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Effects of intensity on emotion regulation strategy preferences are emotion-specific

Bram Van Bockstaele *Ghent University*

Patrick J.F. Clarke *Curtin University*

Jemma Todd *University of Western Australia*

Frances Meeten *King's College London*

Julie L. Ji *School of Psychology*

et al. *See next page for additional authors*

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ORIGINAL RESEARCH

Effects of intensity on emotion regulation strategy preferences are emotion-specific

Bram Van Bockstaele[1,2,3] · Patrick J. F. Clarke[4] · Jemma Todd[3,5] · Frances Meeten[6,7] · Julie L. Ji[3,8] · Julian Basanovic[3,9] · Nigel T. M. Chen[10] · Daniel Rudaizky[3,4] · Lies Notebaert[3]

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Abstract
Adaptive emotion regulation is characterized by the ability to flexibly select and switch between different strategies, depending on individual and contextual factors. Previous studies have shown that people prefer disengagement strategies to regulate more intense emotions, while they prefer engagement strategies to regulate less intense emotions. In this study, we investigated whether – in addition to the intensity of emotions – the discrete emotion type (disgust versus fear) also affects emotion regulation strategy preferences. A total of 401 students from three different universities completed an emotion regulation choice task in which they could choose between distraction and reappraisal to regulate their emotions in response to viewing high versus low intensity disgust- and fear-evoking pictures. We found that strategy choices did indeed depend on the nature of specific emotions, with distraction being preferred for regulating disgust, and reappraisal being preferred for regulating fear. Crucially, the nature of the emotion also qualified the previously reported effect of emotion intensity on strategy choice: Only for disgust- but not for fear-evoking pictures did participants show an increased preference for distraction over reappraisal with increased emotion intensity. Our results thus show that the effects of emotional intensity on emotion regulation strategy choice are emotion-specific and indicate that factors affecting emotion regulation strategy choice interact with each other.

Keywords Fear · Disgust · Distraction · Reappraisal · Emotion regulation choice

Emotion regulation refers to "the processes by which individuals influence which emotions they have, when they have them, and how they experience and express these emotions" (Gross, 1998, p. 275). Emotion regulation allows us for example to control anxiety for an upcoming job interview, to feign enthusiasm for the menial aspects of the job during the interview, and to deal with disappointment if we eventually do not get offered the job. People who struggle with emotion regulation, or who use less effective or maladaptive strategies to regulate emotions, have more psychological problems, including depression and anxiety disorders (Aldao et al., 2010; Garnefski et al., 2001). Being able to regulate emotions by using appropriate emotion regulation strategies is thus key to psychological well-being. But what constitutes 'good emotion regulation' and which strategies are adaptive and effective?

Early studies on emotion regulation attempted to answer these questions by zooming in on specific strategies, arguing that some strategies are adaptive and other strategies are maladaptive. For instance, the use of positive reappraisal, a strategy in which emotion-eliciting stimuli or situations are reframed positively, was considered generally adaptive, and people who often use reappraisal have less symptoms of depression (Aldao et al., 2010). However, in more recent years, studies have shown that specific strategies are not adaptive or maladaptive per se, but rather the extent to which a strategy matches the emotional context or situation determines its adaptiveness and effectiveness. For instance, Haines et al. (2016) found that people who used more reappraisal in uncontrollable situations, but *less* reappraisal in controllable situations, reported greater well-being (see also Troy et al., 2013). Similar findings have also been reported for distraction, an emotion regulation strategy in which

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attention is moved away from emotion-eliciting stimuli or situations. For example, Rottweiler et al. (2018) found that distraction was effective in improving students' mood when they experienced anxiety that was unrelated to upcoming exams, while it was not effective in improving mood when they experienced exam-related anxiety. As such, rather than rigidly using one or two strategies, adaptive or healthy emotion regulation is regarded as the ability to flexibly switch between strategies depending on properties of the emotion, the emotional context, or the abilities of the individual regulating the emotion (Bonanno & Burton, 2013; Aldao et al., 2015). Consequently, studies have attempted to identify both contextual factors and individual differences that influence emotion regulation strategy preferences and emotion regulation flexibility.

Empirical studies on emotion regulation strategy choice have relied heavily on the emotion regulation choice task (Sheppes et al., 2011). In this task, participants are briefly shown emotion-evoking pictures, and after each picture, they are asked to choose an emotion regulation strategy that would help them reduce the intensity of the emotions evoked by the picture when they see it a second time. In two studies, Sheppes et al. (2011) used negative pictures, and participants could choose between positive reappraisal and distraction (i.e., disengaging from the emotion by producing neutral thoughts) to downregulate their negative emotions. Crucially, the emotional intensity of the negative pictures was manipulated to assess emotion regulation strategy preferences in high versus low intensity negative situations. Participants preferred reappraisal over distraction for low intensity negative pictures, but they preferred distraction over reappraisal for high intensity negative pictures.

This pattern of results has been replicated since the original study (e.g., Scheibe et al., 2015; Sheppes et al., 2014), and supports the idea that the intensity of emotions has a strong impact on people's emotion regulation strategy choices (Matthews et al., 2021). The common explanation for this choice pattern (e.g., Sheppes & Levin, 2013) is that in low intensity situations, people choose engagement strategies, such as reappraisal, prioritizing long-term adaptation. For high intensity stimuli however, people choose disengagement strategies, such as distraction or situation modification (Van Bockstaele et al., 2020), prioritizing short-term relief or instant inhibition of the emotions before they gather force. The effect of intensity on emotion regulation strategy preferences is considered to generalize across emotions, which we refer to as the generalized intensity hypothesis.

Apart from emotion intensity, researchers have attempted to identify other determinants of emotion regulation choice (for a review, see Matthews et al., 2021). Another potential determinant of emotion regulation choice that – to date – has received little attention is the specific type of emotion elicited by a situation or stimulus. Most previous studies used generic negative pictures, and asked participants to choose a strategy that would help them downregulate the negative emotions evoked by these pictures (e.g., Sheppes et al., 2011, 2014). To our knowledge, only three studies have differentiated between different negative emotions. Vishkin et al. (2020) found in two separate studies that people preferred reappraising situations by changing future consequences for fear- but not sadness-evoking situations, while they preferred accepting the situation more for sadness- than fear-evoking situations. Suri et al. (2018, study 4) asked participants to choose between reappraisal and distraction to regulate their emotions in response to vignettes, but they found that the primary emotion evoked by the vignette (mostly anger or disgust) did not predict emotion regulation strategy choices. Finally, Young and Suri (2020) asked people to rate the experience of different emotions evoked by negative pictures, and they found that, in general, people were more likely to choose distraction (and less likely to choose reappraisal) when experiencing increased intensities of disgust, but intensities of fear, anger, sadness, and happiness did not predict strategy choices. Thus, while previous findings are somewhat mixed, the specific nature of emotions may give rise to different emotion regulation strategy preferences.

