Mental Time Travel: The Positivity Bias in Individuals with Mixed Symptoms of Anxiety and Depression.

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Abstract

Background and aim: Mental Time Travel is the ability to mentally project oneself into one's personal past or future, in term of memories of personal past events or projections of possible events in the personal future. The aim of the present study was twofold. It aimed to shed further light on the positivity bias in Mental Time Travel in individuals with mixed symptoms of anxiety and depression and tested whether there was a distinction in positivity bias between anxiety and depression.

Methods: Participants with mixed symptoms of anxiety and depression were compared to controls. A 2 (group: mixed symptoms (n=22), control group (n=52)) x 2 (valence: positive, negative) x 4 (time: distant past, recent past, recent future, distant future), was used. Furthermore, within the mixed symptoms group symptom measurements and accessibility of past and future oriented negative and positive events were correlated. A combination of the Autobiographical Interview and the Modified Autobiographical Memory Interview was used; participants had to recollect past and imagine future events after the presentation of a positive or negative cue word. The dependent variable was reaction time of recollection.

Results: Findings showed that there were no differences in accessibility of past and future oriented positive or negative events between the mixed symptoms and control group. Total state anxiety scores were not associated with each of the dependent variables. Trait anxiety scores, on the other hand, were positively related to reaction times on Negative Recent Past, and BDI-II scores were positively related to reaction time on Negative Recent Past, and negatively to reaction time on Positive Distant Future. However, regression analyses, including both anxiety and depression symptoms, indicated that symptoms of depression were not a significant predictor for Negative Recent Past and Positive Distant Future, neither was trait anxiety for Negative Recent Past accessibility scores.

Conclusion and discussion: The current study failed to support the notion that people suffering from both symptoms of anxiety and depression have a reduced positivity bias during MTT. Contrary to the hypotheses, symptoms of depression and trait anxiety were each associated with *decreased* accessibility of negative events in the recent past and symptoms of depression were associated with *improved* accessibility of positive events in the distant future. Therefore, results failed to provide support for the notion of a reduced positivity bias in depression, and a distinction between anxiety and depression.

Introduction

One of the most fascinating aspects of human cognition is our ability to withdraw from the current moment and to mentally transport ourselves to another place, time, or perspective. The capacity to subjectively recall and re-experience episodes from our past, or pre-experience our lives in the future through imagination and simulation is called Mental Time Travel (MTT; Suddendorf & Corballis, 1997). This is an integral component of human cognition, one that has been claimed to distinguish humans from other species (Brown, Dorfman, Marmar, & Bryant, 2012).

Episodic memory (Tulving, 2002) enables mental traveling, from the present to the past, thus allowing one to re-experience one's own previous experiences and pre-live possible events in one's personal future through future projections. It can be either initiated voluntarily or arise spontaneously or involuntarily, that is with no preceding conscious attempt at mentally projecting oneself forward or backward in time (Berntsen & Jacobsen, 2008). MTT has to do with autonoetic consciousness, which refers to a special kind of consciousness that allows us to be aware of subjective time in which events happened (Tulving, 2002). For example, we seldom confuse the feeling that we are *remembering* a past event with the feeling that we are living in the moment, or that we are dreaming. It enables imagining future events, which engages a memory system that facilitates the flexible recombination of elements from past events in order to project and simulate novel events into the future (Brown et al., 2014). According to an emerging view in the literature, past and future MTT are constructive processes largely based on the same neutral networks (Addis, Wong & Schacter, 2008). When individuals function normally, pre-experiencing likely facilitates better decision-making by helping them to self-regulate, plan, and solve their problems. Faulty prospection may contribute to psychopathology, because it can negatively influence emotion, cognition, and behaviour (Roepke & Seligman, 2015). In addition, involuntary images and visual memories are prominent in many types of psychopathology. People suffering from posttraumatic stress disorder, other anxiety disorders, depression, eating disorders, and psychosis frequently report repeated visual intrusions corresponding to a small number of real or imaginary events, usually extremely vivid, detailed, and with highly distressing content (Brewin, Gregory, Lipton & Burgess, 2010). However, future-oriented thinking was relatively neglected within the field of clinical psychology for many years, whereas the weight of aetiology was mostly placed on the past. Therefore, there is a theoretical need to distinguish past and future-directed cognitions in the aetiology of mental disorders.

