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‘It might be time to accept’. Exploring the dynamics between affect regulation strategies, anxiety and timing of regulation

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ABSTRACT

Very few studies have explored variations in the implementation of affect regulation strategies over time and the impact of anxiety, even though understanding these putative dynamics would serve both clinical and research purposes. We hypothesized that (i) emotion regulation strategies vary in their evocability (i.e., probability of being used), depending on the timing of affect regulation in response to negative events, and (ii) these dynamics are modulated by trait anxiety in nonclinical individuals. Generalized additive mixed models highlighted three waves of affect regulation: avoidance and expressing and maintaining negative affects as openers; positive reappraisal as a midregulation strategy; and acceptance as a late strategy, depending on trait anxiety level. Problem solving was a mid-to-late strategy. Our data did not support any of the social sharing models. Interestingly, acceptance was the only strategy with a temporal pattern that clearly differed between high- and low-anxiety individuals. Our results (i) emphasise that time and anxiety are only partially predictive of affect regulation dynamics, and (ii) highlight the challenges that will have to be overcome in future research, if we are to wholly unravel the functioning of these dynamics in daily life events.

1. Introduction

1.1. Affect regulation strategies across the emotional response timeline

Affect regulation refers to a set of processes involved in either the modification or maintenance of affects (i.e., stress responses, emotions and moods; Gross, 2015). To modify or maintain a given affective state, individuals require strategies. A *strategy* is a method used to achieve a goal (Newell & Simon, 1972). In general, the goal that individuals report when regulating their affects is to enhance or maintain positive affect and decrease negative affect (Gross, 2015). To achieve this end, individuals can use a considerable number of qualitatively different affect regulation strategies.

One aspect of affect regulation that has been the subject of several studies is the overall adaptiveness or maladaptiveness of certain affect regulation strategies. Recent research has demonstrated that this partly depends on dispositional (e.g., Pavani, Le Vigouroux, Kop, Congard, & Dauvier, 2017) and contextual (e.g., Christensen, Aldao, Sheridan, & McLaughlin, 2017) factors. Furthermore, the *evocability* (i.e., probability of being implemented; Reuchlin, 1999) of some strategies (e.g., avoidance and rumination) is positively linked to anxiety, while other strategies (e.g., reappraisal and problem solving) are negatively linked to anxiety (Aldao, Nolen-Hoeksema, & Schweizer, 2010).

Another aspect of affect regulation, but one that has received far less attention, is the *dynamics* of strategy evocability. In the present article, we took this to mean the order in which different affect regulation strategies are used over time (i.e., the manner in which certain affect regulation strategies are preferentially used at a particular moment). This issue has been the subject of scant research, despite its possible theoretical and clinical implications. At the *theoretical* level, acquiring knowledge on the dynamics of affect regulation strategy use could improve our general understanding of how people regulate their affect. This intriguing observation could be partly explained by timing, insofar as different strategies may be used at different points in the regulation episode. At the *clinical* level, some sequences of affect regulation strategy use may be generally more adaptive than others. For instance, ruminating intensely and/or for a long time before implementing problem solving may be maladaptive, in view of the deleterious impact of rumination on problem-solving skills (Lyubomirsky, Tucker, Caldwell, & Berg, 1999). By contrast, reappraising an unpleasant event as a challenge rather than a threat may facilitate the subsequent use of problem solving to deal with that event (Williams, Cumming, & Balanos, 2010), giving rise to a more adaptive overall sequence.

The most influential theory regarding the dynamics of affect regulation is the process model of emotion regulation (Gross, 1998), which was recently updated (Gross, 2015). According to this model, four

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processes are involved in affect generation. These are closely related to specific affect regulation strategies and appear in a fixed order. For instance, the use of affect regulation strategies to select or modify situations (e.g., problem solving) may precede the use of strategies to redirect attention (e.g., avoidance, rumination). The latter may in turn precede the use of strategies for reassessing the perceived stimuli (e.g., reappraisal, acceptance). These may be followed by strategies intended to modify the experiential, physiological and/or behavioural changes that are elicited (e.g., social sharing).

