

Anne Congard 
1 · A,B,C,D,E,F

Arnaud Sapin 
1 · C,D,E

Amelie Bret 
1 · A,B,E

Ghozlane Fleury 
1 · A,B,F

Abdel-Halim Boudoukha 
1 · A,B,F

Oscar Navarro 
2 · A

Sandie Meillerais 
1 · E

Ambre Khocha
1 · E,F

Jean-Michel Galharret 
3 · C,D,E

Individual differences in polynomial trajectories of affect and emotion regulation over time: Ending lockdown is not easy

BACKGROUND

Five years after the COVID-19 pandemic, the scarcity of studies conducted immediately after the lockdowns underscores the ongoing relevance of retrospective analysis – especially regarding the lesser-known emotional experience of emerging from lockdown, compared to the widely documented harmful effects of confinement itself.

PARTICIPANTS AND PROCEDURE

We investigated the impact of the lockdown on individual differences in emotional states and regulation strategies, measured weekly over 12 consecutive weeks in a sample of 187 individuals. Results, with identification of inflection points, also show that emotional regulation strategies were used more often at the beginning of lockdown and that some contributed to more negative experiences, whereas positive reappraisal, savoring, and problem-focused strategies seemed to protect against them.

RESULTS

Data also revealed a polynomial trajectory, often quartic, of affect and emotion regulation, highlighting distinct phases:

shock during the first 2 weeks, characterized by strong negative affect and extensive strategy use; acceptance and adaptation during the last 6 weeks, characterized by stable affect and lower strategy use; and turbulent affect in the week following the announcement of the end of lockdown, followed by a clear improvement in perceptions and less strategy use, with four trajectory profiles reflecting individual differences during the period of uncertainty.

CONCLUSIONS

This study may help reveal whether the patterns observed during lockdown and deconfinement are unique to these periods or reflect broader dynamics in emotional adaptation and regulation.

KEY WORDS

end of lockdown; affect; emotion regulation; COVID-19; longitudinal; latent growth models; identification of stationary and inflexion points

ORGANIZATION – 1: Nantes Université, Université d'Angers, Laboratoire de Psychologie des Pays de la Loire, Nantes, France · 2: Nîmes Université, Laboratoire CHROME, Nîmes, France · 3: Nantes Université, CNRS, Laboratoire de Mathématiques Jean Leray, Nantes, France

AUTHORS' CONTRIBUTIONS – A: Study design · B: Data collection · C: Statistical analysis · D: Data interpretation · E: Manuscript preparation · F: Literature search · G: Funds collection

CORRESPONDING AUTHOR – Prof. Anne Congard, Nantes Université, Laboratoire de Psychologie des Pays de la Loire (LPPL – UR 4638), Chemin de la Censive du Tertre, BP 81227, 44312 Nantes Cedex 3, France, e-mail: anne.congard@univ-nantes.fr

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BACKGROUND

Five years after the COVID-19 pandemic, it is particularly relevant to reflect on that period and analyze its consequences. Few studies were conducted immediately after the end of lockdowns, leaving significant room for retrospective analysis. More broadly, adopting a dynamic perspective opens up interesting avenues for future research on the evolution of the pandemic and its long-term impacts. Lockdown is a policy designed to restrict human contacts and movements, implemented by governments to help contain and control the spread of infectious diseases. The negative psychological impacts of the multiple confinements carried out in many countries have now been widely studied (Brooks et al., 2020; Congard et al., 2022; Fernandez-Abascal & Martín-Díaz, 2021; Kim et al., 2020; Kluwe-Schiavon et al., 2022; Prati & Mancini, 2021; Wang et al., 2020; Wu et al., 2021). In contrast, the post-lockdown period has garnered considerably less interest from researchers (Rousset et al., 2022), although the multiple changes (changing health situation, affect, and emotion regulation strategies) that individuals must cope with during this period of regaining freedom may suggest that it is a period highly worthy of study (Martín-Brufau et al., 2020). In this study, we investigate the emotional life and the use of emotional regulation strategies (ERS) from the beginning of the lockdown to the return to life without lockdown. The investigation of affective fluctuations over time and the differentiated use of regulation strategies across the different phases of the lockdown is a central objective of this work. The dynamic approach to this phenomenon is now crucial for understanding the psychological impact of events, both in the short and long term, as evidenced by the effects observed today, a few years later.

TOWARD A LONGITUDINAL APPROACH TO AFFECT DURING AND AFTER LOCKDOWN

Some longitudinal studies are particularly informative in this domain, as they allow assessment of the evolution of conative variables as lockdown progresses (e.g., Martín-Brufau et al., 2020; Mengin et al., 2022; Mukherjee et al., 2020). Taken together, these results highlight two distinct phases in the lockdown process. During the initial phase, people appear to experience fear and helplessness, followed by a second phase characterized by feelings of acceptance and adaptation. For instance, Mukherjee et al. (2020) observed irritation at the start of lockdown, which gradually subsided as people seemingly adapted to the situation. Similarly, Mengin et al. (2022) found that anxiety followed a comparable trajectory. An inverse pattern was observed for well-being. Gubler et al. (2021) demonstrated that although well-being initial-

ly deteriorated, it did not worsen beyond the first six weeks, except among individuals with pre-existing psychological disorders. For affect, Martín-Brufau et al. (2020) observed a decrease in activated negative affect (ANA; e.g., anger, anxiety) during lockdown and an increase in deactivated negative affect (DNA; e.g., moroseness, sadness). Relatively few studies have assessed the evolution of emotional states after the end of lockdown. Some data indicate that participants were less depressed, anxious, and stressed one month after lockdown than during lockdown (Kluwe-Schiavon et al., 2022). According to Rousset et al. (2022), levels of positive emotions were higher one year after the end of the first lockdown compared to during lockdown, although the ratios of negative emotions remained high.

EMOTION REGULATION STRATEGIES AND COVID-19

Emotion regulation refers to all the processes involved in shaping affective experiences, as well as all the ways in which these emotions are experienced and expressed (Gross, 1998), in order to improve them (Gross, 2015; Mariani et al., 2020; Russell, 2003). We can assume that the use of ERS led to less anxiety about COVID-19 in the early days of the pandemic (Jungmann & Witthoft, 2020). Research has shown that affective experiences were weakened during the pandemic (Congard et al., 2022), and that some of these strategies contributed to better regulation. Understanding the dynamics of affect in relation to these ERS is crucial to understand how emotion dysregulation occurs (Wichers et al., 2015), as well as better affective experiences. Problem-focused, positive reappraisal, experiential acceptance, and savoring strategies all allowed for better regulation of negative affect. Positive emotion-focused strategies, such as humor and distraction, had even more beneficial effects on distress than active problem-solving strategies (Hamidein et al., 2020; Park et al., 2021). Moreover, positive reappraisal and acceptance were found to be the most effective strategies for alleviating anxiety at the start of the COVID-19 pandemic (Xu et al., 2020). In addition, emotional wellbeing during lockdown was positively predicted by the acceptance strategy (Pellerin & Raufaste, 2020), and cognitive reappraisal was associated with fewer depressive symptoms, less negative affect, and greater life satisfaction (Wu et al., 2021). Research also highlighted the importance of problem-focused strategies and distraction, rather than rumination and suppression of emotions (Hamidein et al., 2020), that emotion suppression predicted higher stress levels (Kluwe-Schiavon et al., 2022), and that symptoms of stress in the early days of the pandemic were predicted by higher use of suppression and lower use of cognitive reappraisal (Jiang et al., 2020).

