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# Reduced specificity and enhanced subjective experience of future thinking in ageing: the influence of avoidance and emotion-regulation strategies

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## ABSTRACT

Future thinking in older adults is characterised by a lack of specificity of imagined events and by an equal or even higher subjective experience, compared to younger adults. We considered whether this lack of specificity stemmed partly from the avoidance of a somewhat disturbing future and then examined the extent to which certain types of emotion-regulation strategies, namely positive reappraisal and positive refocusing, contributed to the subjective experience of future thinking. Middle-aged and older adults completed an adapted version of the AMT, in which temporal distance and cue word valence were manipulated, thus resulting in future conditions assumed to represent varying degrees of discomfort. Results indicate that distant future and negative cues restricted both the specificity and the subjective experience of future thinking. In addition, the use of avoidance strategies predicted the nature of future thoughts in the context of a supposed uncomfortable future (i.e., a distant future induced by negative cues), although it followed quite different age-related patterns. Together with the findings that positive reappraisal and positive refocusing (to a lesser extent) contributed to the subjective experience of future thinking, this study indicates that how individuals imagine their personal future also relies on affect- and emotion-regulation strategies.

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## KEYWORDS


Future thinking; avoidance; emotion regulation; middle-aged and older adults

Projecting oneself into the future by mentally pre-experiencing scenarios that are likely to occur in the near or distant future is a highly evolved adaptive function (Miloyan & Suddendorf, 2015; Tulving, 2005). This ability is strongly linked to the capacity to recall memories (for a review, see Klein, 2013). Among the numerous similarities between these two kinds of mental time travel is the way they are affected by ageing (for a review, see Schacter, Gaesser, & Addis, 2012). In particular, older adults exhibit difficulties generating specific future events (i.e., unique events, precisely located in time and lasting no more than a day, such as “going to the theatre tomorrow evening”; cf. Williams et al., 1996). Concurrently with this age-related lack of specificity (e.g., Abram, Picard, Navarro, & Piolino, 2014; Gallo, Korthauer, McDonough, Teshale, & Johnson, 2011), older adults, as compared to younger ones, rate their representations of future events as associated with an equal or even stronger subjective experience (e.g., De Brigard et al., 2016; Johnson, Kuhl, Mitchell, Ankudowich, & Durbin, 2015). The present study was designed to investigate whether affective factors account for this age-related pattern of future thinking by addressing, first, the lack of specificity, and second, the subjective experience of future thinking.

Several cognitive factors have been identified as contributing to the age-related weakening in future thinking, including executive functions, working memory and visuospatial processing (Cole, Morrison, & Conway, 2013; Zavagnin, De Beni, Borella, & Carretti, 2015). These factors may, at least partly, account for elderly people’s reduced ability to extract stored information from episodic memory and recombine it into future mental representations (Schacter & Addis, 2007).

In addition to these cognitive factors, studies conducted in both clinical and non-clinical samples have shown that other individual differences, and particularly proneness to avoidance, induce a reduced specificity of remembered memories (e.g., Debeer et al., 2012; Debeer, Raes, Williams, & Hermans, 2011; Geraerts, Ditschel, Kreplin, Miyagawa, & Waddington, 2012; Hauer, Wessel, & Merckelbach, 2006; Hermans, Defranc, Raes, Williams, & Eelen, 2005; Raes, Hermans, de Decker, Eelen, & Williams, 2003; Raes, Hermans, Williams, & Eelen, 2006). One account of this reduced specificity is the *affect regulation hypothesis* (Williams, 1996; see Williams et al., 2007), which proposes that, by adopting a less specific memory retrieval style, one might escape the affective and emotional effect of memories and that the search for specific events in

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memory is aborted to avoid harmful consequences (Williams, 1996). Hence, this hypothesis posits that reduced memory specificity serves an avoidance function (Hermans et al., 2008; Raes et al., 2003; Raes et al., 2006; Williams, 1996). Although a few studies have shown that this hypothesis also applies to the imagination of future events, particularly in repressors, who are assumed to avoid, ignore or dismiss strong emotions and exhibit a lack of specificity of imagined events (Dickson & Bates, 2005; Dickson, Moberly, Hannon, & Bates, 2009), the question has not yet been raised as to whether the functional avoidance hypothesis also applies to the imagination of future events in older adults, and more specifically whether the lack of specificity of their future representations stems partly from a strategy to avoid certain disturbing events that may await them in their personal future.

In fact, inviting older adults to project themselves into their personal future is far from trivial. The progression through life is associated with a narrowing of one's time perspective, that is, one's sense of future time remaining to live is reduced (Carstensen, Isaacowitz, & Charles, 1999; Lang & Carstensen, 2002). In addition, the preferred focus is on the past rather than the future, as the latter has less positive implications (Webster & Ma, 2013). Moreover, the limited time perspective in elderly people is commonly described as including a higher likelihood of negative events (e.g., Bohn, 2010; Lazarus & DeLongis, 1983). When young and older adults list the most important events in the normal life course and the expected timing of these events, both generations agree that negative events (e.g., one's own death, the partner's death or serious disease) are more likely to occur in old age, whereas positive events (e.g., having a child or getting married) are more likely to occur in early adulthood (Bohn, 2010). Therefore, inviting older adults to think about their distant personal future not only requires them to consider the limits of their future perspective but might also confront them with a series of inescapable and threatening situations. One might therefore wonder whether older adults tend to avoid projecting themselves into their personal future when they are asked to in experimental settings and whether this avoidance of future scenarios accounts for the loss of specificity discussed above. Addressing these issues constituted the first aim of this study.

The second objective was to investigate the possibility that certain emotion-regulation strategies account for the subjective experience of future thinking. Older adults' memories and prospectations have been shown to be rated as more personally significant and emotionally intense (Abram et al., 2014; Addis, Wong, & Schacter, 2008; Rubin & Berntsen, 2009; Schlagman, Schulz, & Kvavilashvili, 2006) and more vivid (e.g., Cole et al., 2013; Comblain, D'Argembeau, & Van der Linden, 2005; Gallo et al., 2011; Janssen, Rubin, & St. Jacques, 2011; McDonough & Gallo, 2013; Rubin & Berntsen, 2009) than younger adults'

memories and prospectations. To explain this age-related difference in the subjective experience of mental time travel, it has been proposed that young adults rate the vividness of their experiences by focusing on visual information, whereas older adults are more prone to base their ratings on the emotional value of the events than on their episodic attributes (Johnson et al., 2015). This tendency to rely on the emotional value of the events may result in older adults rating many attributes of their future thoughts higher, especially as meaningful events have been shown to be associated with a greater feeling of pre-experiencing (D'Argembeau & Van der Linden, 2012). We argue that basing the subjective rating on the emotional value of an event requires older adults to appraise personal events more favourably than younger adults by applying some emotion-regulation strategies.