Based on an examination of neural activity during a laboratory task, Goldin, Manber, Hakimi, Canli, and Gross (2009) concluded that reappraisal is implemented earlier than suppression. Other studies have found that distraction is implemented before reappraisal (e.g., Paul, Simon, Kniesche, Kathmann, & Endrass, 2013). These studies all had limitations. First, they generally featured brief laboratory tasks, thus making it impossible to observe the full sequence of affect regulation strategy implementation during an affective episode. Second, these laboratory tasks induced the implementation of affect regulation strategies. Consequently, the studies tell us little about the spontaneous implementation of affect regulation strategies in daily life. In this respect, Kalokerinos, Réisibois, Verduyn, and Kuppens (2017) provided new information by investigating variations in the evocability of strategies over time in an ecological context. These authors showed that suppression and rumination occur at an early stage of regulation, whereas reappraisal and distraction are mostly implemented at a later stage. However, their three-level time variable and their measurement of strategy use on a 7-point Likert-like scale were not sufficiently fine-grained to identify the precise affective regulation trajectory step by step.

1.2. Trait anxiety and the implementation of affect regulation strategies over time

Not only is there a paucity of research on the dynamics of affect regulation strategy use, but no study has yet investigated potential interindividual differences in these dynamics, even though these processes can differ considerably from one individual to another. Trait anxiety may account for a proportion of the potential interindividual differences in the dynamics of affect regulation strategy use. For example, compared with their less anxious counterparts, anxious individuals tend to engage more in specific strategies such as avoiding situations or ruminating on negative thoughts (Aldao et al., 2010). Hence, anxiety makes it harder to use strategies such as problem solving (Aldao et al., 2010), and negative affects take longer to regulate (Congard, Dauvier, Antoine, & Gilles, 2011; Pavani et al., 2017).

Little attention has been paid to the relationship between trait anxiety and the timing of affect regulation in the literature. Only studies of the attentional biases associated with trait anxiety seem to have yielded relevant findings, providing indirect information on avoidance and rumination. More specifically, anxious individuals appear to implement avoidance more readily than their less anxious counterparts (e.g., Vassilopoulos, 2005). Moreover, anxious individuals have greater difficulty disengaging themselves from negative stimuli (Fox, Russo, Bowles, & Dutton, 2001). This may lead them to ruminate, precluding the use of problem solving (Lyubomirsky et al., 1999). However, these studies have not provided any information about the order in which different strategies are used by participants, and their method involved instructing participants to engage in specific behaviours. The spontaneous dynamics of affect regulation strategy use were therefore not addressed.

1.3. The present study

Considerable advances have been made in understanding how the implementation of one affect regulation strategy rather than another impacts individuals' affective experience, as well as their mental health

(Aldao et al., 2010). However, fewer studies have examined another aspect of variability in affect regulation, as noted by Kalokerinos et al. (2017). This aspect concerns variations in the evocability of different strategies in the course of a regulation episode (i.e., an episode during which individuals attempt to regulate their affects after experiencing a particular event). Therefore, our study had two innovative objectives: (i) investigate the dynamics of affect regulation strategy use when facing everyday negative events, and (ii) understand how individual characteristics moderate the use of regulation strategies over time.

To this end, we focused on six strategies: *acceptance* (nonjudging and tolerating the situation and its outcomes); *avoidance* (withdrawing from the problem or trying to stop thinking about it); *expressing and maintaining negative affects* (expressing negative affect and ruminating); *positive reappraisal* (evaluating a situation that was initially perceived of as negative in a more favourable fashion); *problem solving* (changing the situation by planning or undertaking concrete actions); and *social sharing* (seeking the support of others in order to verbalise, share or seek advice, information, or direct help). We chose to focus on these six strategies because they are frequently used in affect regulation research and are known to impact individuals' affective lives.

Our hypotheses were based on the theoretical arguments advanced in the process model of emotion regulation (Gross, 1998), as well as the empirical findings reported by Kalokerinos et al. (2017). On this basis, we hypothesized that the evocability of expressing and maintaining negative affects is higher at the outset and decreases over time, the evocability of positive reappraisal and avoidance (analogous to distraction in the study by Kalokerinos et al., 2017) increases over time, problem solving peaks early on, while social sharing peaks in the latest stages of regulation, and acceptance may peak like positive reappraisal, as they are both focused on the appraisal of an event. Moreover, we hypothesized that trait anxiety is associated not only with the mean level of strategy evocability (Aldao et al., 2010), but also with the timing of strategy use (Fox et al., 2001; Vassilopoulos, 2005).

2. Materials and methods

2.1. Participants

We originally recruited 115 participants, but 18 of them were excluded from the study because they answered on fewer than 15 of the 20 days of the experiment. All participants were unpaid volunteers, and were free to stop the experiment at any time if it became too difficult for them. We therefore analysed the data of 97 participants (32 men and 65 women; 62% college students). Participants were sent an email inviting them to take part in an experiment on the regulation of emotions in everyday life. These nonselected participants, recruited from the authors' workplace, were aged 18–56 years ($M = 26$, $SD = 8.8$).

