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The effect of future time perspective manipulation on affect and attentional bias.

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Abstract

Socioemotional selectivity theory proposes that decreased future time perspective would lead to an emphasis on goals of well-being, with attentional preference for positive information. We developed a procedure to manipulate future time perspective, based on mental imagery, to experimentally investigate its effects on attention and affect. In experiment 1, we tested a new measure of future time perspective, the scrambled sentence test. In experiment 2, 41 undergraduates were randomly assigned to the imagery procedure with either short-term or long-term future scenarios. Attentional bias was measured by an exogenous cueing task. Between-group differences were found on the scrambled sentence test, indicating that the manipulation induced a different future time perspective in the long-term future imagery group compared to the short-term future imagery group. Although there were no differences in attentional bias at group level, a more expansive future time perspective after the manipulation correlated with more avoidance of negative information. These results indicate that future time perspective is related to information processing, which may point to an affect regulation strategy.

*Key words***:** Future time perspective, affect, attentional bias, imagery

The effect of future time perspective manipulation on affect and attentional bias.

Information processing biases have been investigated in numerous studies, and it has been concluded that these biases can play an important role in emotional well-being and different forms of psychopathology, such as depression (for a review see De Raedt & Koster, 2010) and anxiety (for a review see Cisler & Koster, 2010). Recently, it has been demonstrated that these information processing biases can be influenced by motivational aspects and personal goals (e.g. Vogt, De Houwer, Moors, Van Damme, & Crombez, 2010). According to the socioemotional selectivity theory, our motivation and prioritization of goals are inevitably influenced by our future time perspective (Carstensen, Isaacowitz, & Charles, 1999). This future time perspective refers to how far people look ahead, ranging from a far, expansive to a near, limited view of the future. People with an expansive future time perspective would be inclined to prepare for future goals by focussing on the acquisition of relevant information, both negative and positive. However, when people are confronted with a limited future time perspective, they would focus on emotionally meaningful aspects of life, prioritizing present-oriented goals of well-being. Given that information processing can be guided by personal motivation and goals, future time perspective would also influence information-processing tendencies (Carstensen & Mikels, 2005). Congruent to their goals of emotional well-being, people with a limited future time perspective would show a preference towards positive information and away from negative information. Consequently, this preference might improve their emotional state.

Research into the socioemotional selectivity theory has mostly investigated the effects of future time perspective by comparing young and old age groups (for a review see Scheibe & Carstensen, 2010). Given that chronological age is inherently related to a growing constraint on the time left in life, young adults typically show an expansive future time perspective in contrast to a more limited future time perspective in older adults. Even though

the socioemotional selectivity theory states that people are faced with future limits at many different times in their lives (e.g. moving away, graduating or even birthdays), old age represents the clearest constraint on the future. Age cohort studies usually found that older adults show an increased preference for positive information and/or a decreased preference away from negative information, which has been called the 'positivity effect' (Carstensen & Mikels, 2005), and it has been argued that this would be caused by a limited future time perspective. Studies focussing on differences in memory bias concluded that older adults are better in remembering positive than negative information as compared to younger adults (Charles, Mather, & Carstensen, 2003; Mikels, Larkin, Reuter-Lorenz, & Carstensen, 2005). However, findings about a positivity effect in attention are less conclusive. Some studies demonstrated that older adults show a bias towards positive information (e.g. Isaacowitz, Wadlinger, Goren, & Wilson, 2006), whereas other studies reported a bias away from negative information (e.g. Mather & Carstensen, 2003). Moreover, some studies were not able to replicate the positivity effect in older adults (Steinmetz, Muscatell & Kensinger, 2010; Murphy & Isaacowitz, 2008). However, all these studies only looked at differences between age groups and have not directly investigated the motivational influence of future time perspective on attentional bias.

Importantly, the socioemotional selectivity theory does not argue that age itself would be the causal factor leading to changes in motivation and information processing (Carstensen et al., 1999). Even though the theory acknowledges that age is inherently related to future time perspective, it states that people can adopt a future time perspective that is not associated with their age. Moreover, research using tasks in which hypothetical conversation partners can be selected, has shown that young adults who are confronted with a limited future time perspective show emotionally rewarding social preferences similar to older adults and also that the preference of older adults can be influenced by considering a more expansive future

time perspective (Carstensen & Fredrickson, 1998; Fung, Carstensen, & Lutz, 1999). Therefore, it is proposed that future time perspective would be a better predictor of goals and motivational preferences leading to information processing changes than chronological age. Additionally, it was found that there are also important inter-individual differences in future time perspective within the age groups (Fung, Lai, & Ng, 2001). Given these findings, it is important that research investigating the basic tenets of the socioemotional selectivity theory moves beyond studies using cross-sectional designs that use young and older adults to compare people with expansive versus limited future time perspective. By only relying on indirect age-driven indications of future time perspective, other possible age-related factors or even cohort effects may explain the differences that have been found in motivation and information processing.

