5-2015

Effects of Current Mood State on the Time-Frame Orientation of Mind-Wandering

William D. Gooding

Effects of Current Mood State on the
Time-Frame Orientation of Mind-Wandering

A thesis submitted in partial fulfillment of the requirement
for the degree of Bachelor of Science in Psychology from
The College of William and Mary

by

William Daniel Gooding

Accepted for HONORS
(Honors, High Honors, Highest Honors)

Dr. Chris Ball, Director

Dr. Jennifer Stevens

Dr. Cary Humber

Williamsburg, VA
May 7, 2015

Effects of Current Mood State on the Time-Frame Orientation of Mind-Wandering

William D. Gooding

The College of William & Mary

Abstract

The current study examined the effect of mood state on the time-frame orientation (retrospective versus prospective) of mind-wandering (i.e., daydreaming). The mood states of participants were recorded before and after performing a long, repetitive facial emotion discrimination task using the Affect Grid (emotional valence and arousal). Depending on the initial valence reported by participants, various experimental manipulations were selected to attempt to maintain this mood state, such as emotionally provoking images, the brightness of background lighting, and emotion inducing background music. During this task, each participant was prompted 15 times to provide their mind-wandering state and, if mind-wandering at the time, to then provide the time orientation and emotional content of the mind-wandering episode. Results revealed that the time-frame orientation of mind-wandering episodes were more likely to be prospective than retrospective, and the time-frame orientation was affected by both arousal and emotional valence. Depression scores, gathered at an earlier time via mass testing and related to emotional valence, were related to time orientation. Not surprisingly, the emotional content of the mind-wandering episodes matched the participant's emotional state during the experiment. These results clearly highlight that the time-frame orientation and content of our mind-wandering episodes (daydreams) are not random but rather reflect our current concerns and physiological states.

Effects of Current Mood State on the Time-Frame Orientation of Mind-Wandering

Mind-wandering is defined as any cognitive event which redirects executive control functioning from an initial task to processing personal goals (Smallwood & Schooler, 2006). Mind-wandering is synonymous with task-unrelated thought (TUT), stimulus-independent thought (SIT), and daydreaming (Berntsen, 2009; Giambra, 1989; Mason, Norton, Van Horn, Wegner, Grafton, & Macrae, 2007; McVay & Kane, 2009; Smallwood, Obonsawin, & Heim, 2003). Mind-wandering has received recent research interest from cognitive scientists after being neglected in the past. The relationship of mind-wandering to the default mode network of the brain has helped trigger these new research developments (Christoff, Gordon, Smallwood, Smith, & Schooler, 2009; Mason et al., 2007), as well as a general interest in other unconscious cognitive phenomena, such as involuntary memories (Mace, 2008). In fact, recent cognitive studies have now been successful in linking mind-wandering with a plethora of other psychological phenomena, including subjective life narratives (Berntsen & Rubin, 2002), age-related effects on memory (Kliegel, Kvavilashvili, Schlagman, & Schulz, 2009), and specific personality variables (Hartmann, Kunzendorf, Rosen, & Grace, 2001). Many additional studies have been conducted in which the cognitive processes associated with mind-wandering itself were explored, including its often dreamlike mental imagery (Kunzendorf, Hartmann, Cohen, & Cutler, 1997), as well as its apparent goal-directed functioning (Klinger, 1999). However, one particular feature of mind-wandering which has remained relatively ignored by cognitive psychologists is the time-frame orientation (retrospective versus prospective) of its content, and more specifically, the cognitive processes by which this orientation is determined.

Time-Frame Orientation

Understandably, the concept associated with the time-frame orientation of mind-wandering may be somewhat difficult to grasp. Therefore, a good example taken from the psychological literature might be more effective in delineating this feature of mind-wandering. There is perhaps no better description of a mind-wandering episode than that provided by French novelist Marcel Proust within the first volume of his semi-autobiographical novel "*In Search of Lost Time*," Proust describes an unusual experience of the novel's narrator while enjoying a piece of madeleine cake dipped in tea. In what has come to be known as the "episode of the madeleine", the narrator vividly delineates how the taste of the tea-soaked cake revealed to him a distant memory of when he used to eat the confection with his aunt, Léonie, on Sunday mornings as a child (Proust, 1913-1927). This example accurately illustrates the concept of time-frame orientation in the form of a past-directed (retrospective) mental journey that catapulted him back in time to past memories spent with his aunt as a youth. One critical question remains for psychologists ---- Why did Proust's mind-wandering send his involuntary thought processes hurtling to the past, as opposed to the future, and furthermore, what cognitive and psychological factors influenced this time travel direction?

