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Mental journey to the future and memory for future thoughts during the COVID-19 pandemic lockdown

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Abstract

This study analyzes the production and recall of future thoughts during the COVID-19 lockdown. Participants were free to produce future thoughts (Experiment 1) or received cues to promote production (Experiment 2), and then were asked to recall as many of the future thoughts produced as possible. The Valence (positive vs. negative) and the Event Type (personal vs. collective) thoughts were considered. In production and recall, there were no global differences between the positive and negative thoughts in Experiment 1, whereas in Experiment 2 the cues led to more positive than negative ones. More importantly, a Valence \times Event Type interaction was observed in both experiments for production and recall data, indicating a positivity bias for personal and a negativity bias for collective future thinking. These findings contribute to a better understanding of mental time travel in situations as complex as the COVID-19 pandemic.

KEYWORDS

collective memory, COVID-19, episodic future thinking, free vs. cued, future emotional events

1 | INTRODUCTION

Episodic memory allows us to travel to the past and the future, to project the self-mentally to past experiences included in our autobiographical memory, but also to envision and plan for the future (Addis, 2020; Schacter & Addis, 2007). These two kinds of mental journeys share multiple aspects. They use the same rules of action, activate the same brain areas (Addis et al., 2007; Botzung et al., 2008), they are built with details of the same nature as perceptual aspects, emotional contents, or conceptual information about the world (D'Argembeau & Van der Linden, 2004; for reviews, see Addis, 2020; Schacter et al., 2007; Szpunar, 2010), and are related to subjective well-being (Conway & Pleydell-Pearce, 2000). However, there are also differential aspects between the two. For example, compared to autobiographical memories of the past, future events are less vivid (Cole & Berntsen, 2016; Niziurski & Schaper, 2021), they are less precisely elaborated—possibly because they require greater cognitive effort

(e.g., Lalla & Sheldon, 2021), and are largely schema-driven (see Özbek et al., 2020). More importantly, plans and visions of the future tend to be emotionally more positive than autobiographical past memories, with a tendency to remember a rosy simulated future (Barsics et al., 2016; Finnbogadóttir & Berntsen, 2013; Lalla & Sheldon, 2021; Rasmussen & Berntsen, 2013; Salgado & Berntsen, 2020; Szpunar et al., 2012; but see Niziurski & Schaper, 2021). In addition, details associated with negative simulations are more difficult to remember and fade away more quickly than details associated with positive or neutral simulations (Szpunar et al., 2012).

The pandemic has generated an exceptional and ideal situation to study aspects of health and the functioning of cognitive processes, including memory. Both experiments contained in the current study were carried out in mid-April 2020 after the Spanish Government extended the confinement, in a period of uncertainty about the duration of the restrictions, and when many people were affected by the virus (169,496), and many were dying (17,489) in Spain. In that time,

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when there were still no effective vaccines, virtually all countries imposed quarantines and safety guidelines to prevent the spread of the virus. The lockdown meant the loss of freedom, separation from friends and family, and a sudden and unforeseen interruption of daily life and activities related to work/studies and leisure time (Benke et al., 2020; Vindegaard & Benros, 2020), a complex situation that required a significant process of adaptation. In fact, opinion polls conducted in this period showed an increase in symptoms of anxiety, stress, and depression in the general population, and intensification of symptoms in the clinical population (Balluerka et al., 2020; Odriozola-Gonzalez et al., 2020; Rodríguez-Rey et al., 2002). In sum, the pandemic not only caused economic uncertainty with substantial repercussions at the professional and social level, but also enhanced feelings of isolation and generated higher levels of anxiety and depression and, ultimately, a reduction in the sense of well-being compared with the prehealth-crisis status (Carstensen et al., 2020; Killgore et al., 2020; Odriozola-González et al., 2020; Tull et al., 2020; Vindegaard & Benros, 2020; Xiong et al., 2020).

Therefore, there is no doubt that COVID-19 was a milestone in our lives that affected the way we remembered our past and the way we visualized our future. The pandemic was a particularly stressful event due to its novelty and the inability to predict its evolution (Vinkers et al., 2020). Additionally, social isolation is associated with psychological symptoms (e.g., Jacobsen & Jacobsen, 2020). Thus, it can be expected that the psychological state the pandemic generated could modulate the processes involved in the mental journey to the future (e.g., Lachman & Agrigoroaei, 2012). For example, patients with high levels of stress or severe depression have been observed to show deficiencies in imagining the future and evoke very generic experiences (e.g., Buss et al., 2004; Fynes-Clinton & Addis, 2023; Williams et al., 2007).

It should not be forgotten that, despite the conditions of lockdown and social isolation, thinking about the future is an activity that never stops. The ability to travel mentally to the past and imagine future events helps us to achieve objectives, favoring adaptive behaviors and the feeling of well-being (Ballance et al., 2022; Lalla & Sheldon, 2021; Szpunar et al., 2012). Several online surveys were conducted during the pandemic, where participants were asked to produce past and future events and to assess different dimensions of these thoughts. For example, Lalla and Sheldon (2021) asked their participants to produce, based on positive and negative cues, specific events of the past and visions of the future linked to COVID-19. The authors observed that it was more challenging to generate future experiences than past experiences but that the future events were more positive, revealing a tendency to positivity. On the other hand, also through an online survey, Niziurski and Schaper (2021) asked participants to recall and predict events related to the pandemic. They found that participants reported past events more vividly and positively than future events, and that positive events were rated as more emotional and vivid than negative ones.

Knowing how the future is projected in special situations (such as the recent health crisis) is certainly interesting for cognitive researchers. Nevertheless, hardly any works exist that have analyzed subsequent recall of the future predicted by the participants themselves. Therefore, what was the impact the pandemic and

confinement had on that mental journey and specifically on later recall of the produced future plans? Determining what types of future thoughts we had during the most challenging moments of the pandemic, analyzing their emotional valence and characteristics, and knowing the strategies we use to organize the subsequent recall of future thoughts produced are the priority objectives of this study.

It would be reasonable to think that the pandemic, already considered a chronic stressor (Vinkers et al., 2020), would lead us to depict a negative view of the future. According to both hypothesis, the *cognitive theory of depression* (Beck, 2002), and the *hopelessness theory* (Abramson et al., 1989; Liu et al., 2015)—which proposes that repeated exposure to an aversive and uncontrollable stimulation leads to the belief that we cannot escape from that situation and to accept it as irremediable—, it is easier for people in this health crisis situation to think about negative future events and to believe that those events are really going to occur (e.g., Wu et al., 2015). These ideas are consistent with empirical evidence from research on attention, perception, and memory that supported the *mood-congruency effect*, that is, that individuals process, maintain, and recall content that is more coherent with their current mood (for reviews, see Blaney, 1986; Drace, 2013; Siemer, 2005). Therefore, consistent with these previous findings, positivity is expected not to be observed in the health alert situation and the confinement derived from it.