In our present study, we focused on differentiating regulation preferences for fear and disgust, for two reasons. First, fear and disgust are two emotions centrally implicated in anxiety disorders (Cisler et al., 2009), but they differ in their cognitive appraisal and physiological response. While fear is elicited in response to a perceived external threat and activates the sympathetic nervous system, disgust is elicited by a perceived source of contamination that is primarily passive, often associated with both sympathetic and parasympathetic nervous system activation (de Jong et al., 2011; Woody & Teachman, 2000). While fear can elicit both approach (fight) and avoidance (flight) responses (Kozlowska et al., 2015), disgust elicits primarily avoidant responses to protect from contamination or disease (Davey, 2011). As such, fear and disgust may elicit different emotion regulation strategies. While fear may be characterized by both engagement and disengagement strategies, people may prefer to regulate disgust (compared to fear) more with disengagement and less with engagement strategies. Second, as mentioned earlier, most of the original studies using the emotion regulation strategy choice task used generic negative pictures (Sheppes et al., 2011, 2014). Many of the high intensity pictures in these studies depicted bloody scenes or mutilated corpses. Research has shown that such pictures elicit more intense feelings of disgust and only limited fear (e.g., Connolly et al., 2006). From these initial studies, it thus remained unclear whether the central finding of an

increased preference for distraction over reappraisal with increased emotion intensity generalizes across fear and disgust or whether it is emotion-specific (but see Sheppes et al., 2011, Study 3, for an example of how electrical shock intensity affected strategy choices in a more fear-relevant context). The one previous study in which strategy choices in response to both fear and disgust were assessed (Young & Suri, 2020) also used generic negative pictures including mutilations, but participants rated each picture on separate emotion (disgust and fear, among other emotions) intensity scales. As such, their finding of increased disgust (but not fear) intensity ratings predicting stronger preferences for distraction over reappraisal supports the idea that varying levels of disgust can give rise to different emotion regulation strategy preferences than varying levels of fear.

The general aim of our study was to further investigate whether fear and disgust are preferentially regulated using different strategies. We focussed specifically on whether the finding of increased distraction preferences for high intensity situations and increased reappraisal preferences for low intensity situations is consistent or differs depending upon the specific emotion that is evoked. We used an emotion regulation choice task to present high versus low intensity disgust- versus fear-evoking pictures to participants, after which we asked them to choose between distraction and reappraisal to downregulate their emotions. We expected to replicate the general intensity effect in the emotion regulation strategy choices, with participants being more likely to choose reappraisal for low intensity pictures and distraction for high intensity pictures. Of most direct relevance to the research question under consideration in the current study is the potential interaction between emotion and intensity, which allows us to differentiate two contrasting hypotheses. According to the generalized intensity hypothesis, effects of intensity on emotion regulation strategy preferences generalize across emotions, and it thus predicts that the intensity effect will be similar for fear- and disgust-evoking pictures. In contrast, according to the emotion-specific intensity hypothesis, effects of intensity on emotion regulation strategy preferences are emotion-specific, leading to the prediction that the intensity effects will differ between emotions. Based on the findings of Young and Suri (2020), we expected our results to support the emotion-specific intensity hypothesis, with a stronger effect of intensity on strategy preferences for disgust- than fear-evoking pictures. Additionally, we adapted a trait emotion regulation questionnaire to probe self-reported emotion regulation strategy use in response to feelings of fear versus disgust to examine whether these emotions are associated with different regulation patterns.

Method

Participants

Participants were recruited as part of a large multi-site online research project (CERCI) across three institutions (Curtin University, University of Sydney, University of Western Australia). Given the intense nature of some of the stimuli in the emotion regulation choice task, this task formed an optional component of the larger project. Of the in total 928 university students involved in the project, 407 also elected to complete the emotion regulation choice task (the remaining 521 students skipped the task and moved on to the debriefing without further consequences). Six of these students who self-identified their level of English as worse than moderately fluent were excluded from the data set.[1] Our final analytical sample thus consisted of 401 students (277 women, 120 men, 4 non-binary/prefer not to say; age $M = 21.32$, $SD = 5.76$). Participants identified mostly as Australian (45%), Asian (18% Chinese, 15% other Asian), or European (15%). A post-hoc sensitivity analysis using G*Power (Faul et al., 2007), with conventional values of 0.80 for power and 0.05 for alpha and four uncorrelated measurements, showed that our sample size of 401 participants was large enough to detect small within-subjects main effects and interactions of $f = 0.08$ and larger.

Materials

For the emotion regulation choice task, we used eight high intensity and eight low intensity disgust-provoking pictures from the DIsgust RelaTed Images database (DIRTI: Haberkamp et al., 2017), and eight high intensity and eight low intensity fear-provoking pictures from the International Affective Picture Set (IAPS: Lang et al., 2005)[2]. We created high and low intensity subsets based on the available normative arousal ratings. Both the high and low intensity sets of disgust-provoking pictures contained two pictures each of rotten foods, body products, dead animals, and poor hygiene. According to the normative ratings (Haberkamp et al., 2017), disgusting pictures evoke considerable levels of disgust but low levels of fear (Table 1). For the fear-provoking sets, we deliberately avoided pictures of mutilations or injuries, because such pictures are also included in the DIRTI and can thus be considered disgust-provoking (Haberkamp et al., 2017). The fear-provoking pictures

[1] Inclusion of these participants did not change the pattern of results.

[2] We used the following pictures: High intensity disgust: DIRTI 1026, 1040, 1122, 1135, 1201, 1239, 1253, 1276; Low intensity disgust: DIRTI 1006, 1027, 1121, 1129, 1204, 1207, 1260, 1281; Low intensity fear: IAPS 2120, 2692, 6241, 6561, 6610, 6940, 7135, 9471; High intensity fear: IAPS 2811, 6230, 6350, 6821, 9904, 9908, 9910, 9921.

