

Effects of past versus future mental time travel on levels of mindfulness in the present

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Submitted in partial fulfilment of the requirement of the BA (Hons) in Psychology at Dublin  
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March 2014

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### *Acknowledgements*

Firstly, I would like to thank Dr. Jonathan Murphy for his invaluable support and feedback throughout my project. I am greatly indebted to him for his patience, advice, and inspiration. I would like to thank the other DBS lectures who have inspired me throughout my studies, my fellow classmates, and all my family and friends. Lastly, and perhaps most of all, thank you to all 175 participants who took part in my study, this would never have been possible without you.

## Abstract

One hundred and seventy-five participants ( $N = 175$ ), aged 18-67, comprised of 26% males and 74% females, participated in a between-group experiment aiming to investigate the effects of mental time travel on levels of in-the-moment mindfulness. Four separate conditions required participants to remember or imagine 2 positive or negative emotional life events, after which in-the-moment mindfulness was measured. Analyses revealed no significant difference between conditions on mindfulness levels. There were significant differences found between conditions on perceived functionalities and characteristics of constructed events. A number of non-hypothesized effects were also found. The study supported previous findings on the functional qualities of mental time travel, and afforded the opportunity to explore factors including how effective mental time travel is at influencing certain mental states.

**Keywords** Mental time travel • Autobiographical memory • Autonoetic consciousness • Mindfulness

## Introduction

### *1.1 Mindfulness and mind-wandering*

“The practically cognized present is no knife-edge, but a saddleback, with a certain breadth of its own on which we sit perched, and from which we look in two directions of time. The unit of composition of our perception of time is a duration, with a bow and a stern, as it were—a rearward—and a forward looking end....We do not feel one end and then feel the other after it, and from the perception of the succession infer an interval of time between, but seem to feel the interval of time as a whole, with its two ends embedded in it” – William James 1890/1950 (p21).

One’s experience of the present moment is not a minuscule instant, but rather it comprises a minimum duration, a window in motion through life in which one seizes not just the immediate “now” but also a sliver of the recent past and a taste of the imminent future, what William James called “the specious present”. Humans tend to trichotomize time into a psychological present (moments of awareness about 3 seconds long), an ill-defined past (divided into distant and recent), and an ill-defined future (also divided into distant and recent) (Pinker, 2008). As William James observed, our experience of the present is usually short-lived due to the wandering nature of the mind. On other hand, to truly live in the present moment is to be in a state of mindfulness.

Mindfulness is generally defined to include focusing one’s attention in a non-judgmental or accepting the experience occurring in the present moment (Baer *et al*, 2004). The construct of mindfulness, is by no means new. William James (1890) understood that “the

faculty of voluntarily bringing back a wandering attention, over and over again is the very root of judgment, character, and will....An education which should improve this faculty would be an education par excellence” (p424). Mrazek, Smallwood and Schooler (2012) have examined both constructs of mind-wandering and mindfulness. Mindfulness has been operationalized in many ways, with disagreement over what is the most privileged and useful definition. One approach defines mindfulness as “sustained non-distraction”. The other, emphasizes awareness of one’s present experience, and orientation toward that experience characterized by curiosity, openness and acceptance (Mrazek, Smallwood & Schooler, 2012). Via empirically supported research, Davis and Hayes (2012) report that the benefits of mindfulness include reduced rumination, stress reduction, enhanced working memory and focus, and less emotional reactivity.

Event-related potential studies have shown that mind-wandering is usually characterized by an attenuated *awareness* of task stimuli and one’s external environment (Barron *et al* In press; Smallwood, Beach, Schooler, and Handy, 2008, Kam *et al*; 2011).Mzarek *et al* (2012) have found that the ability to remain *mindfully focused* on a given task contrasts directly with the tendency for attention to wander toward non-task agendas. Their research resulted in a reliable negative correlation between mindfulness and mind-wandering. Mzarek *et al* (2012) maintain that “where mindfulness ends, mind-wandering begins” (p443), and also suggest that mindfulness may well be the antidote to mind-wandering. Both constructs are possibly two sides of the same coin. Nevertheless, although mindfulness is highly beneficial, most our time is spent mind-wandering.

The tendency for the mind to stray from the *present* in favour of thoughts unrelated to current events occupies 50% of one’s waking hours (Killingsworth & Gilbert, 2010). People are literally “lost in thought”, that is, while people deliberately try to pay attention at times, they will

find the task is actually close to impossible. People “talk” to themselves continuously, they never truly shut off, and tell themselves what just happened, what almost happened, what should happen, and what might yet happen and ceaselessly reiterate their hopes and fears of the future. Attention never truly shuts down, and is seldom focused in the here and now of our experiential self (Brockman, 2012).

Mind-wandering is characterized by decoupling of attention from an immediate task context, toward unrelated concerns, a severing of one’s engagement with external stimuli. Mind-wandering often occurs at a high cost to performance, such as deficits in reading, sustained attention, aptitude, ability to deal with automatized responses, working memory, mood and general intelligence (Mooneyham & Schooler, 2013). Nevertheless, most people escape into the past, into the future, into to-do lists and wander off away from the present, engaging in ‘should-haves’ and ‘what-ifs’.

Even when minds wander off to pleasant things, people are less happy than when they are fully present in the moment (Popova, 2013). Gilbert and Killingsworth (2010) have shown that individuals are less happy when they are mind-wandering even during the most enjoyable tasks, because they fail to stay *present-focused*. These researchers demonstrated that mind-wandering, often leads to greater discontent rather than vice-versa, and that happiness is highly sensitive to the contents of one’s *moment to moment* experience. They found that one of the most powerful predictors of happiness is something we often do unconsciously; mind-wander.

Mind-wandering plays an important role in autobiographical planning, and creative problem solving (Mooneyham & Schooler, 2013). Indeed, there are costs as well as benefits. Potential benefits include the facilitation of future thinking, prospective anticipation and planning of personally relevant future goals, (autobiographical planning), and creative thinking



/incubation, i.e. the unconscious recombination of thought processes after they are stimulated by mental activity, allowing for a solution to arise at a later time. Another benefit is attentional cycling i.e. the switching between streams of thought. It is striking that mind-wandering is both simultaneously ubiquitous and problematic. Even when engaged in a highly demanding task, the mind will still wander off (Mooneyham & Schooler, 2013). Somewhat paradoxically, humans are wired to wander, in that it is the brain's natural state (Buckner *et al*, 2008). The ability to mind-wander, more specifically, to be able engage in mental time travel (MTT), is a valuable adaptation. MTT affords self-regulation, goal-directed behaviour, and mental projection. Humans owe a great debt to this ability, and engage almost endlessly in it. In fact, it is one of the most ubiquitous of all mental activities.

### ***1.2 The default-mode network and neural substrates of mental time travel***

MTT is defined as is the ability to mentally project oneself backward or forward in time in order to remember events from one's personal past, or to imagine possible events in one's personal future (Tulving, 2002). Mental projection matters because among other things, it influences current cognitions, decisions and emotions (Van Boven & Ashworth, 2007). Mind wandering, mental time travel, and a person's theory of mind all depend on the *default-mode network* (DMN), which is active when the mind is not engaged in interaction with the immediate environment. Whenever thoughts are suspended between specific, discrete, goal-directed behaviours, the brain reverts to the baseline resting state of the DMN (Buckner *et al*, 2008; Konnikova, 2013). The DMN is activated if people are left to think for themselves undisturbed, without focusing on the immediate environment, thus allowing their minds to wander (Corballis,

2012). Buckner, Andrews-Hann, and Schacter (2008), have also found that autism, schizophrenia, and Alzheimer's disease all have associations, and possible causal links with disruptions to default-mode activity. Via fMRI, Raichele (2006) has investigated baseline network activity "at rest", and has shown that the brain's energy consumption is in fact, *never* at rest, but what he calls "at rest, but active". He refers to this kind of intrinsic brain activity as the brain's dark energy, and has shown that 70-80% of the brain's energy budget supports this communication among neurons and supporting cells. Indeed, intrinsic brain activity includes daydreaming and mind-wandering (stimulus independent thoughts), whereas only 1% of brain energy is expended on the *momentary demands* of the environment (Raichele, 2006).

Buckner and Carroll(2007) purport that envisioning the future, remembering the past, conceiving the viewpoint of others, and some forms of navigation reflect the workings of the DMN. The network includes frontal regions along the midline, a network of lateral and medial parietal regions, and medial temporal lobe structures. Past and future MTT have many similarities, and both temporal directions depend on this network and similar structures. Both processes involve emotional, sensory, and spatial (p) reliving, and the experience of the *self being present in the mental projection* (Bernsten& Bohn, 2010; D'Argembeau& Van der Linden, 2004). Damasio (2007) refers to such processes as activities of one's *extended consciousness*.

MTT relies of two streams of consciousness. Autonoeticconsciousness is the awareness of the self in time, and chronesthesia is the awareness of subjective time. Autonoetic consciousness is the quality of self-knowing, used in relation to consciousness of something personally experienced, that is, the subjective re-experiencing of a past event. While both constructs imply awareness of one's self in time, the emphasis on the self in time is distinguishable amongst the two. In autonoesis, the emphasis is on an awareness of *self*,albeit in

subjective time, while in chronesthesia, the emphasis is on awareness of subjective *time*, albeit in relation to self (Tulving, 2002).

Tulving (2002) purports that consciousness as a capacity is not directed at any one thing, whereas awareness is always directed at something stating that “awareness presumes consciousness, but consciousness does not imply awareness: Consciousness is a necessity but not sufficient condition for awareness” (p 313). Auto-noetic consciousness is a valuable, adaptive quality, and recent evidence has even shown non-human primates, birds and even rats are able to engage in MTT to varying degrees (Corballis, 2012).

A mounting body of evidence suggests that auto-noetic consciousness, MTT, and emotional self-regulation are largely implicit right-hemispheric brain functions. From a meta-analysis, McGilchrist (2010) observes that “The right hemisphere seems more engaged by emotional, autobiographical memories. It is hardly surprising that the ‘sense of self’ should be grounded in the right hemisphere”, (p 88). Nobel laureate Roger Sperry hypothesized that the right-hemisphere network gives rise to self-awareness. Indeed, the right hemisphere is responsible for ‘maintaining a coherent and continuous sense of self’, and is involved in the processing of self-images, at least when self-images are not consciously perceived (McGilchrist, 2010).

The right hemisphere is in fact, largely unconscious (McGilchrist, 2010). Joseph (1992) observes that what many researchers refer to as subconscious or unconscious processes are associated with right-hemispheric qualities and functions. Schore (2012), observes the same functionality, like Joseph, he refers to the ‘right brain implicit self’. Schore (2012) states; “autobiographical memory, an output of the right brain, is the highest memory system that consists of personal events with a clear relation to time, space and context. In this right brain

state of ‘autonoetic’ consciousness, the experiencing self represents emotionally toned memories, thereby allowing for “subjective time travel” and the capacity to project the self into the future” (p141). He continues; “This developmental progression is reflected in a functional expansion in implicit self-regulation, affect, communication and cognition, essential functions of the right brain, the locus of the highest human mental function, responsible for creativity, and *integration of past, present, and future experience*” (p141).