To further investigate the possible motivational influence of future time perspective on information processing, it is thus important to include a direct measure of future time perspective. Moreover, new insights might be derived from research using an experimental design to establish the causal influence of future time perspective on motivation and information processing. Experimental designs in which future time perspective is manipulated also control for potential age and cohort effects. In a few studies, future time perspective has already been manipulated in young participants (e.g. Fung & Carstensen, 2004) to investigate its influence on goals and social relations. It could be demonstrated that individuals show a preference for emotionally close partners when confronted with a limited future time perspective. Moreover, in another experimental study, participants' focus on goals (either information gathering or emphasis on current emotions) was manipulated (Kennedy, Mather & Carstensen, 2004). In this study, a positivity effect in memory in the emotion-focused group was found, regardless of age. These results show that future time perspective can influence personal goal preference and that personal goals can drive the positivity effect in

information processing. However, to our best knowledge, no experimental studies have focussed on the direct influence of future time perspective on emotional information processing and more specifically on attentional processing. Therefore, we aimed at manipulating future time perspective to investigate the causal influence on attentional bias for emotional information. Moreover, given the potentially influential role of future time perspective, we developed a suitable measure and manipulation procedure for future time perspective.

Study 1

To test whether the manipulation of future time perspective is successful, we need a sound measure of future time perspective. Previous studies have always relied on questionnaires to measure this variable (e.g. Kessler & Staudinger, 2009). However, the problems with explicit instruments, such as social desirability, are well-known. Specifically after an overt manipulation of future time perspective, questionnaires measuring changes might be seriously biased by social desirability because for young people, having a longer time perspective might generally be regarded as more adaptive . In order to ascertain that our future time perspective manipulation was successful, we developed a new instrument that should be less susceptible to these problems. We designed an implicit measure for future time perspective based on an adaptation of the scrambled sentence test (Wenzlaff, 1993). Prior use of this test in other domains (e.g. Wenzlaff, 1993; Rude, Wenzlaff, Gibbs, Vane, & Whitney, 2002) has demonstrated that people tend to unscramble the sentences in line with their cognitive mind set and most activated cognitions. This test was adapted to investigate cognitions about the future, measuring the availability of long-term future cognitions as indexed by the number of sentences unscrambled in congruence with a long future time perspective. Because this is a newly developed measure and the validity of instruments is a prerequisite for research focusing on inter-individual differences, our first study aimed at testing concurrent validity of

this new implicit measure of future time perspective with a psychometrically sound questionnaire, the FTPS.

Study 2

The main goal of our second study was to manipulate future time perspective to investigate its influence on attentional bias. Future time perspective will be manipulated based on mental imagery, a technique that has been extensively used in other research domains (Blackwell & Holmes, 2010; Holmes & Mathews, 2010). During mental imagery, people are asked to envision scenarios thoroughly and vividly from a field perspective (as through one's own eyes). Research has already shown the advantage of mental imagery over just verbal processing, as it involves deeper cognitive processing (Holmes, Mathews, Dalgleish, & Mackintosh, 2006). To manipulate future time perspective with imagery, we used a between-subjects design with two different sets of imagery scenarios. One group focused on various opportunities in a far away future, whereas the other group received short-term future-orientated scenarios. Future time perspective was originally considered to be a bipolar, one-dimensional construct ranging from limited to expansive. Recently however, Cate and John (2007) argued for a multidimensional approach in which the opposite end points are separate dimensions that can influence behaviour independently. Moreover, it has been stated that a limited time perspective leads to a more present-oriented state (Carstensen et al., 1999) and that when time is constrained, the most salient goals are the ones that can be realized in a short-term (Carstensen, 2006). Based on these findings, we opted to compare a long-term oriented to a short-term oriented future manipulation and not to perceived limits on the future, as used in previous research. By inducing a focus on short-term future time perspective, we wanted to prevent that the limited future manipulation would be more artificial and harder to imagine for our young student sample compared to the expansive, long-term future

manipulation or that it would induce a negative affect which might confound results on other measures. Given that this is the first study using mental imagery to manipulate future time perspective, we first investigated the effectiveness of the imagery procedure. Both the scrambled sentence test and a questionnaire were administered after the manipulation to investigate whether it had been successful in creating differences in future time perspective.

Secondly, we investigated whether the induction of different future time perspectives would influence affect. For this purpose both positive and negative emotional states were measured before and after the manipulation. The socioemotional selectivity theory states that individuals confronted with a more limited perspective prioritize current well-being, which would result in improvements in affect. Therefore, participants receiving the short-term future manipulation might show less negative and/or more positive affect. Given the well-established effect of emotional state on attentional bias (e.g. Gotlib, Krasnoperova, Yue, & Joormann, 2004), we wanted to control for the possibility that our manipulation might lead to differences in affect that may confound findings on attentional bias.

