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Clinical Psychology

Emotion Regulation Choice and Psychosis Proneness: A Replication and Extension Study

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Evidence shows that participants choose to disengage during emotion regulation (ER) when facing high intensity stimuli, whereas engage when the intensity is low. No study explored ER choice when participants have more than two strategies to regulate their emotions, nor the role of psychopathology on ER choice. This study aimed to replicate and extend the results of Sheppes et al. (2011) and to explore the role of psychosis-proneness in ER strategies choice. In total, 128 non-clinical participants completed two experimental tasks (a replication task and an extension task), choosing an ER strategy in two conditions. Participants favoured disengagement strategies when the emotional intensity was high and engagement strategies when the intensity was low. Psychosis-proneness seems to be associated with difficulties in adapting to the emotional context. These results expand our understanding on ER choices and provide knowledge on flexibility in ER as well as its implication in psychosis-proneness.

Introduction

Emotion regulation

According to Gross (2008), emotion regulation (ER) refers to "the heterogeneous set of processes by which emotions are themselves regulated" (page 7), which can result in the reduction, intensification, or persistence of emotion. In other words, ER refers to the process by which individuals influence the emotions they feel, when they feel them, and how they experience and express them. Multiple pieces of evidence have highlighted the role of ER in the onset and persistence of mental disorders (Aldao et al., 2010; Webb et al., 2012). ER strategies have traditionally been labelled as either maladaptive (risk factors for psychopathology) or adaptive (protect against psychopathology) (Aldao et al., 2010). However, the level of adaptability of a strategy might depend on whether the physiological, experiential, and behavioural response patterns triggered by the emotion will enable the individual to respond adaptively to the demands of a specific context (Aldao et al., 2015; Bonanno & Burton, 2013).

Aldao (2013) highlighted the importance of understanding how the variation in context affects the process of ER. More specifically, they described different components that can be varied to assess context: (a) the organism carrying out the regulation (e.g., psychopathology); (b) the emotion-eliciting stimuli in the environment (e.g., emotional intensity); (c) the selection and implementation of strategies (e.g., type of task proposed); and (d) the types of outcomes considered (e.g., short- vs long-term goals). Related to this perspective, Sheppes and colleagues (2011) designed an experiment to explore whether participants would choose different ER strategies (i.e., cognitive reappraisal vs distraction) depending on the context, here, the intensity of the stimuli (i.e., high- and low-intensity negative images). Overall, in high emotional intensity contexts, participants chose disengagement strategies (e.g., distraction), while engagement strategies (e.g., cognitive reappraisal) were favoured in low emotional intensity contexts (Sheppes et al., 2014). The authors argue that strategies intervene at different levels of emotional information processing (Sheppes et al., 2011). More precisely, distraction would implicate an initial mechanism of information selection at an early attentional level, resulting in disengagement from emotional information before it is processed in working memory. Reappraisal, a later mechanism, would consist of an attentional engagement in processing emotional information at a semantic level. They argue that individuals regulate emotions by flexibly switching strategies depending on context (Gross, 2015; Sheppes et al., 2011). More precisely, Sheppes and Gross (Sheppes, 2020; Sheppes et al., 2011; Sheppes & Gross, 2012) conceptualise ER as a

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set of decision-making processes that take place at different stages of ER: identification (initially deciding whether to regulate or not), strategy selection (which strategy is selected) and implementation (how the strategy is implemented) (Sheppes, 2020).

Despite the strengths of this study, including the fact that it was replicated several times (e.g., Argyriou & Lee, 2020; Hay et al., 2015; Young et al., 2019), one of its major limitations is its two-alternative forced choice paradigm. Thus, little is known about whether participants will make the same choices (reappraisal vs distraction) when they are given more options or when they can spontaneously choose them, and whether other strategies are chosen according to their disengagement vs engagement classification. This forced-choice paradigm prevents participants from selecting and implementing different or multiple strategies (Aldao & Nolen-Hoeksema, 2012), which limits our understanding of an individual's ability to be flexible in ER. Therefore, the first aim of this study is to replicate Sheppes and colleagues' results in a French sample while extending them by exploring what strategies individuals will choose when they are given different ER strategies options.

Emotion regulation and psychosis proneness

Mental health is also suggested to influence ER choice (Aldao, 2013; Nolen-Hoeksema & Aldao, 2011). Indeed, a meta-analysis (Aldao et al., 2010) showed "maladaptive" ER strategies (e.g., rumination and suppression) are most often selected by individuals reporting mental health disorders (e.g., depression). Conversely, acceptance and other strategies considered to be adaptive are less often selected by the same individuals. This meta-analysis also provided strong evidence of the transdiagnostic nature of ER processes. That is, the association between ER difficulties and various forms of psychopathology (e.g., borderline personality disorder, major depressive disorder, bipolar disorder, general anxiety disorder, etc.) (Aldao et al., 2010).

Even though psychosis and psychotic disorders were not considered in this meta-analysis, there is strong evidence of the important role of disruption in ER on psychosis (Bartolomeo et al., 2022; Ludwig et al., 2019; Raugh & Strauss, 2021; Strauss et al., 2019; Visser et al., 2018). Likewise, cognitive models of psychosis have emphasised the emotional components of psychotic symptoms (Freeman & Garety, 2014; Garety et al., 2001, 2007). Heightened emotions resulting from stressful events are suggested to lead to cognitive disturbances and anomalous experiences and influence how individuals appraise them in a congruent-emotion manner, increasing the risk for psychosis. Moreover, emotional dysfunction associated with psychotic experiences influences how individuals cope with these experiences (e.g., avoidance, worrying, etc.), increasing their intensity and frequency (Freeman & Garety, 2014; Garety et al., 2001, 2007). Thus, difficulties using ER strategies might contribute to an increase in negative affective states, which in turn may amplify the frequency and conviction of beliefs congruent with emotion (Freeman et al., 2001).