2.2. Procedure

The procedure was divided into two steps. During the first step, participants were first asked to fill in two questionnaires: a questionnaire collecting sociodemographic information (age, sex, occupation, marital status, whether or not they had children), and the State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). Next, they were each given a glossary containing information about the six above-mentioned affect regulation strategies, accompanied by explanations and clarifications, as well as illustrative examples.

The second step consisted in filling in a logbook (on LimeSurvey) once a day for 20 days. Participants were free to report whichever positive or negative events they liked, whether they were work-related or concerned their private life. They could not report more than one event each day. Each daily recording included two steps: (i) indication of the first strategy used to regulate their affects in reaction to the event, and (ii) indication of whether a second strategy was subsequently

Table 1
Descriptive statistics of evocability (number of uses) for each strategy at each moment.

	Acceptance	Avoidance	Expressing and maintaining negative affects	Positive reappraisal	Problem solving	Social sharing
Moment 0	0.04 (51)	0.20 (252)	0.31 (378)	0.19 (232)	0.14 (174)	0.12 (149)
1	0.06 (44)	0.14 (112)	0.20 (156)	0.29 (229)	0.16 (128)	0.14 (110)
2	0.16 (82)	0.09 (47)	0.07 (35)	0.27 (141)	0.27 (140)	0.16 (82)
3	0.30 (92)	0.03 (10)	0.04 (11)	0.15 (47)	0.28 (86)	0.20 (62)
4	0.29 (33)	0.01 (1)	0.03 (3)	0.12 (13)	0.32 (36)	0.23 (26)
5	0.43 (13)	0.03 (1)	0.00 (0)	0.13 (4)	0.27 (8)	0.13 (4)
6	0.56 (5)	0.00 (0)	0.00 (0)	0.22 (2)	0.22 (2)	0.00 (0)
7	0.00 (0)	0.33 (1)	0.00 (0)	0.00 (0)	0.33 (1)	0.33 (1)
8	1.00 (1)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)

implemented. If this was not the case, the data recording stopped for that day. If it was the case, the participant reiterated step (i), stating which additional strategy was used, and then step (ii).

In this study, each episode was divided into *moments*, according to the sequence of regulation strategies that were used (e.g., in an avoidance + social sharing sequence, avoidance would be Moment 0 and social sharing Moment 1). Further analyses were restricted to negative events only.

2.3. Statistical analysis

The evocability of each of the six strategies was estimated as the probability of using a strategy as a function of moment and participant's anxiety level. In the model, the response variable was binary (strategy used or not used), while the explanatory variables were continuous, and the data were hierarchically organized, with observation nested within participants. We fitted six sets of *generalized additive mixed models* (GAMMs) to the data, one for each strategy. GAMMs are a combination of generalized linear models (GLMs), mixed models (MM), and additive models (AMs). *GLMs*, a generalization of multiple regressions, allow for different response distributions (the binomial distribution is suitable for a binary response variable). *Mixed, or multilevel models*, which contain a random effect, allow the hierarchical organization of the data to be taken into account. The random effect represents between-participants variability; in the form of the distribution of individual parameters included in the model. Mixed models are thus recommended for longitudinal designs. *Additive models*, a generalization of linear models, allow nonlinear relationships between the predictors and the response variable to be studied. Moreover, they can automatically reveal nonlinear interactions between continuous predictors with an inferential approach. Their operating principle is close to that of a backward stepwise multiple regression, where the predictors are nonlinear transformations of the initial predictors and their interaction surface. At the end of the model simplification process, only the significant and potentially nonlinear contributions of the predictors are left (Wood, 2006). A GAMM is therefore an extension of the generalized additive model (GAM), in which the additive predictors contain random effects in addition to the usual fixed ones. They also inherit from GAMs the

Table 2
Correlation table for each strategy (all moments combined) and the STAI score.