The idea that emotion regulation influences the subjective experience of past and future thinking is not new but it has never been studied in the context of ageing. Indeed, in young adults, individual differences in emotion regulation have been shown to influence the subjective experience accompanying mental time travel; for instance, the use of expressive suppression leads to a reduced subjective experience (D'Argembeau & Van der Linden, 2006; Richards & Gross, 2000). In older adults, it has only been shown that past experiences were reappraised in a positive light (Comblain et al., 2005; Schryer & Ross, 2014). Since it is known that positive future events contain more sensory details and are associated with clearer representations of contextual details and stronger feelings of pre-experiencing (D'Argembeau & Van der Linden, 2004; Painter & Kring, 2015; Rasmussen & Berntsen, 2013; De Vito, Neroni, Gamboz, Della Sala, & Brandimonte, 2015), one could assume that the higher subjective experience in older adults may be related to their positive enhancement of future events. We shall therefore investigate whether positive reappraisal (i.e., revisiting emotional responses by reassessing the meaning of the stimulus as valuable or beneficial) and positive refocusing (i.e., replacing negative emotions with positive and pleasant ones) – both of which strategies are used more easily by older adults (Lohani & Isaacowitz, 2014; Nowlan, Wuthrich, & Rapee, 2015; Phillips, Henry, Hosie, & Milne, 2008; Shiota & Levenson, 2009) – contribute to the stronger subjective feelings associated with prospectation in older adults.

Thus, this study seeks, first, to investigate the pattern of future thinking using a modified version of the autobiographical memory task (AMT; Williams et al., 1996) in middle-aged and older adults, with both the temporal distance and the emotional valence of cue words being manipulated. Cue words with emotional valence have been shown to enhance access to memories and prospectations with a similar emotional valence (Gallo et al., 2011; Young, Erickson, & Drevets, 2012). In addition, the use of the fairly distant future (i.e., 5 years from the present) was expected to confront older adults with the limits of their future perspective. Manipulating both the valence

and the temporal distance allowed us to generate future conditions presenting varying degrees of discomfort. Thus, the most uncomfortable future condition was assumed to correspond to a distant future induced by negative cue words, and this stressful condition was expected to enhance the use of avoidance strategies, particularly in older adults.

Proneness to avoidance was assessed with two questionnaires, the Acceptance and Action Questionnaire (AAQ-II; Bond et al., 2011) and the Questionnaire d'Évitement Cognitif (CAQ; Gosselin et al., 2002) in order to examine whether the reduced specificity of future thinking was related to particular types of avoidance strategies. It has been shown that, in healthy participants, less specific autobiographical memories correlate with a variety of thoughts, feelings and even situation avoidance strategies (Hermans et al., 2005). The AAQ-II is a measure of experiential avoidance, which refers to the general tendency of individuals to feel uncomfortable and enmeshed in their own internal experiences, and which has previously been used in studies investigating the relationship between avoidance and less specific memories (Hermans et al., 2005; Kashdan, Breen, Afram, & Terhar, 2010; Raes, Williams, & Hermans, 2009; Spinhoven, Bamelis, Molendijk, Haringsma, & Arntz, 2009). On the other hand, the CAQ, which has also been shown to be correlated with reduced memory specificity in clinical and non-clinical samples (Gandolphe, Nandrino, Hancart, & Vosgien, 2013), assesses the extent to which individuals resort to cognitive strategies to escape disturbing experiences.

We hypothesised that older adults would provide less specific, more general future events and more omission-type responses (i.e., failure to respond or responses consisting in semantic associates that neither refer to an event nor are future-oriented). Applying the functional avoidance hypothesis regarding memories to the imagination of future events, we expected that the participants who produced less specific responses would have a higher propensity to be avoidant in a particularly uncomfortable condition (i.e., thinking of a distant future induced by negative cue words). We also hypothesised that, in this particular condition, the more avoidant older participants would attempt not to project themselves into the future and would thus produce more omission-type responses.

The second objective of this study was to investigate the contribution of positive refocusing and positive reappraisal to the ratings for subjective experience of imagined future events. Following the imagination of future events in the modified AMT, participants were invited to rate the characteristics of their subjective experience (i.e., emotion, visual details, vividness, importance, and feeling of experiencing), and individual differences in the use of positive refocusing and positive reappraisal were assessed. We expected older adults to report higher ratings for most phenomenal qualities and hypothesised that positive reappraisal and positive refocusing would contribute to the age-related differences in the subjective qualities of

future events. In other words, we expected that the participants who were most inclined to use these two emotion-regulation strategies would give higher ratings to the phenomenological qualities of their future representations.

Finally, the sample in the present study consisted of middle-aged and older adults, contrasting with the vast majority of previous studies on future thinking in ageing, which usually compared older adults to young adults (generally aged between 18 and 30). Yet, most events deemed to be important and “central to the life story” occur in early adulthood, that is, between the ages of 15 and 30 (e.g., Berntsen & Rubin, 2002, 2004; Bohn, 2010). These highly positive events may therefore be the ones young adults are most likely to imagine when they are prompted to project themselves into their personal future, whereas middle-aged adults may be more likely to have already experienced these events. The use of middle-aged rather than young adults as a control group was intended to overcome this plausible bias toward generating highly positive events in the future while still allowing us to preserve the difference in future temporal perspectives between middle-aged and older adults.

## Method

### Participants

The sample consisted of 51 middle-aged adults (26 females; ranging from 35 to 45 years,  $M = 39.5$ ,  $SD = 3.5$ ) and 49 older adults (26 females; ranging from 65 to 75 years,  $M = 69.4$ ,  $SD = 2.8$ ) from France and Switzerland, who were contacted by convenience sampling at community/associative centres and at various workplaces. Two older adults were excluded from the data analysis because their number of omission responses in the Specificity Thinking Task exceeded the mean of their group by more than 2 SD. The middle-aged adults were active in the workforce, whereas the older adults were retired but actively involved at least twice a week in various social activities (e.g., volunteering). Middle-aged and older adults were matched for education (i.e., number of years in school since the age of six;  $M = 16.4$  years,  $SD = 2.3$ , and  $M = 15.9$  years,  $SD = 2.4$ , respectively;  $t(99) = 1.02$ ,  $p = .31$ ). None of the participants reported any significant neurological or psychological disorder or the use of psychotropic medication. They received no compensation for their participation. This study was approved by the Ethics Committee of the University of Geneva.

### Materials

*Specificity Thinking Task* (adapted from the AMT; Williams et al., 1996):

This task assesses the ability to elaborate future events in a specific way. In response to a series of 20 cue words written on cards that were presented one at a time, participants were given 60 seconds per cue word to imagine and

orally describe specific events that could reasonably happen to them in the close (i.e., 1 year) and the distant future (i.e., 5 years), depending on the condition (i.e., “Try to imagine and describe a specific future event that might happen to you in the next year [or in 5 years], relating to the word *stairs*”). Two sets (A and B) of 10 cue words each were built from Bonin et al.’s (2003) set such that the two sets were matched for imageability, frequency of use, concreteness, and length (confirmed by *t*-tests, all *ps* > .50). Each set consisted of five positive and five negative words (positive and negative cues differed significantly in emotional valence,  $F(1,20) = 965.49$ ,  $p < .001$ ,  $\eta_p^2 = .99$ ). There was no significant difference between the mean valence of positive cue words in sets A and B, nor between the mean valence of negative cue words in sets A and B,  $F(1,20) = 0.01$ ,  $p = .92$ ,  $\eta_p^2 = .01$  (for further details, see Table A in the Supplemental Material). Four pseudo-random presentation orders of cue words were generated and the assignment of sets A and B to the close or distant future condition was counterbalanced, as was the order of completion of the two conditions. Some examples were provided to illustrate what would or would not be considered as a specific event, and one or two practice trials (in case of failure in the first trial) were performed with neutral cue words (i.e., *stairs* and *tap*). Only during the trial phase were the participants prompted a second time to imagine a specific event if their first response was not specific (e.g., “Can you think of a specific episode?”). Participants were reminded of the instructions twice, after the presentation of five cue words in each condition.