In agreement, Ludwig et al. (2019) found that individuals with psychotic disorders use maladaptive ER more often than adaptive ones, which is associated with worse levels of psychotic symptoms. Nevertheless, experimental studies have found less consistent findings. When patients are instructed to use some ER strategies, they are overall as capable as healthy individuals in employing them (Grezellschak et al., 2015; Opoka et al., 2021; Perry et al., 2011). That is, individuals with psychotic disorders are able to implement ER strategies when they are taught to do it. Moreover, most past experimental research has been interested in how individuals with psychosis (or prone to psychosis) implement ER strategies and their effect on psychotic experiences (e.g., Grezellschak et al., 2015). Less is known, however, about ER choice. Thus, more experimental studies are necessary to understand further which ER steps are disrupted in psychosis. In the present study, we are interested in the selection step from Gross's (Gross, 2015) model. Thus, our second aim is to understand how proneness to psychosis influences ER choice when confronting high versus low-intensity emotional stimuli in two tasks (two-forced choices and several ER strategies are presented).

Psychotic-like experience is defined as psychotic experiences (e.g., persecutory ideation) in the absence of illness (Kelleher & Cannon, 2011). Although a minority of people reporting psychotic-like experiences make the transition to a psychotic disorder (Linscott & Van Os, 2013), psychosis-proneness refer to individuals that are prone to experience them. This notion is consistent with the psychosis continuum hypothesis and recent evidence showing that psychotic symptoms are not specific to psychosis and can also be consistent in the general population (Toh et al., 2022; Van Os et al., 2009). For example, a cross-national study found that the mean lifetime prevalence of psychotic-like experiences was 5.8%, with mostly infrequent occurrences (32.2% reporting only one experience) (McGrath et al., 2015). Another study found that 14.4% of college students reported experiencing at least one kind of psychotic experience (Gong et al., 2022). Other studies investigated specifically non-clinical voice hearing and showed a lifetime prevalence ranging between 5-15% (Beavan et al., 2011). Evidence suggests that these experiences are associated with greater perceived control and less functional disturbance (Toh et al., 2022). Moreover, among those reporting psychotic-like experiences, it has been found that 7% will later develop psychotic disorders (Linscott & Van Os, 2013). Consequently, studies on non-clinical populations can help us delineate mechanisms implicated in both clinical and non-clinical samples and thus inform us of the processes specifically implicated in suffering in clinical populations (Kelleher et al., 2010). Also, these studies improve knowledge in designing future interventions targeting those processes without confounding effects associated with clinical populations (e.g., medication, stigma) (Larøi, 2012).

Objectives

1. The first goal of this study was to replicate Sheppes's results regarding adaptive choices when changing context (i.e., high- vs low-intensity images) in a French sample (Replication task).
2. Secondly, the purpose of this study was to extend these results by exploring other strategies. More precisely, we will explore whether engagement strategies are more chosen in the low condition and disengagement strategies in the high condition (Extension task). Likewise, we want to explore what type of ER strategy participants use most often under low and high-intensity emotion when they are given more options in terms of ER strategies.
3. The third goal of this study was to explore the influence of the propensity to psychosis in ER choice (both tasks).

Hypotheses

1. From a replication perspective, we hypothesised that reappraisal would be preferred in the low condition, and distraction in the high condition.
2. Also, we expected that engagement strategies (i.e., reappraisal, rumination, acceptance) would be preferred in the low condition, and disengagement strategies (i.e., distraction, behavioural avoidance, relaxation) in the high condition. From an exploratory perspective, we wanted to explore which specific strategy was chosen when various options were given.
3. We hypothesised that higher scores at psychosis proneness (measured with the Community Assessment of Psychic Experience 42; CAPE-42, Stefanis et al., 2002) would be associated with distraction in both conditions in the Replication task, and both with suppression and disengagement strategies in the Extension task.

Method

Participants

Participants were French women and men recruited from the general population. Our sample was recruited through online social media, university mailing lists and acquaintances of the authors with a snowball procedure. Inclusion criteria consisted of being between 18 and 65 years old and fluent in French. Participants received 10€ compensation for participating in the study or course credits if they were students. Exclusion criteria consisted of having vision or motor difficulties that could make the task impossible (i.e., watching images and using a computer), previous participation in another study on emotion regulation, and being a student in psychology at the Master's level. Considering that most of our initial sample was composed of psychology students, we decided, later on in the implementation of the study, to no longer include students in psychology in general.

In total, 128 participants were recruited and completed the study. The study was carried out according to the code of ethics of the World Medical Association (Declaration of Helsinki). Moreover, data collection was carried out to ensure that participants' identities remained anonymous and the hypotheses were preregistered (https://osf.io/s6kmr/?view_only=a2c5360298ca469fb1de784fd2987dbf). All material and the Rstudio script can be found on the same link.

Measures

Step 1: Measures used during the experimental tasks

Emotion regulation strategies. Seven strategies were proposed for the Extension task: reappraisal, distraction, behavioural avoidance, relaxation, suppression of emotional expression, acceptance and rumination. Participants could also choose any other strategy from their repertoire by selecting the option "other". For the Replication task, as in the previous study by Sheppes et al. (2011), only two strategies were proposed to the participants: reappraisal and distraction.

Manipulation checks. We included three manipulation checks. First, we included (1) a measure of emotional intensity using the Self-Assessment Manikin (SAM; Bradley & Lang, 1994). The SAM evaluates both the emotion's arousal dimension (i.e., the extent to which the image elicits excitement or appeasement from 0 to 9) and valence (i.e., the extent to which the image elicits pleasantness or unpleasantness from 0 to 9). For the Replication task only, we also evaluated (2) participants' subjective perception of their ability to employ the chosen strategy from 1 Not at all to 7 perfectly (considering reappraisal and distraction separately). Finally, they were also requested to report the percentage of time (3) they spent applying each strategy and (4) not looking at the images displayed on the screen. No additional manipulation checks were added to the Extension task.