	Acceptance	Avoidance	Expressing and maintaining negative affects	Positive reappraisal	Problem solving	Social sharing
STAI	0.095	0.186*	0.265**	-0.151	-0.076	0.151
Acceptance		0.647***	0.609***	0.106	0.606***	0.526***
Avoidance			0.694***	-0.177	0.528***	0.601***
Expressing and maintaining negative affects				-0.187	0.422***	0.608***
Positive reappraisal					0.331***	-0.049
Problem solving						0.445***

Note.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

idea of extending additive mixed models to non-normal data. The GAMM is then a flexible statistical framework that allows nonlinear surfaces to be fitted and account for repeated-measures situations (for an example, see McKeown & Sneddon, 2014) which is suitable in our longitudinal approach because the evocabilities are supposed to evolve nonlinearly over time and to interact with individual characteristics. We used the *gamm4* package (Wood & Scheipl, 2017) in R version 3.3.1 (R Core Team, 2014). The response variables were the use or not of each strategy coded 0 (absence) or 1 (presence) and the predictors were the moment and individual trait anxiety. We included participants as a random effect (random intercept) and a nonlinear smoothing function for each predictor. Curves are nonlinear if the estimated degree of freedom (*edf*) is above 1, and highly nonlinear if the *edf* is above 8. *gamm4* also provides an estimated R^2 . Here, to avoid overfitting, we allowed only a limited amount of nonlinearity by setting the maximum degree of freedom to $k = 9$.

For each strategy, we compared four computed GAMMs, including different combinations of explanatory variables with smoothers (i.e., moment and anxiety with or without interaction, moment only, null random-effects model). We then sorted the models, starting from the lowest Akaike information criterion corrected (AICc), and used a minimum reduction threshold of two AICc units for each added parameter to select the most parsimonious model.

3. Results

In our sample, the mean STAI score was 45.02 ($SD = 9.33$). There was no significant sex difference in trait anxiety level, $F(1, 95) = 0.125$, $p = 0.725$. In total, there were 3005 strategy use reports (Table 1). Participants required an average of 2.22 ($SD = 0.95$) successive strategies to cope with a negative daily event. Participants used positive reappraisal 647 times, problem solving 586 times, expressing and maintaining negative affects 579 times, social sharing 447 times, avoidance 425 times, and acceptance 321 times. There were no missing data. Only expressing and maintaining negative affects was positively correlated with the STAI score ($r = 0.27$, $p < 0.01$; Table 2).

Table 3
Model selection for each strategy based on the Akaike information criterion corrected (AICc).

Strategy	Model	ΔAICc	Df
Acceptance	Moment * Anxiety	0.0	8
	Moment	18.4	4
	Moment + Anxiety	22.3	6
	Null	255.3	2
Avoidance	Moment * Anxiety	0.0	8
	Moment	4.5	4
	Moment + Anxiety	5.7	6
	Null	128.9	2
Expressing and maintaining negative affects	Moment * Anxiety	0.0	8
	Moment + Anxiety	4.3	6
	Moment	5.8	4
	Null	378.5	2
Positive reappraisal	Moment + Anxiety	0.0	6
	Moment	3.3	4
	Moment * Anxiety	3.5	8
	Null	40.5	2
Problem solving	Moment + Anxiety	0.0	6
	Moment * Anxiety	0.6	8
	Moment	1.5	4
	Null	63.6	2
Social sharing	Moment * Anxiety	0.0	8
	Moment	1.8	4
	Moment + Anxiety	3.6	6
	Null	8.2	2

Note. The selected model is shown in bold. ΔAICc: difference in AICc compared with the model with the lowest AICc; Df: degrees of freedom.

3.1. Model selection

In accordance with the ΔAICc ≥ 2 rule, the Moment * Anxiety model was selected for acceptance (Table 3). The moment model was selected for avoidance, expressing and maintaining negative affects, positive reappraisal, and problem solving. The null model was selected for social sharing.

3.2. GAMM results per strategy

For acceptance, the interaction between moment and anxiety was significant (χ² = 145.8, df = 5.667, p < 0.001, R² = 0.101; Table 4). Acceptance was seldom used as an early strategy, and little used at any time by the least anxious individuals (Fig. 1a). However, its evocability increased among individuals with medium, and more particularly high, anxiety, who used it extensively as a final strategy.

For avoidance, the moment smooth was significant, indicating that the curve coefficient differed significantly from 0 (χ² = 101.7, df = 1, p < 0.001, R² = 0.031; Table 4). Edf was 1, thus indicating a monotonic but nonlinear curve, as it corresponded to the logit function used in binomial models. The evocability of avoidance decreased significantly over time (Fig. 1b).

For expressing and maintaining negative affects, the moment

Table 4
GAMM results per strategy.

Strategy	R²	Variable	Significance	Edf	Partial residual values > 0
Acceptance	0.101	t2 (moment, anxiety)	***	5.667	No value due to significant interaction
Avoidance	0.031	s(moment)	***	1	< 2
Expressing and maintaining negative affects	0.072	s(moment)	***	1	< 2
Positive reappraisal	0.019	s(moment)	***	4.039	[2;3]
Problem solving	0.017	s(moment)	***	2.551	[3;7]
Social sharing	0.003	s(moment)	**	1	> 2

Note. R²: amount of variance explained; t2: tensor product smooth (interaction model); s: smooth based on thin plate regression splines; Edf: estimated degrees of freedom.