Given the involuntary nature of mind-wandering, could time travel just be a random feature of mind-wandering episodes, or could the direction of these travels be predicted by psychologists in some way? Answering these questions is at the heart of the current thesis.

Mood State

One such factor which may provide an explanation for this Proustian dilemma is the mind-wanderer's mood state at the time. Mood state (as evaluated within the current study) will consist of two dimensions: affect valence (negative to positive) and arousal level (low to high)

(Russell, Weiss, & Mendelsohn, 1989). The combination of both components is needed to adequately describe an individual's current mood state. Low arousal with a positive valence would reflect feeling relaxed, where a high level of arousal with a positive affect would reflect feeling excited. Likewise a negative valence with low arousal would reflect feeling depressed whereas a negative valence with high arousal would reflect feeling stressed.

Mood State and Current Concerns

Current concerns can be viewed as the introspective properties associated with the events that makeup the forefront of an individual's daily living (Varendonck, 1921). Formed during the establishment of personal life goals, current concerns remain readily accessible until said goals are either resolved or abandoned completely (Klinger, 1971; Klinger, 1999; Klinger, 2009; McVay & Kane, 2010). According to Klinger, current concerns may be either internally or externally cued by the environment or by other thoughts, upon which varying levels of concern-related thoughts compete for attention (Klinger, 1971; Klinger, 1999; Klinger, 2009; McVay & Kane, 2010). As a result of this competition, mind-wandering may be produced (McVay & Kane, 2010; Watkins, 2008). The presence of current concerns is indicated by an individual's current affect and arousal level, and are reflected as feelings of relaxation, excitement, stress, or depression (Russell et al., 1989). For example, college student participants in a highly competitive academic environment will often report feeling stressed with concerns about their academic performance foremost in their minds.

Mood State and Time-Frame Orientation

It has been inferred that the time-frame orientation of mind-wandering typically manifests itself in one of two ways: retrospectively and prospectively (Smallwood, Nind, &

O'Connor, 2009). Retrospective mind-wandering refers to mind-wandering episodes or daydreams that are oriented to a past relevant autobiographical experience (Smallwood et al., 2009). Conversely, prospective mind-wandering refers to mind-wandering oriented to a future-relevant autobiographical event which allow the mind-wanderer to envision and mentally "try out" autobiographical life scenarios that have yet to occur (Smallwood et al., 2009). This unique chronological feature associated with mind-wandering has also been referred to recently as mental time travel (MTT). Rasmussen and Berntsen (2013) defined MTT as an individual's mental ability to project himself or herself either backward into the past to retrieve a previous autobiographical event or forward into the future to imagine one that has yet to occur.

Prospective Mind-Wandering

Recent empirical evidence suggests that mind-wandering, in general, exhibits a "prospective bias", in that the majority of mind-wandering tends to contain content which is predominantly more future-focused than past-focused (Baird, Smallwood, & Schooler, 2011; D'Argembeau, Renaud, & Van der Linden, 2011; Smallwood, Schooler, Turk, Cunningham, Burns, & Macrae, 2011; Song & Wang, 2012; Stawarczyk, Majerus, Maj, Van der Linden, & D'Argembeau, 2011). The affective content of prospective mind-wandering is largely positive and idyllic (Berntsen & Jacobsen, 2008; Rasmussen & Berntsen, 2013; Rasmussen & Berntsen, 2014).

Furthermore, the inclination for mind-wandering to be prospective correlates with an individual's working memory capacity (Baird et al., 2011), their autobiographical planning (Baird et al., 2011; Berntsen et al., 2008; D'Argembeau et al., 2011; Smallwood et al., 2011; Stawarczyk et al., 2011; Stawarczyk et al., 2013), their current and personal life goals

(D'Argembeau et al., 2004; Song & Wang, 2012; Stawarczyk et al., 2011), and degree of self-reflection (Smallwood et al., 2011). Interestingly, it has been found that para suicidal individuals possess a reduced ability to experience these self-related future thoughts, implying that the autobiographical functions associated with prospective mind-wandering may be inhibited during periods of severe depression (MacLeod & Conway, 2007). Along these same lines, prospective mind-wandering also involves greater extents of inner speech, more personally relevant and realistic content, is more often part of structured sequences of thoughts, and has even been linked to generating illusory optimism for motivational enhancement (Rasmussen & Berntsen, 2013; Robinson & Ryff, 1999; Taylor & Brown, 1988). The empirical findings regarding prospective mind-wandering suggest that an individual's current concerns and emotional state could play significant roles in the time-frame orientation of their mind-wandering episodes.