Damasio (2006) also stresses the unconscious aspect of the autobiographical self, asserting that Freud’s psychoanalytic unconscious is rooted in the neural systems which support autobiographical memory. Damasio argues the autobiographical self is at the upper echelons of consciousness, and that it is the ‘self’ that gives rise to consciousness (Damasio, 2012). Via this “crowning” autobiographical self, individuals can utilize the past, the now, and the anticipated future to be afforded the appropriate salencies, and thus a better chance to influence reasoning and decision-making processes (Damasio, 2010).

### ***1.3 Research on mental time travel***

Autobiographical memories fall into three broad categories: Directive (Instrumental and guiding behaviour), self (Self-concept and self-continuity), and social (Communicative and social bonding). Directive-function guides present and future thinking and behaviour, assists in problem-solving, planning, inspires, informs, and motivates, and is the most basic and evolutionary earliest of the three. Self-function is inherent in autobiographical memory because it is defined as memory related specifically to the self. The maintenance of self-continuity is

suggested to be one of the most important self-functions (Rasmussen & Bernstein, 2009). Because of their central status to one's identity, self-memories may act as highly accessible reference points for the attribution of meaning to other autobiographical memories, and are thus subject to more purposeful and goal-orientated rehearsal than directive or social memories. Social-function is apparent when memories are shared in order to persuade, ease communication, facilitate social bonding, and elicit empathy or intimacy, and they may not be subject as much private rehearsal as directive or self-memories (Rasmussen & Bernstein, 2009).

Rasmussen and Bernstein (2009) found that positive memories are associated with more self and social functions than negative memories, whereas negative memories are associated with a more directive function. Directive memories were dominated by negative emotion and unpleasant content, while self and social memories were dominated by positive and pleasant content. Moreover, directive memories had longer response times than those of the self and social genre. Directive and self-memories were rated as more central to one's identity and life story than social were, while social memories were more talked about than directive and self-memories. These findings suggest that although people distance themselves from painful emotional reliving of negative memories, they still retain enough detail necessary to solve problems and prevent future mistakes. This idea is consistent with results showing dominance of central details of negative memories, and peripheral details of positive memories (Bernstein, 2002, Talarico et al, 2009). From this view, memory for central details at the expense of the peripheral enables negative recollection to serve directive functions, fitting in with the assumption that an important role of autobiographical memory is to maintain a positive self-image. Memory function also varies in predictable ways according to memory *content* (Rasmussen & Bernstein, 2009). Moreover, D'Argembeau and Van der Linden (2004),

suggest that the manner in which we remember our past and imagine our future is constrained by our *currents goals*.

Autobiographical induced emotion is powerful. Radovic, Salas, and Turnbull (2011) investigated emotional autobiographical memories by getting students to watch film clips (external procedure), and recall personal events (internal procedure) inducing 4 basic emotions (fear, anger, joy, sadness) and later completing a self-report questionnaire. Results showed that emotional intensity was significantly higher across all four target variables when internally generated via autobiographical recall, compared to when externally evoked by films consisting of highly emotional content, and that such internally generated approaches have more ecological validity than externally evoked methods. These researchers contend that this approach opens the opportunity to investigate internally generated procedures in more detail, which by merit of its verbal nature, provide richer sources of introspective data related to the subjective quality of emotional experience. Internally generated emotional content seems to exert a stronger influence on subjectivity than emotions triggered by external stimuli, possibly because they are more personally relevant (Radovic *et al*, 2011).

#### ***1.4 Positive versus negative life events***

Emotionally positive autobiographical memories are reported approximately twice as frequently as their negative counterparts, possibly because people's intensity ratings decrease over time, albeit, this decrease is faster for negative memories than positive ones (Walker, Skowronski, & Thompson, 2003). This fading effect has also been found for memories of future events (Szpunar, Addis, & Schacter, 2012). Negative memories, are also perceived as being more

temporally distant than positive, and may serve a self-regulation function, because temporally close events are more likely to be viewed as belonging to the *current self* than are temporally more distant events (Wilson, Gunn, & Ross, 2009).

By asking participants to generate memories as well as their most frequent involuntary and most vivid flashbulb memories, and then mapping these memories onto the 3 functions (directive, social, and self) Rasmussen and Bernstein (2009) found that memories of positive events are more rehearsed across different types of rehearsal (talking or thinking about the event or the memory coming to mind spontaneously) than are memories of negative events. Positive memories have demonstrated higher ratings on measures of imagery, sense of reliving, vividness, and mental time travel (Bohn & Bernstein, 2007; Rasmussen & Bernstein, 2009).

While most biases in autobiographical memory favour positive information, negative memories tend to be more accurate (Bohn & Bernstein, 2007; Kensinger, 2007, 2009; Levine & Pizarro, 2004), and are remembered with more central (but less peripheral) details than the positive genre (Bernstein, 2002; Talarico, Bernstein, & Rubin, 2009). Negative events evoke stronger physiological, cognitive, behavioural, and social reactions than do neutral or positive events. Differences between positive and negative memories may reflect different functionalities between the two types of memories, such as maintaining a positive self-image versus optimizing personal survival (Taylor, 1991).

This view suggests an adaptive value to remembering the aspects of negative events necessary for problem solving and prevention of future mistakes, whilst the promotion of positive memories versus the dampening of negative memories may serve as the establishing of personal and social resources (Bernstein, 2002; Frederickson & Branigan, 2005; Levine & Bluck,

2004; Rasmussen & Bernstein, 2009; Ross & Wilson, 2002; Talarico et al, 2009; Taylor & Brown, 1988).

### ***1.5 Remembered versus imagined life events***

The mental construction of future events is more cognitively demanding than past events, i.e. associated with higher levels brain activity (Addis et al., 2007, 2008; Szpunaret al., 2007), suggesting a more schema-based construction. Nevertheless, past events rate higher on imagery and vividness. Future events rate higher on self-schema variables (e.g. potential consequences) and abstract knowledge such as importance, relevance to life story and identity, and proportion of general versus specific events (Bernstein & Bohn, 2010; D'Argembeau & Mathy, 2011; D'Argembeau & Van der Linden, 2004; Miles & Bernstein, 2011). Future autobiographical thinking also shows greater bias in favour of emotionally positive and idyllic events (Bernstein & Rasmussen, 2012). Although positive past events are more frequently remembered than negative past events, this positivity bias is more distinct for imagined future events (Gallo, Kortnauer, Mc Donagh, Tesdale, & Johnson, 2011; Newby-Clark & Ross, 2003).

Bernstein and Rasmussen (2012), investigated the effects of emotional valence on function and phenomenological characteristics of past versus future events by asking participants to remember or imagine events and rate them on phenomenological characteristics. Overall, results revealed that future events are generally more emotionally positive and that both types of event representations appear to serve contrasting yet important functions for emotion, self, and behavioural regulation (Bernstein & Rasmussen, 2012).



Newby-Clark and Ross (2003) found that when participants' generated events form their personal past and potential futures, they described extremely positive events in both temporal directions, whereas extremely negative events were found almost exclusively in the past condition (Bernsten& Rasmussen, 2012).Positive events were more emotionally vivid than negative events, and emotional valence was higher for future MTT. Future MTT is characterized to a greater extent by uncorrected positive illusions, whereas past MTT is constrained by the reality of events that have already occurred, allowing for corrections of thought and behaviour and the prevention of future mistakes. Indeed, Bersten and Rasmussen (2012) observe that "unlike the future, the past can only be reinterpreted" (p198). Future negative events have longer retrieval times than future positive events, suggesting that they are more difficult to imagine. (D'Argenbeau& Van der Linden, 2004; Lishman, 1974; Newby-Clark & Ross, 2003: Rasmussen &Bernsten, 2009).

Future MTTappears to serve important emotional and self-regulation functions by selectively restraining the phenomenological lucidity of potential future negative events.Past MTT provides valuable corrections of thought and behaviour and may be more associated with problem solving (Bernsten& Rasmussen, 2012). Past events are also rated higher on sensory imagery, (p)reliving, and vividness, whereas future events are rated higher on self-function, consequences, and proportion of general events(Bernsten& Rasmussen, 2012). Consistent with previous work by Bernsten and Jacobsen(2008),and Miles and Bernsten(2011),Bernsten& Bohn (2010) found that future events included fewer specific events, and that negative events were rated as being more distant in time from the present moment than positive events, consistent with the temporal self-appraisal theory for past events (Ross & Wilson, 2002).

Also in agreement with self-appraisal theory (Ross & Wilson, 2002), and the notion of enhanced positivity bias for the future, positive future events were dated as less temporally distant in time than negative future events (Bernsten & Rasmussen, 2012). Future MTT appears to play a more central role for self-regulation and for maintenance of a positive self-image than does past MTT, and that past MTT due to higher associations with negative affect, provides valuable corrections of thought and behaviour, and thus is more associated with problem solving, planning and learning (Bernsten & Rasmussen, 2012).

Some researchers argue that simulating future events is the main function of autobiographical memory, and the very reason why memory evolved to be reconstructive rather than reproductive in process (Constandi, 2013). Van Boven and Ashworth (2007), investigated the emotional intensity of past versus future emotional episodes, and found that individuals report more intense emotions during anticipation of, rather than during retrospection about, emotional events that were positive, negative, routine, and hypothetical. They observed that anticipation is more evocative than retrospection, and that a clear discrepancy between both directions, is that future events are usually less certain than past events. Greater uncertainty of the future genre can generate greater intensity of emotion during anticipation than during retrospection because uncertainty accentuates emotional reactions to the contemplation of emotional events (Van Boven & Ashworth, 2007). As well as uncertainty being stressful and even upsetting, individuals are less adept at being able to “normalize and rationalize uncertain events, making those events more evocative” (Van Boven & Ashworth, 2007, p 290).

Individuals report more intense emotions when they *anticipate* emotional events rather than when they *retrospect*. Van Boven and Ashworth (2007) have observed that the psychological distance between the self and future emotional events seems to be always

decreasing, whereas the psychological distance between self and past almost always increases. Emotional experience depends not only on whether an emotional event is near or far, but also whether one is looking forward or backward in time, i.e. both temporal distance and direction (Van Boven and Ashworth, 2007).