Step 2: Questionnaires completed at the end of the study

The Community Assessment of Psychic Experience 42 (CAPE-42, Stefanis et al., 2002). This self-report questionnaire measures the lifetime prevalence of psychotic-like experiences in the general population (Brenner et al., 2007; Stefanis et al., 2002). The CAPE-42 comprises 42 symptom items covering three symptom dimensions: positive (20 questions), depressive (8 questions) and negative symptoms (14 questions). The three dimensions proved to be independent but correlating, and the internal consistencies were good (Brenner et al., 2007; Stefanis et al., 2002; Verdoux et al., 2003). Recently, Mark and Toulopoulou (2016) provided further evidence favouring the 3-factor model for CAPE. Previous studies indicated that the CAPE is a stable and reliable measure (Mark & Toulopoulou, 2016). Internal consistency for the total scale was.92, of .85 for the Positive dimension, .82 for the Negative dimension, and .79 for the Depressive dimension in the present sam-

ple. In the current study, only the frequency questions were used and analysed to obtain one frequency total score and one frequency score per dimension (positive, negative, depressive).

Sociodemographic questions. Age, sex, status (student or not, which studies), highest level of education, self-report psychiatry diagnosis and treatment.

Participants also completed the **Emotion Regulation Skills Questionnaire** (Berking & Znoj, 2008), but this measure will not be analysed in the context of this study.

Material

Images were all extracted from the IAPS (International Affective Picture System; Lang et al., 2005). Images were classified as High- or Low-intensity depending on their scores on valence and arousal (Sheppes et al., 2011).

The images used in the Replication task were the same as those used in the original study by Sheppes et al., 2011. Moreover, these images were pretested in a French sample (n = 26), previously to this study, confirming lower valence ($t(21) = -16.53$, $p < 0.001$) and higher arousal ($t(21) = 7.10$, $p < 0.001$) for high-intensity images compared to low-intensity images[1]. Likewise, for the Extension task, new pictures were extracted from the IAPS and pre-tested in a French sample (n = 41). Results supported lower valence ($t(39) = -12.3$, $p < 0.001$) and higher arousal of high images ($t(39) = 10.9$, $p < 0.001$), confirming the categorization of high vs low-intensity images[2]. We also compared images from the Replication task and the Extension task in order to ensure they were equivalent. High-intensity images were not statistically different in valence or arousal ($p = 0.09$, $p = 0.08$), nor were the low-intensity images ($p = 0.24$, $p = 0.79$). The differences between the images were assessed using the Self-Assessment Manikin (Bradley & Lang, 1994), measuring both valence and arousal.

The ID number of each image used in this study is available in Supplementary Material and the data related to the pre-tests can be found in OSF.

Procedure

As mentioned above, participants were recruited through online social media, university mailing lists and acquaintances of the authors with a snowball procedure. Participants were invited to scan a QR code or click on a web link to an online platform (i.e., Evento) to choose their time slot. Upon arrival in the lab, participants completed the whole study on a computer. The study was set up on Qualtrics. Prior to the experiment, participants were informed about the study (i.e., the objective, the nature of the measures being collected, the nature of the constraints associated with the study, the foreseeable risks and the expected benefits of the research, their rights in the context of research involving the human being), and created an anonymous code. Participants were also explicitly informed (before and during the study) that they would be invited to watch a few images that could be a source of discomfort. They were invited not to enrol in the study or stop any time they wanted if they judged the images could make them feel uncomfortable (see OSF page for more detailed information). After reading all the information regarding the study, participants signed the consent form.

The Extension task was always completed before the Replication task in order to avoid the effect of the training phase from the latter task into the former. The procedure of the two tasks is described below.

(a) Extension task

Before the Extension task, a list with names and definitions of the 7 ER strategies was given to participants (see OSF website for additional information). A training phase during which the experimenter was present (to answer possible questions and ensure the participants understood the proposed strategies) comprised 8 images (4 low- and 4 high-intensity). Participants watched the image for the first time (500ms) and then had to choose between 7 ER strategies (a list with the names of the strategies was provided), including the option "other". Subsequently, participants had to apply the chosen strategy when presented with the image for the second time (5000ms). As in the original Sheppes et al. (2011) study, the Extension task was composed of two conditions: 15 high vs 15 low-intensity randomly presented images that individuals were asked to watch (see Figure 1).

After the Extension task, participants were asked to fill out the manipulation checks described above and to answer simple calculations to allow a return to a basal level in terms of emotional intensity before proceeding to the Replication task.

(b) Replication task

The Replication task used the same procedure described above, but this time only two strategies were proposed (i.e., reappraisal and distraction), as described in Sheppes's procedure (2011) (see Figure 1). In order to teach individuals to apply each strategy, participants took part in a familiarisation phase during which they were asked to watch 4 images (2 low- and 2 high-intensity) (500ms), and to apply a given strategy while watching the image again (5000ms). Participant were given specific instructions on how to use these strategies. The participants were told:

1 The mean arousal and valence for low-intensity images were respectively of 3.73 and 7.61. The mean arousal and valence for high-intensity images were respectively of 5.77 and 5.46 (Replication task).

2 The mean arousal and valence for low-intensity images were respectively of 4.95 and 3.05. The mean arousal and valence for high-intensity images were respectively of 6.08 and 2.01 (Extension task).

"*Each image will appear once very quickly, and will be followed by an instruction, which you will apply when the image appears again. You will be instructed to either distract yourself by occupying your mind with things unrelated to the image, or to reappraise, thinking about the image in a way that reduces its negative interpretation*". Subsequently, more specific instructions detailing how to apply each strategy was provided (see OSF for more details on the methodology).

The familiarisation phase was followed by the training phase, in which participants had to choose the strategy to apply while watching 8 images (4 low- and 4 high-intensity). During both the familiarisation and training phases the experiment stayed in the room to answer possible questions. The main task was then composed of 15 low- and 15 high-intensity randomly presented images.

After the Replication task, participants were asked to fill out the manipulation checks described below and the different questionnaires (see *Measures*). Before leaving the laboratory, they were presented with a happy short movie (i.e., Baby Girl Laughing Hysterically at Dog Eating Popcorn, available on YouTube) to ensure all participants decreased emotional intensity (see Figure 1).

(c) Manipulation checks

Participants completed the SAM before and after each task, resulting in four measures of emotional valence and arousal. Thus, the participants completed the between task measures twice, before and after the math task. The math task was added between the two experimental tasks to bring emotions back to their baseline levels.

After the Replication task, they were asked to complete the additional manipulation checks to verify (1) perceived difficulty of task when applying reappraisal vs distraction, (2) the overall time perception spent using one strategy, and (3) the appropriate watch of the images.