Retrospective Mind-Wandering

In stark contrast to the evidence available for the prospective time-frame orientation of mind-wandering, very little empirical evidence exists on the retrospective time-frame orientation of mind-wandering; especially concerning its possible interactions with current mood state. It has been inferred that much like prospective mind-wandering, retrospective mind-wandering is also influenced somewhat by current life goals (D'Argembeau et al., 2004), yet this influence is most likely minimal due to its lesser relevance to current motivations (Robinson et al., 1999). One intriguing inference which can be made regarding the affective component associated with retrospective mind-wandering is that if prospective mind-wandering is, as aforementioned, largely "positive and idyllic" (Berntsen & Jacobsen, 2008; Rasmussen & Berntsen, 2013; Rasmussen & Berntsen, 2014), then it would be logical to assume that retrospection would be largely "negative and less idyllic". The presumption is consistent with Rasmussen et al.'s (2013)

finding that affective valence was smaller for past-centered events. Conversely, if future orientation is concurrent with positive affect, could past orientation be concurrent with negative affect? In other words, would a more negative mood state lead an individual's mind to wander retrospectively? This suggestion is supported by the findings of Smallwood and O'Connor (2011) who induced a negative change in the mood states of their participants and this change led to a significant increase in the reporting of retrospective mind-wandering (Smallwood & O'Connor, 2011). Although these researchers attempted to manipulate the emotional valence of the participants' mood states, a closer look at their mood manipulation results suggest that this manipulation was not completely successful. Consequently, the increase in retrospective mind-wandering may be a reflection of the mood manipulation stimuli than the actual mood state of the participant. Given that mind-wandering experiments usually involve long duration repetitive tasks to facilitate boredom, the mood valence manipulation of Smallwood and O'Connor will also be confounded by corresponding changes in arousal experienced during such tasks.

Mood State and Mind-Wandering Content

The current study also examines the emotional content of mind-wandering episodes (positive versus negative). Clinical research by Giambra and Traynor (1978) suggest that the emotional content of the mind-wandering episodes will also relate to the individual's current mood state. They found that the affective disorder of depression was related to mind-wandering content with depressive thought appearing in the form of severely negative, self-deprecating mental content involving personal devaluation, poor body image, and fear of failure mind-wandering (Giambra & Traynor, 1978). Much like the assumption inferred above suggesting that a negative mood state will lead an individual's mind to wander retrospectively, it is also assumed that the emotional content of such mind-wandering episodes will contain more negative

emotional content. Unfortunately, no published empirical research currently exists addressing the emotional content of prospective mind-wandering episodes. But it would seem logical to also assume that positive mood states will lead to more positive emotional content in mind-wandering episodes.

Mood State and Mind-Wandering Frequency

The frequency of mind-wandering episodes experienced by a participant appears to show consistent variations between individuals, and this frequency (or predisposition to mind-wander) may also be related to an individual's current mood state. Song and Wang (2012) tested a sample of 165 Chinese undergraduates and found that the frequency of mind-wandering reported by these participants was influenced by contextual factors at the time, such as doing important tasks or a negative mood state. Smallwood and colleagues found that inducing negative mood changes increased the frequency of participants' reporting of mind-wandering episodes (Smallwood, O'Connor, Sudbery, & Obonsawin, 2007). They also found that self-reported levels of dysphoria also related to mind-wandering frequency (Smallwood, Fitzgerald, Miles, & Phillips, 2009). Consequently, a significant relationship is also expected in the current study when examining current mood state and mind-wandering frequency.