### ***1.6 Rationale for the present research study***

Gaps clearly still exist on MTT research. One worthwhile and unexplored avenue is how emotional MTT affects one's mindfulness levels in the present moment. Mzareket al (2012) have suggested that future research could fruitfully examine how the actual *content of mind-wandering episodes* relates to the sub-processes of multi-factorial frameworks for mindfulness. This suggestion is closely akin to what the present study aims to investigate, by examining the characteristics of emotionally positive versus negative, and past versus future autobiographical event representations, and furthermore, the effects they have on mindfulness levels. A number of studies have investigated the functionalities between temporal direction and emotional valence of autobiographical events, revealing contrasting qualitative differences. These differences may have implications for a person's levels of awareness *in-the-moment*. As far as one is aware, no study has investigated how temporal direction and valence of MTT affects one's awareness in the present moment, or addressed the functional effects of MTT by incorporating a between-groups design comprising 4 separate experimental conditions, aimed at examining these effects across past versus future, and positive versus negative qualities of autobiographical life events. The present study aims to address these issues.

### ***1.7 Proposed hypotheses***

- Hypothesis 1 states there will be significant differences between experimental conditions on mindfulness levels.

The rationale for this hypothesis is previous researchers such as Van Boven and Ashworth (2007) and Bernsten and Rasmussen (2012) have demonstrated many significant functional differences on characteristics of MTT, and thus these significant effects may possibly influence in-the-moment mindfulness levels.

- Hypothesis 2 states that “belief” and “sensory imagery” of events will significantly predict mindfulness scores in the past/positive condition.

The rationale for this is that people are in general, notably confident regarding their belief of the accuracy of their memories, and how on reporting the vividness of the invoked imagery of these memories (Bernsten & Rasmussen, 2012). “Belief” and “sensory imagery” have been demonstrated in previous studies to yield the highest mean scorers for both past conditions (Bernsten & Rasmussen, 2012).

- Hypothesis 3 states that “consequences” and “self” of events will significantly predict of mindfulness scores in the future/positive condition.

Consequences of events have been shown to be the highest scoring of characteristics of MTT in both future conditions in previous studies by Bernsten and Rasmussen (2012). Potential consequences and one’s self-orientation are significant motivating factors involved in future thinking.

Previous studies have shown significant differences between characteristics of positive and negative conditions, nearly all favouring higher scores for positive conditions.

(Bernsten& Rasmussen, 2012).Because of these previous findings, and for parsimonious reasons, it seemed more worthwhile to examine both positive conditions alone, rather than the negative genre.

- Hypothesis 4 states that there will be significant differences between conditions, on the perceived functionalities and characteristics of constructed events.

These differences have been examined previously by Bernsten& Rasmussen(2012), in a within-groups study using 2 groups of 158 participants, yet as far as one is aware, never with in a between-groups design comprised of 4 conditions, of a similar sample size.

## **Method**

## ***2.1 Participants***

The sample type employed for this study was a non-probability, sample of convenience. A total of 175 participants were used, with approximately 40-50 participants per condition receiving each treatment. The sample took approximately 6 weeks to acquire (15<sup>th</sup> Nov- Dec 24<sup>th</sup>). The age range of participants was 18 to 67 years. Mean age of participant was 33.44, with standard deviation of age 11.62. Gender ratio was 45 males (26%), and 130 females (74%). An uneven amount of participants per condition was due to random assignment. Participants were adults drawn from the general population, a number of which were non-Irish, English speaking nationals. A number of participants were also psychology and counselling students. Participants were selected by requesting they partake via email and social network sites and online groups. Subsequently, the external online experimental survey link was forwarded to participants, consisting of 1 of 4 separate experimental conditions. Microsoft Excel random number generator was used to randomly assign participants to conditions. Participants did not receive an incentive or inducement for participating, but were informed they were contributing to the expansion of psychological research. Approximately 14 hard copies of the study were handed out manually to those who requested one.

## ***2.2 Design***

The present study was a quantitative, between groups, intervention-style true experiment. For the first hypothesis the independent variable was assignment to 1-4 experimental conditions of MTT consisting of: Past/positive, past/negative, future/positive, or future/negative. The dependent variable for this hypothesis was the total mindfulness score (Out of 155).

For the second and third hypotheses, the predictor variables were items; Belief and sensory imagery (hypothesis 2), and self and consequences (hypothesis 3) on the MTT questionnaire of perceived functionalities and characteristics of constructed events. The rationale for selection of these items was that “self” is one of broad category of autobiographical memories. The other three items (Belief, sensory imagery, and consequences) were the three highest scoring items in previous studies using the MTT questionnaire (Bernsten & Rasmussen, 2012). The criterion variable for these hypotheses was the total mindfulness score (Out of 155). For hypothesis four, the independent variable was random assignment to 1-4 experimental conditions of MTT consisting of; Past/positive, past/negative, future/positive, or future/negative. The dependent variables were scores on items on the 20-point MTT questionnaire of perceived functionalities and characteristics of constructed events.

### ***2.3 Materials & Apparatus***

The present study employed the 20-point scale of perceived functionalities and characteristics of constructed events taken from Bernstein and Rasmussen (2012) (see appendix A). Reliability and validity of this scale is ensured as these questions were developed and validated in previous work on the function of autobiographical memory in relation to emotion (Rasmussen & Bernstein, 2009). The questions were derived or modified from Rubin and Stiegler (2004), Rasmussen and Bernstein (2009), and Bernstein and Bohn (2010).

For the purpose of the present study, item 2 “days ago”, to was altered to “weeks ago”. It seemed a measure in weeks instead of days would be more convenient for participants (see appendix A). All four conditions were the same, except that this questionnaire was altered slightly to suit each condition of; past/positive, past/negative, future/positive, future/negative. The rationale for using the 20-point scale is that it efficiently measures the characteristics of emotionally positive versus negative, and past versus future event representations.

The dependent variable measure used was the KIMS mindfulness scale (Ruth A. Baer, Gregory T. Smith & Kristin B. Allen, 2004). Regarding reliability, the instrument has good internal consistency. Alpha coefficients for Observe, Describe, Act with awareness and Accept without judgment were .91, .84, .76, and .87, respectively, and adequate to good test-retest reliability with correlations for the Observe, Describe, Act and Accept scores being .65, .81, .86, and .83, respectively. Regarding Validity, this measure demonstrates good content validity and has good concurrent validity. The rationale for using this particular mindfulness scale is that it appears to be the most valid and reliable measure of one’s awareness in the moment, and is more suitable than other mindfulness scales for the purpose of the present study.



Cronbach's alpha was used to test for internal consistency and reliability. Cronbach's alpha score was sufficient at 0.75. There were 175 participants (N=175). There were 31 items on the dependent variable (N=31). All scale items were positive in item statistics and item total statistics. Sample size was determined by using Cohen's power primer table. Tests for normality were ran and checked, and all assumptions were met to run parametric tests. A Levene's test was run for homogeneity of variance, which met criteria. Google Documents, SPSS version 21, Microsoft Excel 2010, and Microsoft Word 2010 were the tools used for data collection, statistical analysis, random assignment, and composition purposes respectively.

#### ***2.4 Procedure***

Firstly, participants were randomly assigned to experimental conditions. A thorough information sheet was provided outlining objectives, rationale for the study, what the study involved, rights of participants, benefits and risks, and confidentiality (see appendix C). Participants were naive about certain aspects of the study, and informed that they were taking part in a study investigating mental projection. Participants were asked to provide consent, were then asked to state their gender and age and then answer the questionnaire (see appendix C). Participants were then (e.g. in the future/negative condition) instructed; "The study requires you to think about TWO emotionally salient events in your life and answer a number of questions. Completion should take about 20 minutes. Please find a quiet place to complete the study that will provide relief from potential distractions. Complete anonymity is guaranteed. Full details of the study will be provided after data has been collected" (see appendix A& C).

The questionnaire was used to probe functionalities pertaining to three theoretically and empirically derived functions of autobiographical memory that were developed and validated in previous work by Rasmussen and Bernstein (2009). After this, participants answered the KIMS mindfulness questionnaire, but were not informed of the purpose of this measure. The questionnaire simply merged in as a continuation of the MTT questionnaire used to treat each condition. This scale measures four core mindfulness skills of; Observing, describing, acting with awareness, and accepting (or allowing) without judgment. For parsimonious reasons, the “describing” subscale was omitted (see appendix B). This questionnaire was used in an attempt to accurately measure how mental time travel, in both temporality and emotional valence, affects one’s awareness in the present moment. Upon completion of the study participants were thanked and given contact details for the researcher, mental health supports, and debriefed (see appendix C). The length of time of participation took approximately 15 minutes.

## ***2.5 Data analysis***

Descriptive statistical analysis was used to establish means, standard deviations and range of participant age, and mindfulness scores. The alpha level of 0.05 was used for all inferential tests. A 2x2 ANOVA was used to test hypothesis 1, to compare overall mindfulness scores across conditions. Multiple regression was used to test hypotheses 2 and 3 in order to examine which of the four items in the priming questionnaire best predicts overall mindfulness scores across each of both (past & future) positive conditions. A 2x2 ANOVA was used to test hypothesis 4, to examine functional differences in MTT across each of the four conditions. A one-way ANOVA, T-tests, and Pearson’s correlations were used for exploratory analyses.

## Results

### 3.1 Descriptive statistics

The negative/future condition had 40 participants ( $N = 40$ ), mean age 32.2, 18% were male ( $N = 7$ ), 82% were female ( $N = 33$ ). The negative/past condition had 50 participants ( $N = 50$ ), mean age 36.2, 32% were male ( $N = 16$ ), 68% were female ( $N = 34$ ). The positive/future condition had 44 participants ( $N = 44$ ), mean age 32.6, 29% were male ( $N = 13$ ), 71% were female ( $N = 31$ ). The positive/past condition had 41 participants ( $N = 41$ ), mean age 32.2, 22% were male ( $N = 9$ ), 78% were female ( $N = 32$ ). Descriptive statistical analysis was carried out to establish the means and standard deviations of mindfulness scores for each of the separate conditions, and conditions compared specifically by valence and temporal direction are shown in table 1. A bar chart representing mindfulness scores and each subscale between conditions is shown in figure 1.