On the contrary, it is also possible that people think that better times will come and compensate for the negative aspects of the present by thinking about a positive future. That is, the mental journey to the future and thinking about our plans and desires can be a way of coping with adversity (Ballance et al., 2022; Lalla & Sheldon, 2021; Szpunar et al., 2012). In fact, research has highlighted the adaptive value of memory by allowing people to prepare for the future (Schacter & Addis, 2007; Szpunar et al., 2012). In this line, nostalgia for better times while envisioning the future can help us distance ourselves from the source of stress by strengthening resilience and emotional balance, and repairing or improving our mood (Faul & De Brigard, 2022). In addition, the *unrealistic optimism phenomenon*, a general belief or bias that one's future will be better than the future of comparable others, has been previously documented (Salgado & Berntsen, 2021; Weinstein, 1980). Taking these ideas into account, a positive perspective or a tendency to remember a rosy simulated future (Szpunar et al., 2012) might be expected when producing and recalling autobiographical future episodes during the pandemic.

Besides a tendency to think positively, in order to face this new negative reality generated by the health crisis, individuals might need to project themselves not only on a personal level but also on a collective level. It is known that people think about the future of groups they belong to, such as work and religious organizations, communities, nations, societies, and even the world, giving rise to the collective future thinking, that is, “the act of imagining an event that has yet to transpire on behalf of, or by, a group” (Szpunar & Szpunar, 2016, p. 378). Although a very recent trend exists within mental time travel research that focuses on collective future thinking (e.g., Topcu & Hirst, 2022), previous scientific literature on the way we think about the future has mainly focused on the future of the individual. Nevertheless, the pandemic had an undeniable social dimension. It did not

only change the way we relate to each other, but it also caused a strong economic crisis with job losses, and a situation of collective uncertainty. Along this line, in addition to personal expectations when thinking about the future, one would also predict participants to reflect on aspects of society that could be transformed (improved or worsened) after confinement. At this point it is worth asking not only whether future thoughts will be more of a personal or collective nature, but also whether this dimension of the thoughts (personal or collective) will interact with the emotional valence (positive or negative) of the thoughts. Therefore, in this study, we also analyze the effects of the event type (personal or collective) to examine the characteristics of retrospective memory for thoughts generated about the future.

Based on recent literature (Shrikanth et al., 2018; Shrikanth & Szpunar, 2021; Szpunar & Liu, 2023), we expected a significant domain-by-valence interaction. For example, Shrikanth et al. (2018) asked participants to list things that they were excited or worried about in the next week, year, and 5–10 years and observed that their participants were positively biased about their personal future while, at the same time, being negatively biased about the future of their country. Moreover, people's tendency to expect negative collective events (e.g., for their country's future) has been documented to vary in different countries depending on national well-being and country identification (Mert et al., 2022). More specifically in the pandemic context, the social or collective perception of the future in its different dimensions was analyzed in a study carried out in May 2020 with 3000 respondents (Minguijón & Pac, 2021), of whom 52% believed that their lives would worsen after the coronavirus pandemic, stating that people would be more fearful and distrustful. In this sense, the perception of different dimensions of social life, such as distrust and collective fear, may cause individuals to tend to process, produce, and recall negative collective thoughts more than negative personal thoughts.

An additional aim of the current study is to examine what we remember of future thoughts previously generated under free vs. cued production. It is known that autobiographical memory retrieval is highly sensitive to the experimental conditions under which memories are constructed (Conway et al., 2019). In a recent study of Aizpurua et al. (2021), hypothetical future events linked to COVID-19 were used, by presenting positive (e.g., the pandemic will make us better people) and negative statements (e.g., mass events will not return). They found that participants recalled more positive than negative events, a positivity that had a greater effect in middle-aged and older adults (i.e., positivity effect). Notably, the contents evaluated in that study were provided by the experimenters (with statements constructed from news taken from newspapers, television, and social networks), so one wonders whether positivity and/or the interaction between Event Type (personal vs. collective) and Valence (positive vs. negative) of the future thoughts would also be observed if the participants themselves generated their own expectations and plans.

Thus, in the current study, we are interested in analyzing the characteristics of future thoughts, leaving participants free to select future experiences and plans and avoiding very restrictive instructions common in the literature (e.g., Jeunehomme & D'Argembeau, 2017;

Szpunar et al., 2012) regarding the characteristics of the simulations to be produced by the participants (e.g., specific, novel, thoughts involving people, location and goals or of a particular emotional valence). In two independent experiments, we analyze future thoughts obtained through a free production task (Experiment 1) or through positive or negative cues (Experiment 2). Previous studies found that processing support generally improves production and recall in episodic memory (Richardson-Klavehn & Bjork, 1988). In fact, it has been observed that access to positive thoughts and future plans is faster when using retrieval cues at production compared to when there are not any cues (e.g., D'Argembeau & Van der Linden, 2004; Lalla & Sheldon, 2021). In the same line, using positive, negative and neutral simulation cues, Szpunar et al. (2012) found that details associated with negative future simulations were more difficult to remember than details associated with positive or neutral ones. Thus, we expect the participants of our study to present a tendency for positive content and to produce, retain, and recall more positive than negative thoughts when retrieval cues are presented. This preference may also be reflected in a greater emotional intensity and a greater tendency to group positive in comparison with negative episodes. In any case, the results of this research will contribute to a better knowledge of the possibilities presented by cued production compared with free production when thinking and digressing about the future. Likewise, these findings can have practical implications and help develop applications (treatments, therapies ...) aimed at improving people's emotional and social well-being.

2 | EXPERIMENT 1

2.1 | Materials and methods

2.1.1 | Participants

The participants were 36 adults (M age = 45.97, SD = 22.44; range 19–86 years), including 25 women (69.4%). Most had completed university (72.2%) or secondary (25%) studies. All participants were students from the University of the Basque Country or members of cultural associations. This sample size was selected a priori using G*Power (Faul et al., 2007) so as to achieve a statistical power of 80%, considering an alpha error of .05 and a medium within-subject effect size ($d = 0.5$), which corresponds to the effect size reported in some previous studies of memory for future simulations (e.g., Jeunehomme & D'Argembeau, 2017; Szpunar et al., 2012).

2.1.2 | Design

The present study employed a 2 (Valence: Positive vs. Negative) \times 2 (Event Type: Personal vs. collective) factorial design with emotional Valence and the Event Type of the contents as within-participant variables.