Present Study

The present study was designed to test the relationships between mood state and the time-frame orientation and frequency of mind-wandering. In order to achieve this research goal some methodological requirements needed to be achieved. First, the maintenance of a participant's mood valence throughout the experiment needed to be utilized. Second, the elicitation of numerous mind-wandering episodes was needed during the experiment's limited duration. The

maintenance of a participant's current mood state was attempted through the use of three experimental manipulations: using emotionally provoking images (Ekman & Friesen, 1971; Ekman, Friesen, O'Sullivan, Chan, Diacoyanni-Tarlatzis, Heider, et al., 1987; Google, 2015), manipulating the brightness of background lighting (Kripke, Risch, & Janowsky 1983; Monje, Cabatic, Divisch, Kim, Herkner, Binder, et al., 2011), and the playing of emotion inducing background music (Mitterschiffthaler, Fu, Dalton, Andrew, & Williams, 2007). Mind-wandering episodes were evoked by creating a boring repetitive task (facial emotion expression discrimination task) that is similar to the sustained attention to response task (SART) used in previous mind-wandering experiments (e.g., Smallwood, Beach, Schooler, & Handy, 2008; Stawarczyk et al., 2011; Smallwood, Obonsawin, & Heim, 2003).

Based on previous research evidence and the assumption that mind-wandering reflects the current concerns of an individual and that these concerns are highly related to an individual's current mood state, the following predictions are made. Firstly, in terms of the time-frame orientation of mind-wandering episodes, individuals in a negative current mood state would experience more retrospective mind-wandering, whereas individuals in a positive current mood state would experience more prospective mind-wandering, Secondly, in terms of the emotional content of mind-wandering episodes, individuals with an overall negative affective valence would experience more negative emotional content, whereas individuals with an overall positive affective valence would experience more positive emotional content. Thirdly, in terms of mind-wandering frequency, individuals experiencing a negative affective state would report more frequent mind-wandering than individuals experiencing a positive affective state.

Method

Participants

Eighty (80) individuals participated in this study (mean age = 19.36 years), with 25 male participants and 55 female participants. All participants received course credit for their participation in this study, and provided their informed consent prior to participating.

Apparatus

The current mood state of the participants was maintained by presenting happy or sad music, manipulating the testing room's lighting, and manipulating the stimuli presented during a facial emotion discrimination task.

Music. Music was continuously played using a pair of Cyber Acoustics CA-2026 five-watt powered speakers throughout the duration of the study. The playlists employed for the positive and negative mood states are provided in Table 1. These songs were selected from previous research that examined the effects of music on mood (Mitterschiffthaler et al., 2007). Music was kept at a conversational volume level of no more than 80 decibels. Music volume was measured using a RadioShack model 33-2055 digital sound level meter.

Lighting. Lighting for the positive mood state consisted of the full fluorescent lights of the small testing room, whereas lighting for the negative mood state consisted only of a small desk lamp with a 40W bulb.

Affect grid. The current mood state of each participant was recorded using the Affect Grid (Russell, Weiss, and Mendelsohn, 1989). The Affect Grid consists of a 9x9 matrix with affective valence (negative to positive) in the x dimension, and arousal (low to high) in the y dimension (refer to Figure 1). The four corners of the matrix are labeled relaxed (positive affect

+ low arousal), excited (positive affect + high arousal), depressed (negative affect + low arousal), and stressed (negative affect + high arousal).

Depression questionnaire. Depression scores for each participant were recorded using the Center for Epidemiologic Studies Depression (CES-D) questionnaire (Hann, Winter, & Jacobsen, 1999; Radloff, 1977). The CES-D questionnaire consists of 20 questions about different feelings or behaviors and the weekly frequencies of each. These frequencies include rarely (< 1 day), some (1-2 days), occasionally, (3-4 days), and most (5-7). Examples of feelings and behaviors from the CES-D questionnaire include "I felt I was just as good as other people" and "my sleep was restless" (Hann et al., 1999; Radloff, 1977). Participant depression scores were recorded during mass testing prior to participation in the study.