Studies of autobiographical memory consistently found a positivity bias in memory recall; this bias applied to both voluntary and involuntary recall (Walker, Thompson & Skowronski, 2003). In addition, Newby-Clark and Ross (2003) found that imagined future events were generally rated more positive than remembered past events, and generating negative future events took more time than positive future events. This suggests a stronger positivity bias towards the future and improved accessibility of positive future cognitions. The positivity bias in MTT may reflect a basic motivational tendency for people to seek out positive experiences and avoid negative ones, to maintain or enhance a positive view of oneself, and to protect the self against threatening information (Finnbogadóttir & Berntsen, 2012). Cacioppo and Gardner (1999) introduced the notion of *positivity offset,* formulated as the tendency to respond mildly positive to neutral stimuli. As a consequence of positivity offset, organisms are motivated to approach novel objects and stimuli in a neutral environment and expect positive outcomes of unknown future events. Furthermore, the Fading Affect Bias suggests that negative affect associated with autobiographical memories generally fades more quickly across time than positive affect associated with such memories (Ritchie, Skowronski, Hartnett, Wells & Walker, 2009).

However, some research indicates that in individuals suffering from anxiety or depression, or in individuals that have the tendency to become worried, the positivity bias in MTT seems to be reduced (Macleod & Byrne, 1996; Finnbogadóttir & Berntsen, 2012). Extensive theoretical and empirical work is converging to the conclusion that the overlap and the distinctiveness of anxiety and depression can be explained by their relationships to basic affective systems of positive and negative affect. Whereas positive affect is a dimension of pleasurable engagement and reflects the extent to which someone feels enthusiastic, active, and alert, negative affect involves un-pleasurable engagement, characterised by states such as anger, fear, and disgust (Macleod et al., 1997). This tripartite view has been supported by studies that have found negative affect to be positively correlated with a broad range of depression and anxiety symptoms, and low positive affect related only to depressive symptoms (Clark & Watson, 1991; MacLeod et al., 1997). Positivity biases are likely to be an important factor in contributing to the increase in positive affect (Mather & Carstensen, 2005).

Finnbogadóttir and Berntsen (2012) examined the valence of involuntary MTT in the context of trait worry. High (n=18) and low (n=16) worriers recorded the valence of involuntary memories and future projections using a structured notebook, and they completed measures related to negative affect. A positivity bias was found for both past and future MTT,

but this bias was greater for future than for past events. Furthermore, negative affect was positively associated with remembering past and imagining future negative events. MacLeod et al. (1997) examined MTT within participants suffering from depression (*n*=16), panic disorder (*n*=17), and control participants without symptoms (*n*=17). None of the anxious patients had a comorbid diagnosis of depression, and vice versa. A personal future as well as a memory task were devised, which required participants to think about experiences occurring over different periods of time. Anxious participants gave more negative, but not fewer positive responses than controls. Depressed participants on the other hand gave fewer positive responses, although they did not generate more negative responses than controls. Furthermore, there was no evidence to support a past-future distinction. A more recent study examined whether students with symptoms of generalized anxiety disorder (GAD) and depression were differentially associated with predictions they made about their future (Miranda & Mennin, 2007). GAD and depression were similarly associated with increased negative-outcome expectations. However, only depression was characterized by decreased expectations that positive outcomes would occur (Miranda & Mennin, 2007). An almost similar picture emerged from the study by Ströber (2000), who performed a replication and methodological extension of Macleod et al. (1997) using a nonclinical sample of 70 undergraduate students. To assess imagery for future events a list of subjective probability items was presented, this list contained 20 negative future events and 10 positive future events. Participants had to form a mental image for each potential future scenario, and then rate speed, vividness and detail on visual analogue scales. Correlations were examined between symptom measures and imagery for future positive and negative events. Results showed that only anxiety was related to enhanced imagery for future negative events. Furthermore, depression showed a unique association with reduced imagery for positive events. These are a few examples of past research on the reduced positivity bias during MTT in anxiety and depression.