2.1.3 | Materials and procedure

This study was carried out following the American Psychological Association standards for the ethical treatment of participants and was approved by the Ethics Committee of the University of the Basque Country (UPV/EHU). Participants were first informed that the experiment dealt with the positive and negative nature of thoughts about the future linked to the COVID-19 pandemic. Because the alarm status was decreed in Spain, and the entire population was at the time confined without the possibility of leaving their homes, this experiment was conducted online.

The survey was disseminated in mid-April through the student council, coordinators, and undergraduate delegates, and the university's website, which opened a space for studies linked to COVID-19. In the form, participants were asked: "In the stage of lockdown and pandemic due to COVID-19, one thinks about the future and imagines positive experiences and facts, but negative fears and experiences also come to mind about what could happen to us in the near or distant future." They were informed that, in this study, we were interested in their thoughts and plans for the future. Their task was to write those thoughts in a sentence and assess the emotional level generated by those ideas of the future on a Likert scale (1 = *low emotional level* to 7 = *very emotional*). They were told that the questionnaire was designed to elaborate 20 thoughts but that if they did not come up with more sentences, they could leave the spaces blank until the end of the test. They were not informed that there would subsequently be a recall test on those contents.

Thus, after the participants had received the instructions and agreed to participate in the study, a blank space appeared on the screen to write the thought or plan for the future, and the Likert scale to evaluate the emotional level, and the instruction to press the spacebar that presented another screen to write and assess another thought. The participants worked at their own pace and after writing their thoughts and plans and rating all the sentences, a 3 min distracting task consisting of writing words that started with S appeared. After the distracting task, a free recall task was administered. Participants were encouraged to write as many of the previously self-generated thoughts about the future as possible, in any order. These free production task and recall task have the additional advantage of revealing participants' strategies to organize the material.

2.2 | RESULTS

The results are presented in two sections. First, we present the results and characteristics of the future thoughts produced spontaneously by the participants, the emotional level of the thoughts, and how they grouped and organized those future thoughts. Second, recall was analyzed considering correct recall, errors, and emotional level of the recalled thoughts, as well as how they grouped the recalled experiences.

Produced and recalled sentences were categorized as positive (e.g., "hugging my friends", "getting back to normal at work") or

negative (e.g., "fear that my grandparents will not survive the pandemic", "there will be a major relapse in the fall") for their valence. In addition, sentences related to the participant or to his/her nearest context (family, partner, friends, colleagues, and/or neighbors) where considered of personal nature, whereas thoughts related to the whole society, groups (e.g., sanitary, politician) or values (e.g., solidarity, empathy) were categorized as collective contents in nature.

Production and recall were scored by two judges, assigning one point for every future thought, and the few discrepancies (i.e., less than 1% of the thoughts) were resolved by an independent judge. Cohen's Kappa coefficients were $k > .90$ in all cases, indicating almost perfect inter-rater agreement. For recall specifically, a literal replication of the original future thought was unnecessary (i.e., it was acceptable to recall the general idea or gist), and thoughts that did not include the relevant details were not evaluated. The emotional intensity of the recalled thoughts was extracted from the emotional intensity associated with the thoughts produced by the participants, except for the ones with/so called errors (i.e., contents reported but not previously produced), in which case, the emotional intensity was not considered.

Clustering or the tendency to group the thoughts by categories (i.e., repeating the same category when producing the thoughts), was also analyzed for both produced and recalled thoughts, using categories of valence (positive, negative) and of Event Type (personal, collective). For both sections, 2 (Valence: positive, negative) \times 2 (Event Type: personal, collective) repeated-measures ANOVAs were performed for both production and recall data.¹

Authors made their data, analytic methods, and experimental materials available to other researchers.

2.2.1 | Production

The average production was 18.72 units (SD = 3.71), with a range of 9 to 23 thoughts. Although participants had 20 screens (i.e., one per each thought) to express their future simulations, some participants expressed on several occasions different ideas within the same statement. We calculated the average proportions of the total amount of future thoughts produced. The results can be seen in Table 1.

The effects of Valence were not significant, $F(1, 35) = 2.123$, $p = .154$, $\eta^2 = .057$. The effects of the Event Type of the thoughts were significant, $F(1, 35) = 7.456$, $p = .010$, $\eta^2 = .176$, with a higher proportion of personal than collective thoughts. In addition, the interaction Valence \times Event Type was significant, $F(1, 35) = 111.74$, $p < .001$, $\eta^2 = .761$. Thus, there was a greater proportion of positive personal thoughts than collective thoughts, whereas, in the negative future experiences, the opposite pattern appeared, with more collective experiences than personal ones. In addition, participants produced more positive personal thoughts than negative collective ones, followed by negative personal thoughts and, finally, positive collective thoughts, with significant differences between all of them.

To quantify clustering, we applied the Adjusted Ratio of Clustering (ARC; Roenker et al., 1971; Senkova & Otani, 2012), in which

chance clustering is set at 0, perfect clustering at 1, and negative scores indicate clustering below chance. The mean ARC value was $M = .30$ ($SD = .27$), range $-.29$ – 1.00 , indicating a tendency to group greater than expected by chance (equal to 0), $t(35) = 6.677$, $p < .001$. The average proportion of repetitions per category was also calculated, dividing the number of repetitions of each category by the total number of units produced. The positive personal category obtained the highest average proportion of repetitions, $M = .54$ ($SD = .35$), followed by the negative collective category, $M = .29$ ($SD = .29$), the negative personal category, $M = .11$ ($SD = .16$), and finally, the positive collective category, $M = .06$ ($SD = .13$), with significant differences between all of them except for the last two categories, negative personal and positive collective. These repetitions reflected the outcome in production; that is, the most frequently produced categories were repeated to a greater extent. In fact, the correlation between the two measures was $r = .87$ for the positive personal category, $r = .81$ for the positive collective category, $r = .82$ for the negative personal category, and $r = .76$ for the negative collective category.

2.2.2 | Emotional intensity of the thoughts produced

The effects of the Valence were not significant, $F(1, 35) = 3.97$, $p = .054$, $\eta^2 = .102$, although the emotional intensity was numerically higher for negative than for positive thoughts. The effects of Event Type were significant, $F(1, 35) = 16.148$, $p < .001$, $\eta^2 = .316$, with greater intensity for personal than for collective thoughts. The significant interaction Valence \times Event Type, $F(1, 35) = 10.152$, $p = .003$, $\eta^2 = .225$, indicated a greater intensity for positive than for negative personal thoughts and, on the contrary, for collective thoughts, a greater intensity for negative than for positive experiences. The lowest intensity was for positive collective thoughts compared with the rest (positive and negative personal thoughts and negative collective thoughts, with no differences between them). That is, the most

TABLE 1 Mean proportions (SD in parenthesis) of produced and recalled future thoughts, as a function of Valence and Event Type in Experiment 1.