Facial emotion discrimination task. The visual stimuli presented in the study was a series of photographed facial expressions (male or female), displaying the emotions of happiness, sadness, and surprise, within a facial emotion discrimination task developed by Ekman and colleagues (Ekman & Friesen, 1971; Ekman et al., 1987). Eleven photographs (5 male and 6 female) depicted expressions of happiness, 11 photographs (7 male and 4 female) depicted expressions of sadness, and 11 photographs (5 male and 6 female) depicted expressions of surprise, and all were retrieved from a public web source (Google, 2015). Each of these photographs were paired with one other to provide five different combinations: "happy-happy", "happy-surprised", "sad-sad", "sad-surprised", and "surprised-surprised", with each category containing 110, 232, 110, 232, and 110 pairs. To maintain a positive mood, participants saw "happy-happy", "happy-surprised", and "surprised-surprised" photos. To maintain a negative mood, participants saw "sad-sad", "sad-surprised", and "surprised-surprised" photos. A total of 452 pairs of photographed facial expressions were presented to each participant using two

experiments (one for each mood state) created on Cedrus SuperLab version 4.5. The presentation of visual stimuli and recording of participant responses were performed using a Dell OptiPlex 9010 computer, and images were displayed on a 24 inch Dell Professional P2412Hb LED backlit LCD monitor. All photographs were presented in a gray scale against a neutral brown background. Participants recorded their responses using a Cedrus model RB-830 response pad placed directly in front of them. Figure 2 displays two examples (one pair) of facial stimuli.

Procedure

After completing the informed consent sheet, participants provided their affect score using the Affect Grid. The participant's response reflected the degree of positive or negative affect they were experiencing at the time. The participant's response determined which testing condition they would be put into. Participants with an affect score of six or higher would be placed into the positive test condition, with bright light, happy music, and happy faces, whereas participants with an affect score of five or lower would be placed into the negative test condition, with dim light, sad music, and sad faces. Participants received 15 blocks of 30 trials (450 trials) and events, and the sequence of stimuli was randomized for each block. Each trial lasted for six seconds, with three allotted for the presentation of faces, and another three seconds of a blank screen. Consequently, each trial block lasted for 180 seconds, with the whole task lasting for approximately 45 minutes. Participants were required to judge if each pair of photographs expressed the same or different emotions. After the last pair of facial expressions was presented in each block, three possible questions were presented in sequence on the screen. The first questions asked, "*Did you find yourself mind-wandering or daydreaming during this last trial (press 'L' for 'no' / 'R' for 'yes')?*" If the participant responded "yes", they then received the second asking, "*Was your mind-wandering or daydreaming centered on the past or the future*

(press 'L' for 'past' / 'R' for 'future')?" The third question asked was, "*How would you describe the emotional content of your thoughts?*" For this question, the participants used the response pad buttons numbered 1, 2, 3, 4, 5, and 6. Rating was done on a scale from 1 to 6, with 1 being the most negative content and 6 being the most positive content. After completing these questions, the next block of facial expression trials began.

After completing the final task, participants were given a second Affect Grid to complete to record their current mood state. Once participants had completed the experiment, their depression scores were recorded from mass testing (if they had completed mass testing previously).

Results

Maintenance of Affect and Arousal

The current experiment attempted to maintain a participant's mood state throughout the long and repetitive facial emotion discrimination task, and was somewhat effective in achieving this goal. A 3-way analysis-of-covariance (ANCOVA) test (mood measure X time X starting emotion grouping) compared mood measures at the start and end of the task while controlling for a participant's depression score as a covariate. Significant main effects were found for mood state measure, F (1, 69) = 43.24, $p < .001$, time of testing, F (1, 69) = 12.93, $p = .001$, and starting mood condition, F (1, 69) = 27.20, $p < .001$.A significant 2-way interaction was found between mood measure and starting mood condition, F (1, 69) = 68.55, $p < .001$, and between mood measure and time of testing, F (1, 69) = 27.74, $p < .001$. A significant 3-way interaction was also obtained, F (1, 69) = 12.85, $p = .001$. This interaction is displayed in Figures 3 and 4 as 2-way interaction effects (time of test x starting mood condition) for mood valence (Figure 3)

and arousal level (Figure 4). The mood manipulation was successful in maintaining the participant's emotional valence although surprisingly, participants in the negative mood starting condition did show an improved mood state (although still not as positive as the positive emotion starting group) (refer to Figure 3). All participants showed declining levels of arousal regardless of what their emotional valence was before starting the facial emotion discrimination task (refer to Figure 4).