Table 1 *Descriptive statistics for mindfulness scores between groups, and results of 2 x 2 ANOVA below*

Variable	Condition	M	SD	<i>F</i>	<i>df</i> (1) (2)	<i>p</i>
Mindfulness	Negative/future	96.75	13.44		3 171	
Mindfulness	Negative/past	95.92	12.00		3 171	
Mindfulness	Positive/future	95.98	12.54		3 171	
Mindfulness	Postive/past	94.37	12.04		3 171	
Mindfulness	Future vs Past	95.76	12.25	.42	3 171	.52
Mindfulness	Negative vs Positive	96.29	12.59	.38	3171	.54

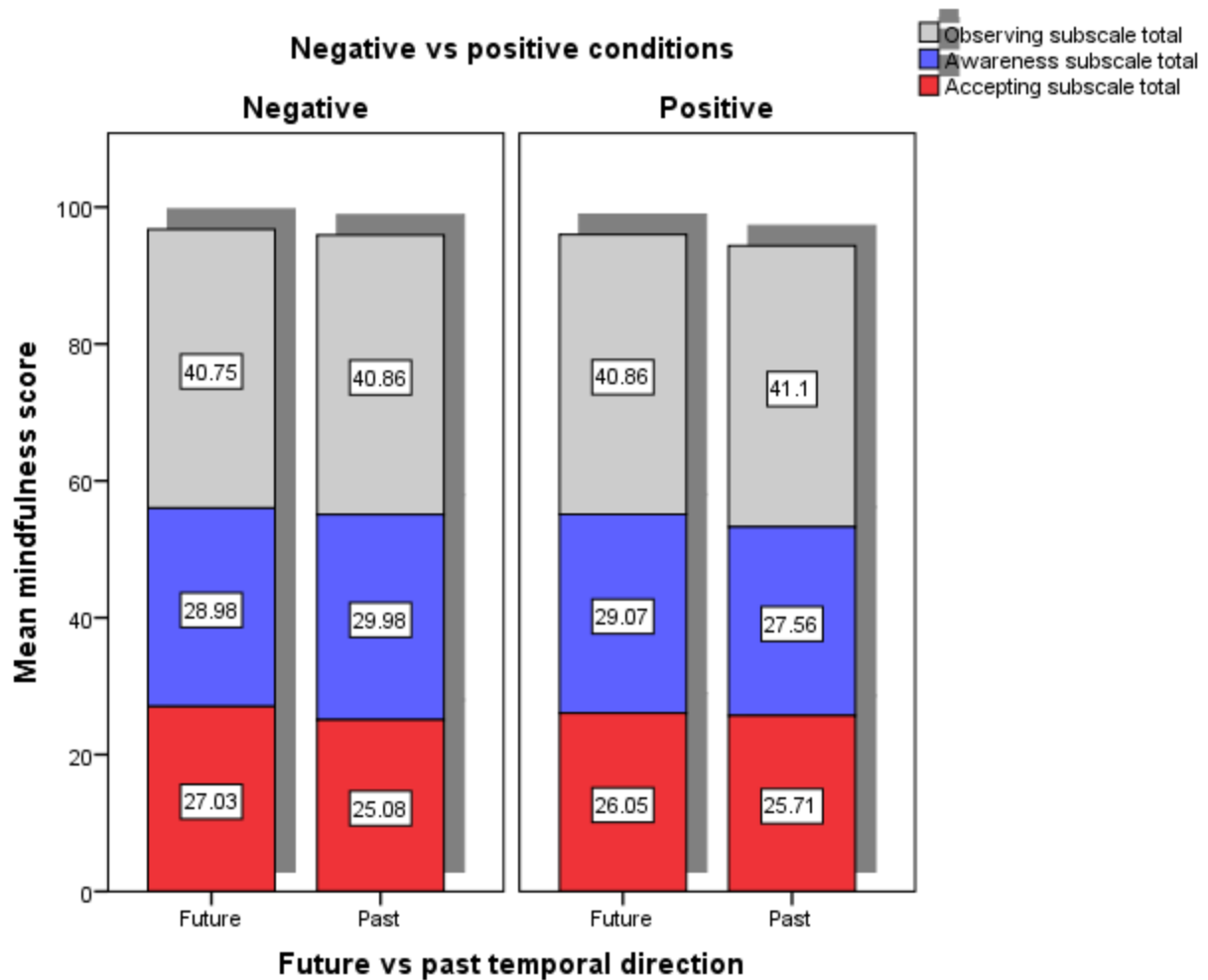


Figure1 Bar chart representing mean mindfulness scores and subscale scores across MTT conditions

### 3.2Inferential statistics

A 2 x 2 analysis of variance showed that mindfulness scores between conditions of negative versus positive emotional valence of mental time travel did not differ significantly between the four conditions. ( $F(3, 171) 0.38, p = 0.54$ ), and showed that mindfulness scores between conditions of future versus past temporal direction of mental time travel did not differ significantly between the four conditions. ( $F(3, 171) 0.42, p = 0.52$ ). (See figure 1)

Multiple-regression was used to test whether belief and sensory imagery were predictors of mindfulness levels in the past/positive condition. The results of the regression indicated that the two predictors explained 16% of the variance ( $R^2 = .16$ ,  $F(2, 38) = 3.34$ ,  $p = .046$ ). However, it was found that sensory imagery significantly and independently predicted mindfulness levels in the past/positive condition ( $\beta = .550$ ,  $p = .028$ , 95% CI = .714-11.88). Regression results for the past/positive condition are shown in table 2.

Multiple-regression was used to test whether consequences and self were predictors of mindfulness levels in the future/positive condition. The results of the regression indicated that the two predictors explained 6% of the variance and did not significantly predict mindfulness levels in the future/positive condition ( $R^2 = .06$ ,  $F(2, 41) = 1.33$ ,  $p = 0.28$ ). Regression results for the past/positive condition are shown in table 3.

Table 2 *Regression results of variables for past/positive condition*

<i>Model</i>	Past/Positive		
Variable	<i>B</i>	<i>SE B</i>	<i>B</i>
Belief	-2.47	-.25	.31
Sensory imagery	6.30	.55	.028
$R^2$		.16	
$F$		3.34	
Sig. ( $p$ )		.046	

Table 3 *Regression results of variables for future/positive condition*

<i>Model</i>	Future/Positive		
Variable	<i>B</i>	<i>SE B</i>	<i>B</i>
Self	-.26	-.034	.83.
Consequences	1.99	.26	.17
$R^2$		.06	
$F$		1.33	
Sig. ( $p$ )		0.28	

A number of 2 x 2 analyses of variance showed a large number of significant differences between conditions on characteristics of emotionally positive versus negative, and past versus future event representations. The most important results are reported below and all other overall effects are illustrated in table 4. A bar chart representing these multiple comparisons of characteristics of emotionally positive versus negative and past versus future event representations is shown in figure 2 (Items “weeks ago/to” and “event age” were omitted due to scores being too high to visually represent on the chart).

A 2x2 analysis of variance showed that there was a significant difference between conditions on social scores ( $F(3, 171) = 12.46, p < .001$ ). Post hoc analysis confirmed that that differences were significant in nature between the negative/future condition and negative past (Mean difference = -1.19,  $p = .002$ , CI (95%) -2.05 – -.34) and with the positive/future condition (Mean difference = -1.31,  $p = .001$ , CI (95%) -2.19 – -.42).

Secondly, there was a significant difference between condition on physical scores ( $F(3, 171) = 6.98, p < .001$ ). Post hoc analysis confirmed that that differences were significant in nature between the negative/future condition and positive/future (Mean difference = 1.16,  $p = .007$ , CI (95%) 0.24 – 2.08) and with the positive/future condition and positive/past condition (Mean difference = -1.28,  $p = .002$ , CI (95%) -2.19 – -.37).

Third, there was a significant difference between conditions on pre/reliving scores ( $F(3, 171) = 8.73, p < .001$ ). Post hoc analysis confirmed that that differences were significant in nature between the positive/past condition and negative/past condition (Mean difference = .912,  $p = .016$ , CI (95%) 0.12 – 0.17) and with the positive/future group and positive/past group (Mean difference = 1.11,  $p = .003$ , CI (95%) 0.30 – 1.92).

Fourth, there was a significant difference between conditions on mood change scores ( $F(3, 171) = 61.91, p < .001$ ). Post hoc analysis confirmed that that differences were significant in nature between the negative/past condition and positive/past condition (Mean difference = -2.69,  $p < .001$ , CI (95%) -3.38 – -2.01) and with the negative/future condition and positive/future condition (Mean difference = -2.47,  $p < .001$ , CI (95%) -3.18 – -1.76).

In addition, there was a significant difference between conditions on back/forward in time scores ( $F(3, 171) = 6.32, p < .001$ ). Post hoc analysis confirmed that that differences were significant in nature between the positive/future condition and positive/past condition (Mean difference = -.92,  $p = .036$ , CI (95%) -1.79 – -.04).

There was also a significant difference between conditions on belief scores ( $F(3, 171) = 61.91, p < .001$ ). Post hoc analysis confirmed that that differences were significant in nature between the negative/future condition and negative/past condition (Mean difference = -2.44,  $p < .001$ , CI (95%) -3.35 – -1.63) and with the positive/future condition and positive/past condition (Mean difference = -1.418  $p < .001$ , CI (95%) 0.65 – -2.30).

Results also revealed a significant difference between conditions on sensory imagery scores ( $F(3, 171) = 7.09, p < .001$ ). Post hoc analysis confirmed that that differences were significant in nature between the negative/future condition and negative/past condition (Mean difference = -1.02,  $p = .007$ , CI (95%) -1.82 – -.21) and with the positive/future condition and positive/past condition (Mean difference = -.84  $p = .043$ , CI (95%) -1.66 – -.02).

Also revealed was a significant difference between conditionson consequences scores ( $F(3, 171) = 4.54, p = .004$ ). Post hoc analysis confirmed that that differences were significant in nature between the negative/pastconditionand positive/past condition(Mean difference = .94,  $p = .013$ , CI (95%) 0.15 – 1.72).Lastly, there was a significant difference between conditionson voluntary rehearsalscores ( $F(3, 171) = 7.56, p < .001$ ). Post hoc analysis confirmed that that differences were significant in nature between the negative/futureconditionand positive/futurecondition(Mean difference = 1.27,  $p = .001$ , CI (95%) -2.10 – -.43).