Immediately after describing each generated event, participants filled in a questionnaire using 7-point Likert scales to assess the subjective attributes of their mental representation. More specifically, these scales measured the emotional valence (from  $-3 = \text{negative}$  to  $+3 = \text{positive}$ ), amount of visual details (from  $1 = \text{none}$  to  $7 = \text{a lot}$ ), and personal importance (from  $1 = \text{not at all}$  to  $7 = \text{completely}$ ) of the imagined event, its vividness (from  $1 = \text{not at all}$  to  $7 = \text{completely}$ ), and the associated feeling of pre-experiencing ( $1 = \text{not at all}$  to  $7 = \text{completely}$ ). We distinguished between vividness and the feeling of experiencing the future since it has been shown that one can vividly imagine fictitious events without necessarily having the sensation of pre-experiencing them (i.e., imagine what it would be like to experience a particular future situation, picturing the characters, setting, etc.) (D’Argembeau & Van der Linden, 2012; De Vito, Gamboz, & Brandimonte, 2012). The ratings for visual details and vividness were averaged to create a Perceptual Index (Cronbach’s alpha estimate reliability was high at .79).

*Acceptance and Action Questionnaire* (AAQ-II; Bond et al., 2011; French version by Monestès, Villatte, Mouras, Loas, & Bond, 2009):

The AAQ-II is a one-dimensional 10-item questionnaire designed to measure experiential avoidance and acceptance. According to Hayes, Wilson, Gifford, Follette, and Strosahl (1996, p. 1154), experiential avoidance is

the phenomenon that occurs when a person is unwilling to remain in contact with particular private experiences (i.e., bodily sensations, emotions, thoughts, memories, behavioural predispositions) and takes steps to alter the form or frequency of these experiences or the contexts that occasion them (a sample item indicating avoidance is I worry about not being able to control my worries and feelings).

In contrast, acceptance refers to the ability to cope with private events, especially ones with negative connotations (a sample item indicating acceptance is “It’s OK if I remember something unpleasant”). Participants indicate the extent to which each statement applies to them on a 7-point Likert scale (from  $1 = \text{never true}$  to  $7 = \text{always true}$ ). For improved readability, we inverted the scoring, such that higher scores indicate higher experiential avoidance. In the present study, the Cronbach’s alpha was .67.

*Cognitive Avoidance Questionnaire* (CAQ; Gosselin et al., 2002; English validation by Sexton & Dugas, 2008):

The CAQ is a 25-item questionnaire assessing people’s proneness to resort to five types of cognitive avoidance strategies. In this study, we were particularly interested in the Avoidance of Threatening Stimuli subscale (Cronbach’s  $\alpha = .84$ ), which assesses proneness to avoid stimuli likely to trigger unpleasant thoughts and comprises statements such as “I avoid people who make me think about things that I do not want to think about” and “Sometimes I avoid places that make me think about things I would prefer not to think about”. Participants indicate the extent to which each statement seems true of them on a 5-point Likert scale (from  $1 = \text{not at all typical}$  to  $5 = \text{completely typical}$ ). The higher the score, the more avoidant the participant is.

*Cognitive Evaluation Regulation Questionnaire* (CERQ; Garnefski, Kraaij, & Spinhoven, 2001; French adaptation by Jermann, Van der Linden, d’Acremont, & Zermatten, 2006)

The CERQ is a 36-item questionnaire designed to assess the use of nine different types of emotion-regulation strategies, both maladaptive (self-blame, rumination, catastrophizing and blaming others) and adaptive (acceptance, positive refocusing, focusing on planning, positive reappraisal and putting into perspective). We were particularly interested in two adaptive emotion-regulation strategies: *positive refocusing* (i.e., positive and pleasant thoughts replace the original thought about an event; e.g., “I think of nicer things than what I have experienced”; Cronbach’s  $\alpha = .83$ ) and *positive reappraisal* (i.e., thoughts focusing on the purpose of an event and making positive sense of what happened; e.g., “I think I can learn something from the situation”; Cronbach’s  $\alpha = .78$ ). Participants indicate on a 5-point Likert scale (from  $1 = \text{almost never}$  to  $5 = \text{almost always}$ ) the extent to which each statement applies to the way they usually deal with negative events.

*Centre for Epidemiologic Studies Depression Scale* (CES-D; Radloff, 1977; French version by Führer & Rouillon, 1989):

The CES-D is a 20-item questionnaire measuring depressive symptomatology. The scale assesses symptoms



associated with depression and more particularly “depressed mood, feelings of guilt and worthlessness, feelings of helplessness and hopelessness, psychomotor retardation, loss of appetite and sleep disturbances” (Radloff, 1977, p. 386). Participants indicate the frequency at which they experienced some of these symptoms during the last week, on a 4-point Likert scale (from 0 = *never, very rarely* to 3 = *frequently, all the time*). The highest score indicates the presence of severe depressive symptomatology (Cronbach’s  $\alpha = .66$ ).

We also examined the extent to which avoidance (AAQ-II and CAQ) and emotion-regulation measures (positive reappraisal and positive refocusing of the CERQ) tapped into related or independent constructs. Measures of avoidance (AAQ-II\* CAQ,  $r = .41$ ,  $p < .001$ ) were correlated, indicating that both measures tapped into the same construct despite a certain degree of independence, probably because these measures evaluate two different types of avoidance. The significant correlation between positive reappraisal and positive refocusing ( $r = .35$ ,  $p < .001$ ) also indicates that both emotion-regulation strategies tapped into the same construct, with a degree of independence. In addition, experiential avoidance was negatively correlated with positive reappraisal (AAQ-II\* positive reappraisal,  $r = -.29$ ,  $p < .01$ ), indicating that the measures of avoidance and emotion-regulation strategies may evaluate two different ways of regulating emotions, one of which is considered “passive” (avoiding, disengaging) and the other “active” (confrontation, reappraisal).

### **Coding of the responses to the specificity thinking task**

The participants’ responses to the Specificity Thinking Task were classified into three categories, *specific*, *non-specific* and *omission*, which are described below. The first two response categories referred to potential future events, while events that were not future-oriented were classified as omissions. Responses referring to temporal windows that did not match those specified in the task (i.e., 1 year or 5 years) or referring to past events were discarded.

The *specific category* comprised future events meeting the criteria of specificity developed by Williams et al. (1996) (i.e., events that might happen at a particular time and place and last no longer than a day; e.g., “A year from now, I would like to go to the ‘Papillorama’ exhibition with my grandson, and I picture us lying on the grass, looking at the butterflies flying above our heads on a warm afternoon”).

The *non-specific category* encompassed future events lasting more than a day (e.g., “I picture myself going back to Martinique for a few weeks with my family”), series of repeated events (e.g., “Five years from now, I think I will allow myself to eat biscuits every now and then; that’s my own little sin”), or abstract future thoughts (e.g., “Five years from now, I would like my emotional wound to be completely healed”).

The *omission category* included, first, failure to produce an answer at all, and second, responses consisting in semantic associates of the cue word that neither referred to an event nor were future-oriented (e.g., “The first word that comes to my mind is *dog*”). Although in earlier studies conducted in non-clinical samples, responses consisting in omissions and semantic associates were usually classified as “non-specific” (e.g., Raes et al., 2003; Raes et al., 2006; but see also Raes, Hermans, Williams, & Eelen, 2007), we considered that participants, particularly older adults, might avoid facing threatening future events by making omission-type responses. Moreover, given the significant difference in the proportion of omission-type responses represented in our age groups (five times as high in older as in middle-aged adults; see Table 2), the choice was made to group them in a separate category.