*** p < 0.001.
** p < 0.01.

smooth was significant (χ² = 251.7, df = 1, p < 0.001, R² = 0.072). The evocability of this strategy underwent a monotonic decrease over time (Table 4; Fig. 1c).

For positive reappraisal, the moment smooth was significant (χ² = 50.05, df = 4.039, p < 0.001, R² = 0.019; Table 4). Edf was 4.039, indicating a nonlinear curve, using 4.039 different functions to fit the data better. Thus, positive reappraisal was characterised by a spike around Moments 1–2 of the full-length regulation episode (Fig. 1d). Conversely, evocability decreased from Moment 3 onwards.

For problem solving, the moment smooth was significant (χ² = 74.09, df = 2.551, p < 0.001, R² = 0.017; Table 4). Edf was 2.551, indicating a nonlinear curve. Evocability increased, particularly between Moments 2 and 6, and peaked at around Moment 4 (Fig. 1e).

For social sharing, the moment smooth was significant (χ² = 10.73, df = 1, p < 0.01). Edf was 1, indicating a linear curve (Fig. 1f). However, the most relevant model explained only 0.003 of the variance (Table 4). Hence, our data did not support any of the social sharing models.

4. Discussion

To our knowledge, the present study is one of the first to have investigated the varying evocability of affect regulation strategies over time. GAMMs proved to be useful, as evocability followed a nonlinear trend for three strategies. The study's originality lay in the exploration not only of *if*, but also *when* a given regulation strategy is likely to be used to cope with a negative daily event.

4.1. Towards three-wave affect regulation dynamics

Our main results indicated that the evocability of acceptance, avoidance, expressing and maintaining negative affects, positive reappraisal, and problem solving fluctuates during the regulation of a negative event. Social sharing was not concerned by these temporal variations. Avoidance and expressing and maintaining negative affects were characterised by decreasing evocability over time, meaning that they were primarily implemented at the start of episode. By contrast, evocability increased over time for acceptance and problem solving, which probably served as mid-to-late regulation strategies. Positive reappraisal was characterised by a single spike in the middle of the regulation.

Avoidance and expressing and maintaining negative affects both served as early regulation strategies. These two strategies are particularly efficient in modifying the intensity of negative affects (Thayer, Newman, & McClain, 1994). When the intensity of a negative event is too high, individuals often prefer avoidance rather than reappraisal (Birk & Bonanno, 2016). Thus, avoidance and expressing and maintaining negative affects may both be available at the beginning of a negative event, as individuals prioritize the regulation of affect intensity, rather than valence. Nonetheless, these two strategies have different effects. Avoidance may thus be better for *diminishing* the