The third and major aim of our study was to investigate the link between future time perspective and attentional bias. We examined whether the manipulation would lead to differences in attentional bias for negative and/or positive information. For that purpose, we used an emotional variant of the exogenous cueing task (Posner & Cohen, 1984) with long cue presentations. In contrast to previously used attention paradigms, such as the dot probe (e.g. Mather & Carstensen, 2003), this task allows a more straightforward disentanglement of several attentional processes such as attentional avoidance and maintained attention for emotional information (Koster, De Raedt, Goeleven, Franck, & Crombez, 2005). We used long cue presentations because former studies have shown that the positivity effect in attention only operates at later elaborative stages and not at early automatic stages (Isaacowitz, Allard, Murphy & Schlangel, 2009). Based on the socioemotional selectivity

theory and the older adult literature (e.g. Mather & Carstensen, 2003), we expected that participants who are oriented towards a short-term future time perspective would show more maintained attention towards positive information and/or more avoidance away from negative information as compared to participants who focus on a long-term future time perspective.

Study 1

Method

Participants

Participants were 32 Caucasian undergraduate students (26 female, 6 male) with a mean age of 21.31 (*SD* = 5.81). They were financially compensated.

Materials

Scrambled sentence test. The scrambled sentence test (Wenzlaff, 1993) measures the availability of specific cognitions by presenting participants with scrambled sentences that can be unscrambled in different ways. The way an individual unscrambles sentences is indicative of the availability of certain concepts and a certain mindset at that moment (Wenzlaff, 1993). The original list of scrambled sentences (used for positive versus negative interpretations) was adapted towards sentences (e.g. seems/ to/ time/ infinite/ be/ limited) that can be interpreted in a short-term (e.g. Time seems to be limited) or long-term future perspective (e.g. Time seems to be infinite). Participants are asked to produce grammatically correct sentences with five of the six words of each scrambled sentence by writing numbers from 1 to 5 under the words. All sentences were in Dutch and some translated examples are ‘as/ limited/ time/ I/ unlimited/ experience’ and ‘always/ I / rarely/ make/ ahead/ plans/’. Participants complete as many sentences as possible within a time constraint of 2.5 minutes. The ratio of long-term future sentences over the total number of completed sentences indicates how far participants look ahead, with higher scores reflecting a more expanded future time perspective. In line with other studies using the scrambled sentence test in other domains (Rude et al., 2002) a

cognitive load (remembering a six digit number) was given to the participants to hamper the tendency to suppress socially undesirable solutions, given that thinking further ahead might be perceived as more socially desirable. The participants were not allowed to write this number down until the end of the 2.5 minutes test. The experimenter stayed in the room to check this. Both the cognitive load and the time pressure would prevent strategic responding and lead to the selection of the sentence most closely related to the accessible future time perspective cognitions that were induced by the imagery procedure.

Future Time Perspective Scale (FTPS). The FTPS (Carstensen & Lang, 1996) assesses the extent to which individuals see their future as more expansive or limited. Participants rate their agreement with 10 statements (e.g. 'my future seems infinite to me.') on a 7-point scale. Higher scores on this scale indicate a more expansive perception of the future. The Dutch translation of this scale has proven to have acceptable psychometric qualities with a Cronbach's Alpha of .90 and moderate concurrent validity to other questionnaires measuring time perspective (Demeyer & De Raedt, 2013).

Procedure

At the start of the experiment, informed consent was obtained. Subsequently, participants completed the scrambled sentence test. To avoid priming effects, participants completed the FTPS at the end of the whole procedure.

Results

Participants had a mean score of 51.97 (SD = 6.91) on the FTPS and .71 (SD = .17) on the scrambled sentence test. They completed on average 13.28 (SD = 3.11) sentences in 2.5 minutes, and 84% of the participants reported the six digit number with perfect accuracy.

To test concurrent validity of the implicit test of future time perspective, Pearson correlations with the FTPS calculated. The scores on the scrambled sentence test were significantly correlated to the scores on the FTPS, $r = .48$, $p < .01$, which shows moderate

overlap, thus suggesting that the adapted scrambled sentences test can measure future time perspective.

Study 2

Method

Participants

Forty-one Caucasian undergraduate students participated for course credits. Participants were randomly divided in two groups who received a different induction of future time perspective: long-term future (LTF) versus short-term future (STF) imagery. The LTF group consisted of 20 participants (13 female, 7 male) with a mean age of 19.25 (*SD* = 1.41). The STF group was comprised of 21 participants (15 female, 6 male) with a mean age of 18.90 (*SD* = 1.55).

Materials

Future Time Perspective measurements. The same measurements for future time perspective as those described in study 1 were used for study 2: the future time perspective scale (Carstensen & Lang, 1996) and the adapted scrambled sentence test (Wenzlaff, 1993).

Positive and Negative Affect Schedule (PANAS). The PANAS (Watson, Clark, & Tellegen, 1988) is a brief measure of positive affect (PA) and negative affect (NA). The state version of the PANAS was used. In this version, participants rate the extent to which they experience an affective state (e.g. distressed, happy, scared) at the current moment on a 5-point Likert scale.