The number of discarded responses (i.e., thoughts that did not correspond to the temporal windows or temporal direction) varied across participants; in order to assess individuals’ proneness to be specific (or non-specific), we computed ratios of specific and non-specific responses over the total number of responses (excluding discarded responses) according to the formulas below:

Ratio of specific responses =

$$\frac{\text{Number of specific responses}}{\text{Number of cue words} - \text{Number of discarded responses}},$$

Ratio of non - specific responses =

$$\frac{\text{Number of non - specific responses}}{\text{Number of cue words} - \text{Number of discarded responses}},$$

Ratio of omissions =

$$\frac{\text{Number of omissions}}{\text{Number of cue words} - \text{Number of discarded responses}}.$$

The responses were classified by the first author and a random selection of 20% of the responses was scored by an independent trained rater, revealing good inter-rater reliability ( $K = .89$  and agreement = 94%).

## **Results**

### **Characteristics of responses on the Specificity Thinking Task**

Overall, participants provided a total of 2000 responses, of which 49 (2.45%) were discarded, since they referred to past events or to future temporal windows that did not match those specified in the instructions (i.e., 1 year or 5 years). Of the remaining 1951 responses, 64% described specific events, 30% non-specific events, and 6% were omissions (see upper section of Table 1 for descriptive data). Within the category of non-specific responses, 49% corresponded to abstract future thoughts, 37% described extended series of events and 14% were categorical. Within the category of omissions, 59% corresponded to an absence of response and 41% were semantic associates.

**Table 1.** Characteristics of responses to the specificity thinking task and mean ratings for phenomenal characteristics.

	Middle-aged adults (N = 51)		Older adults (N = 49)		t-Value
	M	SD	M	SD	
<i>Objective measures (%)</i>					
Specific responses	74%	(18)	52%	(21)	5.33***
Non-specific responses	23%	(17)	37%	(18)	3.92***
Omission-type responses	2%	(5)	11%	(11)	4.37***
<i>Mean ratings</i>					
Emotion	0.79	(0.55)	0.71	(0.66)	0.66
Perceptual Index	4.75	(0.79)	4.96	(0.95)	1.23
Feeling of experiencing	4.56	(0.93)	4.89	(1.15)	1.56
Importance	3.85	(0.81)	4.21	(0.96)	2.04*

\*\*\* $p < .001$ ; \*\* $p < .01$ ; \* $p < .05$ .

### Questionnaire results

In order to examine the effects of gender on measures of emotion regulation, avoidance and depressive symptomatology, as well as the possible interactions between gender and age on these measures, we conducted a series of two-way analysis of variances (ANOVAs) with age (older vs. middle-aged) and gender (male vs. female) as independent variables and scores for cognitive avoidance (avoidance of threatening stimuli subscale of the CAQ), experiential avoidance (AAQ-II), emotion-regulation strategies (positive refocusing and positive reappraisal) and depressive symptomatology (CES-D).

For *experiential avoidance* (AAQ-II), a main effect of age was identified,  $F(1, 96) = 6.34$ ,  $p < .05$ ,  $\eta_p^2 = .06$ , with older adults scoring higher than middle-aged adults; there was also a main effect of gender,  $F(1, 96) = 9.8$ ,  $p < .01$ ,  $\eta_p^2 = .09$ , with women scoring higher than men; but no significant interaction between age and gender,  $F(1, 96) = 2.70$ ,  $p = .11$ ,  $\eta_p^2 = .03$ .

For *cognitive avoidance* (CAQ), there was no significant main effect of age,  $F(1, 96) = 0.62$ ,  $p = .43$ ,  $\eta_p^2 = .006$ , but there was a significant effect of gender,  $F(1, 96) = 4.43$ ,  $p < .05$ ,  $\eta_p^2 = .04$ , with women displaying higher scores than men; there was no significant interaction between age and gender,  $F(1, 96) = 0.06$ ,  $p = .81$ ,  $\eta_p^2 = .001$ .

For *positive reappraisal* (CERQ), there was no significant effect of either age,  $F(1, 96) = 0.26$ ,  $p = .61$ ,  $\eta_p^2 = .003$ , or gender,  $F(1, 96) = 0.58$ ,  $p = .45$ ,  $\eta_p^2 = .006$ , nor was there any significant interaction between age and gender,  $F(1, 96) = 0.33$ ,  $p = .57$ ,  $\eta_p^2 = .003$ .

For *positive refocusing* (CERQ), there was no significant main effect of age,  $F(1, 96) = 0.55$ ,  $p = .46$ ,  $\eta_p^2 = .006$ , but

there was a significant main effect of gender,  $F(1, 96) = 7.10$ ,  $p < .01$ ,  $\eta_p^2 = .07$ , with women reporting more frequent use of positive refocusing than men; there was no significant interaction between age and gender,  $F(1, 96) = 0.12$ ,  $p = .73$ ,  $\eta_p^2 = .001$ .

For *depressive symptomatology* (CES-D), there was no significant main effect of age,  $F(1, 96) = 2.07$ ,  $p = .15$ ,  $\eta_p^2 = .02$ , or gender,  $F(1, 96) = 1.37$ ,  $p = .25$ ,  $\eta_p^2 = .01$ , nor was there an interaction between age and gender,  $F(1, 96) = 0.05$ ,  $p = .82$ ,  $\eta_p^2 = .001$ .

### Age-related patterns of future thinking according to cue word valence and temporal distance

To examine the effects of age, valence and temporal distance on both objective (i.e., types of events: specific, non-specific, omission-type response) and subjective (i.e., self-ratings) measures of future-oriented thoughts, several 2 (age: middle-aged vs. older adults)  $\times$  2 (valence: positive vs. negative)  $\times$  2 (temporal distance: 1 year vs. 5 years) ANOVAs with repeated measures on the last two factors were conducted. The distribution of specific, non-specific and omission-type responses within each temporal distance  $\times$  cue word valence condition is presented in Table 2. In the following analysis, we report the significant and marginally significant interactions ( $p$ -values considered marginally significant when  $0.05 < p < .10$ ). (See Table B in the Supplemental Material for further results of the two-way and three-way interactions.)

### Objective measures of responses

#### Specific responses

We observed main effects only of age,  $F(1, 98) = 28.85$ ,  $p < .001$ ,  $\eta_p^2 = .23$ , as older adults provided less specific responses than middle-aged adults; valence,  $F(1, 98) = 16.13$ ,  $p < .001$ ,  $\eta_p^2 = .14$ , with participants providing more specific events in response to positive cue words; and temporal distance,  $F(1, 98) = 23.48$ ,  $p < .001$ ,  $\eta_p^2 = .19$ , with participants providing more specific responses for the close than the distant future.

#### Non-specific responses

The analysis revealed main effects only of age,  $F(1, 98) = 15.53$ ,  $p < .001$ ,  $\eta_p^2 = .14$ , as older adults provided more non-specific responses than middle-aged adults; valence,

**Table 2.** Types of responses within each temporal distance  $\times$  cue word valence condition, in middle-aged and older adults (distribution).