Statistical analyses

All analyses were performed in R and Rstudio free software version 2021.09 (RStudio Team, 2020).

The hypotheses were tested by fitting logistic regression models using Generalised Estimating Equations (GEE) method for parameter estimation (Liang & Zeger, 1986) (*geeglm* function from the *geepack* package) (Højsgaard et al., 2006). This method allows the modelling of binary outcomes (i.e., reappraisal vs distraction in the Replication task; engagement vs disengagement strategies in the Extension task), while considering repeated observations within each participant (15 trials of each condition) (*GEE*; Ballinger, 2004). In GEE, a working correlation matrix is defined, and regression estimates are generated as if the observations were independent. Because of the longitudinal design (trials), an autoregressive working matrix was used. The sample size of 128 met the minimum assumption of 50 clusters (McNeish & Stapleton, 2016). GEE analyses were conducted predicting strategy selection (0 = reappraisal vs 1 = distraction in the Replication task; 0 = engagement [reappraisal, acceptance, rumination] vs 1 = disengagement strategies [distraction, behavioural avoidance, relaxation, expressive suppression] in the Extension task), and included predictors were condition (low vs high intensity, centred using the *scale* function) and psychosis proneness (CAPE-total score, centred using the *scale* function). Models included the condition (-0.5 = low, +0.5 = high) and the CAPE predictor for simple effects, and interaction term. To facilitate interpretation, coefficients on logit scale from the analyses were transformed into odds ratio (using the *exp* function, built-in R function). From an exploratory perspective, models were also performed using the CAPE subdimensions (positive, negative, depressive), all centred using the *scale* function (built-in R function). Also in exploratory analysis, MANOVA was performed using the *lm* function from the *car* package (Fox et al., 2007). Correlational analyses were performed using the function *cor* from the *stats* package (Scott, 1990). Finally, analyses related to manipulation checks were performed using Wilcoxon tests (using the function *wilcox.test*, built-in R function). To clarify the presentation of results, we will first present the findings related to the Replication task before those of the Extension task.

Results

The descriptive characteristics of the sample are presented in Table 1.

Manipulation checks were investigated using Wilcoxon tests, which revealed a significant difference between emotional intensity after the Extension task and before the Replication task (isolating the math task) (V = 2500.5, p < 0.001). Emotional intensity was significantly higher after the Extension task than before the Replication task, suggesting that the math break did serve as a distractor by decreasing emotional intensity before the Replication task. However, no significant difference was found for emotional intensity measures after both tasks (V = 2004.5, p = 0.42), which indicates that they induced a similar overall level of emotional intensity.

Moreover, participants reported being more successful in applying reappraisal (M = 4.98, SD = 1.32) compared to distraction (M = 4.18, SD = 1.57) (V = 1611.5, p < 0.001). Additionally, participants spent significantly more time on average using reappraisal (M = 58.65%, SD = 23.79%) compared to distraction (M = 46.31%, SD = 24.80%) (V = 2070.5, p < 0.001). Finally, participants reported, on average, spending 15.74% of the time not looking at the images (SD = 18.54%).

Sheppes's Replication task.

For comparison with previous studies, the percentage of each strategy used was calculated (see Figure 2).

As hypothesized (H1), the effect of condition (low vs high) is significant ($x^2(1)$ = 150, p < 0.001, QIC = 4428.54). The odds of choosing distraction in the high condition are 6.31 times higher than those of choosing distraction in the low condition ($ß$ = 1.84, p < 0.001). In the low condition, the odds of choosing distraction are of 0.21 compared to choosing reappraisal ($ß$ = -0.62, p < 0.001). This indicates that participants choose more distraction in the high condition, and reappraisal in the low condition.

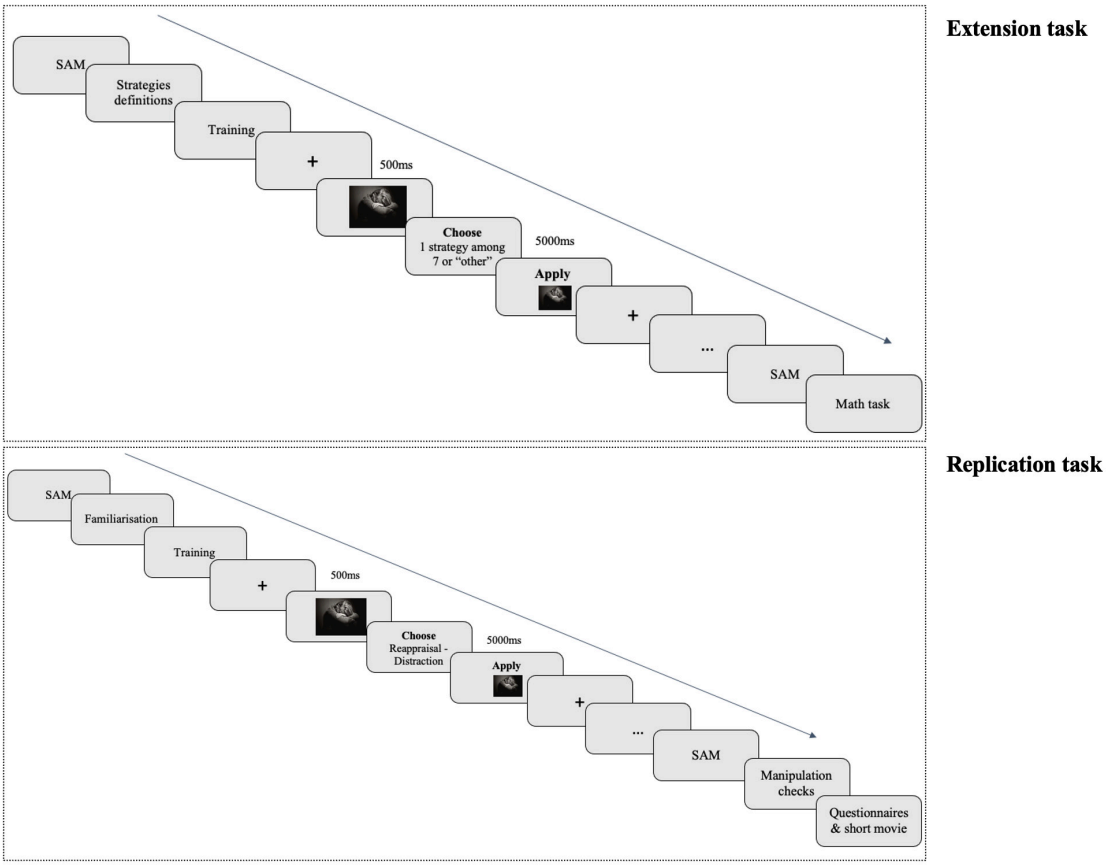

Figure 1. Trial procedures for both tasks.