The results from past research have failed to provide a clear and conclusive view on the positivity bias in past and future-directed thinking in people suffering from anxiety and depression. An explanation for these differences may be found in the relatively small samples that were used; the size of the samples may limit the generalizability of the findings. Furthermore, in each study different self-report measurements of anxiety and depression were used, which makes it hard to compare the symptoms of the included participants. Also, the various measurements that were used to assess MTT could explain the inconclusive results. It

is also noteworthy that some studies have only included one specific type of anxiety in their research.

Therefore, the aim of the present study was twofold. It aimed to shed further light on the positivity bias in Mental Time Travel in individuals with mixed symptoms of anxiety and depression and it tested whether a distinction in positivity bias could be made between anxiety and depression. As depression and anxiety typically co-occur (Byrne & Macleod, 1996), this study first examined the differences in accessibility of positive and negative valenced past and future thoughts in participants suffering from symptoms of both anxiety and depression and a control group consisting of participants with hardly any symptoms of anxiety or depression. Second, a distinction was made between symptoms of anxiety and of depression by relating each of them to the accessibility of positive and negative past and future events and symptom measurements.

In the aforementioned studies, the positivity bias or valence of past and future cognitions was measured by counting positive and negative responses or self-reported predictions regarding the likelihood that a positive or negative event would occur. In the present study participants were manipulated during a semi-structured interview with negative and positive cue words, in reaction to which they had to report past or possible future events. Consequently, time between manipulation and recollection of the events will be measured, reflecting the accessibility, or fluency, of positive and negative past and future events. One suggested explanation of cognitive bias in affective disorders is that it arises from difficulties accessing cognitions and, in particular, positive cognitions (Bjärehed, Sarkohi, & Andersson, 2010). Therefore, accessibility will give a better indication of the possibly reduced positivity bias in reproducing past events and imagining future events in anxiety and depression. Moreover, temporally close events tend to have more (p)reliving sensory details as compared to temporally distant events, so the time period may have an influence on the accessibility of past and future events (Berntsen & Jacobsen, 2008). Therefore, in contrast to past research, the present study made a distinction between recent and distant past and future thoughts. Also, the involvement of both general state and trait anxiety instead of just one specific anxiety related-disorder, will provide a more complete picture of the positivity bias during MTT in individuals with symptoms of anxiety.

The hypothesis was that the experimental group with mixed symptoms of both anxiety and depression show reduced accessibility (i.e., higher reaction time) of positive imagined past and future events compared to the control group consisting of participants with hardly any symptoms of anxiety or depression. Furthermore, it was expected that the experimental

group has increased accessibility (i.e., lower reaction time) of negative past as well as future-oriented thoughts. Within the group of participants with mixed symptoms, it was expected that both symptoms of anxiety as well as depression are each positively associated with accessibility of negative experiences. However, there should be a unique negative association between symptoms of depression and accessibility of positive experiences. Furthermore, in line with previous research (Macleod et al., 1997) as well as the notion that past and future MTT are based on the same memory system, it was predicted that there are no differences in the pattern of reaction times between past and future thoughts.

Methods

Participants

A total of 75 students (17 male, 58 female) participated in this study, which was as part of a more extensive Mental Time Travel study. Participants ranged in age from 18 to 33 years (*M* = 22; *SD* = 2.8). They were recruited via the Social Science laboratory of Utrecht University. Participants had to be students, the ability to speak and read Dutch, and a maximum age of 35 years. One of the original participants was excluded before the statistical analysis, because the maximum age was violated. Each participant was compensated with €12,- or 1 hour course credit.