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Used and learned during lockdown, the strategy of savoring the small pleasures of life was also effective in helping people to manage their negative emotions better or counter them with positive affect (Congard et al., 2022).

Regarding the impact of these ERS, strategies such as negative emotion expression and avoidance were predictors of anxiety and depressive symptoms (Mariani et al., 2020; Xu et al., 2020). Li et al. (2022) led an extensive cross-sectional study in China, showing that emotional coping and expression of panic about COVID-19 on social media were the strongest predictors of psychological distress. Le Vigouroux et al. (2021) also highlighted the negative effects of behavioral disengagement and self-blame on anxiety and depressive symptoms in college students during the COVID-19 pandemic.

In the present longitudinal study, we explored affect and emotion regulation strategies through weekly assessments conducted from the beginning of France's first lockdown to one month after it ended. Our objective was to understand how they changed over time, in order to confirm or contradict previous research in this field. It seemed essential to study the changes that occurred through the use of emotion regulation strategies, as this is an area that has received relatively little attention from researchers.

PARTICIPANTS AND PROCEDURE

PARTICIPANTS

The longitudinal sample consisted of 185 participants (108 women, 71 men, 6 other) with a mean age of 35 years ($SD = 13.2$). Participants' characteristics are shown in Table 1. Each participant answered 12 weekly questionnaires during the first period of the COVID-19 pandemic, from 20 March to 15 June 2020. The data were cleaned according to several criteria (numerous missing answers, wrong answers to the first two control questions, odd occupational status, etc.). This allowed us to exclude participants who were likely to skew the analyses. Regarding occupational status, the majority of participants in our sample were in employment (68.1%) and had a relatively high education level (64.3% 5 or more years of higher education). The data are available upon request from the authors.

Participants were recruited through social media via email. They did not receive any remuneration. We excluded persons who were under 18 years old and/or not French residents. Questionnaires were presented on Qualtrics and could be completed anonymously on a tablet, smartphone, or computer.

All procedures in this study were carried out in accordance with the ethical standards of the Ethics Committee for Non-Interventional Research (CERNI)

Table 1

Participants' characteristics

	<i>N</i> = 185	%
Gender		
Women	108	58.38
Men	71	38.38
Other/Not specified	6	3.24
Age in years		
18-30	86	46.49
31-40	42	22.70
41-50	30	16.22
51-60	12	6.49
Over 60	10	5.41
Not specified	5	2.70
Occupational status		
Economically active	126	68.11
Unemployed	10	5.41
Retired	8	4.32
Student	26	14.05
Other	10	5.41
Not specified	5	2.70
Education level		
High-school diploma or lower level of education	17	9.19
Undergraduate	44	23.78
Graduate	99	53.51
PhD	20	10.81
Not specified	5	2.70
Housing unit size		
0-20 m ²	6	3.24
20-50 m ²	52	28.11
50-100 m ²	75	40.54
100-150 m ²	32	17.30
Over 150 m ²	15	8.11
Not specified	5	2.70
Living alone		
Yes	52	28.11
No	128	69.19
Not specified	5	2.70

Note. Sociodemographic data were collected at the first timepoint.

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of Nantes University (approval no. 19052021) and with the 1964 Declaration of Helsinki and its subsequent amendments, or comparable ethical standards. Consent was obtained from every participant included in this study.

It seems important to describe the first three months of the COVID-19 pandemic in France, in order to clarify our intentions in carrying out the present study. The initial assessment corresponded to the beginning of the first French lockdown, imposed on 17 March 2020. The rules were quite drastic: travel authorized only with a certificate and for specific purposes (impossibility of working remotely, grocery shopping, health issues, urgent family reasons); all educational institutions shut down; and people only allowed outside their place of residence to take individual exercise or walk pets within a small radius. In addition, a decree stipulated that failure to respect these rules would incur a €135 fine. This first lockdown ended on 11 May 2020, coinciding with the eighth timepoint of data collection. The first seven measures therefore corresponded to the lockdown period, and the following five to the phased lifting of lockdown measures in France (see Figure 1). On 7 May, the French Government announced its plan to end the lockdown in three phases. Accordingly, on 11 May, some businesses reopened, along with institutions such as primary schools, albeit with particularly strict safety rules (repeated handwashing, compulsory or recommended mask wearing, and staggered breaks). Secondary schools only opened on 18 May. It was possible to go outside freely and travel without a certificate for up to 100 kilometers in every region, beyond which a certificate was still required. In June, most social spaces reopened (cafes

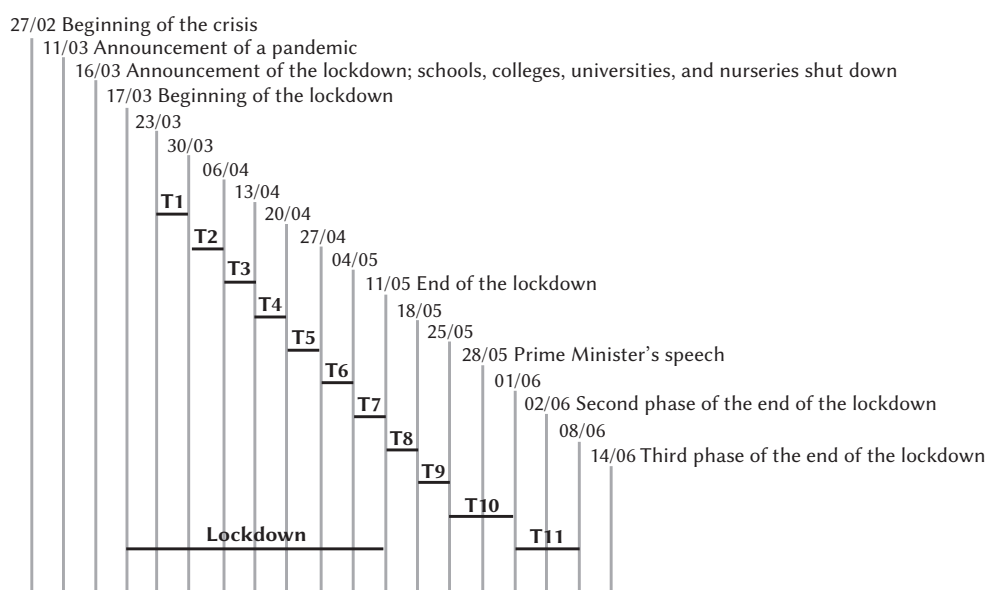
and restaurants, parks and gardens, museums, monuments, zoos, etc.), with safety measures and social distancing. Public transport also returned to normal (subway, buses, trains), and limitations on the number of people who could gather (a maximum of 10) were lifted. Borders remained closed in Europe until 15 June.