Imagery. Based on a Dutch translation of the lemon training exercises of Holmes et al. (2006), participants were trained in vividly imagining situations from a field perspective (i.e. through one's own eyes). To manipulate future time perspective, 20 new scenarios were used to represent short-term and long-term future. Participants in the STF condition were presented with 10 future scenarios that could happen today or tomorrow (e.g. 'Imagine that

tomorrow you get the news that you did well on an exam'). Participants in the LTF condition listened to 10 scenarios representing a more distant future (e.g. 'Imagine that in a few years you are at your graduation ceremony'). Participants were asked to generate a vivid image based on each scenario and to elaborate on what they saw, felt and heard during mental imagery to keep them focused.

The scenarios were formulated based on a survey in 50 students. They were asked to write down events they expected to happen within the following 2 days and events they expected for the next ten years. The most common events were selected for each condition. The events were matched on general content and positivity between both conditions. Moreover, at the end of this study, we asked participants to rate the scenarios they had encountered during imagery on a scale from 1 (not at all positive) to 10 (very positive). This rating allowed us to control for differences in positivity between the STF and LTF scenarios. For an overview of all the scenarios used during the imagery procedure, see table 1.

Exogenous cueing task. The exogenous cueing task was used to examine attentional bias towards negative and positive information. The task was programmed using INQUISIT Millisecond software. Based on a prior validation (Goeleven, De Raedt, Leyman, & Verschuere, 2008), 60 coloured pictures of emotional faces (20 happy, 20 neutral and 20 sad) were selected from the Karolinska Directed Emotional Faces database (KDEF). Pictures were included based on maximum correct categorisation (> 90% for happy, > 85% for sad, > 80% for neutral) and average rating on a 9 point scale of how intense the happy, sad and neutral emotion is depicted (M = 5.28 for neutral, M = 6.78 for happy, M = 6.02 for sad). All pictures were adjusted to the same size (326 X 326 pixels) and cut to exclude interference of background stimuli (hair, clothing).

The stimuli were presented against a black background. Figure 1 depicts the stimulus presentation during the exogenous cueing task. At the beginning of each trial, two white

frames (75mm by 75mm, visual angle: 7.15°) were presented on both sides of a fixation cross. These remained on screen during the entire trial. The middle of each of these frames was at 40 mm distance (3.81° visual angle) from the fixation cross. 500ms later, one of the frames was replaced by a pictorial cue for 1000ms. Immediately after this cue disappeared, a target (a black square, 10mm by 10mm, visual angle 1°) was presented in the middle of one of the two frames and remained on screen until response. Participants were instructed to indicate as quickly and accurately as possible the location of this target by pressing the left or right button of a response box. The location of the picture cued the location of the target correctly on 50% of the trials (valid trials) and incorrectly on the other 50% (invalid trials). Participants were informed that the location of the cue was not predictive for the target location. Pictures were presented randomly with an equal number of presentations and trial type (valid versus invalid).

All participants were seated at 60cm viewing distance of the computer screen (a 19-inch colour monitor). Participants got acquainted with the exogenous cueing task during 16 practice trials before they performed the test block of 240 trials. It was emphasized that attention should be directed towards the fixation cross during the entire experiment. To control for response strategies (for example focussing on only one frame during the experiment) and ascertain central fixation between trials, 24 trials were randomly inserted in which the fixation cross was briefly (150ms) replaced by an arrow. Participants were asked to indicate whether the arrow pointed left or right. The high number of correctly identified arrows by the participants, $M = 23.41$, $SD = .81$, was indicative of a central fixation.

Procedure

At the beginning of the experiment, informed consent was obtained and participants completed the PANAS. Next, the imagery procedure to manipulate future time perspective followed. Participants were randomly divided into the STF or LTF group, which differed only

in the content of the scenarios. First, participants were trained in imagery and keeping a field perspective using the lemon exercise created by Holmes et al. (2006). At the end of each scenario participants rated their ability to vividly imagine the situation from a field perspective by saying a number from 1 (not at all) to 5 (very well). After the imagery procedure, the PANAS, the scrambled sentence test and the FTPS (respectively) were administered. Subsequently, the exogenous cueing task was completed. At the end, participants rated the scenarios.

Results

Group characteristics

Importantly, there were no group differences in age, $t(39) = .75$, $p = .46$, or gender distribution ($\chi^2 < 1.2$). Moreover, the groups reported no difference in their ability to vividly imagine the scenarios during imagery, $t(39) = .95$, $p = .35$. Finally, there was also no significant difference between the positivity ratings of the STF scenarios, $M = 7.67$, $SD = .92$, and the LTF scenarios, $M = 8.08$, $SD = .58$, $t(36) = 1.63$, $p = .11$.

Manipulation check: Effect of imagery on future time perspective

As expected, after our future manipulation, groups differed significantly on future time perspective as measured by the scrambled sentence test, $t(39) = 2.15$, $p < .05$, $d = .64$. This indicated that the group receiving the long-term future imagery showed a more expansive future perspective as compared to the STF group. Even though the results point into the same direction, no significant group differences were found for the FTPS ($t = 1.52$, $p = .13$). Pearson correlation coefficients demonstrated that the FTPS correlated significantly to the scrambled sentence task, $r(41) = .58$, $p < .001$. When controlling for possible changes in affect (PANAS) from pre to post measurements, the group difference in future time perspective on the scrambled sentence test remained significant, $F(1,37) = 5.85$, $p < .05$, $\eta^2_p = .14$. Means and standard deviations of the variables measuring future time perspective are given in Table 2.