Table 1 Normative disgust and fear ratings of pictures used in high and low intensity disgust and fear sets

		High		Low		Total	
		M	*SD*	*M*	*SD*	*M*	*SD*
Disgust set[a]	Disgust	4.95	0.17	3.12	0.25	4.04	0.97
	Fear	1.87	0.09	1.45	0.16	1.66	0.25
Fear set[b]	Disgust	5.2	0.74	4.06	0.73	4.55	0.88
	Fear	5.84	0.57	4.72	0.71	5.25	0.81

Note: [a]. For the disgust set, scores are based on normative ratings, scored on a scale from 1 to 9, provided by Haberkamp et al., 2017 for all pictures included in this set. [b]. For the fear set, scores are based on normative ratings, scored on a scale from 1 to 9, provided by Libkuman et al. (2007) for 11 (6 low intensity, 5 high intensity) of the 16 pictures included in this set

depicted mostly weapons, physical assaults, and car crashes. The IAPS has no separate disgust and fear ratings for all pictures. However, according to the normative ratings provided by Libkuman et al. (2007) for eleven of the pictures that we used, they evoked higher levels of fear than disgust (Table 1). For consent and practice phases, we used different pictures with similar content, all selected from the IAPS. All pictures were presented at 100 × 133 mm.

Emotion regulation choice task (Sheppes et al., 2011)

The emotion regulation choice task was modelled after the task developed by Sheppes et al. (2011) and was used to assess participants' relative preferences for reappraisal and distraction to downregulate negative emotions. Each trial in this task consisted of five steps. First, a randomly selected picture was presented in the centre of the screen for 500ms. Then, participants rated the intensity of their overall negative emotions while viewing the picture on a single 9-point Likert scale (1 = not at all intense; 3 = a little; 5 = fairly intense; 7 = quite intense; 9 = very intense). Next, they selected their preferred emotion regulation strategy, after which the same picture reappeared for 5000ms and participants were asked to use their chosen strategy to downregulate the intensity of their negative emotions. Finally, they again rated the intensity of their negative emotions on a 9-point Likert scale. The entire task was self-paced, and there was no time limit on either of the intensity ratings or the strategy selection. The crucial outcome in this task was the number of times people chose distraction (or reappraisal) on high versus low intensity disgust- versus fear-evoking trials. Strategy choices for each combination of emotion and intensity showed relatively good internal consistency: Cronbach's alphas were 0.75, 0.74, 0.76, and 0.77, for low intensity disgust, high intensity disgust, low intensity fear, and high intensity fear, respectively.

Prior to the task, participants were shown four example pictures, and they were asked whether they wanted to participate in a task containing this kind of materials. Participants who did not consent skipped the task and moved to the debriefing phase. Participants who consented ran through a brief practice phase, in which we explained distraction and reappraisal (full instructions are provided in the online supplement 1). They practiced each strategy with two pictures, and then practiced the choice procedure with four pictures. The main task consisted of 32 trials and each of the eight high/low intensity disgust/fear-provoking pictures was presented once. Participants could skip the task at any point in time by clicking an on-screen escape button.[3]

Cognitive emotion regulation questionnaire (CERQ: Garnefski et al., 2001)

To examine whether fear and disgust are associated with different self-reported emotion regulation patterns, we used the Positive Refocusing and Positive Reappraisal subscales of the CERQ (Garnefski et al., 2001). Positive refocusing is a form of mental disengagement where people think about joyful and pleasant experiences instead of thinking about the negative event and is thus conceptually similar to distraction. The subscales both consist of four 4-point Likert items, with higher scores reflecting more frequent use of a strategy. Because the CERQ does not differentiate between negative emotions, participants completed both subscales twice: Once probing distraction and reappraisal use when experiencing disgust, and once probing distraction and reappraisal use when experiencing fear. To do so, we changed the original general phrasing in the instructions of the CERQ (i.e., "[…] when you experience negative or unpleasant events.") so that participants answered the questions with a specific emotion (disgust or fear) in mind (i.e., ("[…] when you experience disgust." and ("[…] when you

[3] Participants who completed the emotion regulation choice task did not differ from participants who skipped or did not complete this task on either depression, anxiety, or stress, as measured with the Depression Anxiety Stress Scale (Lovibond & Lovibond, 1995), all $ts < 1$, all $ps > 0.76$, all $ds < 0.03$. Comparing completers with non-completers on emotion-specific subscales of the CERQ (see below) revealed that completers reported using more reappraisal in response to disgust ($M = 10.56$, $SD = 4.21$) than non-completers ($M = 9.77$, $SD = 3.74$), $t(656.39) = 2.69$, $p = .007$, $d = 0.20$. Completers did not differ significantly from non-completers in their use of reappraisal in response to fear, $t(659.14) = 1.79$, $p = .074$, $d = 0.13$, or in their use of distraction in response to either disgust or fear, both $ts < 1.23$, both $ps > 0.22$, both $ds < 0.10$.

experience fear."). All scales showed good internal consistency (all Cronbach's alphas > 0.86).

Procedure

After providing written informed consent, participants provided demographic information and completed questionnaires on several diverse topics, including the Positive Refocusing and Positive Reappraisal subscales of the CERQ, separately for fear and disgust. Next, they completed tasks and measures that were included to answer other research questions not directly relevant to the current paper.[4] The emotion regulation choice task was the last task of the procedure, and after completing this task participants were debriefed and awarded course credit. The entire procedure took about 70 min.

Scoring

For the emotion regulation choice task, we calculated the choice percentages for distraction and reappraisal, separately for high and low intensity disgust and fear trials. We used distraction choices as a point of reference (i.e., percentages higher than 50% indicate a preference for distraction over reappraisal, percentages below 50% indicate a preference for reappraisal over distraction, and 50% indicates no preference for either strategy).

Because of a programming mistake, 74 participants did not complete either version of the CERQ. For the CERQ data of the remaining 327 participants, we calculated Positive Refocusing and Positive Reappraisal scores, for each emotion separately, by summing the respective responses.