Production	Total	Event type	
		Personal	Collective
Valence			
Positive	.56 (.25)	.47 (.29)	.09 (.11)
Negative	.44 (.25)	.15 (.12)	.29 (.22)
Total		.62 (.28)	.38 (.28)
Recall		Event type	
	Total	Personal	Collective
Valence			
Positive	.55 (.24)	.49 (.27)	.06 (.10)
Negative	.45 (.24)	.15 (.15)	.30 (.22)
Total		.64 (.25)	.36 (.25)

intense thoughts produced were the personal ones, both positive and negative, and the negative collective ones. The results are shown in Table 2.

2.2.3 | Recall

The average correct recall was 11.44 units ($SD = 4.03$, range 3–20 thoughts), which represents 61.04% of the thoughts produced (there were very few commission errors, $n = 12$, and therefore were not analyzed.) There were more future thoughts in the production phase than in the recall phase, $t(35) = 10.79$, $p < .001$.

We calculated the average proportions of the total thoughts recalled. The results can be seen in Table 1.

As in production, although the effects of the Valence were not significant, $F(1, 35) = 1.569$, $p = .219$, $\eta^2 = .043$, numerically, the proportion for positive experiences was higher than for negative experiences. Event Type was significant, $F(1, 35) = 11.016$, $p = .002$, $\eta^2 = .239$, with a higher proportion of personal than collective thoughts recalled. In addition, the Valence \times Event Type interaction was significant, $F(1, 35) = 95.472$, $p < .001$, $\eta^2 = .732$. The effects of this interaction indicated a higher proportion of recall of positive personal thoughts than of negative ones, whereas for collective thoughts, there were more negative experiences than positive ones. In other words, the highest proportion of recall was for positive personal thoughts, followed by negative collective thoughts, thirdly, by negative personal thoughts and, finally, by positive collective thoughts, with significant differences between all of them (see Figure 1).

Additionally, we calculated a corrected measure of recall for each participant, considering the production difference between positive and negative thoughts in the recall data. For example, if a participant produced 10 positive future thoughts and remembered all 10, he/she remembered 100% of the positive produced thoughts, while if the participant produced 8 negative thoughts and remembered only

TABLE 2 Mean ratings (SD in parenthesis) of emotional intensity (1 = low emotional level to 7 = very emotional) of produced and recalled future thoughts, as a function of Valence and Event Type in Experiment 1.

Production	Total	Event type	
		Personal	Collective
Valence			
Positive	4.16 (1.67)	5.40 (2.27)	2.98 (2.86)
Negative	4.82 (1.79)	5.01 (2.27)	4.64 (2.07)
Total		5.17 (1.39)	5.17 (2.04)
Recall		Event type	
	Total	Personal	Collective
Valence			
Positive	3.47 (1.60)	5.01 (2.07)	1.94 (2.68)
Negative	4.28 (1.91)	4.24 (2.90)	4.31 (2.40)
Total		4.62 (1.57)	3.12 (1.80)

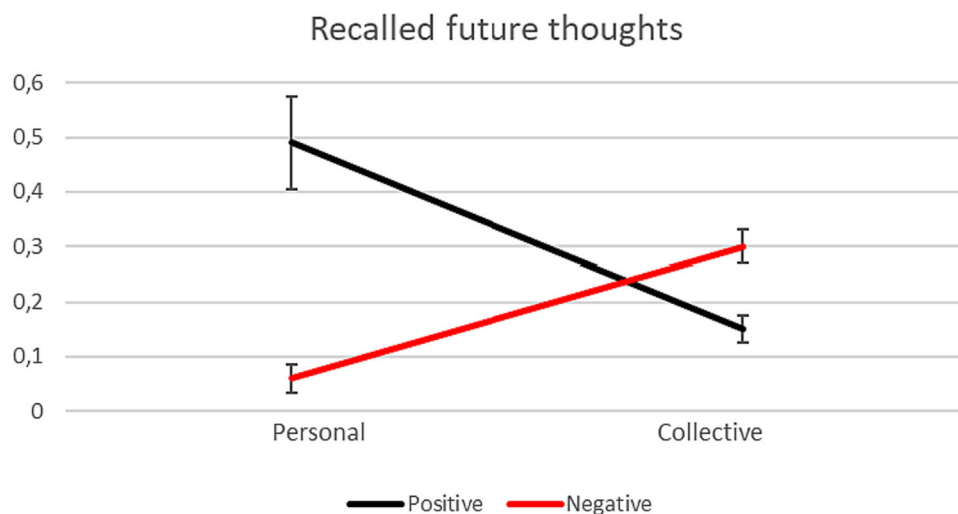


FIGURE 1 Mean proportion of positive and negative personal and collective future thoughts recalled in Experiment 1 (Error bars represent standard errors).

5, he/she only remembered 62.5% out of 100% possible negative produced thoughts. Therefore, we calculated the average percentages of thoughts recalled, and corrected for the baseline (i.e., the number of thoughts produced). The percentage was very similar for positive (62%) and negative thoughts (66%), with no statistical difference between them, $F(1, 34) = .441, p = .511, \eta^2 = .013$.

The clustering of recall was also calculated and analyzed. The tendency for items to be consistently grouped together in the course of recall gives us information on recovery strategies, the most accessible contents that are organized by subject. Overall, participants presented an average trend of $M = .23$ ($SD = .45$), range $-.75-1.00$. This trend was greater than expected by chance, $t(34) = 2.979, p = .005$, and similar to the trend shown by participants in the production phase, $t(34) = 1.526, p = .136$. As in production, the highest average proportion of repetitions was for the positive personal category, $M = .62$ ($SD = .39$), followed by the negative collective category, $M = .22$ ($SD = .34$), the negative personal category, $M = .12$ ($SD = .21$), and finally the positive collective category, $M = .04$ ($SD = .16$). In this case, all the differences were significant except for the negative collective and negative personal categories.

2.2.4 | Emotional intensity of the recalled thoughts

Results are shown in Table 2. As in production, the effects of the Valence were not significant, $F(1, 35) = 3.11, p = .087, \eta^2 = .082$, although the intensity was numerically higher for negative than for positive thoughts. Also as in production, the Event Type of the thoughts had significant effects, $F(1, 35) = 12.508, p = .001, \eta^2 = .263$, with greater intensity for personal than for collective thoughts. The significant Valence \times Event Type interaction, $F(1, 35) = 13.159, p < .001, \eta^2 = .273$, indicated a greater intensity for positive personal than for collective thoughts, but without differences between negative personal and collective thoughts. The highest intensity was for personal thoughts, both positive and negative, and negative collective thoughts (without differences between them), and the

lowest intensity was for positive collective thoughts (whose intensity differed from the intensity of the rest of the categories). Therefore, the effects of this interaction on recall were similar to those observed in the production of experiences.