Table 1. Descriptive Data.

Variable	n = 128
Age (years ± SD)	26.9 ± 11.7
Highest level of education (n [%])	
First cycle of secondary education	2 [1.6]
Second cycle of secondary education	65 [50.8]
Bachelor's degree	35 [27.3]
Master's degree	22 [17.2]
Doctoral degree	4 [3.1]
Gender (n [%])	
Female	105 [82.0]
Male	21 [16.4]
Non-binary/transgender	2 [1.6]
Questionnaire M ± SD	
CAPE-42 – Positive dimension	1.47 ± 0.32
CAPE-42 – Negative dimension	2.00 ± 0.43
CAPE-42 – Depressive dimension	2.24 ± 0.54
CAPE-42 – Total scale	1.79 ± 0.33

Note. M: mean; SD: Standard Deviation; CAPE-42: Community Assessment of Psychic Experiences.

As hypothesized (H3), the effect of psychosis proneness (CAPE-42) was significant ($x^2(1) = 5.4$, $p = 0.02$). The odds of choosing distraction when psychosis-proneness score is higher are 1.43 times higher than those of choosing distraction when psychosis-proneness score is lower ($ß = 0.36$, $p = 0.02$) in both conditions. In other words, it indicates that the odds of choosing reappraisal are decreased with higher psychosis-proneness. However, the interaction between the condition and psychosis-proneness was not significant ($p = 0.22$), indicating that the effect of psychosis proneness does not depend on the condition (see Table 2). An additional model is presented in Supplementary Material (Table 1S) to explore the CAPE subdimensions.

Extension task.

To extend previous studies, the percentage of each strategy used was calculated (see Figure 3). Importantly, the strategies were grouped into two categories: disengagement (i.e., distraction, behavioural avoidance, relaxation, expressive suppression) and engagement strategies (reappraisal, acceptance, rumination) following Sheppes's model (Sheppes et al., 2011, 2014).

The effect of the condition was investigated in the Extension task to explore its impact on various strategies (H2). As hypothesized, the effect of emotional intensity (low vs high) is significant ($x^2(1) = 139.6$, $p < 0.001$, QIC =4776.2). The odds of choosing disengagement strategies in the high condition are 4.05 times higher than those of choosing disengagement strategies in the low condition ($ß = 1.40$, $p < 0.001$). In the low condition, the odds of choosing disengagement strategies are of 0.76 compared to choosing engagement strategies ($ß = -0.27$, $p < 0.001$). This indicates that participants choose more disengagement strategies in the high condition, and more engagement strategies in the low condition.

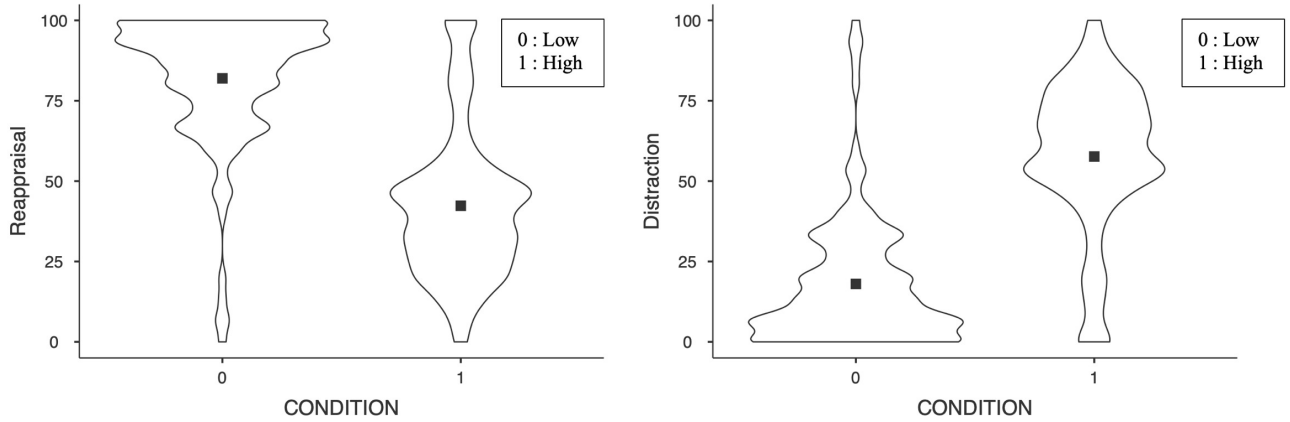

Figure 2. Violin plots for percentage of use of each strategy (Replication task).

Note. ■ *: Mean percentage.*

Table 2. GEE logistic regression analyses predicting the probability of choosing distraction in the Replication task.

Model	ß	SE	Exp(ß)	Exp(ß) %2.5 – 97.5	Wald	p-value	QIC
Intercept	-0.62	0.07	0.54	0.46– 0.62	69.67	**< 0.001**	4428.54
Condition	1.84	0.15	6.31	4.70 – 8.46	151.34	**< 0.001**	
CAPE-total	0.36	0.15	1.43	1.07 – 1.91	6.02	**0.02**	
Condition* CAPE	-0.36	0.29	0.70	0.39 – 1.24	1.51	0.22	

Note. ß = coefficient on the logit scale; SE = Standard error; QIC = Quasi-Likelihood Information Criterion.

Table 3. GEE logistic regression analyses predicting the probability of choosing disengagement strategies in the Extension task.