Data-analytical approach

Strategy preferences in the emotion regulation choice task were analysed using a 2 by 2 repeated measures ANOVA, with Emotion (disgust versus fear) and Intensity (low versus high) as within subjects factors. Significant interactions were decomposed using similar repeated measures ANOVAs, comparing the two levels of one factor on each level of the other factor separately. We used one-sample t-tests to compare choice percentages for each emotion and intensity to a baseline of 50% (i.e., scores of 50% indicate no preference for either reappraisal or distraction). Self-reported strategy use in CERQ was analysed using a 2 by 2 repeated measures ANOVA, with Strategy (positive refocusing versus positive reappraisal) and Emotion (disgust versus fear) as within subjects factors, and significant interactions were decomposed as described above. Correlations between strategy choices in the emotion regulation choice task and self-reported strategy use in the CERQ were calculated using Spearman's rank correlation coefficient and were corrected using Benjamini and Hochberg's (1995) procedure for multiple comparisons, with a false discovery rate of 0.05. Finally, emotion intensity ratings from the preview phase were analysed using a 2 (Emotion: disgust versus fear) by 2 (Intensity: low versus high) repeated measures ANOVA.[5]

Results

Behavioural emotion regulation strategy preferences

Investigating whether participants had different strategy preferences to regulate different emotions depending on the intensity of the stimuli, our repeated measures ANOVA on the percentage of choices for distraction in the emotion regulation choice task revealed significant main effects of Emotion, $F(1, 400) = 65.87$, $p < .001$, $f = 0.41$, and Intensity, $F(1, 400) = 16.57$, $p < .001$, $f = 0.20$. These effects indicated that participants more often chose to use distraction for disgust-evoking ($M = 53.13\%$, $SE = 1.34\%$) than fear-evoking ($M = 45.04\%$, $SE = 1.42\%$) pictures, and they more often chose distraction for high ($M = 51.03\%$, $SE = 1.35\%$) than low ($M = 47.15\%$, $SE = 1.40\%$) intensity pictures. However, these main effects were qualified by the significant interaction between Emotion and Intensity, $F(1, 400) = 9.21$, $p = .003$, $f = 0.15$, see Fig. 1.[6]

Decomposing this interaction, for disgust-evoking pictures, there was a significant effect of Intensity, $F(1, 400) = 23.29$, $p < .001$, $f = 0.24$, demonstrating that participants more often chose distraction for high than for low intensity disgust-evoking pictures. However, for fear-evoking pictures, the effect of Intensity was not significant, $F(1, 400) = 1.82$, $p = .178$, $f = 0.07$, indicating that participants' strategy preference for fear-evoking pictures was not influenced by the intensity of the pictures. Participants chose distraction significantly more often for disgust- than for fear-evoking pictures, both for high ($F(1, 400) = 57.84$, $p < .001$, $f = 0.38$) and low ($F(1, 400) = 25.91$, $p < .001$, $f = 0.25$) intensity pictures. In sum, the interaction between Emotion and Intensity from our omnibus repeated measures ANOVA showed that the effect of Intensity, with people

[4] A full list of measures that were included in the procedure is provided in the online supplement 1.

[5] Analyses using GLMMs, similar to the analyses reported by Young and Suri (2020), are presented in the online supplement 1 and yielded overall similar results.

[6] Adding University as a between-subjects factor did not affect the pattern of results, as the main effect of and all interactions involving University were non-significant, all Fs < 1.29, all ps > 0.27, all fs < 0.08.

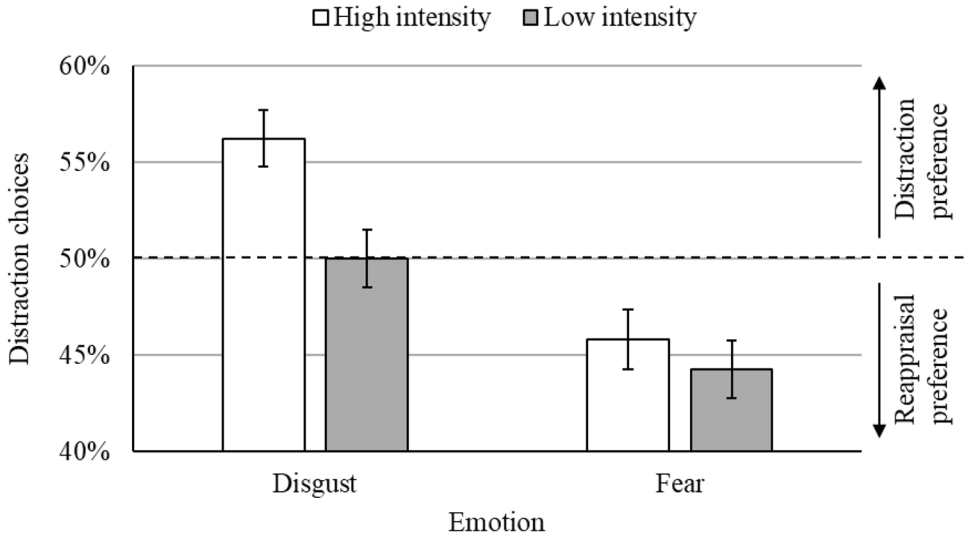

Fig. 1 Distraction Choices in the Emotion Regulation Choice Task as a Function of Emotion and Intensity

more often choosing distraction for high than for low intensity emotions, only held for disgust but not for fear.

Because the emotion regulation strategy data from the emotion regulation choice task are compositional (i.e., distraction and reappraisal choices add up to 100%), the results of the analyses above are identical but inverse when analysing reappraisal choice. That is, the significant interaction between Emotion and Intensity indicates that participants less often chose reappraisal for high than for low intensity disgust-evoking pictures, with no such difference for fear-evoking pictures. Similarly, for both high and low intensity pictures, participants chose reappraisal less often for disgust- than for fear-evoking pictures.