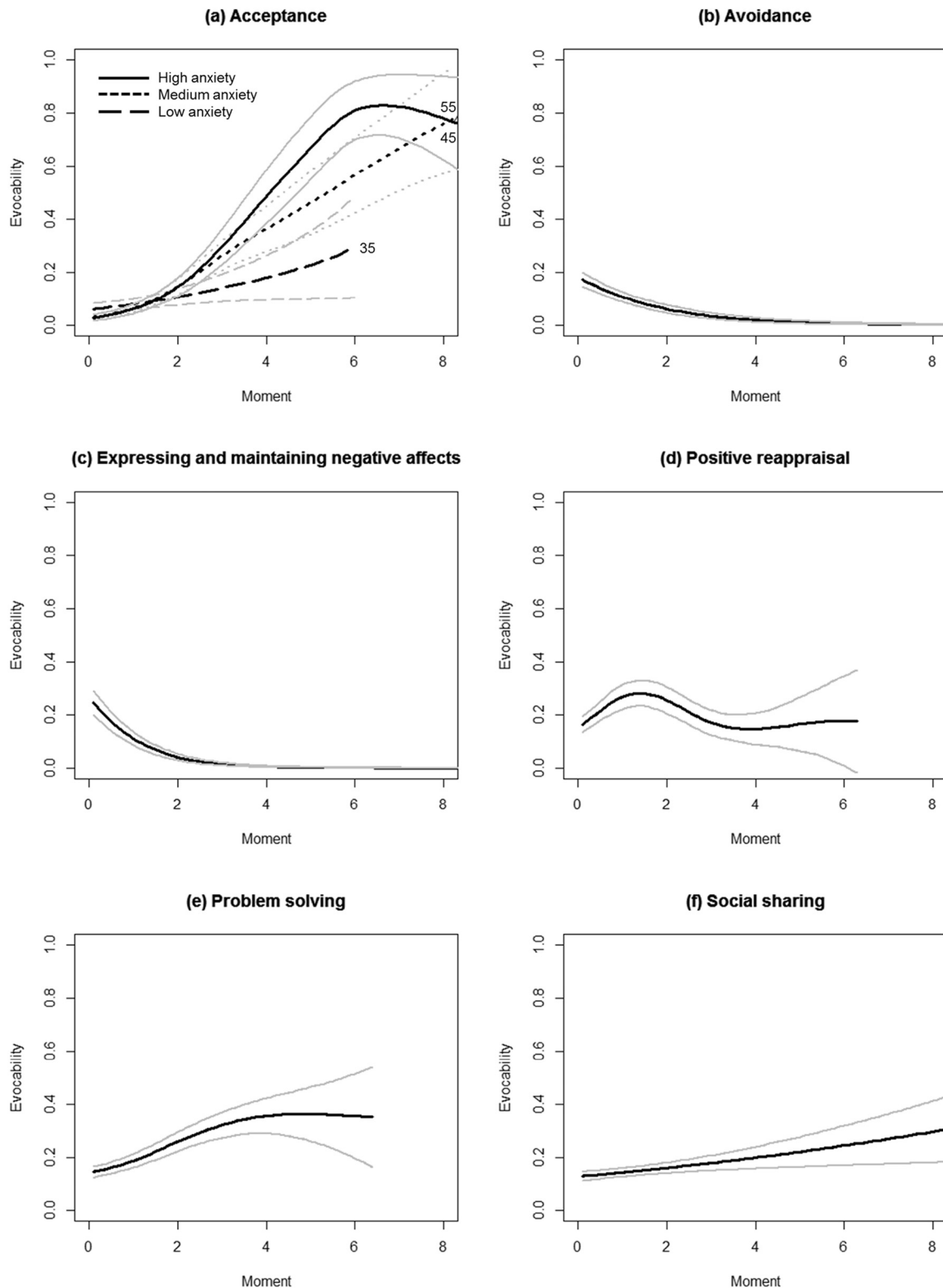


Fig. 1. Evocability predicted by the GAMM according to anxiety level (based on our sample, mean = 45; standard deviation = 10; low anxiety = 35; medium anxiety = 45; high anxiety = 55) and moment of regulation for (a) acceptance, (b) avoidance, (c) expressing and maintaining negative affects, (d) positive reappraisal, (e) problem solving, and (f) social sharing. Black lines represent mean predictions and grey lines indicate the standard error (1.96).

intensity of a negative affect, whereas expressing and maintaining negative affects may be useful for *enhancing* its intensity (Kalokerinos et al., 2017).

Positive reappraisal proved to be a mid-regulation strategy. In Gross (2015), this strategy, along with acceptance, is based on the specific

process of identifying the valence of a situation. It was used less for both early and late regulation, probably because it cannot be implemented if the situation is too emotionally intense (McRae, 2016; Opitz, Cavanagh, & Urry, 2015). This supports the idea that individuals try to cope with the intensity of an affect first, then turn their attention to its valence.

Although acceptance focuses on the perceived valence of a situation, it is mainly used in late regulation, and rarely - if ever - in early or mid regulation. The late high evocability of acceptance may be due to the need to stop seeking a way to control the situation (Troy, Shallcross, Brunner, Friedman, & Jones, 2018; Wolgast, Lundh, & Viborg, 2011). Because of the difficulty of accepting “not to try to control the situation”, this strategy is only used in late moments, after the individual has tried other options. Positive reappraisal may therefore be useful for changing any negative affect into a positive affect, while acceptance may be preferred by anxious individuals to stop the flow of negative affect.

Problem solving is a strategy that focuses on modifying the situation. Nonetheless, we observed it to be a mid-to-late regulation strategy. The low evocability of this strategy in early regulation may be due to the need to gain control over some of the situation's parameters (Smith & Kirby, 2009) and to analyse one's personal goals (Baker & Berenbaum, 2007). We hypothesized that when individuals encounter a negative daily life event, they first regulate the intensity of the affect. They then regulate its valence, and finally try to solve it.