Table 4ANOVA table of multiple comparisons of characteristics of emotionally positive versus negative and past versus future event representations

Variables	Future vs Past		Negative vs Positive	
	<i>F</i>	<i>p</i>	<i>F</i>	<i>p</i>
Directive	.01	.93	1.43	.233
Self	3.50	.06	5.46	.021
Social	13.53	<.001	17.23	<.001
Intimacy	5.89	.19	49.66	<.001
Physical	9.57	.002	6.89	.009
Action	1.08	.301	.887	.348
Specificity	2.78	.097	.393	.532
Mood change	.27	.601	180.85	<.001
Back/forward in time	9.13	.003	7.36	.007
P/Reliving	14.01	<.001	7.97	.005
Belief	75.43	<.001	.125	.724
Sensory Imagery	16.22	<.001	3.12	.079
Consequences	.065	.80	13.27	<.001
Conversational	11.39	.001	7.832	.006
Voluntary	1.65	.20	18.13	<.001
Involuntary	2.38	.124	3.43	.066
Valence	.01	.913	444.34	<.001
Intensity	1.69	.195	.01	.933
Weeks ago/to	11.65	.001	5.76	.017
Event age	51.59	<.001	.151	.698



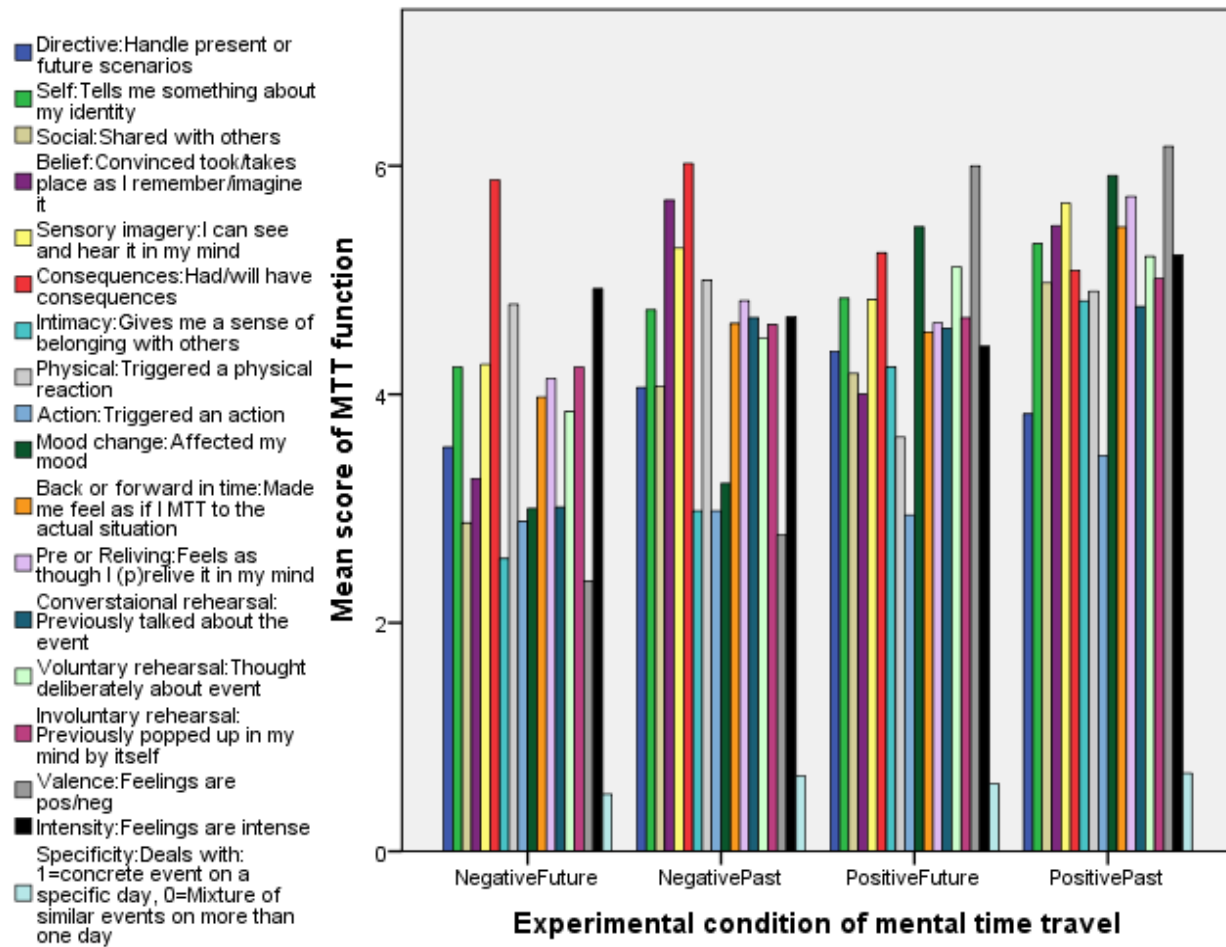


Figure 2 Bar chart of multiple comparisons of characteristics of emotionally positive versus negative, and past versus future event representations

### 3.3 Exploratory analysis of non-hypothesized findings

Exploratory analysis revealed some significant findings. Firstly, a one-way analysis of variance showed there was a significant difference between conditions on weeks ago/to scores ( $F(3, 171) = 6.13, p = .001$ ). Post hoc analysis confirmed that that differences were significant in nature between the negative/future condition and negative/past condition (Mean difference = -247.58,  $p = .009$ , CI (95%) -448.85 – -46.31).

Age of participant correlated significantly with remembered or imagine event age. The mean scores for Age was 33.44 (SD = 11.62) and for imagined or remembered event age was 30.27 (SD = 13.07). A Pearson correlation found that there was a strong positive significant relationship between Age and Event age ( $r(173) = 0.56, p < .001$ ).

Males ( $M = 30.42, SD = 5.54$ ) were found to have higher levels of awareness than females ( $M = 28.45, SD = 5.88$ ). The 95% confidence limits show that the population mean difference of the variables lies somewhere between .00 and 3.96. An independent samples t-test found that there was a statistically significant difference between awareness levels of males and females ( $t(173) = 1.97, p = .05$ ).

Lastly, a one-way analysis of variance showed that there was a significant difference between condition on intensity scores ( $F(3, 171) = 2.872, p = .038$ ). Post hoc analysis confirmed that that differences were significant in nature between the positive/past condition and positive/future (Mean difference = .79,  $p = .029$ , CI (95%) 0.06– 1.54).

## Discussion

### *4.1 Restated aims of present study*

The aims of the present study were to examine the effects of MTT on in-the-moment mindfulness levels, and to examine these effects by using a novel methodological design compared to previous studies. It was hypothesized that there would be significant differences between conditions on mindfulness levels. Findings were inconclusive. Secondly, it was hypothesized that belief and sensory imagery of events would predict mindfulness scores in the past/positive condition. Findings supported this hypothesis. Third, it was hypothesized that self and consequences of events would predict mindfulness scores in the future/positive condition. Findings were inconclusive. Lastly, it was hypothesized that there would be significant differences between conditions on the perceived functionalities and characteristics of constructed events. Findings supported this hypothesis.

### *4.2 (a) Differences between experimental conditions on mindfulness levels: Hypothesis 1*

The study found no significant differences between conditions on mindfulness levels. Individuals who imagined negative events showed slightly higher levels of mindfulness than those who imagined positive events, and individuals who remembered negative events showed slightly higher levels than those who remembered positive events. Both future conditions showed slightly higher levels of mindfulness than both past conditions. Overall, imagining negative events resulted in slightly higher mindfulness levels.

Studies by researchers including D'Argembeau *et al.*, (2011) and Bernstein and Rasmussen (2012), have revealed many effects of the contrasting characteristics of MTT. Nevertheless, these effects do not appear to exert notable influence on mindfulness levels. This finding seems only partially interpretable, but might allude to the non-manipulable qualities of mindfulness. The resting-state of the brain is in fact, a wandering-state. Conversely, mindfulness is *not* a baseline state, requires psychological effort, and isn't just naturally switched on (Konnikova, 2013). Buckner and Carroll (2007) observe that mind-wandering (including MTT) is a natural brain phenomenon. In contrast, mindfulness is not a natural phenomenon, but instead requires attentive-effort and constant monitoring of one's thoughts in-the-moment (Baer *et al.*, 2004). Thus, one might speculate that the seemingly impervious quality of mindfulness, may in-part have been due to the fact that mindfulness is an effortful and consciously-focused psychological phenomenon that is difficult to influence. To be mindful, demands a particular repertoire of psychological skills that takes time to hone and maintain (Baer *et al.*, 2004). Engagement in MTT is somewhat automatic, and follows a different stream of consciousness compared to a mindful-state (Tulving, 2002). These contrasting qualities may help partially explain why MTT failed to influence in-the-moment awareness.

Mzarek *et al.* (2012) maintain that both constructs are two sides of the same coin, and research by Mooneyham and Schooler (2013) supports this suggestion. It remains nonetheless challenging to prise apart both constructs, and examine where mindfulness ends and mind-wandering begins. Mind-wandering is automatic and free-flowing state, mindfulness is effortful and sustained. Mindfulness is also a broad psychological construct that is difficult to truly define, and can be measured in a number of different ways. Furthermore, the describing subscale was omitted from this study for parsimonious reasons, and thus was not an entirely

comprehensive measure of mindfulness. Nevertheless, one can not speculate whether or not results may have been significantly different if the subscale was employed.

The fact that no significance was found between conditions should not detract from the value and rationale of the research question. Indeed, some significant correlations between mindfulness scores and MTT characteristics were found via exploratory analysis. Voluntary rehearsal and specificity of negative imagined events both formed strong significant correlations with mindfulness, and sensory imagery and action of positive remembered events formed strong significant correlations with mindfulness in these conditions. This suggests that while mindfulness seems immune to the influence of MTT, some strong relationships still exist between the two, which require further examination. One can contend that this tested hypothesis still answered a new research question in psychology, but also begs the question of precisely how much MTT might influence other mental states.

#### ***4.2 (b) Belief and sensory imagery of events as predictors (for past/positive mindfulness levels): Hypothesis 2***

Belief and sensory imagery of positive remembered events significantly predicted mindfulness scores in this condition. Belief is a measure of how convinced a person is regarding the event taking place as they remember it. Sensory imagery pertaining to a remembered event is a measure of how much the individual can see or hear the event in their mind. Positive memories have previously demonstrated higher ratings on measures of sensory imagery, and vividness than negative memories (Bohn & Bernstein, 2007; Rasmussen & Bernstein, 2009), and remembered events rate higher on sensory imagery and vividness, compared to imagined events.

(Bernsten&Rasmussen, 2012). This finding might allude to the functional roles that accuracy and saliency of emotionally positive remembered autobiographical events play when reflecting on one's own autobiographical-history.

Consider two findings that pertain to this hypothesis. Both positive and negative remembered events resulted in higher sensory imagery scores compared to both positive and negative imagined events, bolstering previous findings by Bernsten and Rasmussen (2012), who have shown that visual and auditory imagery plays a central for remembered events, compared to imagined events. In addition, belief pertaining to negative remembered events was also significantly higher than negative imagined events. Remembered events are constrained by the reality of events that have already occurred (Rasmussen &Bernsten, 2009, 2012). Thus, one might speculate that due to the actuality of the event having occurred,the vividness of the memory can subsequentlyinfluence a person's mindfulness levels, in that it evokes a more potent measure of psychological imagery (whether visually or auditory) for the event representation. Nevertheless, memory is reconstructive not reproductive,and this interpretation should be approached with caution. Furthermore, this finding can only be generalized to positive remembered events, as it did not have similar effects across different MTTconditions (Bernsten& Rasmussen, 2012).