MATERIAL

Affect measurement. Affects were assessed using the Measurement of Affectivity: Valence/Activation scale (Congard et al., 2011), which applies a circumplex approach (Posner et al., 2005). Our choice is also based on the circumplex approach, which makes a major contribution to work on the structure of affects (Watson et al., 1999). It offers the possibility of representing emotional experience as a whole (Feldman Barrett & Russell, 1998). Indeed, we proposed to apply a circumplex structure to the two axes or dimensions classically defined in the literature: pleasure/displeasure and arousal or activation, which some authors have called 'valence' and 'activation' respectively (Russell & Feldman Barrett, 1999). In a circumplex representation, each affect is organized around a circle with regard to their disposition in relation to these two bipolar dimensions. Each item takes the form of a noun describing an affective state with a positive or negative valence and a high or low activation level. Four categories of affects are considered here: deactivated positive affects (DPA: tranquility, serenity), activated positive affects (APA: surprise, excitement), deactivated negative affects (DNA: weariness, gloom), and activated negative affects (ANA: anger, nervousness).

Figure 1

Chronology of COVID-19 pandemic and data collection



The Measurement of Affectivity: Valence/Activation scale (Congard et al., 2005) comprises 16 items probing 16 affects, which are divided into four subscales according to their level of activation (high or low) and valence (positive or negative). Respondents indicate the amount of each affect they have experienced on a visual analogue scale ranging from 1 (*not felt*) to 100 (*extremely felt*).

Emotion regulation strategies. Participants were encouraged to indicate the degree to which they applied the eight emotion regulation strategies suggested in our questionnaire on a scale ranging from 0% to 100%. Six of the strategies are commonly used in this area of research (e.g., Augustine & Hemenover, 2009): problem-focused regulation strategy (PFC) (e.g., “I took concrete action to change a situation I did not like”; Pavani et al., 2017); negative emotional expression (NEE; e.g., “I expressed my negative emotions”); positive reappraisal (PR; e.g., “I tried to view the situation in a more positive way”) and distraction (Dist; e.g., “I did things that distracted me from my feelings”; Brans et al., 2013). Two more strategies were added, as they seemed relevant to the lockdown situation: Rumination (Rum; e.g., “I ruminated on unpleasant things”) and Savoring (Sav; “I took the time to enjoy the present moment”; Pavani et al., 2017). The data are available upon request from the authors.

GOALS AND HYPOTHESES

Goals. Based on research by Kluwe-Schiavon et al. (2022), we set out to explore affects and their regulation during and after France’s first COVID-19 lockdown in 2020. We had two main goals:

- Longitudinally assess affect and emotion regulation strategies at weekly timepoints, taking into account the political choices of the French Government. Three key periods were analyzed: the first period of lockdown (from 17 March to 11 May), the first week post-lockdown (11–17 May), and the second post-lockdown period (from 17 May to 8 June 2020).
- Assess the influence of emotion regulation strategies on emotional experience and its dynamics over time. We conducted a dynamic analysis of the links between emotion regulation strategies and affect, in order to identify the strategies that constitute protective or risk factors for affective experience over time in a pandemic context.

We tested preregistered hypotheses for the first objective (https://osf.io/qa6vx/?view_only=94d6974b25654b21b42c0e2621717eae).

Hypotheses. We expected emotional experience to fluctuate in waves, following a cubic or quadratic model with distinct phases: 1) First week of confinement (shock phase): characterized by a high level of negative affect and significant use of regulation

strategies. 2) Third week of confinement (regulation phase): marked by the continued use of strategies, which facilitates adaptation. During the subsequent eight weeks of confinement, we anticipated a gradual regulation of negative affect, an increase in positive affect, and a reduced reliance on regulation strategies. 3) Week of the announcement of the end of confinement and the week of deconfinement: expected to show turbulent emotional experiences, marked by fluctuating affect. 4) Two weeks after deconfinement: characterized by improved perceptions, a further increase in positive affect, and a significant reduction in the use of regulation strategies.

1. We predicted (H1) that positive affect would drop drastically at the beginning of lockdown but would rise again over time, returning to its initial state at the end of lockdown.
2. We also predicted (H2) that, overall, negative affect would follow the opposite trajectory from positive affect. We expected to see a rise in negative affect at the beginning of lockdown and a gradual decline after the end of lockdown was announced.
3. In line with research by Martín-Brufau et al. (2020), we further predicted (H3) that the level of affect activation would decrease during lockdown. Thus, we expected to observe a reduction in ANA (i.e., worried, nervous) during lockdown, especially at the end of lockdown, while DNA (i.e., sad, bored) would increase slightly during lockdown, then decrease at the end of lockdown, though to a lesser extent than ANA.
4. Regarding emotion regulation strategies, we predicted (H4) that people who used more efficient strategies (problem-focused strategies, positive reappraisal, acceptance, and savoring) would regulate their emotions better.
5. We expected (H5) these strategies to predict a reduction in negative affect and an increase in positive affect, whereas negative emotion expression, rumination, and suppression would lead to an increase in negative affect and a reduction in positive affect. As distraction and avoidance (thought to be adapted to this kind of context characterized by a low level of control over the situation) might prove efficient in a pandemic, they were also tested.

STATISTICAL ANALYSES

All statistical analyses were conducted using R (mainly the lmerTest package).

We studied the trajectories of different affects and emotion regulation strategies across the 12 timepoints. We tested whether these trajectories were non-monotonic and underwent several changes of direction depending on the period (lockdown, end of lockdown, public health information provided by government).

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Anne Congard,
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We modeled these trajectories with growth curve models, using polynomials with order greater than two, assuming there would be changes of direction during the study. Very high correlation between the time variables $t, t^2, t^3 \dots$ is a major drawback in growth curve modeling and can be problematic for the estimation step of the parameters. A current way is to replace $t, t^2, t^3 \dots$ by orthogonal polynomials $P_1(t), P_2(t), P_3(t) \dots$ of degree 1,2,3...