Effect of imagery on affect

As expected, both groups did not differ significantly in pre-measurements of affect, as measured by the PANAS (all $t < .11$, $p > .91$). Table 2 shows means and standard deviations for the pre and post measurements of affect. A 2 x 2 ANOVA with positive affect (PA) as dependent variable, Time (pre and post scores) as within subjects variable and Group as between subject variable only showed a significant main effect of Time, $F(1,39) = 4.66$, $p < .05$, $\eta^2_p = .11$, which is indicative of an overall improvement in positive affect after the imagery procedure. Likewise, a 2 x 2 ANOVA with negative affect (NA) as dependent variable, Time (pre and post score) as within subject variable and Group as between subject variable was performed. A significant main effect was found for Time, $F(1,39) = 10.80$, $p < .01$, $\eta^2_p = .22$, showing a decline in negative affect from pre to post measurement. Again there was no significant interaction effect with Group (all Fs $< .62$, $p > .44$). These results are shown in figure 2 and indicated that the imagery procedure led to an increase in positive affect and a decrease in negative affect, independent of group. Interestingly, when investigating inter-individual differences in the scrambled sentence test scores over both groups, Pearson correlation coefficients showed a significant positive relationship with post manipulation positive affect, $r(41) = .31$, $p = .05$, and a negative relationship with negative affect, $r(41) = -.33$, $p = .04$. These relationships point to more positive and less negative affect in participants with an expansive future time perspective.

The link between future time perspective and attentional bias

Trials with errors ($M = 1\%$) and outliers ($M = 2\%$) were omitted from analyses. In line with previous studies using the exogenous cueing task in young adults, responses shorter than 200ms and longer than 750ms, which reflect anticipatory and delayed responding, were considered to be outliers (e.g. Leyman, De Raedt, Schacht, & Koster, 2007). Statistical analyses were performed on the remaining data.

The reaction times on the attention task were subjected to a 3x 2x 2 mixed ANOVA (multivariate approach) with Cue Valence (happy, neutral, sad) and Trial Validity (valid, invalid) as within subject variables and Group (STF and LTF group) as between subject variable. Mean reaction times and standard deviations are presented in table 2. We found a main effect of Trial Validity, $F(1,39) = 37.47$, $p < .001$, $\eta^2_p = .49$, pointing towards a faster response to valid compared to invalid trials. However, no other significant main or interaction effects were found (all $F < 1.08$, $p > .31$), indicating that there are no group differences in attentional bias.

The lack of between-group differences may be a result of the limited strength of our future time manipulation. Therefore, in a next step, we investigated whether the magnitude of future time perspective after manipulation is related to attentional processing, independent of group. We performed a 3 (Cue Valence) x 2 (Trial Validity) ANCOVA with the scores on the scrambled sentence test as continuous factor. By using Future Time perspective scores after manipulation as a continuous independent variable instead of Group as a dichotomous factor, we directly investigated the influence of the actual future time perspective orientation after the induction procedure, taking inter-individual differences of the effect of our manipulation into account. This analysis showed a near significant interaction effect between Cue Valence and Trial Validity, $F(2,38) = 3.04$, $p = .06$. This effect is subsumed under the significant 3-way interaction effect between Cue Valence, Trial Validity and Future Time perspective as measured by the scrambled sentence test, $F(2,38) = 3.52$, $p < .05$, $\eta^2_p = .16$. No other effects were significant (all Fs < 1.5).

To further investigate the significant 3-way interaction, 3 Cue Validity Indexes (CVI) were calculated by subtracting RTs of valid trials from RTs of invalid trials for each emotion separately (happy, sad and neutral). Positive scores indicate maintained attention towards a cue, whereas negative scores indicate attentional avoidance of the cue. Using CVI for neutral

information as baseline, 2 new variables were created by subtracting CVI for neutral from both CVI for happy faces and CVI for sad faces. Pearson correlation coefficients with scrambled sentence test and Cue Validity Indexes were calculated. A more expansive future time perspective, as measured by the scrambled sentence test, was significantly correlated with more avoidance of sad information as compared to neutral information (CVI sad-neutral), r = -.39, p = .01. This relationship remains significant, β = -.33, $t(37) = 2.06$, $p <$ .05, when controlling for the possible influence of post positive affect, β = -.13, $t(37)$ = .70, p = .49, and post negative affect, β = .08, $t(37)$ = .44, p = .66, in a regression analysis. No other significant correlations between future time perspective measures and attentional bias indices were found.