Participants were divided into two different groups based on their scores on the BDI and STAI; the first group consists of 22 participants (7 male; 31,8%, 15 female; 68,2%) with symptoms of depression or/and anxiety and a control group of 52 participants (9 male; 17,3%, 43 female; 82,7%). Cut-off scores were used to divide participants into these two separate groups; participants with BDI scores of 13 or more (van der Does, 2002), TRAIT scores of 40 (male) and 42 (female) or more, and STATE scores of 38 (male) and 39 (female) or more (Ploeg, Defares, & Spielberger, 1980) were included in the anxiety and/or depression group. The average score on the BDI-II for the anxiety and/or depression group was 15.05 (*SD* = 7.69; range = 3 to 38). The STAI was divided in two subscales, average scores on the STATE and TRAIT scales were 41.45 (*SD* = 5.97; range = 31 to 54) and 46.36 (*SD* = 7.82; range = 30 to 60), respectively. For the control group the average score on the BDI was 4.65 (*SD* = 3.44; range = 0 to 12), STATE *M* = 29.52 (*SD* = 4.83; range = 20 to 38), and TRAIT *M* = 30,81 (*SD* = 5.27; range = 21 to 41). There were no statistically significant age or gender differences between both groups.

Design

The study examined the positivity bias in MTT within participants with mixed symptoms of anxiety and depression compared to controls. The between subjects design was a 2 (group: mixed symptoms, control group) x 2 (valence: positive, negative) x 4 (time: distant past, recent past, recent future, distant future), between subjects design. The dependent variable was reaction time (see below).

The Autobiographical Interview, an adapted version (A-AI)

For this particular research project stimulus material and methodology were based on the Autobiographical Interview (AI) and the Modified Autobiographical Memory Interview (M-AMT).

During the Autobiographical Interview (Levine, Svoboda, Hay, Winocur, & Moscovitch, 2002) autobiographical recollections are sampled across five life periods, and scored according to a standardized and reliable system in which details are assigned to various phenomenological categories. The interview consists of three phases, which are Recall, General Probe, and Specific Probe. Recall is a non-structured phase were as much information as possible will be collected about past and future events. In the second phase the interviewer asks specific questions, which aim to collect more information about the events, for example time and place ('Is there something else you can tell me about it?'). In the last phase the interviewer examines the details of the events ('Do you have any visual images associated with this memory?'). The Autobiographical Interview was found to have high internal consistency, with a Cronbach's alpha ranging from .88 and .96. Furthermore, construct validity was established by examining patterns of correlations with The Autobiographical Memory Interview (r = .65).

Brown and colleagues developed and used an extended version of the AI, that was oriented on the future as well, i.e., the M-AMT (Brown, Dorfman, Marmar, & Bryant, 2012). During this version of the AI individuals were presented with 20 positive (e.g. *joy, pride, love*) and negative (e.g. *blame, sad, stress*) cue words and were instructed to recall personal past and imagine future events. Following stimulus presentation, participants then described the event in detail. Events had to be personally relevant, occurring within a 24-h time period, realistic, and for future events, not previously experienced by the participants. The mean kappa reliability coefficient was .78 for positive words, and .86 for negative words.

In the present study individuals were presented with 6 positive (e.g. *love, happiness*) and 6 negative (e.g. *pain, angry*) cue words. The cue words are of the same length, and the

likelihood of occurrence -to the average Dutch person- was equally divided among the positive and negative cue words ranging from 105.79 to 477.21 million (Keuleers & New, 2010). After a short task instruction (‘‘describe an event in your –time period-’’), cue words were presented in the center of the computer monitor. The cue words were randomly divided into four lists of three words; the order of presentation was counterbalanced. Following stimulus presentation, participants then described the event using the AI protocol corresponding the three phases. Reported events had to be personally relevant, and specific in time and place. The combination of the AI and the M-AMT enables to examine the content of past events, and also the content of imagined future events. But, considering the age of the participants, other life periods were chosen (i.e., more than five years ago, one month ago, one month into the future, and more than five years into the future).