In mathematical terms, this amounts to considering the mixed model: for each individual j

$$\begin{cases} y_j(t) = \beta_j^{(0)} + \beta_j^{(1)}P_1(t) + \beta_j^{(2)}P_2(t) + \\ + \beta_j^{(3)}P_3(t) + \dots + \sigma\epsilon_j(t) \quad [\text{Eq1}] \\ \beta_j^{(1)} = \mu_i + \sigma_i\epsilon_{i,j} \quad [\text{Eq2}] \end{cases}$$

where $y_j(t)$ is one of the affect or emotion regulation strategies at time ($1 \leq t \leq 12$) and $\epsilon_j, \epsilon_{i,j}$ are independent Gaussian distribution of mean 0 and variance 1. Note that the means μ_i are often denoted as fixed effects and the variance σ_i^2 as random effects. To investigate the order of the trajectory, we carried out comparisons of models that were nested by the change in log-likelihood:

- Constant model (i.e., zero-order polynomial), only intercept $\beta_j^{(0)}$ in [Eq1];
- Linear model (i.e., first-order polynomial), only $\beta_j^{(0)} + \beta_j^{(1)}P_1(t)$ in [Eq1];
- Quadratic model (i.e., second-order polynomial), only $\beta_j^{(0)} + \beta_j^{(1)}P_1(t) + \beta_j^{(2)}P_2(t)$ in [Eq1]
- And so on...

In the best model, we tested whether the coefficients of the individual trajectories were different ($\sigma_i^2 = 0$) and whether the coefficient of the average trajectory was different from 0 ($\mu_i = 0$).

The second aim of this study was to predict affects according to emotion regulation strategies (ER).

Autoregressive models of order 1 were fitted to the data. More precisely, the model for an affect at time t is $y_i(t) = \beta_0 + \beta_1 y_i(t-1) + \beta_2 z_i^{(1)}(t) + \dots + \beta_{k+1} z_i^{(k)}(t) + \sigma\epsilon_i(t)$, where ϵ_i has a Gaussian distribution of mean 0 and standard deviation 1 and $z_i^{(j)}$ denotes the j -th emotion regulation strategy. The statistical analyses were performed with R and jamovi. The analytic dataset is available at <https://osf.io/jeu73/>. Materials are available at <https://osf.io/4yf9d/>, with additional relevant materials for the PSA's rapid-response COVID-19 projects at <https://osf.io/s4hj2/>.

In polynomial trajectories, two different changes were considered: stationary points (minimum or maximum) where the curve changed trajectory (for example, the curve decreased before and increased after) and inflection points where the curve passed through its tangent, which means that when the curve is decreasing, the descent decreases up to the inflection point and increases after. This study of change points was carried out for all individuals on their affects, and we assessed whether they fell within the period studied (i.e. t between 1 and 12).

PRELIMINARY ANALYSIS

Table 2 presents the correlation between affects and emotion regulation strategies across the 12 timepoints. The correlations between the four affective variables remained high throughout the study (at least 0.358), while those between emotional regulation strategies were weaker (for example, the correlation between distraction and other regulation strategies was very close to zero at least at one point in time).

Table 2

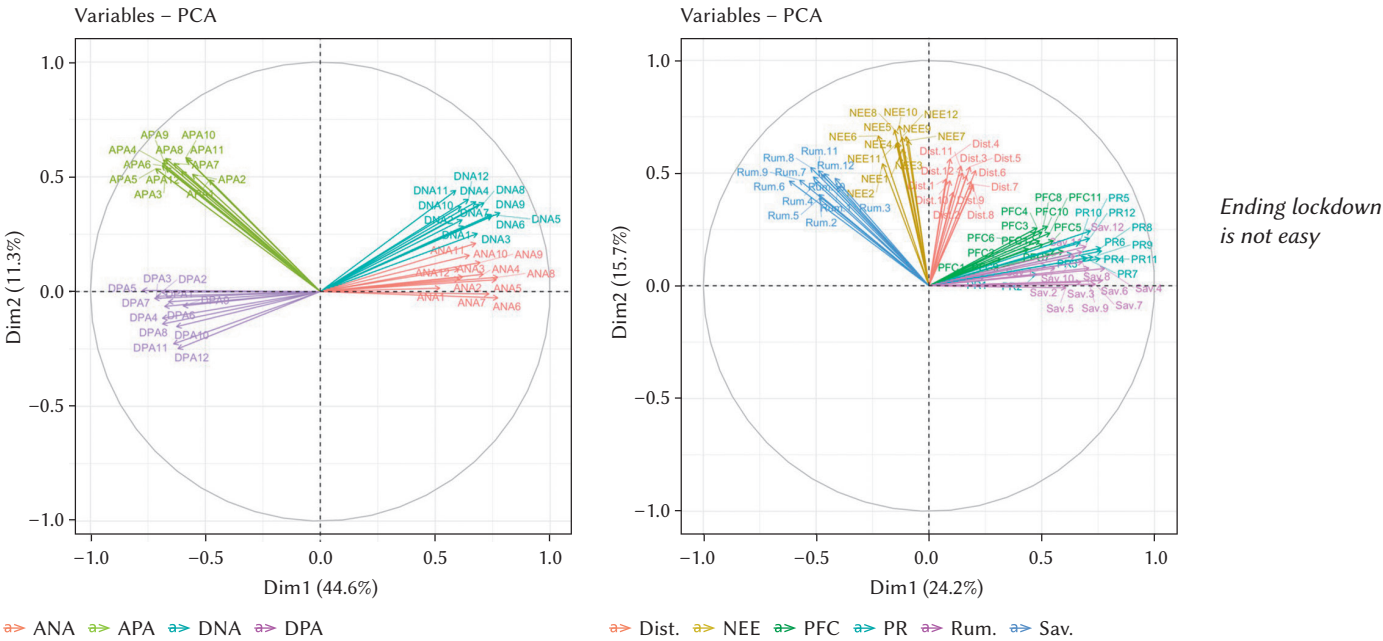
Correlations between affects and emotion regulation strategies across the 12 timepoints. Minimum correlations are reported above the diagonal, whereas maximum correlations are reported below the diagonal

	DPA	DNA	ANA	APA	NEE	PR	PFC	Rum.	Sav.	Dist.
DPA		-0.538	-0.391	0.630	-0.160	0.366	0.226	-0.253	0.345	0.118
DNA	-0.734		0.679	-0.249	0.447	0.066	0.005	0.539	-0.154	0.222
ANA	-0.574	0.388		-0.386	0.426	-0.243	-0.029	0.643	-0.305	0.130
APA	0.358	-0.422	-0.619		-0.004	0.585	0.358	-0.272	0.575	0.113
NEE	-0.314	0.236	0.171	-0.158		0.090	0.150	0.479	0.016	0.232
PR	0.125	-0.306	-0.450	0.344	-0.107		0.556	-0.219	0.665	0.265
PFC	-0.016	-0.197	-0.313	0.176	-0.036	0.134		-0.023	0.405	0.186
Rum.	-0.519	0.412	0.455	-0.479	0.310	-0.437	-0.252		-0.281	0.305
Sav.	0.091	-0.381	-0.470	0.296	-0.132	0.349	0.240	-0.538		0.267
Dist.	-0.184	-0.086	-0.028	-0.114	0.013	0.060	-0.031	-0.052	0.041	

Note. DPA – deactivated positive affects; APA – activated positive affects; DNA – deactivated negative affects; ANA – activated negative affects; NEE – negative emotional expression; PR – positive reappraisal; PFC – problem-focused regulation strategy; Rum. – rumination; Sav. – savoring; Dist. – distraction.