2.3 | DISCUSSION

The participants of this study, after a free production phase, had to recall their thoughts produced about the future, although they were never explicitly informed that they should subsequently recall the content produced. Unlike previous studies where participants were instructed to generate a specific, novel, and plausible future event that included a person, a target and a location (e.g., Jeunehomme & D'Argembeau, 2017; Szpunar et al., 2012), our instructions were less restrictive in elaborating post-pandemic future thoughts. It has been observed that when complex instructions are not provided and participants are allowed to produce spontaneously, there is a greater tendency to generate positive content, and the preference for the positive is accentuated (e.g., García-Bajos et al., 2017; Reed et al., 2014).

Our data show concerns about the personal future and negative visions of social areas linked to the pandemic and its consequences, but they also show clear signs of positivity when envisioning and planning for the future, especially for the personal future. Although numerically there were more positive than negative thoughts both in the production phase (.57 vs. .43) and in the free recall task (.55 vs. .45), there were no significant differences between positive and negative future thoughts (even when the corrected recall measure was calculated). However, as indicated by the significant Valence \times Event Type interaction in both phases of the experiment, there were more positive personal contents and plans, whereas, for more collective or social aspects, negative visions predominated. These findings are consistent with the recently observed domain-by-valence interaction showing a positivity bias about personal future and negativity bias about collective future (Shrikanth et al., 2018; Shrikanth & Szpunar, 2021; Szpunar & Liu, 2023). In fact, in our study, negativity

for collective thinking was to be expected because of the social perception of distrust and the feelings of fear observed in the initial moments of the pandemic (Minguijón & Pac, 2021).

However, although participants perceived social situations negatively, they had a preference for the positive with regards to their own future prospects, showing a tendency to remember a rosy simulated future (Szpunar et al., 2012). In addition, these positive personal aspects were subjectively rated by the participants as of greater emotional intensity than the collective aspects. Niziurski and Schaper (2021) also found that positive events produced by participants were rated as more emotional, more vivid, and more reviewed than negative events (see also García-Bajos & Migueles, 2013). It seems that there is a tendency for personal facts (which depend on or are the responsibility of each person) to be more positive, whereas the more social or collective visions of the future are more negative and attributed to external or uncontrollable causes. It could be that all aspects related to health, the spread of the virus, and the economic and social consequences produced by COVID-19 are attributed to external causes (e.g., government, health policy-makers, or selfish and unscrupulous people) and do not depend on the individual's behavior, as has been seen in studies of autobiographical recall (García-Bajos & Migueles, 2013; Walls et al., 2001).

Although the situation is considered complex, people tend to think that they will be able to overcome and enjoy life again as it was before the pandemic. Thus, people may not be objective when they envision their personal future, an effect known as *unrealistic optimism* (Jefferson et al., 2017; Weinstein, 1980; see Shepperd et al., 2013 for a revision), and they consider that their future will be more successful and better than that of other people. This phenomenon was also observed in the COVID-19 pandemic, where people were noted to underestimate the severity, the risks of contagion, and the consequences of the virus, considering that the probability of falling ill is lower for them and for the people of their close environment than for other people (Salgado & Berntsen, 2021). This positive view of the personal future coincides with the idea of an egocentric bias that distorts our memories in favor of emotional stability and a sense of well-being (Conway & Pleydell-Pearce, 2000; Schacter, 1999). An interesting aspect of the way one produces and recalls the contents of the mental journey to the future is how the future thoughts are organized. Cluster analyses additionally show that participants grouped more thoughts of a positive personal nature, clustering that is not observed with negative personal or collective thoughts.

Episodic memory allows us to envision and plan for the future and to project the self mentally to past experiences included in our autobiographical memory (Addis, 2020; Schacter & Addis, 2007). The present findings coincide with the notion that imagined future events, both in the production and recovery phases, share many characteristics with the recall of past experiences. Autobiographical memory and future thinking involve the integration of general events, lifetime periods, and themes that are represented in an interconnected way (Conway et al., 2019). In other words, our ability to project ourselves into the future relies on the same memory system used for recalling the past. Regardless of their emotional valence and the contents more

directly related to the pandemic, the episodes tend to focus on similar topics observed in previous studies (D'Argembeau & Van der Linden, 2004; for review, see Addis, 2020), such as social activities, relationships with family and friends, personal successes and failures, and visions about the future based on social life scripts shared by the members of a culture (e.g., popular festivals, weddings and graduations). In addition, simple experiences that were pleasing to them in the past (e.g., bathing on the beach, visiting grandparents in the village, or climbing a mountain with one's dog), which were perceived as everyday activities, take on a new dimension during the lockdown. Nostalgia for better times can explain this observed tendency in the events produced and remembered (Faul & De Brigard, 2022; Gammon & Ramshaw, 2021). In pre-pandemic studies of autobiographical memory (e.g., García-Bajos & Migueles, 2013), these daily activities are rated as having moderate emotional intensity, but during the pandemic, it seems that they acquired a greater emotional intensity.

Our findings support the idea that there are two routes whereby episodic future experiences are brought to conscience (Cole & Kvavilashvili, 2019, 2021). On the one hand, there are future thoughts that are voluntary where, to construct the future scene with people, objects and a defined space, the participant needed controlled processes and effort. On the other hand, there are future simulations that are more involuntary and spontaneous, that are "pre-made" or previously constructed, and that emerge smoothly and effortlessly (Cole & Kvavilashvili, 2019, 2021). These spontaneous future thoughts are usually concrete plans, tasks and personal goals that we have previously thought about (Jeunehomme & D'Argembeau, 2017). The pandemic may have promoted such point-into-mind thoughts of the future (e.g., hugging my grandchildren again, being able to go into town to see my parents, or walking on the beach with the dogs).

In Experiment 2, visions of the future are analyzed from 12 positive and 12 negative recovery cues. It has been observed that, in the face of recovery cues, positive thoughts and plans for the future are accessed more quickly (D'Argembeau & Van der Linden, 2004; Lalla & Sheldon, 2021), and that there is a tendency to see the future positively. Experiment 2 provides us with the opportunity to analyze whether, with retrieval cues for production, future thinking differs as a function of event type and emotional valence, and whether significant effects of the interaction between the two variables are observed as in Experiment 1 (where participants were free to produce their future thoughts). In addition, this production format also allows us to analyze whether participants tend to bias and modify the negative cues to produce, and subsequently recall, more neutral or positive content, at least during pandemic lockdown.