We also checked if participants' strategy choices differed from a neutral (chance) baseline of 50%. For disgusting pictures (aggregated across intensities), participants chose distraction more often than chance ($M = 53.13\%$, $SE = 1.34\%$), $t(400) = 2.33$, $p = .020$, $d = 0.12$[7], while for fear-evoking pictures, participants chose distraction ($M = 45.04\%$, $SE = 1.42\%$) less often than chance, $t(400) = 3.50$, $p < .001$, $d = 0.17$. For high intensity pictures (aggregated across emotions), distraction choices did not differ from chance ($M = 51.03\%$, $SE = 1.35\%$), $t(400) < 1$, $p = .446$, $d = 0.04$, but for low intensity pictures, participants selected distraction less often than chance ($M = 47.15\%$, $SE = 1.40\%$), $t(400) = 2.04$, $p = .042$, $d = 0.10$. Analysing high and low intensity disgusting pictures separately, participants chose distraction more often than chance only for high intensity pictures ($t(400) = 4.23$, $p < .001$, $d = 0.21$), but not for low intensity pictures ($t(400) < 1$, $p = .983$, $d = 0.001$). For fear-evoking pictures, participants chose distraction less often than chance for both high ($t(400) = 2.70$, $p = .007$, $d = 0.13$) and low ($t(400) = 3.78$, $p < .001$, $d = 0.19$) intensity pictures. Again, results for reappraisal are identical but inverse (i.e., if distraction was chosen more often than chance, reappraisal was chosen less often than chance, and vice versa).

Self-reported emotion regulation strategy use

We also assessed whether participants self-reported using different strategies to regulate fear and disgust (irrespective of their intensity) in the CERQ. To do so, we conducted a 2 (Emotion: disgust versus fear) x 2 (Strategy: positive reappraisal versus positive refocusing) repeated measures ANOVA on the corresponding subscale scores. We found significant main effects of Emotion, $F(1, 326) = 12.62$, $p < .001$, $f = 0.20$[8], and Strategy, $F(1, 326) = 85.43$, $p < .001$, $f = 0.51$. Participants reported engaging in more emotion regulation for fear ($M = 10.62$, $SE = 0.19$) than for disgust ($M = 9.99$, $SE = 0.19$), and they reported using positive reappraisal ($M = 11.18$, $SE = 0.21$) more often than positive refocusing ($M = 9.43$, $SE = 0.18$). However, the significant interaction, $F(1, 326) = 27.65$, $p < .001$, $f = 0.29$, indicated that the frequencies of self-reported strategy use depended on the specific emotion (Fig. 2). Comparing strategy use for each emotion separately, participants reported using positive reappraisal more often than positive refocusing for both disgust ($F(1, 326) = 25.83$, $p < .001$, $f = 0.28$) and fear ($F(1, 326) = 117.05$, $p < .001$, $f = 0.60$). The use of positive refocusing did not differ between disgust and fear, $F < 1$, $f = 0.01$, but participants reported using positive reappraisal more often to regulate fear than disgust, $F(1, 326) = 31.53$, $p < .001$, $f = 0.31$.

[7] According to Cohen (1992), thresholds for small, medium, and large *d*s are 0.20, 0.50, and 0.80, respectively.

[8] According to Cohen (1992), thresholds for small, medium, and large *f*s are 0.10, 0.25, and 0.40, respectively.

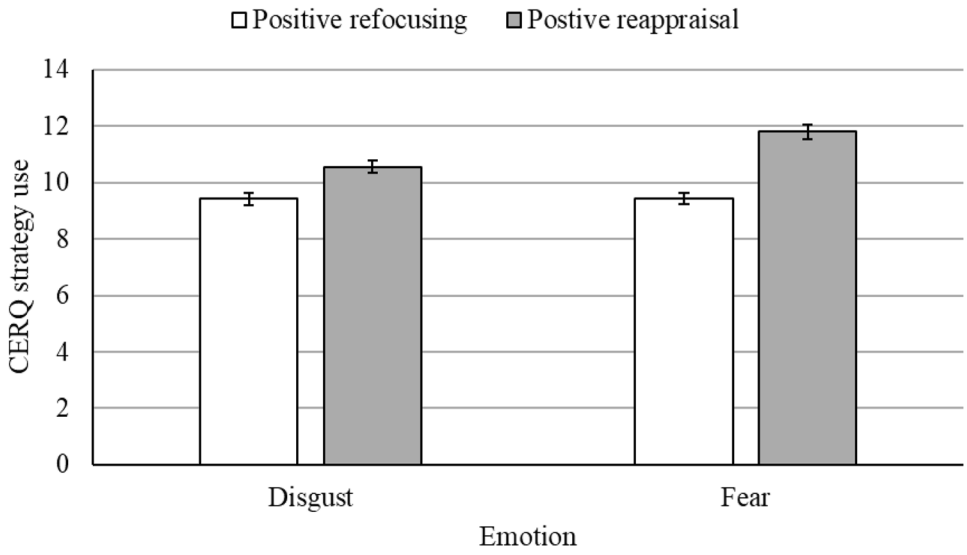

Fig. 2 Self-Reported Strategy Use for Disgust and Fear in the Cognitive Emotion Regulation Questionnaire

Table 2 Spearman correlations between strategy choices in the emotion regulation choice task and self-reported strategy use in the cognitive emotion regulation questionnaire

Distraction choices ERCT	Positive refocusing CERQ
Disgust	
High intensity	0.167*
Low intensity	0.130*
Total	0.157*
Fear	
High intensity	0.148*
Low intensity	0.100
Total	0.135*
Reappraisal choices ERCT	**Positive reappraisal CERQ**
Disgust	
High intensity	−0.023
Low intensity	−0.032
Total	−0.027
Fear	
High intensity	−0.030
Low intensity	−0.050
Total	−0.041

Note: ERCT = Emotion Regulation Choice Task; CERQ = Cognitive Emotion Regulation Questionnaire; * statistically significant after controlling for multiple comparisons using the Benjamini-Hochberg procedure with a false discovery rate of 0.05 (Benjamini & Hochberg, 1995)

Correlations between behavioural and self-reported strategy preferences

To assess whether participants' choices for reappraisal and distraction in the emotion regulation choice task converged with their self-reported use of positive reappraisal and positive refocusing in the CERQ, we calculated correlations between these variables (Table 2). In general, correlations between distraction choices and self-reported positive refocusing for both disgust and fear were small but mostly significant and positive, indicating that behavioural and self-reported use of distraction converged to some extent. This was not the case for reappraisal: None of the correlations between reappraisal choices and self-reported reappraisal were significant, thus indicating that behavioural choice patterns of reappraisal and self-reported use of reappraisal do not converge.