Figure 2

PCA of the four affects (left) and of the six emotion regulation strategies (right) across the 12 timepoints in the study



Note. ANA – activated negative affects; APA – activated positive affects; DNA – deactivated negative affects; DPA – deactivated positive affects; NEE – negative emotional expression; PFC – problem-focused regulation strategy; PR – positive reappraisal; Dist. – distraction; Rum. – rumination; Sav. – savoring.

To illustrate these correlations, two principal component analyses (PCA) were conducted: one for the four standardized affects and the other for the six standardized emotional regulation strategies (Figure 2). For the affects, the two first principal components explained 56% of the variance, whereas for the emotional regulation strategies the two first principal components explained only 40%. Furthermore, PCA confirmed the temporal structure of affect measurements, which remained grouped over time, with the first component contrasting positive affects with negative affects. With regard to emotional regulation strategies, PCA confirmed that the correlation between distraction and other strategies is weak (poor projection of distraction on the first factorial plane), that rumination and negative emotional expression were well measured over time (grouped on the first factorial plane and negatively correlated with the first principal component), while the other three are less identifiable over time on the first factor plane.

RESULTS

INDIVIDUAL DIFFERENCES IN TRAJECTORIES OF AFFECT AND EMOTIONAL REGULATION STRATEGIES DURING AND AFTER LOCKDOWN

Table 3 provides the estimations (and their significances) of the coefficients of sixth-order orthogonal

polynomials for the trajectories of the affects and the emotion regulations. In all cases, a fourth-order polynomial trajectory fitted better the individual differences in affects and the emotional regulation strategies.

Note that the variances of these coefficients (i.e. the random effects) are almost all significantly different from 0, meaning that at least one individual trajectory was significantly different from the average trajectory (i.e. the fixed effect). Figure 3 presents the mean scores for each affect across the 12 time points, together with the predicted trajectories derived from the fixed effects (i.e., the means of the Gaussian distributions) used as fourth-order polynomial coefficients. Figure 4 presents the corresponding results for the emotion regulation strategies.

AFFECT PREDICTIONS ACCORDING TO EMOTION REGULATION STRATEGIES

As shown in the PCA, the four affects can be summarized by a latent score calculated as the difference between the positive affects and the negative affects. A higher score on this variable indicates greater positive affects. This variable reveals a temporal trajectory comprising four distinct phases. From time 1 to time 3, negative affects are elevated, followed by a period of relative stabilization. A further increase in negative affects is observed at the announcement of the lockdown easing and during the week of easing.

Table 3

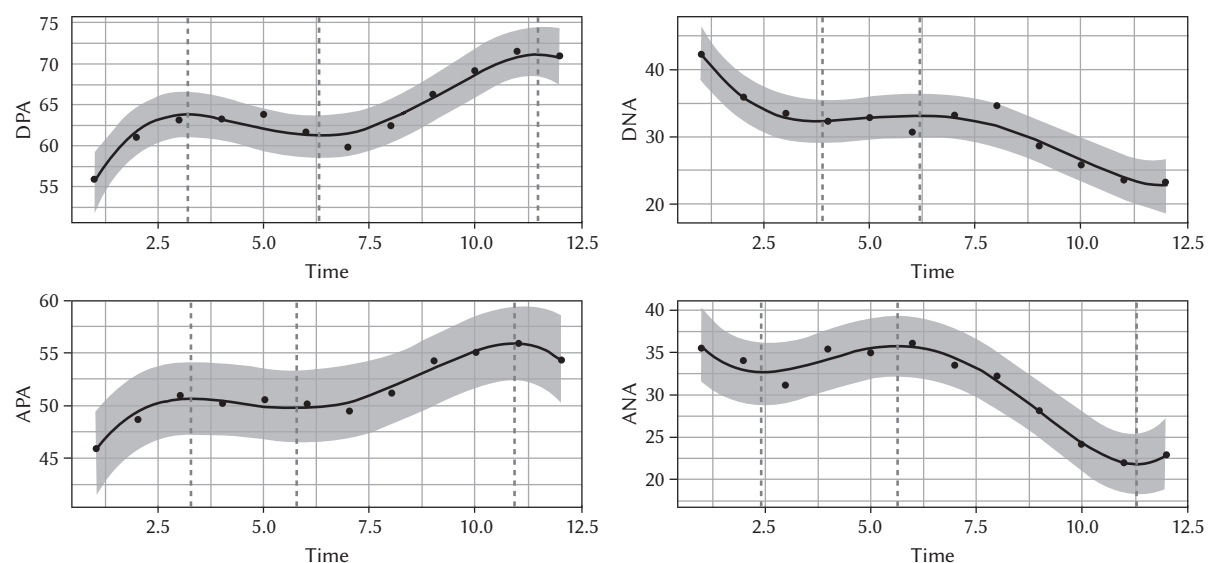
Estimated parameters for each of the orthogonal polynomial coefficients