3 | EXPERIMENT 2

3.1 | MATERIALS AND METHODS

3.1.1 | Participants

The participants were 29 adults (M age = 44.24, SD = 21.94; range 20–76 years), 24 women (82.8%). Most had secondary (51.7%) or

university (44.8%) studies. All participants were students from the University of the Basque Country or members of cultural associations. This sample size was selected a priori using G*Power (Faul et al., 2007) so as to achieve a statistical power of 80%, considering an alpha error of .05 and a medium within-subject effect size ($d = 0.5$), which corresponds to the effect size reported in some previous studies of memory for future simulations (e.g., Jeunehomme & D'Argembeau, 2017; Szpunar et al., 2012).

3.1.2 | Design

As in Experiment 1, a 2 (Valence: Positive vs. Negative) \times 2 (Event Type: Personal vs. Social) factorial design was used with emotional valence and the Event Type of the contents as within-participant variables.

3.1.3 | Materials and procedure

The procedure was similar to Experiment 1. There was first a phase of production of thoughts and plans for the future after the pandemic, followed by a distracting task, and finally, a free recall test in which participants had to recall the experiences generated in no particular order. Thus, each participant was presented with 24 randomly organized cues, 12 positive and 12 negative. In addition, two examples were used to control the primacy effects, which also enabled the participants to understand the task, and were not included in subsequent analyses. The clustering analysis (ARC) of the cues in the material presented had a value of $-.027$, indicating that the positive and negative cues were interleaved, with four repetitions of both positive and negative cues.

The cues to generate future experiences were obtained from a previous normative study (García-Bajos et al., 2017) using 600 participants of similar characteristics to the current study, but none of them subsequently participating in the present experiment. That sample from 2017 was composed of 300 young adults aged between 18 and 30 years ($M = 20.46$, $SD = 2.38$), of which 243 were females and 57 males. The other 300 participants were older adults aged between 56 and 80 years ($M = 66.59$, $SD = 5.09$), of whom 212 were females and 88 males. All participants produced, for 8 min, positive and negative future events. Based on the experiences obtained, 12 frequent positive and 12 negative events were selected, generated by more than 20% of the participants. These typical and frequent experiences became cues (a procedure based on Migueles & García-Bajos, 2015; García-Bajos & Migueles, 2017; García-Bajos & Migueles, 2017) to produce their own future events or experiences that could be either positive (e.g., Traveling to...) or negative (e.g., Fear of...). For both positive and negative cues their Event Type was taken into account, with half of them being more directed toward personal issues (e.g., Having a good time/having fun with), and the other half toward collective or social issues (e.g., The situation becoming complicated).

Authors made their data, analytic methods, and experimental materials available to other researchers.

3.2 | RESULTS

As in Experiment 1, the results are presented in two sections, production and recall.

3.2.1 | Production

Each participant produced 24 units (24 cues were presented for this purpose, and participants did not produce more than one thought per cue). However, 44 future thoughts (from 15 participants) did not refer to a specific future event (e.g. "I can't think of anything/I think I have already answered this/I don't even want to think about it") or did not make sense with the cue (e.g., "abandon the external view/suffering for the cows") and thus were excluded from the analyses, thus leaving 652 future events. We calculated the average proportions of the total thoughts produced, depending on the Valence and Event Type of the future thoughts. The results can be seen in Table 3.

The effects of Valence were significant, $F(1, 28) = 18.94$, $p < .001$, $\eta^2 = .403$, with a higher proportion of positive than negative thoughts produced. The effects of Event Type were also significant, $F(1, 35) = 893.653$, $p < .001$, $\eta^2 = .970$, with a higher proportion of personal than collective thoughts. In addition, the interaction between the two variables was significant, $F(1, 35) = 36.793$, $p < .001$, $\eta^2 = .658$. The effects of the Valence \times Event Type interaction indicated a higher proportion of positive personal thoughts than of negative ones, whereas there were more negative than positive collective thoughts. That is, in the positive thoughts, there were more personal thoughts than collective ones and, on the other hand, in the negative

TABLE 3 Mean proportions (SD in parenthesis) of produced and recalled future thoughts, as a function of valence and event type in Experiment 2.

Production	Total	Event type	
		Personal	Collective
Valence			
Positive	.60 (.12)	.58 (.11)	.02 (.04)
Negative	.40 (.12)	.35 (.13)	.05 (.06)
Total		.62 (.08)	.07 (.08)
Recall			
	Total	Personal	Collective
Valence			
Positive	.64 (.30)	.57 (.27)	.07 (.14)
Negative	.36 (.30)	.27 (.25)	.09 (.21)
Total		.64 (.24)	.16 (.24)

thoughts, there were more collective thoughts than personal ones, similar to the results of Experiment 1. In this case, the proportion of positive personal thoughts was higher than that of negative collective thoughts, followed by negative personal thoughts, and finally, by positive collective thoughts, with significant differences between all of them.

Interestingly enough, when producing thoughts about the future, some participants changed the valence of the cue presented, so that, for example, in the face of a negative cue (e.g., losing... breaking up with...), they produced a positive thought (e.g., losing pounds gained during the pandemic... quitting a routine or unhealthy habits). Although there were few valence changes (25 times in total), negative-to-positive cue changes were 4 times more frequent than positive-to-negative cue changes (20 vs. 5 changes). In addition, excluded future thoughts (e.g., I cannot think of anything) were produced more often when referring to negative cues than to positive cues (72.72% vs. 27.27%).

3.2.2 | Emotional intensity of the thoughts produced

The results are shown in Table 4. The effects of Valence were significant, $F(1, 28) = 6.264$, $p = .018$, $\eta^2 = .183$, with a greater intensity for negative than for positive thoughts. Event Type also had significant effects, $F(1, 28) = 114.579$, $p < .001$, $\eta^2 = .804$, with greater intensity for personal than for collective thoughts. The significant Valence \times Event Type interaction, $F(1, 28) = 5.814$, $p = .023$, $\eta^2 = .172$, indicated a greater intensity for negative than for positive collective thoughts, but without differences between negative and positive personal thoughts. The greatest intensity was for personal thoughts, either positive or negative (with no differences between them), than for negative collective thoughts, with the lowest intensity for positive collective thoughts.

TABLE 4 Mean ratings (SD in parenthesis) of emotional intensity (1 = low emotional level to 7 = very emotional) of produced and recalled future thoughts, as a function of valence and event type in Experiment 2.