	Specific responses				Non-specific responses				Omission-type responses			
	Middle-aged adults		Older adults		Middle-aged adults		Older adults		Middle-aged adults		Older adults	
	M (%)	SD	M (%)	SD	M (%)	SD	M (%)	SD	M (%)	SD	M (%)	SD
Distant future – negative cue words	65	28	47	30	31	28	42	29	4	11	11	16
Distant future – positive cue words	75	26	48	27	23	25	43	25	2	7	9	16
Close future – negative cue words	73	20	54	25	23	18	37	23	4	8	9	14
Close future – positive cue words	84	20	64	27	16	19	28	26	0	4	8	16

$F(1, 98) = 10.01, p < .01, \eta_p^2 = .09$ , with participants providing more non-specific events in response to negative cue words; and temporal distance,  $F(1, 98) = 16.34, p < .001, \eta_p^2 = .14$ , with participants providing more non-specific responses for the distant than the close future.

### Omissions

The ANOVA showed a main effect only of age,  $F(1, 98) = 19.37, p < .001, \eta_p^2 = .17$ ; and a marginal effect of valence,  $F(1, 98) = 3.72, p = .06, \eta_p^2 = .04$ . Older adults produced more omission responses than middle-aged adults, and participants in both age groups tended to make more omission responses when cue words were negative.

## Subjective measures of responses

### Emotion

The ratings for emotion were affected by valence,  $F(1, 98) = 553.62, p < .001, \eta_p^2 = .85$ , as representations of future events produced in response to positive cue words were rated as more positive than in response to negative cue words. A marginal effect of temporal distance was also observed,  $F(1, 98) = 3.44, p = .07, \eta_p^2 = .03$ , with events represented 1 year from the present being rated as more positive than events represented 5 years in the future.

### Perceptual Index

The ratings for sensory-perceptual details were affected only by valence,  $F(1, 98) = 157.23, p < .001, \eta_p^2 = .62$ , indicating that representations of future events mentioned in response to positive cue words were rated as more vivid and associated with more visual details than representations of future events provided in response to negative cue words.

### Feeling of pre-experiencing

For the feeling of pre-experiencing the events, there was a main effect only of valence,  $F(1, 98) = 107.34, p < .001, \eta_p^2 = .52$ . These results indicate that representations of future

events mentioned in response to positive cue words were associated with a stronger feeling of pre-experiencing than representations of future events provided in response to negative cue words.

### Importance

Finally, the ANOVA conducted on the ratings of importance of future events indicated main effects of age,  $F(1, 98) = 3.94, p < .05, \eta_p^2 = .04$ ; and valence,  $F(1, 98) = 143.57, p < .001, \eta_p^2 = .59$ ; and a significant interaction between valence and age,  $F(1, 98) = 3.99, p < .05, \eta_p^2 = .04$ . Participants rated future events provided in response to positive cue words as more important than events described in response to negative cue words. Tukey post hoc tests revealed that older adults rated future events to be more important than middle-aged adults did, and age-related differences in the ratings for importance were greater for future events described in response to negative cue words.

## Relations between proneness to avoidance and the nature of future-oriented thoughts

The correlations between individual differences in experiential avoidance (AAQ-II), cognitive avoidance (the avoidance subtest of the CAQ) and the nature of responses (i.e., ratios of specific, non-specific and omission responses), with depressive symptomatology (CES-D) computed as a covariate, are reported in Table 3, along with their 95% confidence interval (CI). Correlations were applied separately to each age group. The analyses of correlations were conducted on responses induced by both positive and negative cue words and compared for the two temporal windows (i.e., close vs. distant future) (see Table 3).

Correlation analyses conducted on responses induced by positive cue words did not reveal any significant relationship with measures of avoidance.

In the distant future condition, the ratio of specific events induced by negative cue words was negatively

**Table 3.** Correlations between measures of avoidance and the nature of responses (ratios) induced by negative and positive cue words at both temporal distances, controlling for depressive symptomatology.

	AAQ-II				CAQ			
Nature of thoughts	Middle-aged adults		Older adults		Middle-aged adults		Older adults	
<i>Negative cue words</i>								
Specific – 5 years	–0.29*	(–0.56, 0.02)	–0.00	(–0.29, 0.29)	–0.18	(–0.45, 0.10)	–0.11	(–0.40, 0.17)
Non-specific – 5 years	0.23	(–0.04, 0.51)	–0.12	(–0.41, 0.16)	0.19	(–0.08, 0.47)	–0.05	(–0.34, 0.24)
Omissions – 5 years	0.15	(–0.13, 0.42)	0.23	(–0.05, 0.51)	–0.04	(–0.33, 0.23)	0.32*	(0.05, 0.59)
Specific – 1 year	–0.20	(–0.53, 0.01)	0.02	(–0.27, 0.31)	–0.12	(–0.39, 0.17)	0.15	(–0.14, 0.43)
Non-specific – 1 year	0.15	(–0.12, 0.43)	–0.14	(–0.42, 0.15)	0.10	(–0.19, 0.37)	–0.13	(–0.42, 0.15)
Omissions – 1 year	0.20	(0.06, 0.59)	0.19	(–0.09, 0.47)	0.07	(–0.21, 0.35)	–0.04	(–0.33, 0.24)
<i>Positive cue words</i>								
Specific – 5 years	–0.07	(–0.35, 0.21)	–0.01	(–0.29, 0.28)	–0.09	(–0.37, 0.19)	0.01	(–0.27, 0.30)
Non-specific – 5 years	0.03	(–0.25, 0.31)	–0.09	(–0.38, 0.20)	0.08	(–0.20, 0.36)	0.02	(–0.27, 0.30)
Omissions – 5 years	0.16	(–0.12, 0.44)	0.14	(–0.14, 0.43)	0.07	(–0.21, 0.35)	–0.05	(–0.33, 0.24)
Specific – 1 year	0.11	(–0.16, 0.39)	0.09	(–0.19, 0.38)	–0.12	(–0.40, 0.16)	0.13	(–0.16, 0.41)
Non-specific – 1 year	–0.07	(–0.35, 0.28)	–0.23	(–0.51, 0.05)	0.08	(–0.20, 0.36)	–0.16	(–0.44, 0.13)
Omissions – 1 year	–0.20	(–0.48, 0.07)	–0.21	(–0.06, 0.49)	0.19	(–0.09, 0.46)	0.05	(–0.24, 0.33)

Note: 95% confidence intervals are shown in parentheses. \*Correlations significant at  $p < .05$ ; and marginally significant  $p$ -values are in italics. Correlations for this analysis did not pass multiple comparison corrections (False Discovery Rate; Benjamini & Hochberg, 1995), with all lines meeting  $p < .05$  uncorrected.



correlated, in middle-aged participants, with proneness to experiential avoidance (AAQ-II), indicating that the more avoidant middle-aged participants produced less specific descriptions. No significant correlation was found in this distant future  $\times$  negative cue word condition between experiential avoidance and the ratio of specific events in older adults. A Steiger test (which evaluates whether correlation coefficients are significantly different in strength; Steiger, 1980) confirmed that the correlation in middle-aged adults between experiential avoidance and the ratio of specific events differed significantly from the correlation in older adults ( $p = .0075$ ).

In older adults, the ratio of omission-type responses in the distant future induced by negative cue words was positively correlated with the measure of cognitive avoidance (CAQ), whereas no significant correlation between cognitive avoidance and omission-type responses was found in middle-aged adults. A Steiger test confirmed that the correlation observed in older adults differed significantly from the correlation in middle-aged adults ( $p = .033$ ).