	DPA		DNA		ANA		APA		Latent affect			
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Intercept	64.0***	17.9***	31.4***	20.7***	30.8***	21.6***	51.4***	21.8***	53.2***	69.4***		
Order 1	13.2***	18.8***	−16.2***	23.6***	−14.4***	23.8***	8.7***	22.5***	52.3***	71.8***		
Order 2	2.7*	8.2	−0.8	15.5***	−7.4***	19.8***	0.2	17.0***	11.3*	50.4**		
Order 3	3.8*	11.8***	−5.5***	10.8***	0.3	11.9***	0.9	9.7***	10.3**	33.6***		
Order 4	−6.1***	2.6	4.5***	9.6***	5.7***	12.3***	−4.0***	7.6***	−20.2***	21.3***		
Order 5	−1.6	4.9*	2.1*	5.2*	0.2	5.2*	−0.7	6.9***	−4.7	6.6		
Order 6	0.6	2.2	0.4	2.9	−0.2	3.9	0.7	8.3***	1.3	14.0		
	Negative emotional expression		Positive reappraisal		Problem-focused regulation		Rumination		Savoring		Distraction	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Intercept	44.1***	23.0***	65.5***	17.8***	57.5***	20.3***	35.6***	22.3***	74.7***	17.5***	65.3***	20.5***
Order 1	−1.6	24.7***	3.4*	21.4***	3.6*	17.5***	−4.7*	24.1***	2.5	21.4***	−3.8	20.3***
Order 2	1.9	17.9***	4.1**	14.7***	3.1*	11.1*	−0.9	20.2***	5.9***	14.6***	2.2	15.2***
Order 3	−2.7	12.4***	−0.5	9.9***	−3.8**	6.8*	0.9	10.8***	0.4	4.6	3.6**	7.6*
Order 4	6.2***	9.6***	−1.6	4.3	0.6	4.5	3.1*	7.6	−4.0***	3.7	−0.9	4.9
Order 5	−0.1	9.3	−0.4	4.7***	0.0	6.0***	−0.8	6.6**	0.8	5.3**	1.4	3.7
Order 6	0.8	6.4***	3.4***	0.8	0.2	1.1	−2.0	2.3	2.0*	1.8*	0.3	9.6***

Note. DPA – deactivated positive affects; APA – activated positive affects; DNA – deactivated negative affects; ANA – activated negative affects. * $p < .05$, ** $p < .01$, *** $p < .001$.

Figure 3

Mean affect scores at each of the 12 timepoints (points in black) and mean trajectory (with its 95% confident interval) estimated by fourth-order orthogonal polynomial model. Dashed lines in gray correspond to stationary points



Note. APA – activated positive affects; DPA – deactivated positive affects; ANA – activated negative affects; DNA – deactivated negative affects.

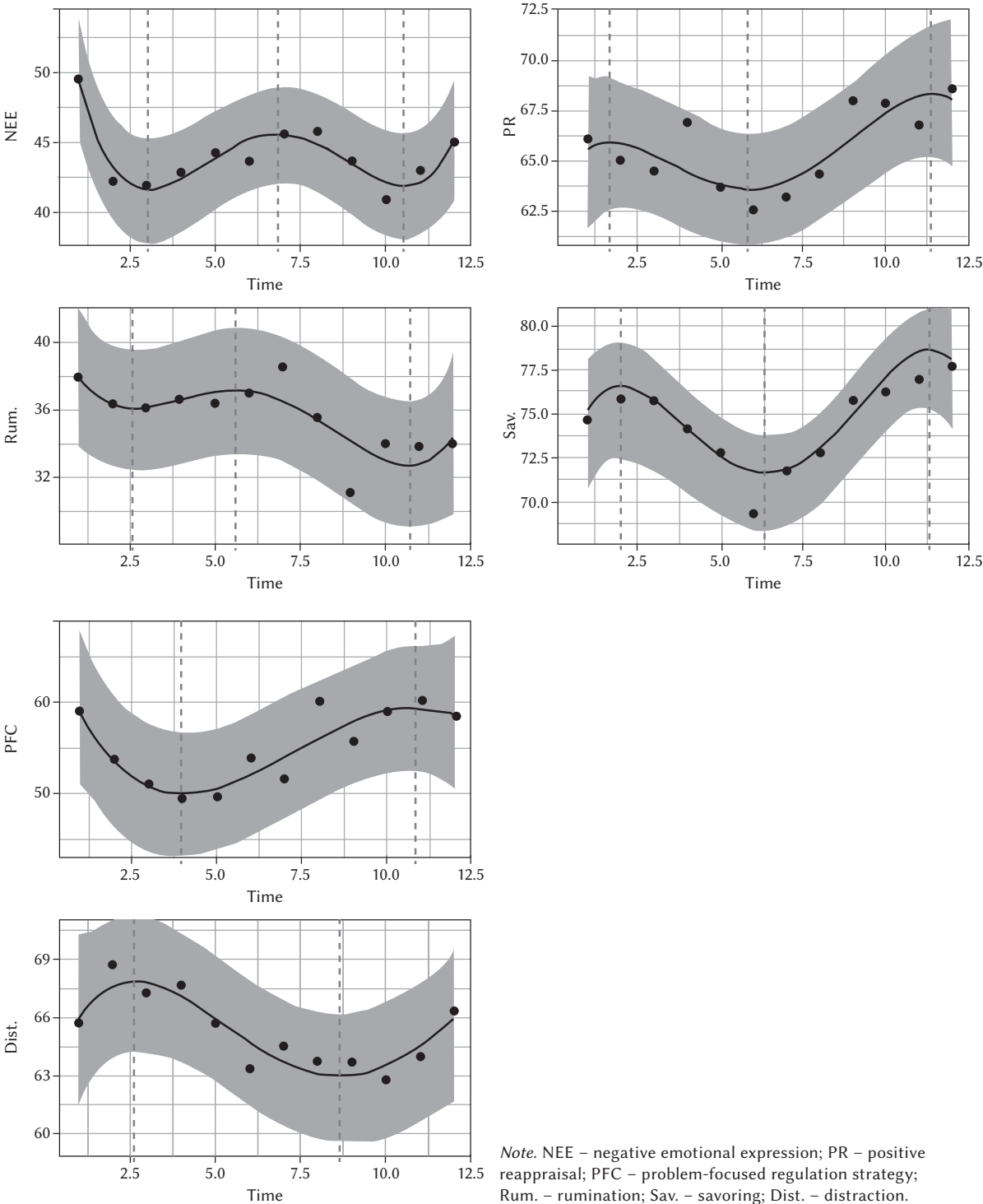
Finally, approximately one week after easing, negative affects decrease and the trajectory shifts progressively toward more positive affects.

As before, a four-order polynomial fitted the data well (see Table 3 and Figure 4). A first-order autoregressive model was built to predict affective dimen-

sion according to the six emotion regulation strategies. More specifically, we assumed that affect was predicted by current emotion regulation strategy use, controlling for the level of affect at the previous time-point (t-1). The results for the total affective dimension are shown in Table 4.

Figure 4

Mean latent affect at each of the 12 timepoints (points in black) and mean trajectory (with its 95% confident interval) estimated by fourth-order orthogonal polynomial model. Dashed lines in gray correspond to stationary points of the mean trajectory



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Ambre Khocha,
Jean-Michel
Galharret

Better use of positive reappraisal ($b = 0.28$, $p < .001$), problem-focused regulation ($b = 0.12$, $p < .01$), and savoring ($b = 0.22$, $p < .001$) were predictive of a significant increase in positive affect. In contrast, expressing negative emotions more ($b = -0.53$, $p < .001$) and ruminating more ($b = -0.12$, $p < .01$) were associated with a significant decrease in positive affects.