Production	Total	Event type			
		Personal		Collective	
Valence					
Positive	3.49 (1.34)	5.74 (0.96)	1.23 (2.49)		
Negative	4.39 (1.81)	5.71 (1.12)	3.07 (3.07)		
Total		5.72 (0.92)	2.15 (1.99)		
Recall					
		Event type			
	Total	Personal		Collective	
Valence					
Positive	2.83 (2.01)	4.32 (2.78)	1.34 (2.60)		
Negative	2.23 (2.19)	4.81 (2.52)	1.65 (2.78)		
Total		4.57 (1.80)	1.50 (2.01)		

3.2.3 | Recall

The average recall was 8.90 units (SD = 4.83, range 3–20 thoughts), which represents 37.08% of the thoughts generated in the production phase (there were very few commission errors, $n = 9$, and therefore they were not analyzed.) We calculated the average proportions of the total future thoughts recalled. The results can be seen in Table 3.

The effects of Valence were significant, $F(1, 28) = 6.338$, $p = .018$, $\eta^2 = .185$, with a higher proportion of positive than of negative thoughts recalled. The effects of Event Type were also significant, $F(1, 28) = 56.656$, $p < .001$, $\eta^2 = .669$, with a higher proportion of personal than collective thoughts. The Valence \times Event Type interaction was also significant, $F(1, 28) = 14.917$, $p < .001$, $\eta^2 = .348$, indicating a higher proportion of recall of positive personal thoughts than negative personal ones, whereas for collective thoughts, there were no differences between positive and negative ones. In this case, more positive personal thoughts were recalled, followed by negative personal thoughts, and, finally, positive and negative collective thoughts, with no differences between the latter two (see Figure 2).

As in Experiment 1, additional calculations and analysis were conducted for the average percentage of thoughts recalled, corrected for the baseline (i.e., the number of thoughts produced). This percentage was higher in positive (41%) than in negative thoughts (30%), $F(1, 28) = 4.128$, $p = .05$, $\eta^2 = .128$.

When recalling future experiences, some participants recalled the thought with the change of valence made in the production. They changed the valence of the cue presented so that, for example, in the face of a negative cue (e.g., losing... breaking up with), they produced a positive thought (e.g., losing kilos... quitting a routine/unhealthy habits) and then, they recalled it like that. There was no cue valence switch in recall that participants had not done previously in the production phase.

Finally, the mean clustering value was $M = .12$ (SD = .50), range -1.14 – 1.00 , indicating a similar tendency to group as that expected by chance (equal to 0), $t(28) = 1.25$, $p = .220$. The highest mean proportion of repetitions was for the positive personal category, $M = .75$ (SD = .33), followed by the negative personal category, $M = .12$ (SD = .18), the negative collective category, $M = .08$ (SD = .28), and finally, the positive collective category, $M = .04$ (SD = .20). In this case, only the differences of the remaining categories with the repetitions of personal positive thoughts were statistically significant.

3.2.4 | Emotional intensity of the recalled thoughts

The results can be seen in Table 4. The effects of valence were not significant, $F(1, 28) = .54$, $p = .467$, $\eta^2 = .019$. However, the intensity of personal thoughts was greater than that of collective thoughts recalled due to the effect of the manipulation of the variable Event Type, $F(1, 28) = 53.061$, $p < .001$, $\eta^2 = .655$. The Valence \times Event Type interaction was no significant, $F(1, 28) = .069$, $p = .795$, $\eta^2 = .002$.

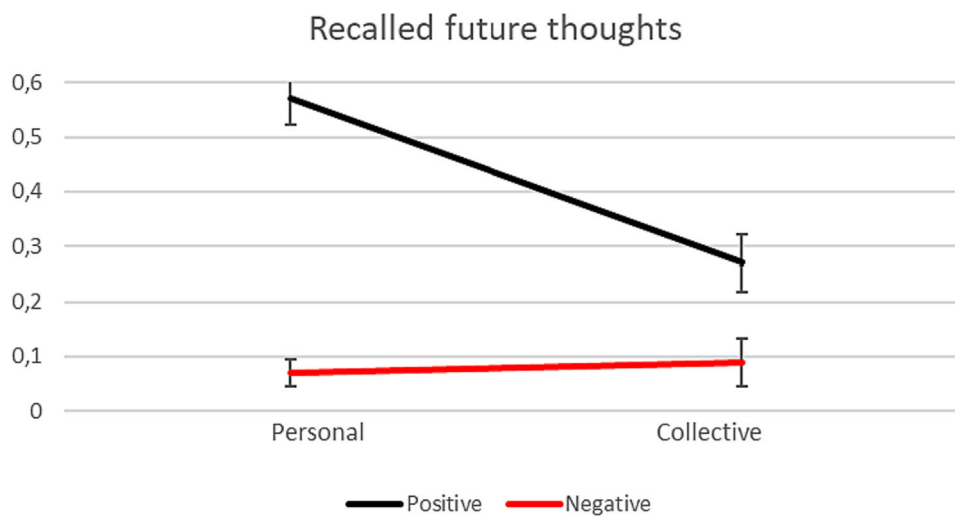


FIGURE 2 Mean proportion of positive and negative personal and collective future thoughts recalled in Experiment 2 (Error bars represent standard errors).

3.3 | DISCUSSION

The participants of this study received some cues that led them to think about positive future plans and other cues that led them to envision negative events. In a previous study, the cues used in this experiment were found to effectively induce both the autobiographical recall of past experiences and to consider and envision plans and objectives for the future (García-Bajos et al., 2017). In the current study, the number of positive and negative valence cues as well as collective and personal cues were experimentally controlled. Still, we observed that in both the analyses performed the participants produced more positive than negative future events, showing a clear preference for the positive (Szpunar et al., 2012). For this purpose, some participants changed the initial valence of the cue from negative to positive when producing their future plans (e.g., “losing pounds gained in the pandemic). However, in other cases, participants' answer did neither make sense with the cue (e.g., “abandon an external view”) nor did it include a specific future thought (e.g., “I don't even want to think about it”), suggesting a resistance to produce negative valence future simulations. In addition, participants produced fewer collective than personal contents, although negative collective thoughts predominated.

It has been observed that, in the face of recovery cues, positive thoughts and future plans are accessed faster and more fluidly (e.g., D'Argembeau & Van der Linden, 2004). Our results coincide with those provided by Lalla and Sheldon (2021), who also asked their participants to produce positive and negative events of the past and the future from retrieval cues, finding a preference for the positive and a tendency to remember a rosy simulated future (Szpunar et al., 2012). In addition, as in Experiment 1, this preference for the positive is more closely linked to personal events and visions of the future whereas a negative vision is more prevalent in collective episodes, showing the concern of the participants for social issues such as job loss, low public-health expenditure, the lack of organization of governments or the uncertainty of the future at a global level (see also Mert et al., 2022; Minguijón & Pac, 2021). Thinking about negative plans and visions may also have an adaptive function because it helps to prepare for negative

consequences. Although people have little control over events with social or collective implications (e.g., employment policies, or health expenditure), on a personal level they can develop strategies to anticipate, avoid, or adjust behavior and thus reduce its impact, as understood in *proactive coping* (Aspindwall & Taylor, 1997; Seligman et al., 2016; Suddendorf & Corballis, 2007).