#### ***4.2 (c) Self and consequences of events as predictors (for future/positive mindfulness levels:***

##### ***Hypothesis 3***

Self and consequences of positive imagined events failed to significantly predict mindfulness scores in this condition. Self is a measure of how much the event tells the person

something about his or her identity, and consequences is a measure of how certain the individual is that the event will have consequences. Self-function for future/positive thinking and the consequences of the imagined events have been shown to be significantly higher compared to past/positive thinking (Bernsten & Rasmussen, 2012). This finding might reflect how the self-function of positive imagined scenarios serves adaptive, regulating, identity-driven purposes. Indeed, mindfulness is not necessarily *identity-related*, but pertains more to awareness and acceptance of a person's thoughts in-the-moment. Bernsten and Bohn, (2010), D'Argembeau *et al*, (2011), and Miles and Bernsten, (2011), have shown that future events rate higher on self-schema variables (e.g. consequences of an event) and knowledge pertaining to the relevance to life story and identity. Self and consequences are identity-driven features of MTT which pertain more to the possible future outcomes of potential events, and the implications they may have for the individual (Miles & Bernsten, 2011). Thus, due to the distinct qualitative differences of the identity-driven characteristics of MTT compared to those of in-the-moment mindfulness, it is comprehensible that they failed to influence participants' mindfulness levels. For an imagined positive event, the hypothetical consequences are not yet realized, and thus may exert only a small measure of potency toward influencing a person's immediate thoughts. In comparison, consider the potency of the reality of a positive remembered event that has actually occurred, i.e. its psychological saliency, how strongly-imprinted in the individual's long-term memory it is, and the fact that it is *already self-relevant* to the individual's sense of identity (Bernsten & Rasmussen (2012).

One should note that hypotheses 2 and 3 rested heavily on whether or not characteristics of MTT would significantly affect mindfulness levels in the first hypothesis. Therefore, it is not entirely surprising that the MTT variables in this case failed to significantly

predict mindfulness levels, considering that the first hypothesis was not supported by the research data.

#### ***4.2 (d) Differences between conditions on perceived functionalities and characteristics of constructed events: Hypothesis 4***

Many significant differences between conditions on the perceived functionalities and characteristics of constructed events were found. The largest effect found was for positive imagined and remembered events on mood levels. Both positive imagined and remembered events resulted in significantly higher levels of affected mood compared to both types of negative events, suggesting that positive autobiographical thinking (regardless of temporal direction) significantly enhances mood, consistent with work by Bernstein and Rasmussen (2012).

Consistent with previous findings by Rasmussen and Bernstein (2009), memories of positive events were more rehearsed across different types of rehearsal, compared to negative events. Conversational rehearsal of positive imagined events was found to be significantly higher than positive remembered events. This finding may suggest that people talk more openly about potential future events that have yet to be realized, compared to reminiscing on actual positive events that have passed. Individuals may gain more social pleasure by discussing positive future outcomes that have not yet occurred, compared to remembering events, possibly because it may be more socially rewarding conversing about the array of possibilities that may or may not happen. Voluntary rehearsal of positive imagined events was found to be significantly higher than positive remembered events. It may be possible that people actively think about potential future



events more than deliberately thinking about remembered events. Actively thinking about positive future scenarios may serve a positive, self-regulating function.

Positive memories rated higher on levels of pre/reliving and back/forward in time, supporting previous research by Bohn and Bernstein (2007), and Rasmussen and Bernstein (2012). Individuals who remembered positive events reported significantly higher levels of reliving than those who remembered negative events. This effect may be due to the fact that positive remembered events are often more emotionally salient, and pleasant to recall compared to negative events. Negative remembered events may not be as well maintained in long-term memory as much as positive events due to the fact that many are painful to relive. This suggestion is supported by previous work by Rasmussen and Bernstein, (2009), and Talarico *et al*, (2009).

Positive imagined events rated significantly higher on social-function, compared to positive remembered events. Social-function arises when memories are shared in order to persuade, ease communication, facilitate social bonding, and elicit empathy or intimacy, and they may not be subject as much private rehearsal as directive or self-memories. This finding suggests individuals disclose their goals and aspirations in social situations, more so than reflecting and disclosing positive remembered events (Rasmussen & Bernstein, 2009). The finding that sensory imagery of events was significantly higher for both negative and positive remembered events compared to imagined events, supports previous research by Bernstein and Rasmussen (2012). Bernstein and Rasmussen (2012) showed that past events rate higher on vividness and mental imagery, possibly due to the actuality of the event having occurred, and the flashbulb-type characteristic of these memories. This effect may be partially due to the actuality of the remembered event, and the possibility that it evokes greater psychological lucidity compared to

the hypothetical structure of a negative imagined event. This suggestion also pertains to the finding that positive remembered events resulted in significantly higher levels of (p) reliving of that event compared to positive imagined events. Indeed, Imagined episodes only offer only a vague, hypothetical snapshot of an event that may or may not occur.

Consistent with research by Newby-Clark and Ross (2003), extreme emotional valence of negative events was found almost exclusively in the remembered condition (Bernsten & Rasmussen, 2012), possibly due to the large number of traumatic events reported, such as death of a loved one or relationship break-up. Physical scores of negative imagined events were also significantly higher than positive imagined events, thus evoking stronger physiological reactions. Indeed, Bernsten and Rasmussen (2012) showed that negative events evoke stronger physical, cognitive and behavioural reactions than the positive genre, possibly due to the flashback-type distress of reliving the negative event.

Specificity ratings of both positive and negative imagined events was found to be notably less than remembered events, most likely due to the fact the future has yet to be realized. Specificity measures how; the memory deals with either a concrete event that happened on a specific day, or a mixture of similar events that happened on more than one day. Remembered events rated higher in concreteness, whereas imagined events were more hypothetical due to the uncertainty factor. This finding is consistent with observations by Bernsten and Bohn (2010), and consistent with temporal self-appraisal theory for past events. Temporal self-appraisal theory states that individuals evaluate their past selves in a way that makes them feel good about their current self (Ross & Wilson, 2002).

### ***4.3 Discussion of Exploratory analysis of non-hypothesized findings***

Results of exploratory analysis revealed a number of interesting findings. Consistent with temporal self-appraisal theory, negative remembered events were found to be more temporally distant than positive events. Distance to and from imagined or remembered negative events showed significantly greater distance of remembered events being further away from the present than future events. This finding supports research by Van Boven and Ashworth (2007) who purport that the psychological distance between the self and future emotional events seems to be always decreasing, whereas the psychological distance between self and past almost always increases (Van Boven and Ashworth, 2007).

While people distance themselves from painful emotional reliving of negative memories, they still retain enough detail necessary to solve problems and prevent future mistakes (Bernsten, 2002; Talarico, 2009; & Wilson *et al*, 2009). Rasmussen and Bernsten (2009), and Talarico *et al* (2009) allude to this adaptive value to remembering the aspects of negative events necessary for problem solving and prevention of future mistakes, whilst the promotion of positive memories versus the dampening of negative memories may serve as the establishing of personal and social resources (Bernsten, 2002; Frederickson & Branigan, 2005; Levine & Bluck, 2004; Ross & Wilson, 2002).

Participant age and event age showed a highly significant correlation. Of course, a remembered or imagined event can't influence a person's age, and so can only suggest that a person's age is an excellent predictor of the age projected toward or recalled regarding imagined or remembered life events. Interestingly, men scored significantly higher than women on the "acting with awareness" subscale. This finding may suggest two possibilities. Firstly, it

may simply be that men in general act with greater awareness in the moment than do women. On the other hand, it may be more plausible that the very act of engaging in mental time travel significantly affects levels of acting with awareness among men, but does not have the same effect on women. Event-related potential studies have shown that mind-wandering is characterized by an attenuated awareness of task stimuli and one's external environment (Smallwood et al, 2008; Kam et al, 2011). Thus, a question worth asking is whether the mindfulness quality of acting with awareness equates with this type of awareness measured in ERP studies. If this is the case, one might examine what influence the external environment (context) has on individuals whilst engaging in MTT, and whether any gender differences are apparent.

Contrary to research by Van Boven and Ashworth (2007), intensity for positive remembered events was found to be significantly higher than positive imagined events. Van Boven and Ashworth (2007) found that individuals report more intense emotions when they anticipate emotional events rather than when they retrospect. They proposed that greater uncertainty of the future can generate greater intensity of emotion during anticipation than during retrospection, because uncertainty accentuates emotional reactions to the contemplation of emotional events. The opposite effect was seen in this study, suggesting more research is required. Nevertheless, the finding may have been due to the fact the present study was conducted mostly online, and thus perhaps not as well controlled for as previous research conducted in lab-settings. Furthermore, this study was a between-groups design, whereas previous research only employed within-groups designs, which may help explain the contradiction. Additionally, this effect was only found for positive conditions and not negative, and thus needs to be interpreted cautiously.

#### ***4.4 Strengths and limitations***

The present study demonstrated the potency of autobiographically-induced emotion, consistent with previous research by Radovic et al, (2011), and Bernsten and Rasmussen (2012), and contributed to psychological science by investigating the characteristics and effects of MTT in a new way. As far as one is aware, no previous studies have employed a between-groups design comprised of 4 experimental conditions that employed an admirably large and diverse sample size. The research methodology was comprehensive in that each condition was treated for a different valence and temporal direction of MTT. Many interesting and unexpected findings were revealed, such as how in-the-moment mindfulness appears somewhat immune to manipulation via engaging in remembered or imagined streams of autobiographical thinking. The study showed evidence supporting previous research, and findings that were surprising and contrary to previous work.

It is however, important to note some limitations. Some results were only partially interpretable, and further research may be required. This study omitted the describing mindfulness subscale for parsimonious reasons, and thus was perhaps not an entirely accurate measure of mindfulness. Almost three quarters of participants were females (74%), which may or may not have affected experimental results. Arguably, the biggest limitation was that the experimental procedure of treating each condition failed to significantly affect mindfulness levels between conditions. Nevertheless, it can be said that the design itself compensated for this, as evidenced by the other results found by the experimental manipulation between conditions of MTT.

#### ***4.5 Caveats, future implications and possible applications***

Because MTT explores autobiographical life events, future directions might investigate whether MTT influences life satisfaction, general wellbeing, or similar life-relevant mental states. On the other hand, rather than examining what types of thinking might affect mindfulness, future research might examine whether mindfulness shares *relationships* with other mental constructs such as self-conscious emotions, mood-states, or even personality traits such as conscientiousness. Indeed, it is reasonable to contend that MTT and mindfulness research have much to contribute to positive psychology and optimum mental-health in general. Males acting with significantly higher levels of awareness compared to females, suggests that future research might explore gender-related differences for autobiographical thinking or in-the-moment mindfulness. Research of this kind might determine whether there are pre-existing gender qualities or whether males and females differ notably in how malleable they are when engaging mindfulness-related cognitions. Positive remembered events were found to be significantly more intense than imagined events, contradicting previous assumptions that intensity for positive imagined events is notably higher, favouring more idyllic future thinking. Thus, future research could examine the intensity of autobiographical thinking specifically, and in a more controlled setting, to better determine the reasons for contradictory findings like this. The present study revealed qualities alluding to the impervious quality of mindfulness, and although MTT did not significantly affect mindfulness levels, one can't rule out the possibility that MTT can affect other psychological constructs.