Responses were audio recorded, and time (including ‘’hmm’’ and thinking out loud) between the cue word and start of the Recall phase was measured, representing the accessibility of the past and future events. In this phase participants simply spoke spontaneously about the event without any interruption from the examiner, contrary to the other phases in which semi-structured questions were asked (Levine et al., 2002). Therefore, the reaction time measured in the Recall phase was best comparable between subjects. Furthermore, the recollected past and imagined future events in this phase are possibly best generalizable to every day life because the content is more spontaneous than in the other phases. The data collected in the last two phases was used in two other studies into MTT.

The Interclass Correlation Coefficient was used to display inter-rater reliability of the outcome variable reaction time (or accessibility of events) of two independent raters. Both measured accessibility of 12 events for 23 randomly chosen participants, 276 values were compared. A high degree of inter-rater reliability was found; the single measures ICC was .933 (the average measures ICC was .965) with a 95% confidence interval from .916 to .947, F (275)= 28.83, p = .000. Furthermore, no statistically significant gender or group differences were found in accessibility scores for the four different time periods.

Beck Depression Inventory II (BDI-II)

The Dutch version of the BDI-II (Beck, Steer & Brown, 1960; Dutch version: van der Does, 2002) is a short self-report scale, containing 21 items, which were designed for the assessment of symptoms according to the diagnostic criteria for depressive disorders (APA, 1994). Items reflect symptoms such as sadness, loss of pleasure, and changes in energy, sleep, and appetite. Individuals are asked to choose statements that indicate their feeling in the past two weeks.

Each item is scored on a 4-points Likert scale ranging from 0 (minimal severity) to 3 (severe). Total scores range from 0 to 63, scores ranging from 0 to 13 indicate minimal depression, 14 to 19 mild depression, 20 to 28 moderate depression, and 29 to 63 severe depression.

The Dutch translation of the BDI was found to have high internal consistency, with a Cronbach's alpha ranging from .88 and .92, and high test-retest reliability. Furthermore, van der Does (2002) established construct validity by examining patterns of correlations with other self-report measures, the Hamilton Depression Rating Scale (r = 0.79) and the Montgomery-Asberg Depression Rating Scale (r = 0.85).

State-Trait Anxiety Inventory (STAI)

The Dutch version of the STAI (Spielberger, 1983; Dutch version: Ploeg, Defares, & Spielberger, 1980) was used. The STAI is a self-report instrument consisting of 2 separate questionnaires, state and trait, 20 items each. In the state questionnaire, respondents indicate for each item how they feel at a given moment in time, whereas in the trait questionnaire they indicate how they feel in general. An example of such a statement is: 'I am tense'. Each item is scored on a four points Likert scale, ranging from 1 = not at all to 4 = a lot (state), or 1 = almost never to 4 = almost always (trait). The possible range of total scores is 20-80.

The state-anxiety scale demonstrated high test-retest reliability, as well as high internal consistency, Cronbach's alpha ranging from .75 to .92. The state-trait scale demonstrated low test-retest reliability, which can be expected from a scale that indicates an emotional condition at a certain time (Ploeg, Defares, & Spielberger, 1980). Results suggest that both sub-questionnaires are valid measurements.

Procedure

The current study was part of a more extensive MTT study. Students registered themselves to participate in this study in the Social Science laboratory of the University of Utrecht. Before the start of the study, participants filled in an informed consent. The experiment had two possible scenarios; in the first scenario the BDI-II and STAI were completed before the adapted version of the A-AI and in the second scenario the participants completed the questionnaires after the A-AI.