Even so, the negative cues and the negative visions of the future produced in response to them were rated as having greater emotional intensity than the positive projections. Participants may have been forced to think about situations in which they imagined themselves to be unsuccessful, frustrated, or troubled, and this may have led them to increase the level of emotional intensity because this went against their will, needs, desires, and even their self (Conway, 2005). This resistance to thinking about negative future events coincides with the tendency to transform negative cues to produce more positive plans or visions.

In the recall task a greater recall of positive contents was also observed. As in Experiment 1, positivity only appears in personal content and not in collective future thoughts. Thus, there was a greater recall of positive simulations of personal character than negative ones and, moreover, subjectively perceived with a high emotional level. This pattern shows an optimism that helps maintain one's mood and the feeling that, although the situation and the social context may not look particularly hopeful, participants foresee their own future with optimism. They grant value to simple activities and future events that they enjoyed before the pandemic and that now acquire an exaggerated emotional value (Faul & De Brigard, 2022; Gammon & Ramshaw, 2021). Another index that shows this preference for the positive is the way memory is organized. Although participants combine positive and negative content and personal and collective aspects, there are more repetitions and clusters with positive personal content.

4 | CONCLUSIONS

The two experiments of the present research were carried out in mid April 2020, when due to the COVID-19 pandemic the population was

confined to stop the advance of the virus and—with no vaccines and not knowing the evolution and the real scope of the health alert—there was a generalized atmosphere of pessimism, concern, and hopelessness. In this context, following ideas from the *congruency effect* (for reviews, see Blaney, 1986; Drace, 2013; Siemer, 2005), the *theory of depression* (Beck, 2002) or the *theory of hopelessness* (Abramson et al., 1989; Liu et al., 2015), a greater production and recall of negative contents was expected. This prediction was also supported by previous evidence showing a negative perception of the pandemic atmosphere (e.g., Mert et al., 2022; Minguijón & Pac, 2021; Oner et al., 2022).

However, current results indicate that, even in challenging and uncertain situations, our mind continues to plan, envision, and think about the future positively. Both in Experiment 1, where participants had total freedom to describe their visions of the future after the pandemic, and in Experiment 2, with specific cues to favor production, participants showed a tendency toward positivity both in the production task and the recall phase. This preference for the positive has been observed in episodic memory tasks using emotional words (Hamilton & Allard, 2020), drawings and faces (e.g., Charles et al., 2003; Mammarella et al., 2016; Mather & Carstensen, 2005; Reed et al., 2014), and autobiographical experiences of the past and visions of the future (Berntsen & Jacobsen, 2008; Cole et al., 2016; García-Bajos et al., 2017). The few studies on memory for future thinking developed during the lockdown or in the darkest hours of COVID-19, also show a preference for the positive in production tasks (Aizpurua et al., 2021; Lalla & Sheldon, 2021). For example, Aizpurua et al. (2021) presented positive and negative statements extracted from the press and social networks about the future linked to COVID-19. They observed a better recall of positive content and a tendency to modify the valence of negative content, making it more neutral or more positive; a positivity bias that was accentuated with increasing age.

It is very relevant to note that, as in recent studies on collective future thinking and memory that take into account not only the personal but also the social dimension of thinking, this positivity bias was limited to personal content, whereas negative future thoughts were of a collective nature (Shrikanth et al., 2018; Shrikanth & Szpunar, 2021). This negativity bias for collective future thinking might show the uncertainty about the future at a global level, the concern for health, and the limitations that the pandemic's expansion were generating in daily life. It also suggests that as thinking moves further away from the individual's personal dimension, as in the case of public versus private past events (Shrikanth & Szpunar, 2021) and global versus national future events (Oner et al., 2022), we tend—to a greater extent—to generate and recall negative future thoughts.

However, although there was general restlessness regarding our personal future and that of our loved ones, the mind was observed to travel toward a positive personal future. Even the few errors of recall in Experiment 1 and the transformation from negative to positive cues observed in the production and recall in Experiment 2 reveal this

effect of positivity bias. The nostalgia for pleasant activities of the near past (Faul & De Brigard, 2022), the conviction that negative events do not affect us or our relatives—showing an unjustified optimism (Salgado & Berntsen, 2021; Weinstein, 1980)—, or the need to think positively to improve mood and the feeling of well-being (Barsics et al., 2016), could potentially explain this positivity bias for personal future thoughts.

Future research is needed to continue advancing our knowledge about these positivity and negativity biases and deepening its theoretical and applied implications. For example, it was observed that inhibitory processes blocking access to negative content could be an effective tool to improve mood and reduce symptoms of depression, stress, and anxiety (e.g., Hallford et al., 2020; Ji et al., 2020; Sacchet et al., 2017). Thus, working on positive future thoughts, helping to capture the good side of things, even in times of uncertainty, can be an effective tool to improve mood and enhance well-being. In addition, increasing the level of support for recovery through cues that reduce self-initiated processing improves recall (Richardson-Klavehn & Bjork, 1988), making the access to positive thoughts and future plans faster (D'Argembeau & Van der Linden, 2004; Lalla & Sheldon, 2021), and making it more difficult to remember details associated with negative rather than positive or neutral future simulations (Szpunar et al., 2012). All these aspects of episodic future thinking should be more elaborately analyzed in the future.

The present study has some limitations, such as, for example, the low experimental control due to having carried out the experiments online and the very short delay between production and recall tests, so future studies could look at longer delays (e.g., 24 or 48 h). An additional limitation is that, although data on levels of psychological symptoms during the pandemic are available (Carstensen et al., 2020; Killgore et al., 2020; Odriozola-Gonzalez et al., 2020; Vindegaard & Benros, 2020), we lack clinical measures of our participants' mental health status. For this study, we considered that administering depression, stress, or anxiety tests before the production and recall phases could bias participants' selection of future thoughts, and administering the tests at the end could mediate the results by the contents already produced and recalled. In short, the findings of the present study show that, even in difficult times, without being able to go outside and being isolated, people envision their personal future positively but their collective future negatively. In this line, we provide some ideas about how to use that mental journey as a tool that allows us to improve mood, escape from routine, and perceive with hope that better times are yet to come.

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CONFLICT OF INTEREST STATEMENT

The authors report there are no competing interests to declare.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are openly available in DSpace at <http://hdl.handle.net/10810/59770>.

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ENDNOTES

¹ The participant's age seem to have no significant effect on either production, recall, or on the emotional aspects of production or recall.

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