Discussion

In the current study, we investigated the influence of future time perspective on affect and attentional bias towards emotional information as suggested by the socioemotional selectivity theory (Carstensen et al., 1999). In a first study, an implicit measure of future time perspective was tested. The results showed that the adapted scrambled sentence test correlated with a frequently used questionnaire of future time perspective, showing moderate concurrent validity. Given that this implicit measure is completed under mental load, which further limits the influence of strategic processes, it may be more valid after an overt manipulation than an explicit questionnaire. Therefore, this test was included in the next study.

In study 2, future time perspective was manipulated using an imagery procedure in which participants focused on either events in the short-term future (STF) or events in the long-term future (LTF). Although imagery has proven to be a successful mood induction procedure (Holmes et al., 2006), it was the first time this procedure was used as an induction of different future time perspective orientations. Therefore, the first aim of this study was to investigate whether the induction procedure was successful. The results from the scrambled

sentence test showed a significant difference in future time perspective between groups. This effect remained significant when controlling for possible differences in affect between both groups. In line with our expectations, the LTF group unscrambled more sentences referring to an expansive future, which indicated that they were more focused on an expansive future compared to the STF group. Importantly, to avoid priming effects, there were no overlapping words used in the imagery procedure, which focuses on specific future events, and the scrambled sentence test, which focuses on broad future statements. Moreover, although not significant, the results of the FTPS questionnaire point into the same direction as the scrambled sentence task. Given that these results are indicative that the manipulation of future time perspective was effective, we proceeded to investigate the influence of future time perspective on affect and information processing.

Secondly, the effect of future time perspective on emotional state was investigated. As expected, no significant differences between the STF and LTF group were found for both positive and negative affect before the manipulation. Moreover, even after manipulation the groups showed no difference in affect. Both groups showed an increase in positive affect and a decrease in negative affect, which might be explained by the nature of the scenarios chosen for the manipulation. The participants rated the scenarios of both short-term and long-term future as positive. We had selected slightly positive scenarios because negative scenarios for the future might be fear-inducing and neutral scenarios might be too abstract for mental imagery. Imagining positive future scenarios might resemble to some extent an induction of optimism for either near or distant future because studies inducing optimism (e.g. Fosnaugh, Geers, & Wellman, 2009) also rely on generating thoughts about positive future events. Moreover, optimism has been shown to relate to positive mood (Ben-zur, 2002).

When investigating inter-individual differences in the scrambled sentence test, we found that the expansion of future time perspective is related to more positive and less

negative affect. These findings seem to contradict the socioemotional selectivity theory, which states that individuals with a limited future time perspective focus more on and also achieve more affective well-being. Recently, other studies have also shown the reversed relationship: an expansive future time perspective may be more beneficial as it is related to more affective well-being (Demeyer & De Raedt, 2013; Kotter-Gruhn & Smith, 2011) and better affect regulation (Kessler & Staudinger, 2009). However, further research into the direction of the relationship is necessary. Our next hypothesis was that future time perspective would motivate a specific way of information processing which serves affect regulation.

Therefore, the third and most important aim of the study was to investigate whether future time perspective would have an influence on attentional processing of emotional information. We found no significant between-group differences in attentional bias. However, when taking inter-individual differences in the effect of the future time perspective manipulations into account, a significant relationship with attentional bias was found. This might indicate that our manipulation may not have been strong enough to find group effects, although it seems that the manipulation has created variability within a young adult group that would generally show a more expansive future time perspective. This variability may have allowed finding inter-individual differences over the whole sample. Based on the socioemotional selectivity theory, we had predicted that there would be a positivity effect in the attention of participants after a short-term future perspective induction. However, the results point to more avoidance of negative information in participants with a more expansive future time perspective. This finding contradicts the socioemotional selectivity theory and studies showing that older adults that are assumed to have a limited future time perspective demonstrate a positivity effect in attention (Mather & Carstensen, 2003). Given that, in this study, a more expansive future time perspective was also related to more positive and less negative affect, it might have been possible that avoiding negative information points towards

a strategy to maintain a positive state. Importantly, we controlled for the influence of affective state on attentional bias and found that only the scrambled sentence test could predict the attentional avoidance of negative information. This showed that the attentional bias was related to future-based motivational differences and not to affective state. Another possibility for the reversed relation is that participants with an expansive future time perspective are more motivated to avoid negative information as a strategy to maintain this expansive perspective, because negative information in the present may alter and decrease future time perspective. However, the question remains whether avoidance of negative information is an adaptive strategy for affect regulation in the long run. Given that avoidance is often regarded as a maladaptive emotion regulation strategy that is related to symptoms of anxiety and depression (e.g. Olatunji, Moretz, & Zlomke, 2010), more research is necessary to verify whether an expansive future time perspective is beneficial in the long run.

Importantly, in contrast to other studies investigating the role of future time perspective that focused on constraints of the future, we used a short-term future orientation to compare with an expansive future time perspective. Based on our study we can only confirm the relationship between an expansive future time perspective and attentional avoidance of negative information. In addition, although we found no effects of future time perspective based on our analysis at the group level, our analysis at the individual level confirmed that there is a relationship between future time perspective and attentional bias without confound of age and cohort effects.

