difficulties				
Beliefs negative emotions are uncontrollable -> negative emotion regulation difficulties	−0.096	−0.170	−0.035	.003
Beliefs positive emotions are useless -> positive emotion regulation difficulties	−0.238	−0.338	−0.158	.000
Beliefs positive emotions are uncontrollable -> positive emotion regulation difficulties	−0.053	−0.108	−0.017	.002
Positive perseveration via				
Beliefs positive emotions are useless -> positive emotion regulation difficulties	.082	.024	.147	.004

Note. Estimates reported from bootstrapped bias corrected percentile method.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jadr.2022.100351.

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