The experiment was conducted at computers with Windows 7, property of Utrecht University. The programme that was used to run the experiment was OpenSesame 3.0.5. The interview was recorded on a Sony voice recorder, also property of Utrecht University. The instructions and cue words were shown in bold white characters (font 20, Mono) in the middle

of a black screen. The temporal condition was placed underneath the specific cue word in italic white characters (font 18, Mono). Participants sat at a viewing distance of approximately 60 cm from a computer screen. The conditions each were presented for a maximum of five minutes (cf., Levine et al., 2002).

The researcher introduced the task: a brief general introduction of the A-AI followed by some specific instructions on the events the participant could choose. After these instructions the participant started with the experiment using the computer, where instructions were displayed at the computer as described before. At stimulus presentation, a beep was heard, and participants had to give a verbal description of the events in detail into a digital recorder. The phases of the original Autobiographical Interview (Levine, Svoboda, Hay, Winocur & Moscovitch, 2002) were used to assess specific information and content of the events. The participant first went through two practice trials, with neutral cue words, followed by twelve tasks with negative and positive cue words. After the experiment a debriefing was presented and the participant received the reward.

Statistical Analyses

Analyses were carried out using SPSS Statistics 20.0. The event descriptions were screened on content topics and a manipulation check was conducted.

Before conducting the statistical analyses, the data were examined to ensure that all of its underlying assumptions were met. First stem-and-leaf plots and boxplots indicated that not all the variables were normally distributed, and some contained univariate outliers. Therefore, the new average score replaced extreme scores on the two STAI subscales. A Log transformation was applied on the accessibility variables (i.e., reaction time), and a Square root transformation on the BDI-II scores, resulting in a normal distribution of all variables.

To test the hypothesis that the group with mixed symptoms has reduced accessibility of positive imagined past and future events, and increased accessibility of negative past and future events in comparison to participants with hardly any symptoms, Independent Samples *t* Tests were used, followed by a multivariate analysis of variance (MANOVA) taking the shared variance of the dependent variables into account. Before conduction the MANOVA, the data were examined to ensure all of its underlying assumptions were met. Correlations between the dependent variables were not excessive, indicating that multicollinearity was not of concern. Furthermore, the relationships that did exist between dependent variables were roughly linear. Finally, Box's *M* was non-significant at x = .001, indicating homogeneity of variance-covariance matrices could be assumed. To test the second hypothesis, within the

mixed symptoms group both symptoms of anxiety and depression were each associated with accessibility of positive and negative experiences, using non-parametric correlations (Spearman's Rho). To indicate whether each predictor accounted for a proportion of unique variance a standard Multiple Regression was conducted with the non-transformed data.

Results

Descriptive Statistics

As a manipulation check participant descriptions of events were screened on whether the content corresponded with the valance (positive or negative) of the cue word. Manipulation failed when for example a positive event was described, whilst a negative cue word was presented and no other event was collected. For example, manipulation failed several times using the positive cue word ''safe'', which was occasionally associated with an unsafe past or future event. Manipulation failed in only 19 times of 888 items (2,1%), with a maximum of one failure per participant. Therefore, the particular item score was replaced by participant's average score in the respective time by valence condition.

The content of past and future directed events, positive or negative, are best illustrated by the most frequently reported themes during the experiment. Recurrent themes were: the death of a family member or friend; a wedding; job interview or future job; having a family; graduating; buying a house; traveling or remembering past travels; experiencing a terrorist attack; imagining or remembering an accident; ending a relationship. There was often an association found between the cue word "pain" and physical pain in the content of the descriptions. Average scores on the accessibility variables in both groups, are shown in Table 1.

Independent Sample *t* Tests were used to compare the average accessibility scores reported by participants with mixed symptoms of anxiety and depression (n = 22) to the average accessibility scores reported by those in the control group (n = 52).