Analysis of preview picture ratings

Finally, because the disgust and fear-evoking pictures were selected from different picture sets, we examined emotion intensity ratings from the preview phase to determine the possible presence of baseline differences in emotional intensities between picture sets.[9] To address this possibility, we ran a 2 (Emotion) x 2 (Intensity) repeated measures ANOVA on the emotion intensity ratings from the preview phase. This analysis revealed significant main effects of both Emotion, $F(1, 400) = 9.75$, $p = .002$, $f = 0.16$, and Intensity, $F(1, 400) = 1139.92$, $p < .001$, $f = 1.69$, indicating that, overall, fear-evoking pictures ($M = 4.05$, $SD = 1.63$) were rated as more intense than disgust-evoking pictures ($M = 3.88$, $SD = 1.46$), and that high intensity pictures ($M = 4.58$, $SD = 1.59$) were rated as more intense than low intensity pictures ($M = 3.36$, $SD = 1.37$). These main effects were further qualified by the significant interaction, $F(1, 400) = 8.22$, $p = .004$, $f = 0.14$.

Follow-up paired-samples t-tests on the preview ratings showed that for both disgust- and fear-evoking pictures, there were very large differences between the high- and

[9] Strategy choices are the main outcome of this task. Exploratory analyses of differences in preview ratings and downregulation ratings are provided in the online supplement 1.

low intensity pictures (High intensity disgust: $M = 4.53$, $SD = 1.71$; Low intensity disgust: $M = 3.23$, $SD = 1.37$; High intensity fear: $M = 4.63$, $SD = 1.79$; Low intensity fear: $M = 3.48$, $SD = 1.56$), $t(400) = 26.43$, $p < .001$, $d = 1.32$, and $t(400) = 28.08$, $p < .001$, $d = 1.40$, respectively. Whereas preview intensity ratings for high intensity disgust-evoking pictures and high intensity fear-evoking pictures did not differ, $t(400) = 1.37$, $p = .171$, $d = 0.07$, low intensity disgust-evoking pictures were rated as less intense than low intensity fear-evoking pictures, $t(400) = 4.91$, $p < .001$, $d = 0.25$.

Exploratory analyses

Because previous research has shown that there are age and gender differences in emotion regulation strategy preferences (e.g., Nolen-Hoeksema & Aldao, 2011), we tested whether strategy preferences in the emotion regulation choice task and self-reported strategies in the CERQ were affected by age or gender.

A mixed-measures ANOVA on distraction choices in the emotion regulation choice task with Emotion and Intensity as within subjects factors and age as a covariate showed that none of the effects were qualified by age (all Fs < 1.74, all ps > 0.18). However, there was a significant main effect of age, $F(1, 399) = 7.129$, $p = .008$. The correlation between age and total distraction choice percentage was -0.132 ($p = .008$), illustrating that older participants were less likely to use distraction overall. A similar mixed measures ANOVA with Gender as a between-subjects factor (excluding four participants who identified as non-binary or who preferred not to disclose their gender) revealed neither a significant main effect of Gender nor any significant interactions involving Gender, all Fs < 2.00, all ps > 0.16.

A mixed-measures ANOVA self-reported strategy use in the CERQ, with Emotion and Strategy as within subjects factors and age as a covariate, revealed no significant effects involving age, all Fs < 3.70, all ps > 0.05. A similar mixed measures ANOVA with Gender as a between-subjects factor (excluding two participants who identified as non-binary or who preferred not to disclose their gender) revealed a significant main effect of Gender, $F(1, 323) = 5.44$, $p = .02$, and a significant interaction between Gender and Strategy, $F(1, 323) = 8.62$, $p = .004$. Both other effects involving Gender were not significant, both Fs < 1, both ps > 0.61. The interaction between Gender and Strategy indicated that while men ($M = 9.61$, $SD = 3.64$) and women ($M = 9.36$, $SD = 3.03$) did not differ in their use of distraction (aggregated across emotions), $t(323) = 0.66$, $p = .51$, men ($M = 12.18$, $SD = 3.82$) reported using reappraisal more often than women ($M = 10.73$, $SD = 3.72$), $t(323) = 3.23$, $p = .001$. Comparisons in men and women separately indicated that both men, $F(1, 102) = 57.73$, $p < .001$, and women, $F(1, 221) = 36.83$, $p < .001$, reported using reappraisal more often than distraction.

Discussion

In this study, we addressed whether effects of intensity on emotion regulation strategy preferences are shared across or limited to the specific negative emotions of fear and disgust. We found overall effects of emotion type and intensity, with disgust-evoking pictures prompting a preference for distraction while fear-evoking pictures prompted a preference for reappraisal, and intense pictures prompting a stronger preference for distraction over reappraisal than low intensity pictures. However, the intensity effect was only present in disgust-evoking pictures, not in fear-evoking pictures. As such, our results support the hypothesis that effects of intensity on emotion regulation strategy choices are emotion-specific. While correlations between behavioural strategy choices and self-reported strategy use were small, people did also self-report using positive reappraisal more often for fear than for disgust. For self-reported positive refocusing, we found no difference between fear and disgust.

Our strategy preference findings for disgust are largely in line with the results of previous studies. As in our study, Young and Suri (2020) also found that participants preferred distraction when experiencing increased levels of disgust. Suri et al. (2018) did not find that feelings of disgust predicted emotion regulation strategy preferences. However, numerically at least, their data also suggested that people choose distraction more often than reappraisal when experiencing disgust. As such, it seems that people generally prefer to disengage from, rather than engage with, disgust-related stimuli. For fear-evoking pictures, findings are more mixed. While we found that people generally preferred reappraisal over distraction for fear-evoking pictures, Young and Suri found that fear did not predict strategy choices. However, at least in their third experiment, fear marginally predicted increased choices for reappraisal. Given that our sample was more than four times larger than theirs, the disparity in significance of the findings across the studies could be the result of the larger statistical power of our study.

While we also replicated the finding that peoples' strategy choices are affected by the intensity of the emotional situation, we found that this effect is not general but emotion-specific. Only for disgust-evoking but not fear-evoking pictures did intensity influence strategy choices. This finding presents an important extension to previous findings. Most studies using the emotion regulation choice paradigm have used picture sets that could evoke a range of different negative emotions, including disgust and fear but also sadness (e.g., Sheppes et al., 2014). In addition, most previous

studies did not differentiate between these emotions, inviting the conclusion that people are more likely to select distraction for intense negative emotions and reappraisal for mild negative emotions. We show that this is not necessarily the case: Only when people experienced disgust but not when they experienced fear, are strategy choices affected by the emotional intensity.