#### 4.6 Concluding statement

It can be argued that the findings of the present study answered a relatively important research question. Mindfulness seems to be somewhat impervious to the processes of emotional autobiographical thinking. Significant differences found between conditions on the characteristics of event representations demonstrated the fascinating and contrasting qualities that are apparent across modes of MTT. The study revealed findings contrary to previous research and found belief and sensory imagery of remembered positive events to be significant predictors of mindfulness levels. Participant age was found to be an excellent predictor of imagined or remembered life events, and men displayed significantly higher levels of acting with awareness than females. Overall, and consistent with previous research, the study found an increased positivity bias for future events, supporting research that shows MTT is characterized to a greater extent by uncorrected positive illusions, and that past MTT is constrained by the reality of the events having already occurred (Bernsten & Rasmussen, 2012). MTT research is in its infancy, but nevertheless has much to offer psychology. MTT research affords a window into the underlying processes of autoneotic-consciousness, and the functional roles it serves humans in their everyday lives. To return to the idea of the “specious present”, a concept conceived by E. R. Clay (1882). Clay maintained that time, after “*omitting the specious present*”, consists of three . . . nonentities — the past, which does not exist, the future, which does not exist, and their conterminous, the present; the faculty from which it proceeds lies to us in the fiction of the specious present” (p41). Despite clear disparities between certain characteristics of mental time travel, many thinkers, from physicists to psychologists, still maintain that time is merely a fictional illusion, and that the only real moment that exists is . . . now.

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## Appendices

### *Appendix A*

The 20-point scale of perceived functionalities and characteristics of constructed events (Rubin & Stiegler (2004), Rasmussen & Bernstein (2009), and Bernstein & Bohn (2010). Taken from: Bernstein, D., & Rasmussen, A. S. (2012). The reality of the past versus the ideality of the future: emotional valence and functional differences between past and future mental time travel. *Memory & Cognition*, 41:187-200. DOI: 10.3758/s13421-012-0260-y

**Scoring:** All items are rated on a 7 point Likert scale ranging from 1 to 7, except for items 1 (Age estimated in years) , 2 (Estimated in days), and 9 (1 = a concrete event that happened on a specific day, 0 = a mixture of similar events that happened on more than one day). This questionnaire is not of the conventional totalled kind that will yield an overall score. Each of the 20 items is mutually exclusive, and each is specific in its nature of what it measures. This questionnaire is being used as a priming measure for each of the four experimental conditions, and to examine functional differences of MTT across groups.

Below is the questionnaire for one of the four conditions (past/negative) that was used to prime for effect. Note that this questionnaire was altered slightly for each of the four conditions.

**Are you male or female? \***

- ☐ Male
- ☐ Female

**How old are you? \***

—

**(Negative) remembered life event or episodes**

Please take some time to try to vividly recall and "relive" an emotionally salient, NEGATIVE event in your life, and write a brief description of it below. After this, please answer the following questions based on your personal experience of the event.

**1 \***How old were you when the remembered event took place? (age estimated in years).

**2 \***If you indicated your current age in the previous question, how many weeks from today is the event in the past? (estimated in weeks).

**3 \***I think of this memory in order to handle present or future situations.

1    2    3    4    5    6    7

Not at all ☐ ☐ ☐ ☒ ☐ ☐ ☐ To a very high degree

**4 \***This memory tells me something about my identity.

1    2    3    4    5    6    7

Not at all ☐ ☐ ☐ ☐ ☐ ☐ ☐ To a very high degree

**5 \***I have often shared this memory with other people.

1    2    3    4    5    6    7

Not at all ☐ ☐ ☐ ☐ ☐ ☐ ☐ To a very high degree

**6 \***This memory gives me a sense of belonging with other people.

1    2    3    4    5    6    7

Not at all ☐ ☐ ☐ ☐ ☐ ☐ ☐ To a very high degree

**7 \***This memory triggered an action - for instance, palpitations, feeling restless, tension, fear, laughter.



1 2 3 4 5 6 7

Not at all ☐ ☐ ☐ ☐ ☐ ☐ ☐ To a very high degree

**8 \***The memory triggered an action - for instance buying a special present for another person, listening to a certain song from my collection.

1 2 3 4 5 6 7

Not at all ☐ ☐ ☐ ☐ ☐ ☐ ☐ To a very high degree

**9 \***The memory deals with (1=a concrete event that happened on a specific day, 0= a mixture of similar events that happened on more than one day).

- ☐ 1
- ☐ 0

**10 \***This memory affected my mood.

1 2 3 4 5 6 7

Extremely negatively ☐ ☐ ☐ ☐ ☐ ☐ ☐ Extremely positively

**11 \***The memory made me feel as if I traveled back in time to the actual situation.

1 2 3 4 5 6 7

Not at all ☐ ☐ ☐ ☐ ☐ ☐ ☐ To a very high degree

**12 \***While remembering this event, it feels as though I relive it in my mind.

1 2 3 4 5 6 7

Not at all ☐ ☐ ☐ ☐ ☐ ☐ ☐ To a very high degree

**13 \***I am convinced that the event took place exactly as I remember it.

1 2 3 4 5 6 7

Not at all ☐ ☐ ☐ ☐ ☐ ☐ ☐ To a very high degree

**14 \***While remembering this event, I can see and hear it in my mind.

1 2 3 4 5 6 7

---

Not at all ☐ ☐ ☐ ☐ ☐ ☐ ☐ To a very high degree

---

**15** \*The event had consequences.

1 2 3 4 5 6 7

---

Not at all ☐ ☐ ☐ ☐ ☐ ☐ ☐ To a very high degree

---

**16** \*I have previously talked about the event.

1 2 3 4 5 6 7

---

Almost never ☐ ☐ ☐ ☐ ☐ ☐ ☐ Extremely often

---

**17** \*I have previously thought deliberately about the event.

1 2 3 4 5 6 7

---

Almost never ☐ ☐ ☐ ☐ ☐ ☐ ☐ Extremely often

---

**18** \*The event has previously popped up in my mind by itself - that is, without me trying to recall it.

1 2 3 4 5 6 7

---

Almost never ☐ ☐ ☐ ☐ ☐ ☐ ☐ Extremely often

---

**19** \*The feelings I experience as I recall the event are.

1 2 3 4 5 6 7

---

Extremely negative ☐ ☐ ☐ ☐ ☐ ☐ ☐ Extremely positive

---

**20** \*The feelings I experience as I recall the event are intense.

1 2 3 4 5 6 7

---

Not at all ☐ ☐ ☐ ☐ ☐ ☐ ☐ To a very high degree.

---

\*Below is the scoring key for both past conditions

1. Age at event: How old were you when the remembered event took place? (age estimated in years)
2. Weeks ago: If you indicated your current age in Question number 1, how many weeks from today is the event in the weeks? (estimated in weeks)
3. Directive: I think of this memory in order to handle present or future situations. (1 = not at all, 7 = to a very high degree)
4. Self: This memory tells me something about my identity. (1= not at all, 7 = to a very high degree)
5. Social: I have often shared this memory with other people. (1 = not at all, 7 = to a very high degree)
6. Intimacy: This memory gives me a sense of belonging with other people. (1 = not at all, 7 = to a very high degree)
7. Physical: The memory triggered a physical reaction—for instance, palpitations, feeling restless, tension, fear, laughter. (1 = not at all, 7 = to a very high degree)
8. Action: The memory triggered an action—for instance, deciding to do the dishes, buying a special present for another person, listening to a certain song from my collection. (1= not at all, 7 = to a very high degree)
9. Specificity: The memory deals with (1 = a concrete event that happened on a specific day, 0 = a mixture of similar events that happened on more than one day).
10. Mood change: This memory affected my mood. (1 = extremely negatively, 7 = extremely positively)
11. Back/Forward in time: The memory made me feel as if I traveled back in time to the actual situation. (1 = not at all, 7 = to a very high degree)
12. P/Reliving: While remembering the event, it feels as though I relive it in my mind. (1 = not at all, 7 = to a very high degree)
13. Belief: I am convinced that the event took place exactly as I remember it. (1 = not at all, 7 = to a very high degree).
14. Sensory imagery: While remembering this event, I can see and hear it in my mind. (1 = not at all, 7 = to a very high degree)
15. Consequences: The event had consequences. (1 = not at all, 7 = to a very high degree)

16. Conversational rehearsal: I have previously talked about the event. (1 = almost never, 7 = extremely often)
17. Voluntary rehearsal: I have previously thought deliberately about the event. (1 = almost never, 7 = extremely often)
18. Involuntary rehearsal: The event has previously popped up in my mind by itself—that is, without me trying to recall it. (1 = almost never, 7 = extremely often)
19. Valence: The feelings I experience as I recall the event are (1 = extremely negative, 7 = extremely positive).
20. Intensity: The feelings I experience as I recall the event are intense. (1 = not at all, 7 = to a very high degree)

Below are the questions (slightly altered to accommodate future conditions) asked for the events in the study shown for the future positive & negative conditions.

1. Age at event: How old are you when the imagined future event takes place?
2. Weeks ahead: If you indicated your current age in Question number 1, how many weeks from today is the event in the future?
3. Directive: I think of this imagined future event in order to handle present or future situations.
4. Self: This imagined future event tells me something about my identity.
5. Social: I will often share this imagined future event with other people.
6. Intimacy: Imagining this future event gives me a sense of belonging with other people.
7. Physical: The imagined future event triggered a physical reaction—for instance, palpitations, feeling restless, tension, fear, laughter.
8. Action: The imagined future event triggered an action—for instance, deciding to do the dishes, buying a special present for another person, listening to a certain song from my collection.
9. Specificity: The imagined future event deals with (a concrete event that will happen on a specific day vs. a mixture of similar events that will happen on more than one day).
10. Mood change: This imagined future event affected my mood.
11. Back/forward in time: The imagined future event made me feel as if I was traveling forward in time to the actual situation.
12. P/Reliving: While imagining the future event, it feels as though I prelive it in my mind.
13. Belief: I am convinced that the future event will take place exactly as I imagine it.

14. Sensory imagery: While imagining this future event, I can see and hear it in my mind.
15. Consequences: The imagined future event will have consequences.
16. Conversational rehearsal: I have previously talked about the imagined future event.
17. Voluntary rehearsal: I have previously thought deliberately about the imagined future event.
18. Involuntary rehearsal: The imagined future event has previously popped up in my mind by itself—that is, without me trying to imagine it.
19. Valence: The feelings I experience as I imagine the future event are (extremely negative vs. extremely positive).
20. Intensity: The feelings I experience as I imagine the future event are intense.