Depression and Mood State Relationships

All participants reported at least one episode of mind-wandering when prompted during the facial emotion discrimination task and some participants reported mind-wandering episodes for all 15 prompts. The average number of mind-wandering reports was 12.05 (SD = 3.18). No significant relationship was found between depression scores (M = 16.01, SD = 12.70) and the total number of mind-wandering episodes reported, r (70) = .10, $p > .05$ Depression scores were correlated with various mood state measures (refer to Table 2) with high CES-D scorers more likely to report negative affective valence and lower arousal (average arousal only). The total number of mind-wandering episodes reported by participants did correlate with a negative change in affective valence r (77) = .27, $p < .01$. Surprisingly, participants who reported higher levels of arousal before starting the facial emotion discrimination task also reported more mind-wandering episodes, r (77) = .21, $p < .05$ As expected, depression scores correlated with the emotional content of the mind-wandering episodes, r (70) = -.34, $p < .01$. The mood state of the participant (valence and arousal) also correlated with the emotional valence of the mind-wandering content (refer to Table 2).

Time-Frame Orientation Relationships

Only participants who reported four or more mind-wandering episodes during the facial emotion expression task were included in the following data analyses. Participants reported significantly more (almost twice as many) prospective mind-wandering episodes, (M = 7.56; SD = 3.69) than retrospective mind-wandering episodes (M = 4.62, SD = 3.34), t (78) = 4.11, $p <$ .001. Depression scores did not correlate with any of the time-frame orientation measures, p > .05. However, the mood state of the participant did correlate with time-frame orientation measures (refer to Table 2) with prospective mind-wandering increasing in frequency as a function of the participant's level of arousal and emotional valence. These correlations suggest that a combination of both affective valence and arousal (i.e., stress) correlated with the time-frame orientation of mind-wandering episodes in the current experiment.

Mind-Wandering Content and Time-Frame Orientation Relationships

Only participants who reported three or more retrospective mind-wandering episodes and three or more prospective mind-wandering episodes were involved in these data analyses. The emotional content of retrospective and prospective mind-wandering episodes were highly correlated, r (39) = .71, $p < .001$. The emotional content of both retrospective and prospective mind-wandering episodes were correlated with a participant's depression score (refer to Table 3). The emotional content of both retrospective and prospective mind-wandering episodes were also correlated with a participant's mood state (valence and arousal) (refer to Table 3). The emotional content of mind-wandering mirroring the emotional state and depression level of the participant.

Discussion

The current study was successful in maintaining the mood valences of participants, although the mood valences of participants who started with a negative mood improved slightly

although still was significantly more negative than the participants who started with a positive mood state. All participants showed a marked decrease in arousal regardless of their emotional valence, as expected with such a long and repetitive task. The total number of mind-wandering episodes reported by participants was related to a negative change in affective valence, which is consistent with previous research (Smallwood & O'Connor, 2011). However, participants who reported higher levels of arousal before starting the facial emotion discrimination task also reported more mind-wandering episodes. Depression scores were correlated with the emotional content of the mind-wandering episodes, with emotional content being significantly more negative.

Participants reported significantly more (almost twice as many) prospective mind-wandering episodes than retrospective mind-wandering episodes, with prospective mind-wandering increasing in frequency as a function of the participant's level of arousal and emotional valence; suggesting that stress (high arousal and negative valence) may have influenced time-frame orientation. Lastly, the emotional content of retrospective and prospective mind-wandering episodes were highly correlated, with more depressed individuals experiencing more negative emotional content.

As predicted, the majority of mind-wandering which occurred in the positive mood condition was future-oriented in nature, indicative of the "prospective bias" associated with most mind-wandering (Baird, Smallwood, & Schooler, 2011; D'Argembeau, Renaud, & Van der Linden, 2011; Smallwood, Schooler, Turk, Cunningham, Burns, & Macrae, 2011; Song & Wang, 2012; Stawarczyk, Majerus, Maj, Van der Linden, & D'Argembeau, 2011) However, the majority of mind-wandering which occurred in the negative mood condition was prospective as well, contrary to our original hypothesis that it would be more retrospective in nature. This result

also contradicts Smallwood and O'Connor's finding that negative mood states lead to a significant increase in retrospective mind-wandering (Smallwood & O'Connor, 2011). Furthermore, the fact that prospective mind-wandering increased in frequency as a function of the participant's level of stress (arousal and emotional valence) indicates that current concerns (e.g., future academic requirements) (Klinger, 1971; Klinger, 1999; Klinger, 2009; McVay & Kane, 2010; Varendonck, 1921; Watkins, 2008) may have had an impact on this time-frame orientation rather than just emotional valence alone.