Although further research is necessary, investigating the influence of top down motivational aspects -such as future time perspective- on emotional information processing holds promise for future research. Previous research has shown that the way we perceive the future can have an influence on social relations, self-image, personal choices and actions (e.g. Zimbardo & Boyd, 1999). Our study adds to this literature by showing that future time

perspective is also linked to attentional processing. The fact that we could demonstrate with an experimental manipulation that future time perspective is malleable opens possibilities for further research, which might continue to map the effects of future time perspective manipulations on information processing and well-being. More specifically, future research needs to confirm whether adopting an expansive future time perspective is a more valuable strategy for emotion regulation. Moreover, studies using imagery to modify cognitive styles in people with affective disorders (e.g. Blackwell & Holmes, 2010) might reveal whether people benefit more from training with short- or long-term future events.

Some limitations to the current study should be emphasized. First, an important limitation is the small sample size. Given this limitation and the fact that this study was the first to investigate the malleability of future time perspective through imagery and its influence on attentional bias, the study will need replication**.** Furthermore, even though there are many advantages (i.e. deeper processing of the material) of working with imagery, the downside is that there is little control over the exact application by the participants (Meevissen, Peters, & Alberts, 2011). However, we tried to overcome this problem by guiding the participants through each scenario by asking them to describe several sensory experiences (seeing, hearing, feeling) to keep them focused on the imagery. This may have added to the effect of the manipulation. Another limitation to the current study is the absence of an initial measurement of future time perspective before the manipulation. We chose to administer the adapted scrambled sentence test only once because this measure might be susceptible to learning effects. Moreover, given the small variability in future time perspective in younger adults (Demeyer & De Raedt, 2013) there is little reason to assume that the groups would have differed before the manipulation. Finally, given that the manipulation check of our future time perspective manipulation was only significant with the SST as dependent variable, it is possible that the manipulation was not strong enough to

induce differences in affect and attentional bias. Even though this imagery manipulation seems promising, the limited sample size demands replication and future research into the effects of future time perspective should attempt to further refine this procedure. Given that Sharot, Riccardi, Raio, and Phelps (2007) found that positive future events seem closer in time compared to negative future events in optimistic people, adding negative future events to the imagery procedure may also be an interesting avenue to explore. Moreover, it is difficult to disentangle whether the effect is driven by a change in both groups or only in one group (for example an increase in future time perspective in the LTF group). Therefore, a control condition might have been useful to determine whether the manipulation was equally successful in both groups. Future studies would also benefit from adding an awareness check of the true purpose of the study. Even though participants were led to believe this study was about the ability to imagine events, we cannot rule out that some participants were aware of the true purpose of the experiment. Finally, future studies may also consider using other types of attention tasks, such as the categorization version of the dot probe task which requires more in dept attentional processing of the target.

To summarize, this study introduced imagery as an efficient procedure for manipulating future time perspective, which is proposed as an influential factor for several cognitive and emotional processes. This is to our knowledge the first study using an experimental design to investigate the causal relationship between future time perspective and information processing biases. We found that an expansive future time perspective was related to more attentional avoidance of negative information, which might point to an affect regulation strategy.

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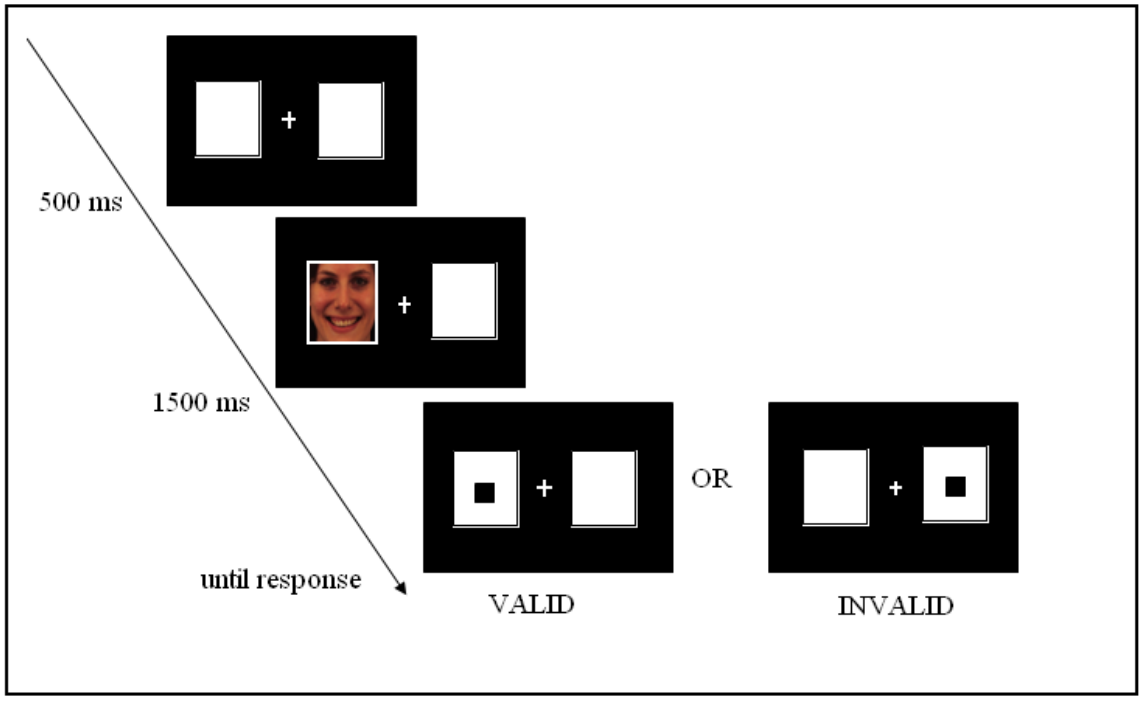