To assess the independent contributions of the propensity for experiential and cognitive avoidance (as measured respectively by the AAQ-II and the avoidance subscale of the CAQ) to the nature of future events presented in the distant future  $\times$  negative cue word condition,<sup>1</sup> we conducted a multiple regression analysis with age as a dummy-coded predictor variable (0 for middle-aged adults and 1 for older adults). The other predictor variables, scores on the AAQ-II, the avoidance subscale of the CAQ, and the CES-D, were mean-centred and their interactions with age were examined (see Table D in the Supplemental Material for further results of these regression analyses).

The ratio of specific events provided in the distant future was independently predicted by the participants' age and tended to be predicted by the AAQ-II score in middle-aged people,  $t(95) = 1.86$ ,  $p = .06$ ,  $\beta = -.32$ . The

age  $\times$  AAQ-II interaction,  $t(95) = 1.32$ ,  $p = .19$ ,  $\beta = 0.21$ , indicated that experiential avoidance (AAQ-II) tended to contribute to the ratio of specific events, particularly in middle-aged adults, with a slope of  $\beta = -.11$  for older adults (see Figure 1).

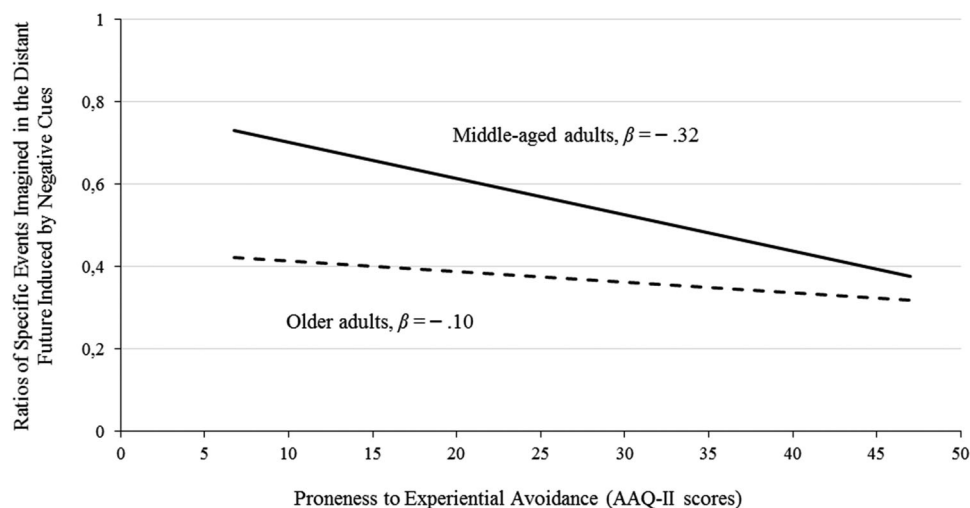
The ratio of omission-type responses in the distant future was independently predicted by the participant's age and by the CAQ score in older adults only, as shown by the significant interaction between age and CAQ,  $t(95) = 2.08$ ,  $p < .05$ ,  $\beta = .28$  (see Figure 2).

### Relations between use of emotion-regulation strategies and subjective experience of future thinking

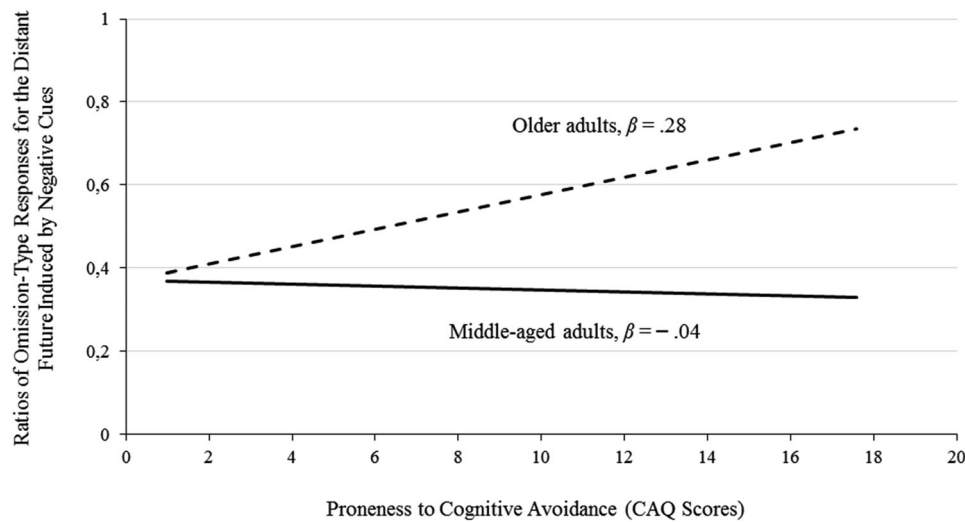
The relationships between the positive refocusing and positive reappraisal strategies (as measured by the CERQ) and the ratings for subjective characteristics of thoughts, with depressive symptomatology (CES-D) computed as a covariate,<sup>2</sup> are reported in Table 4, along with their 95% CI. Correlations were applied separately to each age group.<sup>3</sup>

Positive refocusing was positively correlated, in older adults, with the ratings for the feeling of pre-experiencing the future and importance, and marginally with the ratings for visual details and vividness (i.e., Perceptual Index). Although no significant correlation was identified in middle-aged participants between positive refocusing and the subjective qualities of future events, a Steiger test indicated that the correlations for older adults did not differ significantly from those for middle-aged adults (all  $ps > .19$ ).

Positive reappraisal positively correlated in both middle-aged and older adults with the ratings for the feeling of pre-experiencing the future. Furthermore, positive reappraisal was significantly correlated in middle-



**Figure 1.** Specificity of events imagined in the distant future induced by negative cues, as a function of experiential avoidance, controlling for depressive symptomatology.



**Figure 2.** Ratios of omission-type responses for the distant future induced by negative cues, as a function of cognitive avoidance, controlling for depressive symptomatology.

aged, but only marginally in older adults, with the ratings for visual details and vividness (i.e., Perceptual Index). A Steiger test indicated that the correlations between positive reappraisal and ratings for both visual details and vividness did not differ between age groups (both  $p$ s < .23).

To assess the independent contribution of these emotion-regulation strategies to the subjective experience of imagining future events, we conducted a general linear regression analysis with age as a dummy-coded predictor variable (0 for middle-aged and 1 for older adults). The other predictor variables, namely positive refocusing and positive reappraisal and the CES-D, were centred and the interactions between each one and age were examined (see Table E in the Supplemental Material for further results of these regression analyses).

Positive reappraisal contributed to the ratings for the Perceptual Index in both middle-aged,  $t(95) = 2.68$ ,  $p < .01$ ,  $\beta = .37$ , and older adults, as shown by the absence of interaction between age and positive reappraisal,  $t(95) = 0.32$ ,  $p = .68$ ,  $\beta = -.04$ , with a slope of  $\beta = .33$  for older adults. It also contributed to the feeling of experiencing the future in both middle-aged,  $t(95) = 2.01$ ,  $p < .05$ ,  $\beta = .27$ , and older adults, as revealed by the lack of interaction between age and positive reappraisal,  $t(95) = 0.06$ ,  $p = .85$ ,  $\beta = .03$ , with a slope of  $\beta = .30$  for older adults.

Positive refocusing was not observed to contribute to ratings for subjective qualities in this analysis.