Intensity effects aside, we found that people's strategy preferences depend on the emotion they are experiencing. In the emotion regulation choice task, people preferred distraction over reappraisal for disgust, but they preferred reappraisal over distraction for fear. In the self-reports, people indicated using reappraisal more than distraction for both emotions, but they used reappraisal more to regulate fear than disgust. Theoretically, these different patterns in strategy preferences between disgust and fear can be explained as disgust eliciting primarily avoidant responses to protect from contamination or disease (e.g., Shook et al., 2019), resulting in stronger preferences for disengagement strategies (distraction). Fear can elicit both avoidant (fleeing) and approaching (defensive fighting, inspecting, investigating) responses (Adolphs, 2013), resulting in a more mixed pattern of disengagement (distraction) and engagement (reappraisal) strategies. Alternatively, it could be that stimuli and situations evoking disgust are harder to reappraise than stimuli or situations eliciting fear. Illustrating this idea, Suri et al. (2018, Study 4) found that the primary emotion that was evoked in vignettes depended on reappraisal affordances, with vignettes that were harder to reappraise eliciting primarily anger and vignettes that were easier to reappraise eliciting primarily disgust. As we did not measure or manipulate reappraisal and distraction affordances (i.e., the inherent opportunities for reinterpretation of or distraction from a specific stimulus), we cannot exclude the possibility that disgust-evoking pictures are harder to reappraise (or easier to distract from) than fear-evoking pictures. Future studies assessing strategy affordances in response to stimuli evoking a wider range of different emotions are needed to shed more light on this issue.

One result that may have influenced our findings from the emotion regulation choice task is the small difference in the preview ratings between low intensity disgust-evoking and low intensity fear-evoking pictures. Because the pictures were selected from different picture sets, and because the IAPS does not provide emotion-specific intensity ratings, we could not match the intensity of both picture sets while designing our study. However, we deem it unlikely that differences in intensity between the sets can fully account for the different strategy choice patterns for disgust- and fear-evoking pictures. If anything, the fear-evoking pictures were rated as more intense in the preview phase than the disgust-evoking pictures. Given that increased stimulus intensity is expected to increase distraction choices, a generalized intensity account would predict more distraction choices for the (more intense) fear- than for the (less intense) disgust-evoking pictures. We found no such evidence, as our participants were more likely to choose distraction for disgust- than fear-evoking pictures. In addition, it is worth pointing out that for both disgust- and fear-evoking pictures, there were very large differences in preview intensity ratings between the high and low intensity pictures. From a generalized intensity perspective, this should have resulted in increased distraction choices for high relative to low intensity pictures for both emotions, which is not what we found.

Emotion-specific strategy preferences were also apparent in the self-reported measure of strategy use. Participants reported using more positive reappraisal than positive refocusing for both disgust and fear. This pattern of results was only partly consistent with our findings from the emotion regulation choice task, in which participants preferred reappraisal over distraction for fear, but they preferred distraction over reappraisal for disgust. This limited convergence of findings from both measures was also reflected in the correlations between the measures: Self-reported reappraisal did not correlate significantly with reappraisal choices, and while self-reported distraction did correlate significantly with distraction choices, these correlations were relatively small. The poor convergence between self-reported strategy use and behavioural strategy preferences is not an isolated finding (see e.g. Hannan & Orcutt, 2020; Sauer et al., 2016; Van Bockstaele et al., 2020). One possible explanation is that there were subtle differences in how strategies in both measures are defined and operationalized. Alternatively, it could be due to the emotion regulation choice task only having two strategy options. If people do not use either of these strategies in daily life, their forced choices in the task would not necessarily reflect their everyday strategy preferences as indexed by the questionnaire.

However, there is also research questioning the validity of measures of habitual, trait-like emotion regulation strategy use. For instance, McMahon and Naragon-Gainey (2020) found that students' self-reported habitual use of reappraisal did not correlate significantly with their use of reappraisal in more daily, naturalistic settings. In addition, they found that habitual measures of emotion regulation strategies correlated strongly with daily reports of other strategies, illustrating their poor discriminant validity. Similar findings were also reported in a recent study of Koval et al. (2023), who, in a meta-analytic sample of over 1000 participants, found only a weak correlation of 0.14 between habitual reappraisal use and daily reappraisal use. Such findings caution against interpreting habitual self-reports of reappraisal and other emotion regulation strategies as indices of the tendency to habitually use these strategies in daily life, as they likely

index also other aspects of the emotion regulation process. Considering these limitations of measures of habitual emotion regulation strategy use, our small or non-significant correlations between distraction and reappraisal use in the CERQ and distraction and reappraisal preferences in the emotion regulation choice task are not surprising.

Our study also has limitations. First, we included only reappraisal and distraction as emotion regulation strategies. In absence of assessments of preferences for other emotion regulation strategies, our results inform us only about the relative preferences for distraction and reappraisal. They do not inform us of which strategies are overall preferred to regulate disgust or fear. Including other strategies in future studies may reveal other preferences and may even affect the relative preferences that we have now found for distraction and reappraisal. In a similar vein, we only looked at disgust and fear, but it will be important for future studies to also assess and compare emotion regulation strategy preferences for other emotions, such as anger and sadness. In such studies, it would be interesting to also adapt stimulus sets in a manner that all participants experience similar levels of high and low intensity emotions, or to measure emotion regulation choices in daily life using ecological momentary assessments, which would allow for a more fine-grained analysis of the antecedents, nature, and intensity of emotions and emotion regulation strategy choices over longer time frames.

Second, we addressed only the effects of distinct emotions and their intensity on emotion regulation strategy choices. Earlier studies have identified other factors influencing emotion regulation strategy choice, such as opportunities to implement specific strategies, that may have countered or strengthened effects in our study (for a recent review, see Matthews et al., 2021). For instance, Suri et al. (2018, study 4) found that reappraisal affordances significantly predicted emotion regulation strategy choices. Moreover, the expected effect of emotion intensity on strategy choice was absent in their study once reappraisal affordances were accounted for (see also Young & Suri, 2020). As mentioned earlier, we neither measured nor manipulated reappraisal or distraction affordances. We can thus not exclude the possibility that underlying differences in such affordances for either high versus low intensity or disgust- versus fear-evoking pictures contributed to our findings. Future studies will be crucial to map the relative contributions of and the potential interactions between the different factors that are known to affect strategy choices.