Figure 1. The exogenous cueing task: Stimulus presentation on valid and invalid trials

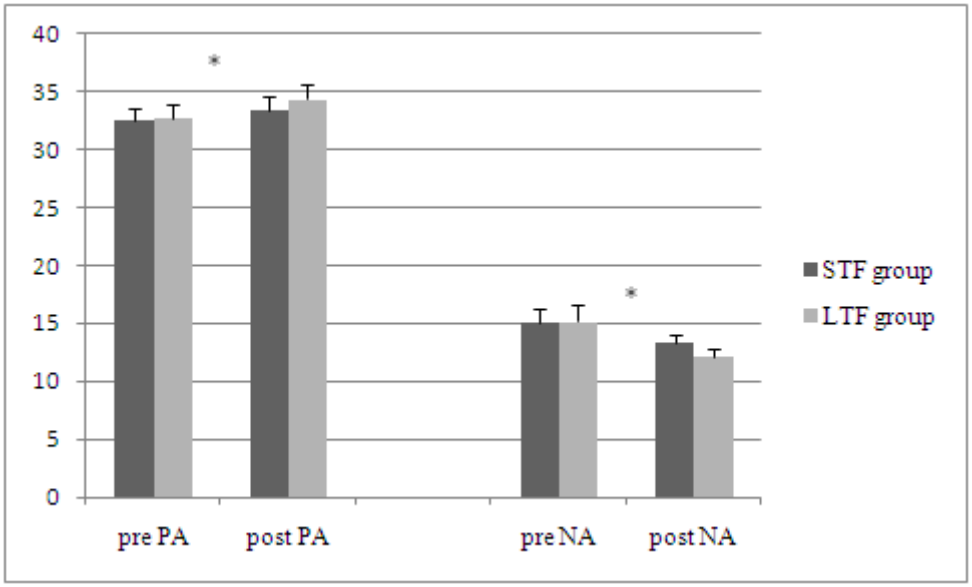

Figure 2. Imagery-induced changes in positive and negative affect in the LTF and STF group

Table 1

An overview of all the scenarios used in imagery.

Events for imagery	
Short-term future	Long-term future
Going on a little trip	Embarking on the voyage of your dreams
Studying	Working (later job)
Meeting friends	Meeting co-workers
Free morning this weekend	Having time of work
Inviting friends over	Invitations for own wedding
Preparing for exams	Preparing for job interview
Birthday party	Birthday party for your firstborn child
Cleaning room	Decorating your own place
Receiving good news about exam/paper	Attending your graduation
Activity with friends	Activity with your children

Table 2

Mean and standard deviations for the future time perspective, affect variables and measures of the exogenous cueing task for both STF and LTF group.

	STF Group		LTF Group	
	M	*SD*	*M*	*SD*
scrambled sentence test	0.68	0.21	0.79	0.12
FTPS	51.48	9.47	55.20	5.63
Pre PA	32.48	4.63	32.65	5.26
Pre NA	15.10	5.33	15.15	6.39
Post PA	33.43	5.15	34.35	5.52
Post NA	13.29	3.32	12.20	3.07
happy valid	311.43	38.60	309.55	30.58
happy invalid	324.05	37.96	320.05	30.16
neutral valid	311.24	37.89	309.90	29.71
neutral invalid	327.62	38.44	320.40	30.33
sad valid	310.19	39.67	308.60	31.00
sad invalid	325.14	39.51	319.00	29.60

Note. Scrambled sentence test = ratio over long-term future sentences over the total number of completed sentences; FTPS = score on the future time perspective scale; Pre PA = score on the positive affect scale before the imagery; Pre NA = score on the negative affect scale before the imagery; Post PA = score on the positive affect scale after the imagery; Post NA = score on the negative affect scale after the imagery; happy valid = reaction times on the validly cued trials with a happy cue; happy invalid = reaction times on the invalidly cued trials with a happy cue; neutral valid = reaction times on the validly cued trials with a neutral cue; neutral invalid = reaction times on the invalidly cued trials with a neutral cue; sad valid = reaction times on the validly cued trials with a sad cue; sad invalid = reaction times on the invalidly cued trials with a sad cue.