To ensure that all the underlying assumptions were supported, before conducting the Independent Sample *t* Test, the transformed data was used to conduct the analyses. Findings showed that there were no differences between the control and the mixed symptoms group on the distinct dependent variables. The *t* test was non-significant for Positive Far Past, t (72) = -0.12, p = .91; Positive Recent Past, t (72) = 1.81, p = .08; Negative Far Past, t (72) = -1.44, p = .15; Negative Recent Past, t (72) = - 0.34, p = .73; Positive Recent Future, t (72) = 0.02, p =

.99; Positive Far Future, t (72) = 0.05, p = .96; Negative Recent Future, t (72) = 0.66, p = .51; Negative Far Future, t (72) = 0.89, p = .38.

Table 1.

Means and Standard Deviations of the accessibility variable, divided by group, time period, and valence.

	Anxious-Depressed		**Control Group**	
	M	SD	M	SD
Negative Far Past	43.45	40.23	27.76	24.04
Positive Far Past	35.95	32.44	33.90	28.08
Negative Recent Past	31.64	19.70	32.29	25.24
Positive Recent Past	19.91	15.26	26.65	17.42
Negative Recent Future	27.82	21.79	29.69	22.01
Positive Recent Future	30.45	24.73	30.27	26.25
Negative Far Future	28.55	21.79	29.54	20.41
Positive Far Future	19.09	14.87	19.08	16.31

Also, findings from a MANOVA showed that there was a non-significant effect of the group variable on the combined dependent variables using Pillai's trace, F (4, 70) = 1.003, p = .443, partial n^2 = .110. Analysis of the dependent variables individually showed no effects for the accessibility scores.

Correlations were examined between symptom measures and accessibility scores on the different conditions within the mixed symptoms group. Analyses were examined by Spearman's Rho. Total STATE scores were not significantly associated with each of the eight independent variables. On the other hand, the bivariate correlation between BDI-II scores and Negative Recent Past was positive and strong, r (20) = .57, p < .01 and Positive Distant Future negative and moderate, r (20) = -.48, p < .05. The bivariate correlation between TRAIT scores and Negative Recent Past was positive, r (20) = 49, p < .05. All Linear associations between psychopathology measurements and accessibility scores are shown in Table 2.

Table 2.

The Linear association between psychopathology measurements, BDI-II and the two subscales of the STAI-II, and accessibility scores divided in eight conditions within the group of mixed anxiety and depression symptoms.

	BDI-II	STATE	TRAIT
	r	*r*	*r*
Negative Distant Past	.13	.24	.10
Positive Distant Past	.37	.31	.29
Negative Recent Past	.57**	.32	.49*
Positive Recent Past	.19	.04	-.02
Negative Recent Future	-.15	.05	.23
Positive Recent Future	-.03	.30	-.09
Negative Distant Future	.32	-.10	.33
Positive Distant Future	-.48*	-.05	-.32

* Correlation is significant at $p < .05$

** Correlation is significant at $p < .01$

To estimate the proportion of variance in Positive Distant Future and Negative Recent Past accessibility scores that can be accounted for by symptoms of depression and anxiety, a MRA was performed within the mixed symptom group. Symptoms of depression were not a predictor for Negative Recent Past and Positive Distant Future β (18) = .14, p = .14 and β (18) = -.28, p = .18, respectively. Furthermore, trait anxiety was not a predictor for Negative Recent Past accessibility scores, β (18) = .13, p = .59

Discussion

Although increased theoretical and empirical attention has been turned toward Mental Time Travel in the past few years, results from research so far have failed to provide a clear and conclusive view on the positivity bias in past and future-oriented thinking in people suffering from anxiety and depression. This study extends prior research by first comparing a group of participants with mixed symptoms of anxiety and depression with a control group on the accessibility of negative and positive past and future events. Second, correlations were measured between symptom measures and the accessibility of positive and negative past and

future events within the group of participants suffering from symptoms of anxiety and depression.