According to our model selection procedure, only one strategy was linked to trait anxiety. High trait anxiety increased the evocability of acceptance for late regulation. This result may be the consequence of the strategy itself. In the short term, acceptance enables individuals to better deal with invasive emotions, compared with positive reappraisal (Wolgast et al., 2011). In the long term, acceptance may lead to a reduction in the anxiety of anticipation (Braams, Blechert, Boden, & Gross, 2012). Therefore, the use of acceptance allows individuals to cope with very negative events, while diminishing their anxiety about future negative events. Nonetheless, the measure of acceptance in our study focused on the situation (which may be closest to a form of resignation), and not on the experiential acceptance of the emotion. This may explain why only participants with medium or high anxiety used acceptance in late regulation. Trait anxiety did not significantly moderate affect regulation dynamics, which suggests that anxious individuals can access all the strategies just as easily as nonanxious individuals can.

4.2. Limitations and future perspectives

First, we must remain cautious regarding the apparent pattern of three-wave affect regulation dynamics, as moment had a relatively limited predictive power when it came to explaining the variability of evocability. Consequently, our findings underscore the importance of the psychologist's work in guiding patients towards alternative functioning rather than letting time take its course. Other components besides time are thus likely to influence the choice of a given strategy.

Second, participants were asked to choose strategies associated with a single one-day event, whereas events are probably sequenced, meaning that one negative event may generate another. Moreover, participants were free to recall any event. Some may have recalled very intense negative events, while others may have preferred to recall less intense ones. Further research is needed to focus on more specific kinds of events.

Third, our results were mostly exploratory. We cannot exclude the possibility that (i) the ecological context of our study and (ii) the nonclinical nature of our population, limited the statistical significance of the effects of trait anxiety on affect regulation dynamics, as evidenced by Aldao et al. (2010). More research is needed to explore the dynamics of affect regulation strategies in clinical populations.

These results suggest that the order of processes in the process model (Gross, 1998) needs to be enhanced when it comes to the sequencing of strategies. This model was not intended to explain strategy order, but rather to understand how each strategy can be efficient for individuals. A new framework or model is needed to understand why individuals use a given sequence of strategies.

4.3. Conclusion

The goal of our exploratory study was to investigate whether the evocability of six strategies varied across affect regulation episodes and to isolate the influence of anxiety. We found that anxiety influences the timing of acceptance strategy use. However, we must emphasise that we investigated the dynamics of each individual strategy, rather than seeking to identify which of the six strategies was used the most for early/mid/late regulation. Further research is needed to identify the determinants of these dynamics and to find out exactly how successive strategies influence one another. Here, the GAMMs offered a glimpse into affect regulation dynamics in an ecological context, indicating an adversarial relationship between *acceptance* and *avoidance/expressing and maintaining negative affects*, with *positive reappraisal* and *problem solving* coming somewhere in between.