Model	ß	SE	Exp(ß)	Exp(ß) %2.5 – 97.5	Wald	p-value	QIC
Intercept	-0.27	0.06	0.76	0.68 – 0.85	21.42	**< 0.001**	4776.2
Condition	1.40	0.12	4.05	3.21 – 5.10	139.72	**< 0.001**	
CAPE-total	0.10	0.16	1.10	0.79 – 1.53	0.34	0.56	
Condition* CAPE	0.01	0.34	1.01	0.52 - 1.95	0.00	0.98	

Note. ß = coefficient on the logit scale; SE = Standard error; QIC = Quasi-Likelihood Information Criterion.

Regarding the effect of psychosis proneness in the Extension task (H3), neither the simple effect of psychosis proneness (CAPE) nor the interaction effect (Condition*CAPE) was significant (respectively, p = 0.56 and p = 0.98) (see Table 3). An exploratory model including CAPE subdimensions is provided in Supplementary Material (Table 2S).

Exploratory Analyses

In order to further understand participants' choices in the Extension task, we also considered each ER strategy separately by investigating whether condition and psychosis-proneness influenced specific strategy choices, using a MANOVA analysis (See Supplementary material, Table 3S).

Given the absence of associations with rumination and relaxation strategies (see Supplementary material, Table 3S) and their more ambiguous categorisation between engagement and disengagement strategies (see discussion for details), we investigated the previous model, excluding those two strategies (see Supplementary material, Table 4S).

We also explored the association between strategy choice in the low condition and psychosis proneness. Previous literature shows that individuals tend to choose disengagement strategies more often to deal with their emotions, including suppression and avoidance. Results are available as supplementary material (Table 5S).

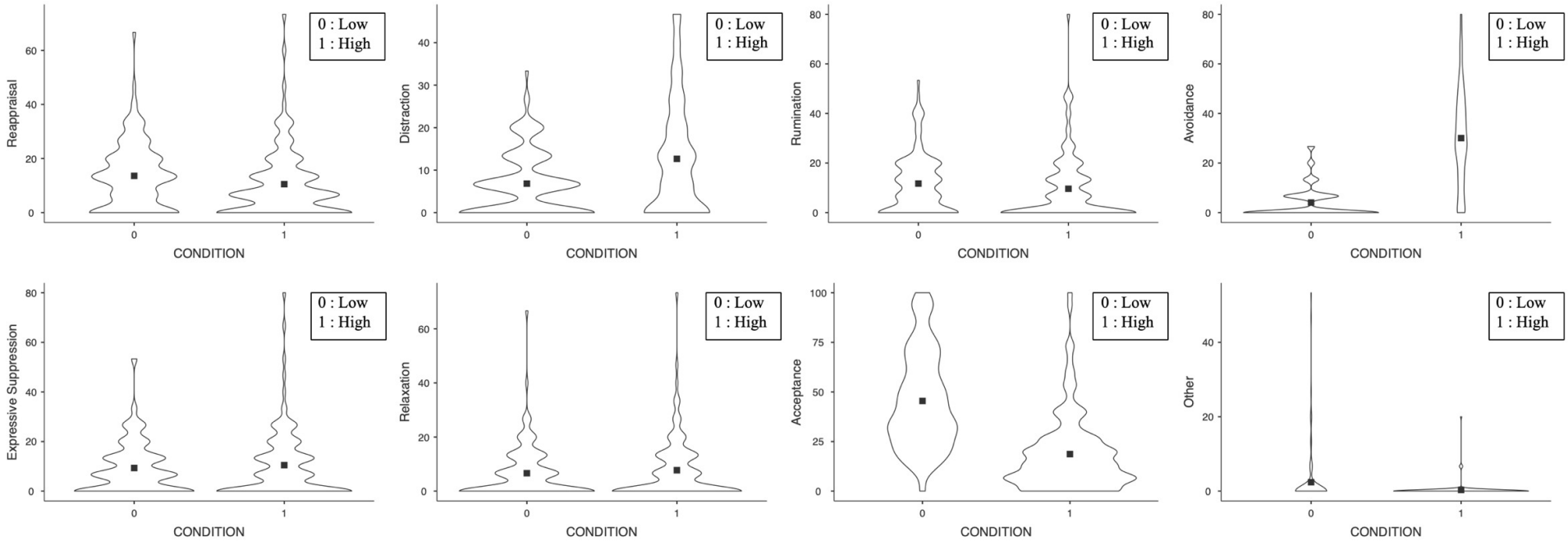

Figure 3. Violin plots for percentage of use of each strategy (Extension task).

Note. ■ : *Mean percentage.*

Discussion

Emotion regulation choices are currently considered to be context-dependent (Bonanno & Burton, 2013). Sheppes's paradigm was designed to investigate strategy choice when individuals are confronted with context variation (here, emotional intensity). The first goal of this study was to replicate this paradigm and to extend it in a task displaying a broader list of ER strategy options. Moreover, psychopathology has been identified as another influential factor in strategy choice (Aldao et al., 2013). More specifically, recent findings suggest that psychosis is associated with frequent use of maladaptive ER strategies (Ludwig et al., 2019), but less is known about ER choice. Thus, the second aim of this study was to evaluate whether psychosis-proneness was associated with a less adaptive choice of ER strategies.

Sheppes's paradigm replication and extension

The first aim of the present study was to replicate Sheppes's results regarding ER choices when changing context in a French sample. In line with previous findings (Sheppes et al., 2011, 2014; Sheppes & Levin, 2013), our results indicate that participants most often choose distraction in high emotional conditions and reappraisal in low emotional conditions. It has been suggested that this ability to choose and switch strategy according to contextual change refers to ER flexibility (Kashdan & Rottenberg, 2010), illustrated in this paradigm by a preference for reappraisal in low-intensity and distraction in high-intensity contexts. Therefore, our results support the importance of studying how individuals' ER choice varies depending on the context (i.e., emotional intensity) by favouring disengagement strategies in high-intensity contexts and engagement strategies in low-intensity contexts (Gross, 2015; Sheppes et al., 2011). However, one important limitation of the traditional paradigm proposed by Sheppes et al. (2011) relies on the forced-choice experimental task used and, thus, on the manipulation of only two strategies (i.e., distraction and reappraisal). As shown elsewhere (Aldao & Nolen-Hoeksema, 2012), individuals often rely on many strategies when regulating their emotions. As such, the two forced-choice between distraction and reappraisal might not represent participants' real choices when facing stressful situations.