Third, more than half of the participants who enrolled in the study elected to skip the emotion regulation choice task. This may in part be due to the emotional nature of the stimuli but may also be due to the fact that participants knew that the task was optional, and that skipping the task would shorten the overall study duration. While those who completed the emotion regulation choice task did not differ from those who did not complete this task in depression, anxiety, or stress levels, they did show a small difference in self-reported use of reappraisal in response to disgust (see footnote 4). While habitual emotion regulation strategy use may thus have contributed to participants' decision to skip or complete the task and we cannot exclude the possibility completers and non-completers would have demonstrated different strategy preference patterns, it is important to note that the correlations between self-reported reappraisal use and reappraisal preferences in the emotion regulation choice task were near zero. In other words, while people who report using more reappraisal in response to disgust were more likely to participate in the task, their self-reports of reappraisal use were not reflected in their behaviour, and thus cannot account for our main findings. Irrespective of the reasons for drop-out, our sample is likely not fully representative of the general population, as participants were recruited exclusively from university student populations. Future studies may thus want to replicate our findings in more diverse or community samples.

Next to exploring preferences for other emotion regulation strategies, studying other emotions than disgust and fear, and addressing the relative contributions of other determinants of emotion regulation strategy choices, our findings could also inspire more clinically applied research. One relevant avenue for future research would be to investigate if and how patterns of emotion-specific strategy preferences are influenced by individual differences in measures of psychological well-being or psychopathology, and if emotion-specific emotion regulation strategy preferences differentiate clinical and non-clinical samples. For instance, people with elevated levels of disgust sensitivity (how unpleasant the experience of disgust is to the individual) and/or disgust propensity (how easily an individual experiences disgust) may have stronger preferences for distraction over reappraisal for disgust stimuli across all intensity levels. Such a strong preference for disengagement strategies may hamper long-adaptation and may thus help to explain the association between disgust sensitivity/propensity and vulnerability to anxiety disorders (Knowles et al., 2018; Olatunji et al., 2017). It may also be interesting to examine variations in emotion regulation strategy choice as a function of relative disgust vs. fear levels in stimuli that elicit both disgust and fear, such as spiders and snakes in phobic samples (Woody & Teachman, 2000), or body fat in those with disordered eating (Griffiths & Troop, 2006). Emotion regulation strategy choice could even facilitate the identification of the primary problem (fear vs. disgust) to inform personalised treatment.

In conclusion, we show that people prefer to use different strategies to regulate different emotions. While distraction is preferred to regulate disgust, reappraisal is preferred to regulate fear. Crucially, the nature of the emotion also qualified the general effect of emotion intensity on strategy choice: Only for disgust- but not for fear-evoking pictures did participants show an increased preference for distraction with increased emotion intensity. Our results thus indicate that the effects of intensity on emotion regulation strategy choices are emotion-specific, and future studies should differentiate between emotions to allow for emotion-specific conclusions.

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Authors contributions Bram Van Bockstaele: Conceptualization, Methodology, Software, Data curation, Formal analysis, Writing – original draft, Writing – review & editing. Patrick J. F. Clarke: Conceptualization, Data collection, Writing – review & editing. Jemma Todd: Conceptualization, Data collection, Writing – review & editing. Frances Meeten: Conceptualization, Writing – review & editing. Julie L. Ji: Conceptualization, Writing – review & editing. Julian Basanovic: Conceptualization, Writing – review & editing. Nigel Chen: Conceptualization, Writing – review & editing. Daniel Rudaizky: Conceptualization, Writing – review & editing. Lies Notebaert: Conceptualization, Methodology, Software, Data collection, Writing – review & editing.

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Data availability The authors confirm that all data, program code, and other methods developed by others are appropriately cited in the text and listed in the references section. The raw data, data curation protocol, transformed data, and the analysis output are available on the following OSF-page: https://osf.io/jpr59/. Materials and tasks described in the methods are not publicly available due to copyrights, but they can be obtained from the corresponding author. We describe in the main manuscript how the sample size was determined and all data exclusions and manipulations. A full list of all study measures is available in the online supplementary materials. This study was not preregistered.

Declarations

Conflict of interest The authors report no conflict of interest.

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Authors and Affiliations

Bram Van Bockstaele[1,2,3] · Patrick J. F. Clarke[4] · Jemma Todd[3,5] · Frances Meeten[6,7] · Julie L. Ji[3,8] · Julian Basanovic[3,9] · Nigel T. M. Chen[10] · Daniel Rudaizky[3,4] · Lies Notebaert[3]

✉ Bram Van Bockstaele
Bram.VanBockstaele@UGent.be; Bram.Vanbockstaele@gmail.com

Patrick J. F. Clarke
Patrick.Clarke@curtin.edu.au

Jemma Todd
Jemma.Todd@sydney.edu.au

Frances Meeten
Frances.2.meeten@kcl.ac.uk

Julie L. Ji
Julie.Ji@plymouth.ac.uk

Julian Basanovic
J.Basanovic@exeter.ac.uk

Nigel T. M. Chen
nigel@drnigelchen.com

Daniel Rudaizky
Daniel.Rudaizky@curtin.edu.au

Lies Notebaert
Lies.Notebaert@uwa.edu.au

1 Department of Developmental, Personality, and Social Psychology, Ghent University, Henri Dunantlaan 2, Gent 9000, Belgium

2 Research Institute of Child Development and Education, University of Amsterdam, Nieuwe Achtergracht 127, Amsterdam, WS 1018, The Netherlands

3 Centre for the Advancement of Research on Emotion, School of Psychological Science, University of Western Australia, 35 Stirling Highway, Crawley, WA 6009, Australia

4 School of Population Health, Curtin University, Kent St, Bentley, WA 6104, Australia

5 School of Psychology, University of Sydney, 94 Mallett Street, Camperdown, NSW 2050, Australia

6 Institute of Psychiatry, Psychology and Neuroscience, King's College London, De Crespigny Park, London SE5 8AF, UK

7 School of Psychology, University of Sussex, Falmer, Brighton BN1 9QH, UK

8 School of Psychology, University of Plymouth, Portland Square, Drake Circus, Plymouth PL4 8AA, UK

9 Department of Psychology, University of Exeter, Perry Road, Exeter EX4 4QG, UK

10 Independent Researcher, South Perth, WA 6151, Australia