## Discussion

Future thinking in older adults is characterised by a lack of specificity associated with an equal or even higher subjective experience of travelling through time than in young adults. The first objective of this study was to examine the influence of temporal distance and cue word valence on the specificity of imagined future events, in both middle-aged and older adults. Manipulating both the distance and the valence resulted in future conditions of varying degrees of discomfort, allowing for the investigation, secondly, of whether proneness to avoidance could account for the lack of specificity in older adults when they project themselves into a distant future generated in response to negative cue words (since this condition is considered the most likely to induce uncomfortable future thoughts). We then examined the role of certain types of emotion-regulation strategies, namely positive focusing and positive reappraisal, in the subjective experience of future thinking.

Manipulating both temporal distance and cue word valence proved to be a relevant approach in several

**Table 4.** Correlations between emotion-regulation strategies and ratings (means) for subjective characteristics of future-oriented thoughts, controlling for depressive symptomatology.

Self-ratings	Positive refocusing				Positive reappraisal			
	Middle-aged adults		Older adults		Middle-aged adults		Older adults	
Emotion	0.15	(-0.12, 0.43)	0.24	(-0.04, 0.52)	0.10	(-0.18, 0.38)	0.13	(-0.16, 0.41)
Perceptual index	0.24	(-0.06, 0.49)	0.28	(0.01, 0.52)	<b>0.40**</b>	(0.11, 0.63)	0.28	(0.01, 0.54)
Feeling of pre-experiencing	0.18	(-0.10, 0.45)	0.35*	(0.09, 0.62)	0.31*	(0.04, 0.58)	0.29*	(0.02, 0.57)
Importance	0.23	(-0.04, 0.50)	<b>0.37**</b>	(0.10, 0.63)	0.23	(-0.04, 0.51)	0.18	(-0.10, 0.46)

Note: 95% confidence intervals are shown in parentheses. \*Correlations significant at  $p < .05$ ; and \*\* $p < .01$ . In bold: correlations that passed multiple comparison corrections (False Discovery Rate; Benjamini & Hochberg, 1995).

respects since both factors influenced the nature of future-oriented thoughts (i.e., specific, non-specific, omissions) and the subjective experience of future thinking (i.e., the self-ratings). With regard to temporal distance, in both middle-aged and older adults, the distant future (i.e., 5 years), compared to the close future (i.e., 1 year), induced the generation of fewer specific thoughts and more non-specific future thoughts and omission-type responses; in addition, the associated ratings of mental representations were lower in terms of visual details. These findings are consistent with construal level theory (Trope & Liberman, 2003), which proposed that, the greater the temporal distance, the more likely future events are to be represented in terms of a few abstract features, an assumption that has been widely confirmed in subsequent studies (e.g., Addis et al., 2008; Arnold, McDermott, & Szpunar, 2011; D'Argembeau & Van der Linden, 2004).

With regard to the valence of cue words, we found that positive cue words led to more intense ratings of mental representations for subjective characteristics than negative ones (i.e., emotion, visual details, vividness, feeling of experiencing and importance), in line with previous studies (e.g., Gallo et al., 2011; Painter & Kring, 2015). In addition, positive cue words led to the production of more specific responses and fewer non-specific and omission-type responses. The latter finding is only partially supported by previous studies, for which some results were equivocal. For example, healthy participants were found to recall more specific memories in response to positive cue words in one study (Young et al., 2012), whereas other studies found no effect of cue word valence on the specificity of elaborated events (Gallo et al., 2011; Goddard, Dritschel, & Burton, 1996; Jones et al., 1999). In all the latter studies, however, although both valence and frequency of occurrence of cues were controlled, their levels of concreteness and imageability were seldom taken into consideration. Yet imageability of cues has been shown to mediate the specificity of personal memories in healthy young adults (Williams, Healy, & Ellis, 1999). It is therefore possible that the inconsistencies in the results related to the effect of valence on specificity may be linked to the method employed to select cue words, as Van Vreeswijk and de Wilde (2004) suggested. Nevertheless, since the desirability of future events contributes to both the episodic richness and the ratings of subjective characteristics of imagined events (De Vito et al., 2015), one can reasonably expect future thoughts generated in response to positive cue words to be more desirable and hence to foster the imagining of more specific events in healthy participants. Finally, the findings complement the existing data on future thinking by comparing middle-aged and older adults; the latter exhibit lower levels of specificity in future thinking but similar subjective experiences of travelling through time, regardless of the temporal distance and the valence of cue words.

The relation between avoidance strategies and the nature of future-oriented thoughts was then addressed,

with a focus on whether avoidance strategy accounted for the lack of future thinking specificity, especially in older adults. The results did indeed indicate a relationship between the nature of future-oriented thoughts and proneness to avoidance in both age groups, although they followed quite different patterns. In middle-aged adults, the level of experiential avoidance, as assessed by the AAQ-II, contributed negatively to the specificity of future thoughts set in a distant future and induced by negative cue words. This result extends previous findings on the role of experiential avoidance – unwillingness to be in contact with private and undesirable experiences (Hayes et al., 1996) – in the lack of memory specificity in both clinical (Kashdan et al., 2010; Raes et al., 2009; Spinhoven et al., 2009) and non-clinical samples (Hermans et al., 2005). In addition, the negative contribution of experiential avoidance to the specificity of future-oriented thoughts seems to confirm the assumption that reduced specificity could be a way of lessening the emotional impact of certain mental projections, not only when remembering past events (e.g., Hermans et al., 2008; Raes et al., 2003; Williams, 1996) but also when imagining future ones, at least in a distant future induced by negative cue words.

In contrast, proneness to cognitive avoidance, as assessed by the avoidance of threatening stimuli subscale of the CAQ, which assesses the effort deployed to avoid situations that conjure up undesirable thoughts, contributed only in older adults to the number of omissions (i.e., lack of responses and semantic associates) of future-oriented thoughts, in a distant future induced by negative cue words, suggesting at first glance that the failure to respond may not necessarily and solely reflect an impairment (e.g., age-related changes in processing speed and/or strategic retrieval) preventing a participant from answering within the allotted time, but may also result from an avoidance strategy triggered by threatening stimuli. The avoidance subtest of the CAQ, which includes items such as “I avoid people who make me think about things that I do not want to think about” and “Sometimes I avoid places that make me think about things I would prefer not to think about”, suggests the use of a proactive strategy fairly similar to situation selection (i.e., choosing the situations one encounters to avoid threats to one's mood). Moreover, the relationship between this avoidance strategy and the number of omissions echoes recent findings that older adults are more efficient at withdrawing their attention from emotional information at an early stage, by using a disengagement strategy (e.g., distraction or denial; Blanchard-Fields, 2007; Scheibe, Shpeppes, & Staudinger, 2015). Indeed, compared to young adults, older adults facing a threat to their well-being have shown a preference for disengaging their attention from the negative information, which appears to be less effortful than strategies such as direct confrontation, which are more frequently used by young adults (Scheibe et al., 2015). We can therefore assume that avoiding generation of a future event in which a threat may be perceived by not

responding to a prompt is less of an effort than transforming mental images into a future event, even in a non-specific way. Since it is plausible that the reduced efficiency of executive functions in ageing (Salthouse, 2010) may drive the most avoidant older adults to select the least effortful solution, namely omission, it would be particularly interesting to explore the extent to which executive functions and ruminative processes jointly participate in determining the nature of future-oriented thoughts (see CaRFAX Model; Williams, 2006).