Therefore, the second goal of the present study was to extend the number of strategies proposed in Sheppes's paradigm and, more specifically, explore what strategies individuals would choose when given a wider range of choices in terms of ER strategies (i.e., reappraisal, distraction, avoidance behaviour, relaxation, suppression of emotional expression, rumination, acceptance) in two different contexts (high vs low emotional intensity; Extension task). As mentioned before, based on their model, Sheppes and colleagues proposed categorising ER strategies as either disengagement or engagement strategies depending on the level of emotional information processed (Sheppes et al., 2011, 2014). Notably, this dichotomisation was first proposed in the coping literature (e.g., Charles S. Carver et al., 1989; C.S. Carver, 2011), depicting engagement-oriented and disengagement-oriented coping strategies. The former refers to strategies that focus on dealing with the stressor or emotion, whereas the latter corresponds to strategies that focus on avoiding it. These categories have also been recently adopted in the development of a new emotion regulation questionnaire, categorising strategies such as confronting unpleasant situations or resolving conflicts as engagement ones and strategies such as cognitive distraction and expressive suppression as disengagement ones (Olderbak et al., 2022). Based on this dichotomisation, we hypothesised that strategies requiring attentional engagement would be preferred in the low condition (i.e., reappraisal, acceptance, rumination), whereas disengagement strategies in the high condition (i.e., distraction, avoidance, relaxation). Consistently and in agreement with previous findings (Sheppes et al., 2011, 2014), disengagement strategies were used more in the high condition (compared to engagement strategies), whereas engagement strategies were preferred in the low condition (compared to disengagement strategies). Our findings support the strategy-situation fit hypothesis, which postulates that ER strategy choices result from a cost-benefit comparison in terms of the individual's emotional, cognitive, and motivational resources, which will optimise ER based on stimulus intensity (Sheppes et al., 2014).

When looking more in detail at our results, we found that when the context is of higher emotional intensity, individuals favour disengagement strategies resulting in a preference for behavioural avoidance, which reflects the prototypic strategy choice of disengagement. This is in line with previous studies showing that distraction does not seem to challenge self-control resources (Sheppes & Meiran, 2008). In turn, when emotional intensity decreases (i.e., low condition), participants favour engagement processes resulting in a preference for strategies such as acceptance, possibly suggestive of a cost-benefit comparison in favour of a specific strategy. Acceptance is often considered distinct from other strategies due to the less active modification of emotional experience that it implies (Gross, 2015; Wojnarowska et al., 2020). For instance, Hayes and colleagues define acceptance as fully experiencing emotions, thoughts and sensations without trying to change them (Hayes et al., 1999, 2002). Hayes and colleagues have placed reduced psychological flexibility - translated as (among other processes) excessive avoidance of experience - as the heart of most (if not all) psychological problems (Hayes et al., 1999). Conversely, acceptance is key to a more meaningful life (Hayes et al., 2002). This is congruent with previous studies showing a frequent use and selection of acceptance in daily life (Heiy & Cheavens, 2014; Wittkamp et al., 2022). Therefore, ours results could be potentially be explained by acceptance being seen as more easily employed when emotional intensity is low (Lennarz et al., 2019), compared to cognitive reappraisal which requires more effort (Tamir et al., 2020).

Furthermore, our exploratory analysis also revealed that the condition (high vs low) had no effect on the ER choice when it comes to relaxation and rumination. That is, those strategies were overall less chosen, and if so, their choice

was not driven by the effect of the condition. These findings question the dichotomisation of engagement and disengagement strategies. Indeed, relaxation could be considered disengagement due to the attentional shift toward breathing or relaxing the muscles and the avoidance of the emotional processing of information. However, one could also argue that it can reflect an engagement toward emotional information through observing the physical expression of emotion (Koole, 2010). As such, this strategy could intervene later than the distraction in the ER process (Koole, 2010) and thus hardly be categorised as being either an engagement or a disengagement strategy. Still, it would exist on a continuum between the two (Sheppes, 2020). Concurrently, no effect of the condition was found on rumination. Considering that rumination has been found to be most often employed when participants need to up-regulate their emotions (Millgram et al., 2019; Sheppes, 2020) and that in the present study, participants needed to down-regulate theirs, our results are not surprising. Another important point is the classification of rumination as an engagement strategy (e.g., as a self-focused response, Nolen-Hoeksema & Morrow, 1993). Indeed, past research has suggested that rumination (as well as worry) works as a form of avoidance (Stroebe et al., 2007), focusing on one specific aspect of emotional information. Still, others consider rumination a form of engagement with the emotional experience (Boelen, 2006), leading to the up-regulation of emotions. A final hypothesis is related to our sample (i.e., undergraduate psychology students), who might have learned that rumination is associated with depression (Nolen-Hoeksema, 1991, 2000; Nolen-Hoeksema et al., 2008) and depicted as a maladaptive ER strategy (Aldao & Nolen-Hoeksema, 2010). As before, further studies should consider a more diverse sample and measure strategies' spontaneous application instead of proposing specific options.

Psychosis proneness and ER choice

In the present study, we also sought to explore the influence of psychosis-proneness on ER choice. Indeed, psychopathology has been suggested to influence ER choice (Aldao et al., 2015), and, in turn, psychosis has been found to be associated with disrupted ER regulation processes (Ludwig et al., 2019). The results of our study indicated that psychosis-proneness increased the odds of choosing distraction (Replication task). As hypothesised, individuals reporting psychosis-proneness tend to employ an early disengagement strategy even when facing low-intensity stimuli. This is in line with previous studies showing a decreased use of reappraisal in psychosis compared to control groups (Chapman et al., 2020; Horan et al., 2013; Kimhy et al., 2012; Livingstone et al., 2009) and greater use of avoidant strategies (Kim et al., 2013; Ludwig et al., 2019).