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References

- Aldao, A., Nolen-Hoeksema, S., & Schweizer, S. (2010). Emotion-regulation strategies across psychopathology: A meta-analytic review. *Clin. Psychol. Rev.* 30(2), 217–237. <https://doi.org/10.1016/j.cpr.2009.11.004>.
- Baker, J. P., & Berenbaum, H. (2007). Emotional approach and problem-focused coping: A comparison of potentially adaptive strategies. *Cognit. Emot.* 21(1), 95–118.
- Birk, J. L., & Bonanno, G. A. (2016). When to Throw The Switch: The adaptiveness of modifying emotion regulation strategies based on affective and physiological feedback. *Emotion*, 16(5), 657–670.
- Braams, B. R., Blechert, J., Boden, M. T., & Gross, J. J. (2012). The effects of acceptance and suppression on anticipation and receipt of painful stimulation. *J. Behav. Ther. Exp. Psychiatry*, 43(4), 1014–1018.
- Christensen, K. A., Aldao, A., Sheridan, M. A., & McLaughlin, K. A. (2017). Habitual reappraisal in context: Peer victimisation moderates its association with physiological reactivity to social stress. *Cognit. Emot.* 31(2), 384–394.
- Congard, A., Dauvier, B., Antoine, P., & Gilles, P. Y. (2011). Integrating personality, daily life events and emotion: Role of anxiety and positive affect in emotion regulation dynamics. *J. Res. Pers.* 45(4), 372–384.
- Fox, E., Russo, R., Bowles, R., & Dutton, K. (2001). Do threatening stimuli draw or hold visual attention in subclinical anxiety? *J. Exp. Psychol. Gen.* 130(4), 681–700.
- Goldin, P. R., Manber, T., Hakimi, S., Canli, T., & Gross, J. J. (2009). Neural bases of social anxiety disorder: Emotional reactivity and cognitive regulation during social and physical threat. *Arch. Gen. Psychiatry*, 66(2), 170–180.
- Gross, J. J. (1998). The emerging field of emotion regulation: An integrative review. *Rev. Gen. Psychol.* 2(3), 271–299.
- Gross, J. J. (2015). The extended process model of emotion regulation: Elaborations, applications, and future directions. *Psychol. Inq.* 26(1), 130–137. <https://doi.org/10.1080/1047840X.2015.989751>.
- Kalokerinos, E. K., Résibois, M., Verduyn, P., & Kuppens, P. (2017). The temporal deployment of emotion regulation strategies during negative emotional episodes. *Emotion*, 17(3), 350–358.
- Lyubomirsky, S., Tucker, K. L., Caldwell, N. D., & Berg, K. (1999). Why ruminators are poor problem solvers: Clues from the phenomenology of dysphoric rumination. *J. Pers. Soc. Psychol.* 77(5), 1041–1060.
- McKeown, G. J., & Sneddon, I. (2014). Modeling Continuous Self-Report Measures of Perceived Emotion Using Generalized Additive Mixed Models. *Psychological Methods*, 19(1), 155–174.
- McRae, K. (2016). Cognitive emotion regulation: A review of theory and scientific findings. *Curr. Opin. Behav. Sci.* 10, 119–124.
- Newell, A., & Simon, H. A. (1972). *Human problem solving*. Englewood Cliffs, NJ: Prentice-Hall.
- Opitz, P. C., Cavanagh, S. R., & Urry, H. L. (2015). Uninstructed emotion regulation choice in four studies of cognitive reappraisal. *Personal Individ. Differ.* 86, 455–464.
- Paul, S., Simon, D., Kniesche, R., Kathmann, N., & Endrass, T. (2013). Timing effects of antecedent- and response-focused emotion regulation strategies. *Biol. Psychol.* 94(1), 136–142.
- Pavani, J. B., Le Vigouroux, S., Kop, J. L., Congard, A., & Dauvier, B. (2017). A network approach to affect regulation dynamics and personality trait-induced variations: Extraversion and neuroticism moderate reciprocal influences between affect and

- affect regulation strategies. *Eur. J. Personal.* 31(4), 329–346.
- R Core Team (2014). *R: A language and environment for statistical computing*. Vienna, Austria: R Foundation for Statistical Computing. <http://www.R-project.org/>.
- Reuchlin, M. (1999). Les processus vicariants [Substitutable processes]. In M. Reuchlin (Ed.), *Evolution de la psychologie différentielle [Evolution of differential psychology]*. Paris: Presses Universitaires de France.
- Smith, C. A., & Kirby, L. D. (2009). Relational antecedents of appraised problem-focused coping potential and its associated emotions. *Cognit. Emot.* 23(3), 481–503.
- Spielberger, C. D., Gorsuch, R. L., Lushene, R. E., Vagg, P. R., & Jacobs, G. A. (1983). *Manual for the State-Trait Anxiety Inventory STAI (form Y)*. Palo Alto, CA: Consulting Psychologists Press.
- Thayer, R. E., Newman, J. R., & McClain, T. M. (1994). Self-regulation of mood: Strategies for changing a bad mood, raising energy, and reducing tension. *J. Pers. Soc. Psychol.* 67(5), 910–925.
- Troy, A. S., Shallcross, A. J., Brunner, A., Friedman, R., & Jones, M. C. (2018). Cognitive reappraisal and acceptance: Effects on emotion, physiology, and perceived cognitive costs. *Emotion*, 18(1), 58.
- Vassilopoulos, S. P. (2005). Social anxiety and the vigilance-avoidance pattern of attentional processing. *Behav. Cogn. Psychother.* 33(1), 13–24.
- Williams, S. E., Cumming, J., & Balanos, G. M. (2010). The use of imagery to manipulate challenge and threat appraisal states in athletes. *Journal of Sport & Exercise Psychology*, 32(3), 339–358.
- Wolgast, M., Lundh, L. G., & Viborg, G. (2011). Cognitive reappraisal and acceptance: An experimental comparison of two emotion regulation strategies. *Behav. Res. Ther.* 49(12), 858–866.
- Wood, S. N. (2006). *Generalized additive models: An introduction with R*. Chapman & Hall/CRC.
- Wood, S. N., & Scheipl, F. (2017). *gamm4: Generalized additive mixed models using 'mgcv' and 'lme4'*. R package version 0.2–5. <https://CRAN.R-project.org/package=gamm4>.