One point to consider is that, in the present study, the use of avoidance strategies was only identified in the context of a supposed uncomfortable future (i.e., a distant future induced by negative cue words), in which the future events produced were rated as more negatively valenced (than those imagined in a close future induced by positive cue words) by both middle-aged and older adults. No relationship was identified between measures of avoidance and the nature of events produced either in the close future or in response to positive cue words. This finding confirms the assumption that in non-clinical samples the link between avoidance strategies and reduced memory specificity may be exhibited only under stressful conditions (Debeer et al., 2011; Debeer et al., 2012). This point also indicates that both temporal distance and cue word valence should be carefully selected when investigating future thinking. In a recent study comparing depressed and healthy individuals, and using mainly positive cue words (cue list comprising positive, negative and neutral cue events, but 63% of which were rated as positive by independent raters) to induce memories and prospectives, no relationship was identified between proneness to avoidance and the specificity of future events (Addis, Hach, & Tippett, 2016). Nevertheless, the authors proposed that the emotional valence of the cues may have modulated the nature of the relationship between avoidance and specificity. Although our study confirms this assumption, it also points to the importance of taking temporal distance into consideration, particularly when investigating ageing.

Finally, we were interested in examining whether particular emotion-regulation strategies accounted for the subjective experience of travelling through time. In both middle-aged and older adults, an increased propensity to use positive reappraisal contributed to higher ratings for visual details, vividness and feeling of experiencing the future. On the other hand, positive refocusing correlated with ratings for vividness, feeling of experiencing and importance of future events in both age groups. Whereas studies conducted in young adults showed that the subjective experience of future thinking was influenced by various factors (e.g., the time perspective, the sensory-perceptual qualities of the events, individual differences in self-consciousness; see Lehner & D'Argembeau, 2016), the present study adds to this list the need to consider the influence of positive reappraisal, and to a lesser extent positive refocusing, in both middle-aged and older

adults. Adding to the assumption that older adults base their ratings of experiencing past and future events on their emotional values more than on their episodic attributes (Johnson et al., 2015), we propose that this emotional focus entails the use of specific emotion-regulation strategies. Finally, let us point out that in this study, very little difference was observed between the two age groups in terms of ratings for the subjective characteristics of future events, which may reflect a similar contribution by both positive reappraisal and positive refocusing in the two age groups. Since emotion regulation seems to improve as we age (e.g., Charles & Piazza, 2009; Scheibe & Carstensen, 2010; Urry & Gross, 2010), the possibility that the expected differences in the subjective characteristics and emotion-regulation strategies are hidden as a result of this development cannot be ruled out. These data, resulting from the comparison of middle-aged and older adults, should be complemented by observations in young versus older adults, which might reveal greater variability in emotion-regulation processes.

Despite the contributions made by this work, some limitations must be acknowledged. In particular, the analyses did not pass the multiple comparison tests. It seems likely that the design of the study may have had an impact on this issue. We attempted to use an individual-differences approach, involving comparisons between participants in various conditions (i.e.,  $\times 4$ ), and allowing a maximum of five observations per participant in each condition (i.e., total of 20 cue words spread over 4 conditions). The limited data set variability within each condition may very well have reduced the statistical power of the analyses. Future studies might favour different designs such as a pre- to post-stress exposure design (e.g., Debeer et al., 2012) or pre-select participants based on their proneness to avoidance (e.g., Raes et al., 2006). Nevertheless, we believe that these preliminary results are worthy of attention for several reasons. First, they are well backed up by the existing literature, especially the affect regulation hypothesis (Williams, 1996), and they replicate previous findings on mental time travel into the past in healthy young adults, from which our hypothesis emerged. Second, the regression analyses are consistent with the correlation analyses and indicate that proneness to avoidance does indeed contribute to the nature of future thoughts. Third, although multiple comparison procedures allow for the detection of type I errors, they also increase the chance of producing type II errors (disregarding a valid relationship due to its failure to pass multiple comparisons). On this issue, the fact that equivalent results were observed in a subsequent study with a different design (i.e., significant relationships in middle-aged and older adults between proneness to avoidance and the specificity of emotional future thoughts in daily life; Jumentier, Barsics, D'Argembeau, & Van der Linden, 2017) reinforces our opinion that, despite our results' failure to pass some multiple comparison corrections in this study, they nonetheless deserve attention. Finally, the present

study, which was intended as a preliminary and exploratory investigation, lacked the statistical power to examine the link between emotion-regulation strategies and the subjective qualities of future thoughts according to their valence. Since proneness to avoidance appears to be related not only to the specificity of future thoughts in middle-aged adults but also to omissions in older adults, the possibility cannot be ruled out that avoidance shapes future thinking in variable ways and that subjective experience may be one of them. This approach may be of particular interest because of what it offers in terms of the applicability of the affect regulation hypothesis.

Another limitation that can be raised relates to the fact that, although the older adults were reasonably well educated, socially active, and involved in various activities and community associations, no cognitive measure was administered to ensure that their cognitive functioning was preserved. Such a measure would have allowed the examination of cognitive measures that tap into certain executive abilities and the extent to which executive functions and avoidance individually or jointly account for the lower specificity of future thinking.

Notwithstanding its limitations, this study presents an interesting new finding, namely that the affect regulation hypothesis (Williams, 1996), which posits that lack of memory specificity serves an avoidance function, also applies to the imagination of future events under particular conditions. Indeed, in the context of a distant future induced by negative cues, proneness to experiential avoidance predicts the defect of future thinking specificity, in middle-aged adults. In older adults, proneness to cognitive avoidance contributes to the omission of distant and negatively connoted future thoughts. It is possible that this relationship between avoidance and the non-elaboration of future events in older adults stems from the perception of a threat of some kind involved in the process of projecting oneself into a distant future induced by negative cue words, that is to say, close to the limits of older adults' temporal perspective and probably characterised by negatively connoted events (see Bulley, Henry, & Suddendorf, 2017, for a discussion of threat and future thinking). Added to the fact that distant future and negative cues generally restrain both the specificity and subjective experience of future thinking, these results suggest that temporal distance and valence should be carefully taken into consideration when investigating future thinking, especially in ageing. Together with the findings that the use of positive reappraisal and positive refocusing (to a lesser extent) enhances the subjective experience of future thinking in both age groups, this study indicates that how individuals project themselves into their personal future also relies on affect- and emotion-regulation strategies, which should not be overlooked.

This line of work, indicating that future thinking in ageing is modulated by emotional factors, should be complemented by studies of an episodic specificity induction (Madore, Gaesser, & Schacter, 2014) on older adults'

affect, since when this kind of training is applied to young adults' perceptions of personal future worrisome events, it has been shown to increase well-being, the perception of a greater likelihood of positive outcomes and the use of active coping (Jing, Madore, & Schacter, 2016). It therefore seems relevant to investigate the impact of specificity training on older adults' well-being or use of coping strategies, in a context where the worrisome events likely to be pictured probably differ considerably between young and older adults.

## Notes

1. In an exploratory test, we also examined the regressions between the various types of responses within each temporal distance  $\times$  positive cue word condition (controlling for depressive symptomatology). The results indicate that no avoidance measure predicts the specificity or the number of omission-type responses induced by positive cue words. These results are presented in Table C of the Supplemental Material.
2. Higher depressive symptomatology scores have been shown to be related to lower phenomenological qualities (vividness, auditory or spatial temporal details) accompanying future events, in healthy (Szöllősi, Pajkossy, & Racsmany, 2015) and dysphoric adults (Anderson & Evans, 2015).
3. Exploratory analyses were run on all the CERQ subtests to examine the association between adaptive vs. maladaptive strategies and subjective experience; see Table F in the Supplemental Material.

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