However, the interaction between psychosis-proneness and the condition was not significant, indicating that psychosis-proneness seems to influence ER choice regardless of the emotional intensity. Thus, our results indicated that high psychosis-proneness is associated with a tendency to disengage from emotional processing earlier, even when the situation is supposed to trigger low levels of emotional intensity. From the perspective of ER flexibility, our findings suggest that psychosis-proneness might be associated with a decreased capacity of ER flexibility (i.e., a decreased adaptation to changing contexts), resulting in applying the same strategy regardless of the situation. Our results are in line with previous evidence showing that individuals with a diagnosis of psychosis tend to present an oversensitivity to emotional experiences (Raugh & Strauss, 2021), and psychosis-proneness is associated with context insensitivity (tendency to detect cues triggering ER when none is present; Bortolon et al., 2022).

Regarding our Extension task, results showed that when given a wider choice of strategies, the effect of psychosis-proneness was found not significant. In other words, psychosis does not seem to influence the choice between engagement and disengagement strategies. Additional correlational analyses revealed a significant association between psychosis-proneness and expressive suppression in the low condition. Interestingly, considering the social value of expressive suppression (Butler et al., 2003), applying it in the context of the current experiment (participants were left alone in the room) might be considered a maladaptive choice. Even though exploratory and only correlational, these results are in line with previous studies showing an association between psychosis (-proneness) and expressive suppression both in questionnaire (Badcock et al., 2011; Horan et al., 2013; Kimhy et al., 2012) and experience sampling method studies (Nittel et al., 2019) and provide further exploratory evidence in favour of reduced ER flexibility (Visser et al., 2018). No association was found between psychosis proneness (or subdimensions in exploratory analyses) and other disengagement strategies in either condition. Contrary to our results regarding Sheppes's original task, this indicates that individuals prone to psychosis do not differ from others in ER choice when given more options. These findings corroborate studies showing an absence of a deficit in applying ER strategies in psychosis-proneness in laboratory studies . Also, experimental designs (vs daily designs) may be less suitable to measure deficits in ER choice. Indeed, psychosis might be more related to difficulties in applying one strategy at a time efficaciously in daily life (Raugh & Strauss, 2021; Visser et al., 2018). Moreover, it is possible that difficulties in ER may also impact the development and/or maintenance of psychotic-like experiences (e.g., Bahlinger et al., 2020; Bartolomeo et al., 2022). Even though the current investigation has not tested this reversed directionality, future studies are needed to disentangle the temporal relationship between ER difficulties and psychotic-like experiences. For example, difficulties in efficiently regulate emotions could be implicated in a later increase in symptoms' frequency.

Limits

Our study has several limits. First, the strategies options were enforced, preventing from measuring spontaneous choices and probably leading to a bias in individuals who would not have chosen to regulate spontaneously at the identification stage (Gross, 2015). However, it is important

to highlight here that the option "Other" was systematically proposed to participants. Importantly, even if a list of strategies' definitions was offered, the participants' own definitions were not considered, which may have impacted individuals' choices. Furthermore, the number of trials per condition (15) can limit the frequency of selection of certain strategies and have consequence on the power related to the findings. Thus, future studies using such paradigm should increase the number of trials. Another limitation of our study concerns our sample characteristics. Indeed, our sample was composed mostly of young females. Previous studies have found that age and sex can impact ER use (Goubet & Chrysikou, 2019; Nolen-Hoeksema & Aldao, 2011; Saeidi et al., 2021). Likewise, many of our participants were undergraduate students in psychology, which might bias their ER choice. We tried to overcome this limitation by recruiting non-student participants (N = 42) and including only students from the first three years of a psychology degree who have less deep knowledge of ER. Moreover, only the frequency scores from the CAPE were used, although related distress may have a specific association with emotion regulation difficulties (Toh et al., 2022); as such, we encourage future studies to include a measure of both symptoms' frequency and related distress. Finally, stimuli (images) lack ecological validity since it reflects only a part of daily emotional stimuli individuals can encounter. Future studies are encouraged to evaluate individuals' choices in daily settings, for example, through experience sampling methods using event-related questionnaires.

Conclusion

This study provides additional evidence of the importance of measuring context while studying ER processes by showing that individuals indeed make different choices when the context changes. Most importantly, we showed that it is still the case when participants are given a wider range of ER strategy choices. That is, individuals tend to use disengagement strategies when facing high-emotional intensity contexts while preferring engagement strategies in low-emotional contexts. Moreover, our study adds to the literature by showing that psychosis-proneness is associated with reduced ER flexibility (i.e., difficulties in adapting strategies to contextual variations). In sum, the current study increases theoretical knowledge on ER by strengthening Sheppes and colleagues' theory depicting the influence of context (emotional intensity) on ER choice and, more precisely, on the use of typical disengagement strategies in high-intensity and engagement strategies in low-intensity contexts. However, whether all strategies can be strictly classified between the two categories remains to be clarified. Finally, these results might have clinical implications specifically if they are replicated in clinical samples. Psychosis seems to be associated with a tendency to choose inadequate strategies without taking into consideration the context. If it is the case, future studies should focus on context sensitivity by helping individuals better analyse which strategy is adaptive to which type of context. Moreover, teaching individuals to learn when it is time to change strategy or stop ER might also help to improve ER in psychosis. Finally, our results indicated that depression symptoms (and potentially anxiety) might be an important focus of these interventions in people with psychosis (-proneness).

Future studies should consider other contextual characteristics that have been identified as possibly influencing strategy choice (Aldao, 2013). For instance, goals pursued to regulate emotions should also be considered more deeply in future studies, given their implication in ER choice (Tamir et al., 2020). Indeed, recent studies have shown that goals greatly influence ER choice, such as whether individuals are motivated to increase or decrease emotions (e.g., Millgram et al., 2019), suggesting that deficits in ER can partly be related to difficulties in ER goals (Millgram et al., 2020).

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Author Contributions

CB & CN: Conceptualisation, Methodology, Formal analysis. CB, ER & CN: Writing of the original draft, reviewing and editing.

Competing Interests

None.

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Data Availability Statement

Data, material and scripts for data analyses are available here: https://osf.io/s6kmr/?view_only=a2c5360298ca469fb1de784fd2987dbf

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