It was predicted that the group with mixed symptoms of both anxiety and depression show reduced accessibility (i.e., higher reaction time) of positive imagined past and future events compared to the control group. Furthermore, it was expected that the mixed group differed from the control group by increased accessibility (i.e., lower reaction time) of negative past and future-oriented thoughts. However, there were no significant differences found between both groups. Therefore, these findings failed to support the notion that the positivity bias during MTT in individuals suffering from anxiety and depression has been reduced. This was contrary, to past research of Finnbogadóttir and Berntsen (2012) examining MTT in the context of trait worry, where findings indicated a reduced positivity bias in individuals with a general tendency to experience negative affect. The lack of significant differences between both groups on accessibility scores in the present study could be explained by the cognitive avoidance theory (Borkovec, Robinson, Pruzinsky & DePree, 1983). In light of this theory, in emotional disorders, such as social phobia, PTSD, and depression, autobiographical memories are often experienced from the observer perspective and these memories have been found to be less specific (Finnbogadóttir & Berntsen, 2011). According to this theory it might be possible that both groups differ on the *content and specificity* of recollected past events and imagined future events, but not on the *accessibility* of those events. The work of Szöllösi, Pajkossy and Racsmany (2015) supports this view. They found a negative association between depressive symptoms and vividness and contextual/sensory details of imagined future events.

Furthermore, within the group of participants with mixed symptoms, it was hypothesized that both symptoms of anxiety as well as depression are each positively associated with the accessibility of negative experiences. However, there should be a unique negative association between symptoms of depression and the accessibility of positive experiences. These findings would indicate that only people suffering from symptoms of depression have a reduced positivity bias. Contrary to the predictions, correlations revealed that trait anxiety was associated with reduced accessibility (i.e., higher reaction time) of recollected negative events in the recent past. Also, depression symptoms were associated with reduced accessibility (i.e., higher reaction time) of negative events in the recent past, and improved accessibility (i.e., lower reaction time) of positive events in the distant future. It is noteworthy that further investigation indicated that symptoms of depression or trait anxiety

were not significant unique predictors for the accessibility of positive and negative events. In contrast to prior research (Macleod et al., 1997; Ströber, 2000; Miranda & Mennin, 2007), these results failed to support the notion of improved accessibility of past or future oriented negative experiences in anxiety and depression. Also, no results were found to support the view of a reduced positivity bias during MTT in depression. The use of a sample of university students with moderate symptoms of both disorders, and not a clinical population, which Macleod and his colleagues (1997) used, may partly account for the lack of results in the current study. Contrary to the present study, past research showed a variety in positivity bias during involuntary MTT as a function of individual differences related to negative affect (Finnbogadóttir & Berntsen, 2012). The focus on only voluntary MTT could explain the differences in results between the present study and past results.

Another limitation of the present study is the lack of a control task, which can control for verbal fluency. For example, Ströber (2000) used a standard task that provides a general measure of verbal fluency, by asking individuals to say as many words as they can think of beginning with particular letters. The control task makes it possible to control for individual verbal fluency differences between participants. Furthermore, the study had a small sample size, which makes it difficult to draw firm conclusions, as it could have been too small to detect differences between the group with mixed symptoms and the control group. The use of only self-report measurements, and a population of university students with a limited range of age, limits the generalizability of the findings to clinical populations.

The current study failed to support the notion that people suffering from symptoms of anxiety and depression have a reduced positivity bias during MTT. Contrary to the hypothesis, symptoms of depression and trait anxiety were each associated with decreased accessibility of negative events in the recent past, and symptoms of depression were associated with improved accessibility of positive events in the distant future. Therefore, results failed to provide support for the notion of a reduced positivity bias in depression, and a distinction between anxiety and depression. However, based on past findings and the tripartite view there is a theoretical need to distinguish past and future-oriented cognitions in the aetiology of anxiety and depression. Further research can play an important role in advancing development of effective biological and psychosocial interventions for these disorders.

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