DESCRIPTIVE ANALYSIS OF INDIVIDUAL TRAJECTORY CHANGES IN THE SAMPLE

From this latent variable, a clustering of the individual trajectories according to their stationary points

Table 4

Unstandardized regression coefficients for affective latent variable at each timepoint (t) according to emotion regulation strategy at the same timepoint (t), controlling for level of affect at the previous time-point (t-1)

	Estimate	Standard error
Affect (t-1)	0.63***	0.02
Negative emotional expression (t)	-0.12**	0.04
Positive reappraisal (t)	0.28***	0.06
Problem-focused regulation (t)	0.12**	0.05
Rumination (t)	-0.53***	0.05
Savoring (t)	0.22***	0.06
Distraction (t)	-0.03	0.04

Note. In the first-order autoregressive model, the process was estimated with time-invariant coefficients, and the error was assumed to be Gaussian, with zero mean and constant variance. ** $p < .01$, *** $p < .001$.

Table 5

Difference in emotional regulation strategy means between the cluster of affect trajectories

	Negative emotional expression		Positive reappraisal		Problem-focused regulation		Rumination		Savoring		Distraction	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Intercept	38.1	2.9***	66.7	2.0***	57.3	2.2***	31.9	2.5***	73.1	2.1***	62.5	2.5***
Group 2 [+–]	4.3	6.1	–3.9	4.9	–8.5	5.6	9.4	6.0	–1.0	4.8	6.8	5.7
Group 3 [+– +]	11.1	4.5*	0.6	3.2	4.2	3.9	–0.8	4.4	6.0	3.4	3.1	4.4
Group 4 [–+]	12.2	4.6**	–3.0	3.5	0.7	3.9	12.0	4.3**	0.6	3.4	6.2	4.0

Note. It should be noted that the dependence of the emotional regulation strategy on time is modeled by a fourth-order orthogonal polynomial. The intercept corresponds to the mean of the group in which all the affect trajectories increased. * $p < .05$, ** $p < .01$, *** $p < .001$.

can be constructed. This clustering of fourth-order polynomial trajectories comprised four groups:

- The first group in which the individual trajectories increased in the studied period (77 participants, 43%).
- The second group in which the individual trajectories had one stationary point that was a maximum (17 individuals, 9%). 53% of these maxima occurred during the lockdown, and only one maximum occurred after the Prime Minister's speech.
- The third group in which the individual trajectories had two stationary points: firstly a maximum and secondly a minimum (41 individuals, 23%). 97% of these maxima and 13% of the minima occurred during the lockdown period.
- The fourth group in which the individual trajectories had one stationary point in the studied period which was a minimum (44 participants, 35%). 66% of these minima occurred during the lockdown, and the others occurred before the Prime Minister's speech.

Table 5 presents the differences in emotional regulation strategies between these groups. Groups 3 and 4 (one maximum and one minimum, and one minimum, respectively) expressed significantly more negative emotions than group 1 (respectively $b = +11.1$, $p < .05$ and $b = +12.2$, $p < .01$). Group 4 showed significantly higher levels of rumination than group 1 ($b = 12.0$, $p < .05$).

Notably, we observed substantial expression of negative emotions both at the onset of confinement and during the week of deconfinement, along with heightened rumination in the period immediately preceding deconfinement.

DISCUSSION

This longitudinal study investigated individual differences in the emotional impact of the end of lockdown. Emotional adaptation over time was examined

in relation to external events and the role of regulatory processes in emotional experience at different times (Brooks et al., 2020; Wang et al., 2020). This research may contribute to understanding the affective dynamics during both lockdown and a post-lockdown phase, which had not yet been studied from this perspective. In addition, quartic trajectories have provided an interesting perspective for grouping individual trajectories according to the presence of stationary points in the period studied.

LOCKDOWN AND POST-LOCKDOWN: TRAJECTORIES OF AFFECTIVE EXPERIENCE AND EMOTIONAL DYSREGULATION

In order to confirm or refute our first four hypotheses, we compared the trajectories of different affects over time. H1 (affective wave) was confirmed for positive affects. Thus, APA increased significantly between T1 and T3, plateaued between T3 and T8, and increased again during the post-lockdown period, following a wave shape. Like Martín-Brufau et al. (2020), we observed a slight reduction in calmness and stillness in the first week following the end of lockdown, followed by a steep increase starting in the second week post-lockdown.

In line with H2, ANA decreased between T1 and T3, remained stable between T3 and T7, increased again at T8, and decreased between T9 and T12. Consistent with the results of Mukherjee et al. (2020) and Mengin et al. (2022), our results revealed a peak in ANA at the beginning of lockdown that gradually decreased thereafter, as though people had adjusted to the situation and become accustomed to it (“Over time, we got used to hearing about a high number of deaths”). The end of lockdown was associated with turbulence in ANA, which increased slightly. In summary, although the announcement of lockdown increased DPA, the first week post-lockdown was associated with a slight increase in ANA and a drop in DPA. Even though people regained most of their pre-lockdown freedom, there seemed to be a lingering fear (Janus et al., 2025). The results showed that the end of lockdown was not, as some media had proclaimed, a time of jubilation and excess. Quite the opposite: French people seemed reluctant to leave their homes again after 2 months of isolation and seemed to be more worried and nervous. In accordance with Martín-Brufau et al.’s (2020) results, and in line with H3 and H4, the results show a reduction in ANA (e.g., worried, nervous) during lockdown, but no increase in DNA (i.e., sad, bored). DNA was relatively high but stable during lockdown, but fell when the government announced the lifting of restrictions. The latent variable constructed from the full set of affects reveals a temporal trajectory structured into four distinct phases. The first phase, extending from

time 1 to time 3, is characterized by an increase in negative affects, likely related to the shock of the announcement and the fears associated with the uncertainties surrounding the pandemic. This phase is followed by a period of relative stabilization of affects. A third phase corresponds to a renewed increase in negative affects at the time of the announcement of the lockdown easing and during the week of the easing. Finally, the last phase is marked by a decrease in negative affects and a gradual shift toward more positive affects approximately one week after the easing of the lockdown.