## ***Appendix B***

### **Kentucky Inventory of Mindfulness Skills (KIMS)**

**Authors:** Ruth A. Baer, Gregory T. Smith & Kristin B. Allen

The KIMS is a 39-item self-report inventory that is used for the assessment of mindfulness skills. Mindfulness is generally defined to include focusing one's attention in a nonjudgmental or accepting the experience occurring in the present moment (Baer et al., 2004). This measurement may be helpful to professionals who teach mindfulness by clarifying strengths and weaknesses in their client's development of different mindfulness skills.

The KIMS is used to assess 4 mindfulness skills:

- Observing: mindfulness involves observing, noticing or attending to various stimuli including internal phenomena (cognitions, bodily sensations) and external phenomena (sounds, smells). Items: 1, 5, 9, 13, 17, 21, 25, 29, 30, 33, 37, 39.
- Describing: involves participant describing, labelling, or noting of observed phenomena by applying words in a nonjudgmental way. Items: 2, 6, 10, 14, 18, 22, 26, 34.
- Acting with awareness: being attentive and engaging fully in one's current activity. Includes the DBT skills of 'participating' and 'one-mindfully'. Items: 3, 7, 11, 15, 19, 23, 27, 31, 35, 38.
- Accepting (or allowing) without judgment: to allow reality or what is there, to be as it is without judging, avoiding, changing, or escaping it. Items: 4, 8, 12, 16, 20, 24, 28, 32, 36.

**Scoring:** Items are rated on a 5 point Likert scale ranging from 1 (never or very rarely

true) to 5 (almost always or always true). Items reflect either direct descriptions of the mindfulness skills, or they describe the absence of that skill and are reverse scored. High scores reflect more mindfulness. Items 3, 4, 8, 11, 12, 14, 18, 20, 22, 23, 24, 27, 28, 31, 32, 35, 36, are all reversed scored. Total score possible: 195

**Reliability:** The instrument has good internal consistency. Alpha coefficients for Observe, Describe, Act with awareness and Accept without judgment were .91, .84, .76, and .87, respectively. Adequate to good test-retest reliability with correlations for the Observe, Describe, Act and Accept scores being .65, .81, .86, and .83, respectively.

**Validity:** Demonstrates good content validity. Has good concurrent validity, correlating with the Mindfulness Attention Awareness Scale (MAAS: Brown & Ryan, 2003). Correlates negatively with the AAQ, the TAS alexithymia scale, and the neuroticism scale of the NEO Five Factor Inventory (NEO-FFI: Costa & McCrae, 1992). The KIMS correlates positively with the Trait Meta-Mood Scale (TMMS; Salovey, Mayer, Goldman, Turvey&Palfai, 1995) a measure of emotional intelligence, and the Conscientiousness and Openness scale of the NEO-FFI.

#### Reference:

Baer, R. A., Smith, G. T. & Allen, K. B. (2004). Assessment of mindfulness by self-report: The Kentucky Inventory of Mindfulness Skills. *Assessment*, 11(3), 191-206.  
Revised date (4 October 2006) 80

#### Kentucky Inventory of Mindfulness Skills Ruth A. Baer, Ph.D. University of Kentucky

Please rate each of the following using the scale provided. Choose the number that best describes your own opinion of what is generally true for you in the present moment.

**Q1** \*I notice changes in my body, such as whether my breathing slows down or speeds up.

1    2    3    4    5

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

**Q2** \*I'm good at finding the words to describe my feelings.

1    2    3    4    5

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

**Q3** \*When I do things, my mind wanders off and I'm easily distracted.

1    2    3    4    5

---

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

---

**Q4** \*I criticize myself for having irrational or inappropriate emotions.

1 2 3 4 5

---

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

---

**Q5** \*I pay attention to whether my muscles are tense or relaxed.

1 2 3 4 5

---

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

---

**Q6** \*I can easily put my beliefs, opinions, and expectations into words

1 2 3 4 5

---

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

---

**Q7** \*When I'm doing something, I'm only focused on what I'm doing and nothing else.

1 2 3 4 5

---

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

---

**Q8** \*I tend to evaluate whether my perceptions are right or wrong.

1 2 3 4 5

---

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

---

**Q9** \*When I'm walking, I deliberately notice the sensations of my body moving.

1 2 3 4 5

---

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

---

**Q10** \*I'm good at thinking of words to express my perceptions, such as how things taste, smell, or sound.

1 2 3 4 5

---

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

---

**Q11** \*I drive on "automatic pilot" without paying attention to what I'm doing.

1 2 3 4 5

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Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

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**Q12** \*I tell myself that I shouldn't be feeling the way I'm feeling.

1    2    3    4    5

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

**Q13** \*When I take a shower or bath, I stay alert to the sensations of water on my body.

1    2    3    4    5

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

**Q14** \*It's hard for me to find the words to describe what I'm thinking.

1    2    3    4    5

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

**Q15** \*When I'm reading, I focus all my attention on what I'm reading.

1    2    3    4    5

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

**Q16** \*I believe some of my thoughts are abnormal or bad and I shouldn't think that way.

1    2    3    4    5

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

**Q17** \*I notice how food and drinks affect my thoughts, bodily sensations, and emotions.

1    2    3    4    5

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

**Q18** \*I have trouble thinking of the right words to express how I feel about things.

1    2    3    4    5

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

**Q19** \*When I do things, I get totally wrapped up in them and don't think about anything else.

1    2    3    4    5

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

**Q20** \*I make judgements about whether my thoughts are good or bad.

1    2    3    4    5

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

**Q21** \*I pay attention to sensations, such as the wind in my hair or sun on my face.



1 2 3 4 5

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

**Q22** \*When I have a sensation in my body, it's difficult for me to describe it because I can't find the right words.

1 2 3 4 5

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

**Q23** \*I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted.

1 2 3 4 5

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

**Q24** \*I tend to make judgements, about how worthwhile or worthless my experiences are.

1 2 3 4 5

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

**Q25** \*I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing.

1 2 3 4 5

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

**Q26** \*Even when I'm feeling terribly upset, I can find a way to put it into words.

1 2 3 4 5

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

**Q27** \*When I'm doing chores, such as cleaning or laundry, I tend to daydream or think of other things.

1 2 3 4 5

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

**Q28** \*I tell myself that I shouldn't be thinking the way I'm thinking.

1 2 3 4 5

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

**Q29** \*I notice the smells and aromas of things.

1 2 3 4 5

---

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

**Q30** \*I intentionally stay aware of my feelings.

1 2 3 4 5

---

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

**Q31** \*I tend to do several things at once rather than focusing on one thing at a time.

1 2 3 4 5

---

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

**Q32** \*I think some of my emotions are bad or inappropriate and I shouldn't feel them.

1 2 3 4 5

---

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

**Q33** \*I notice visual elements in art or nature, such as colours, shapes, textures or patterns of light and shadow.

1 2 3 4 5

---

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

**Q34** \*My natural tendency is to put my expressions into words.

1 2 3 4 5

---

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

**Q35** \*When I'm working on something, part of my mind is occupied with other topics, such as what I'll be doing later, or things I'd rather be doing.

1 2 3 4 5

---

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

**Q36** \*I disapprove of myself when I have irrational ideas.

1 2 3 4 5

---

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

**Q37** \*I pay attention to how my emotions affect my thoughts and behaviour.

1 2 3 4 5

---

Very rarely true ☐ ☐ ☐ ☐ ☐ Always true

**Q38** \*I get completely absorbed in what I'm doing, so that all my attention is focused on it.

	1	2	3	4	5	
Very rarely true	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Always true

**Q39** \*I notice when my moods begin to change.

	1	2	3	4	5	
Very rarely true	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Always true

## *Appendix C*

### **Information sheet and consent form for experiment involving minor deception**

#### **Information sheet for study on mental projection**

You are invited to participate in a research study that will form the basis for an undergraduate thesis. Please read the following information before deciding whether or not to participate.

#### **What are the objectives of the study?**

The nature of this study requires participants to be naive to the exact research question, as information about the research may influence your behaviour and responses. For this reason I can only inform you that I am conducting research on the processes of mental projection. A complete debriefing will be offered after participation, where any questions will be answered.

#### **Why have I been asked to participate?**

I would like to collect information from different people. The research requires participants to take part that meet the following criteria:

- You are aged 18 years or over
- You are of sound mental health

You are not/do not have:

- An intellectual or learning disability
- Might not understand the research and consent process
- Individuals or groups receiving help through the voluntary sector
- Other vulnerable groups

#### **What does participation involve?**

The study requires you to think about TWO emotionally salient events in your life and answer a number of questions. Completion should take about 20 minutes. Please find a quiet place to complete the study that will provide relief from potential distractions. Complete anonymity is guaranteed. Full details of the study will be provided after data has been collected.

**Right to withdraw**

Participants have the right to withdraw from the research at any time for whatever reason. Participants can also request at any time to have their response data removed from record.

**Are there any benefits from my participation?**

While there will be no direct benefit from participation studies like this can make an important contribution to our understanding of some of the processes underlying mental projection. As such, the findings from this study will be presented at a college symposium, and may be presented at a national conference, or submitted for publication in peer-reviewed journals. Interim and final reports will be prepared. However no individual participant will be identified in any publication. Individuals will not be offered any monetary or other rewards for their participation.

**Are there any risks involved in participation?**

There are no risks associated with participation. Any inconvenience involved in taking part will be limited. Complete anonymity is guaranteed, and participants have the right to withdraw at any time and will be offered a full debrief.

**Confidentiality**

All individual information collected as part of the study will be used solely for experimental purposes. They will be stored safely and will not be publicly displayed or published without prior consent. Data will be kept for one year after collection, and will then be destroyed.

**Contact Details**

If you have any further questions about the research you can contact:

1554010@mydbs.ie (Gareth Duffy-Researcher)

\*further mental health resources will be given at the end of the study

**Consent Form****A Study on mental projection**

- I have read and understood the attached Information Leaflet regarding this study.
- I have had the opportunity to ask questions and discuss the study with the researcher and I have received satisfactory answers to all my questions.
- I understand that I am free to withdraw from the study at any time without giving a reason and without this affecting my training.

☐ I provide my consent (please tick)

End of study & contact details

# Thank you for your participation

Note on debriefing:

This study is investigating the effects of mental time travel (in both temporal direction and emotional valence) on levels of awareness in the moment. You were a participant in one of four separate experimental groups. Please contact me if you have any further queries or if you would like a more thorough explanation on the nature of the study. Thank you

If you have been affected by any of the content of the study or have any general queries, please contact:  
1554010@mydbs.ie (Researcher)

Samaritans: 1850 609 090 (<http://www.samaritans.org.uk/talk/branches/ireland.shtm>)

AWARE: 1890 303 302 (<http://www.aware.ie/helpline.htm>)