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INDIVIDUAL DIFFERENCES IN REGULATING EMOTIONS DURING THE PANDEMIC: THE KEY ROLE OF SAVORING THE MOMENT AND COGNITIVE REAPPRAISAL

Regarding individual differences in emotion regulation strategies, analysis generally confirmed our hypotheses and previous research. In line with available findings (Hamidein et al., 2020; Park et al., 2021; Xu et al., 2020), positive reappraisal appeared to be particularly efficient, as it was significantly associated with higher positive affect and lower negative affect. We observed the same results for savoring, consistent with Xu et al. (2020). The problem-focused regulation strategy, traditionally considered the most effective, ranks third compared to these first two strategies. The protective value of this strategy seemed less clear than in pre-COVID-19 research, even in other health-related situations, as also suggested by recent findings linking emotional resource depletion and burnout during the COVID-19 pandemic (Holas et al., 2025). Lockdown rules forcing people to stay at home may have reduced access to this strategy because of the new and undefined characteristics of the COVID-19 crisis. It was difficult to plan solutions and tackle the issue directly in such an uncontrollable situation.

Regarding the strategies that are usually regarded as ineffectual, rumination and, to a lesser extent, negative emotional expression, contributed to the emergence of negative affect.

Overall, the results revealed cubic trajectories of emotion regulation and affect, dividing the lockdown period into three distinct phases with identifiable points of inflection (Grabowski et al., 2025):

1. Beginning of lockdown (shock phase): characterized by a peak in negative affectivity and the expression of negative emotions, coupled with a sharp drop in positive affectivity. This phase necessitated the activation of numerous emotional regulation strategies.
2. Adaptation and acceptance of lockdown (third week of confinement): marked by significant use of emotional regulation strategies, facilitating ad-

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Amelie Bret,
Ghozlane Fleury,
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aptation. During the subsequent eight weeks of confinement, negative affect was regulated, positive affect increased, and the reliance on emotional regulation strategies gradually decreased.

3. Week of the announcement of the end of confinement and the week of deconfinement: a turbulent phase marked by heightened negative affect and significant expression of negative emotions during the week of deconfinement. Additionally, increased rumination and elevated levels of activated negative affect (ANA) were observed in the week immediately preceding the end of lockdown.
4. Post-lockdown period (two weeks after deconfinement): characterized by a sense of enjoyment and improved perceptions, following a brief period of turbulence in the first week post-lockdown. This phase also exhibited a reduced reliance on emotional regulation strategies. The observed pattern of affective change, characterized by phases of shock, adaptation, turbulence, and subsequent improvement, can be interpreted within the framework of emotional responses to change, most closely resembling a variant of the Kübler-Ross change curve or related emotional transition models describing individuals' adjustment to disruptive events (Bridges, 2009; Kübler-Ross, 1973).

To further examine interindividual differences based on the global affective variable, trajectories described by fourth-order polynomial functions were classified according to their stationary points. This approach made it possible to identify four distinct profiles of affective trajectories over the study period. The first profile, representing 43% of participants, was characterized by a gradual increase in positive affect from the initial announcement of the pandemic to the period of lockdown easing. A second profile, more limited in size (9% of participants), showed an overall improvement in affective experience over time, except for a period of affective turbulence coinciding with the Prime Minister's announcement regarding the lifting of lockdown restrictions. The third profile (23%) included individuals whose trajectories were initially marked by a relatively negative affective experience, followed by a gradual shift toward increased positive affect and reduced negative affect; however, a sharp rise in negative affect was observed at the time of lockdown easing. Finally, the fourth profile (35% of participants) was characterized by a globally negative affective experience, with individual trajectories becoming even more negative both prior to the Prime Minister's speech and during the lockdown-easing period.

Analysis of differences in the use of emotion regulation strategies across these four groups revealed a greater reliance on the expression of negative emotions in Groups 3 and 4, whose affective experiences were more negative and unstable compared with Group 1. In addition, Group 4 exhibited significantly

higher levels of rumination than Group 1, highlighting the detrimental role of these two strategies in emotional regulation and in vulnerability to large-scale societal events.

The present research had three main limitations. First, the questionnaires were completed online, limiting inclusion to individuals with Internet access. However, this online recruitment method allowed us to collect data from respondents all over France, despite the lockdown restrictions on mobility. Nevertheless, the size and composition of the sample remain an issue, particularly with regard to educational level. The sample included a disproportionately high number of highly educated and economically active individuals, with more than half holding a university degree and a substantial proportion holding a doctoral degree. This distribution suggests that the survey may have circulated primarily among individuals working in academic, psychological, or helping professions, who may possess greater familiarity with emotional processes or more developed coping strategies. Such a demographic profile limits the generalizability of the findings to the broader French population and may have influenced both affective levels and emotion regulation strategies observed during lockdown and deconfinement. A limitation of this study concerns the interpretation of the "housing unit size" variable, which, in the absence of information on the number of individuals sharing each space, is of limited interpretative value and would have benefited from a more specific question on this topic.

Our results underscore the importance of acknowledging the psychological impacts of lockdown and deconfinement, despite their necessity. These findings emphasize the critical need for thoughtful planning and management of transitional periods. According to Brooks et al. (2020), their psychological impact is broad, substantial, and potentially long-lasting. It is necessary to understand the mental health needs of patients, families, and healthcare professionals. The pandemic has highlighted the fragility of national healthcare systems and the need for evidence-based interventions to improve psychological flexibility (Presti et al., 2020) in terms of emotion regulation strategies. As suggested by Zhang et al. (2020), psychological support must include crisis interventions for patients and healthcare professionals. Kluwe-Schiavon et al. (2022) reported that a lack of understanding of one's own emotions is the most crucial risk factor for anxiety in a crisis, and highlighted the importance of promoting emotional skills. The present study highlights the importance of learning and improving the use of efficient emotion regulation strategies, especially those that foster positive emotions and acceptance during difficult or extraordinary circumstances. Future research could also explore potential intervention strategies

aimed at supporting emotional regulation during crisis periods, such as mindfulness-based programs or cognitive-behavioral techniques, which may help individuals better manage affective fluctuations and promote psychological well-being in stressful contexts (Antoine et al., 2018; Congard et al., 2011; Lindsay & Creswell, 2019).

Many other questions remain unresolved, but could be answered statistically using these data. First, further analysis of inflection points could be conducted by considering individual different or initial experiences, allowing for a deeper understanding of how personality, hope, and gratitude influence affective responses during transitional periods (Lucas & Diener, 2009). Kluwe-Schiavon et al. (2022) highlighted the undermining role of neuroticism, while Pellerin and Raufaste (2020) reported that emotional well-being is positively predicted by hope and gratitude. An important question is whether the number of previous traumatic events predicts negative experiences, quality of life, and stress. Second, identifying individual differences in types of affective trajectories would provide valuable insights into the diversity of affective experiences and regulation strategies, enabling tailored interventions for individuals facing similar situations. Finally, exploring the kinetics of emotional regulation and affect in other contexts, including daily life situations, could extend the applicability of these findings. This would help determine whether the patterns observed during lockdown and deconfinement are unique to these periods or reflect broader dynamics in emotional adaptation and regulation.

DISCLOSURES

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