The results obtained in regards to emotional content supported our hypothesis that mood state valence would relate to the emotional content of mind-wandering episodes. Previous research focused on negative emotional states and the current research extends this relationship to positive mood states.

Our final hypothesis that negative affective mood states would lead to more frequent mind-wandering was supported by the change in valence results. This supports the findings of previous research on this topic (Killingsworth & Gilbert, 2010; Smallwood et al., 2007; Smallwood et al., 2009; Song & Wang, 2012).

Acknowledgements

It goes without saying that this honors thesis, the largest project of my academic career to date, would not have been made possible without the help and support of several people whom I owe the utmost gratitude and recognition. Firstly, I would like to thank my thesis advisor, Dr. Chris Ball, for all of the guidance, wisdom, and inspiration he has so graciously provided me with throughout my journey as an aspiring researcher, and most importantly, for rekindling my passion for the science of psychology. Secondly, I would like to thank Dr. Jennifer Stevens and Dr. Cary Humber, the members of my thesis committee, for their encouragement and fervent interest in my work. Additionally, I would like to thank Dr. Sarah Bisconer for her unending kindness and belief in my abilities, as well as for all of the wonderful conversations we have shared together. Further, I would like to thank Dr. Robert Barnet for making the topics of physiological psychology and learning and memory both entertaining and enlightening, and for all of the time he generously devoted to helping me become a better student. Lastly, I would like to thank my mother, Christine Lauer, my father, Troy Gooding, my brother, Michael Gooding, my aunt, Melinda Hodges, my grandparents, and my good friends, Nicholas Bader, Tyler Estes, Garrett Hendrickson, Jourdan Peratsakis, Julian Samaroo, Patrick and James Silva-Valencia, and Rose St. Clair for all of the love, help, and support they have given me over these many years.

References

Baird, B., Smallwood, J., & Schooler, J. W. (2011). Back to the future: Autobiographical planning and the functionality of mind-wandering. *Consciousness and Cognition, 20*(4), 1604-1611.

Berntsen, D. (2009). *Involuntary Autobiographical Memories: An Introduction to the Unbidden Past*. New York, USA: Cambridge University Press.

Berntsen, D., & Jacobsen, A. S. (2008). Involuntary (spontaneous) mental time travel into the past and future. *Consciousness and Cognition, 17*(4), 1093-1104.

Berntsen, D., & Rubin, D. C. (2002). Emotionally charged autobiographical memories across the life span: The recall of happy, sad, traumatic and involuntary memories. *Psychology and Aging, 17*(4), 636.

Christoff, K., Gordon, A. M., Smallwood, J., Smith, R., & Schooler, J. W. (2009). Experience sampling during fMRI reveals default network and executive system contributions to mind wandering. *Proceedings of the National Academy of Sciences of the United States of America, 106*(21), 8719-8724.

D'Argembeau, A., & Van der Linden, M. (2004). Phenomenal characteristics associated with projecting oneself back into the past and forward into the future: Influence of valence and temporal distance. *Consciousness and Cognition, 13*(4), 844-858.

D'Argembeau, A., Renaud, O., & Van der Linden, M. (2011). Frequency, characteristics and functions of future-oriented thoughts in daily life. *Applied Cognitive Psychology, 25*(1), 96-103.

Ekman, P., & Friesen, W. V. (1971). Constants across cultures in the face and emotion. *Journal of Personality and Social Psychology, 17*(2), 124.

Ekman, P., Friesen, W. V., O'Sullivan, M., Chan, A., Diacoyanni-Tarlatzis, I., Heider, K., et al. (1987). Universals and cultural differences in the judgments of facial expressions of emotion. *Journal of Personality and Social Psychology, 53*(4), 712.

Giambra, L. M. (1989). Task-unrelated thought frequency as a function of age: A laboratory study. *Psychology and Aging, 4*(2), 136.

Giambra, L. M., & Traynor, T. D. (1978). Depression and daydreaming: An analysis based on self-ratings. *Journal of Clinical Psychology, 34*(1), 14-25.

Google images. (2015)., 2014, from https://www.google.com/imghp?hl=en&tab=wi&ei=wno0VZjYEOfIsQS90IGYAg&ved=0CBMQqi4oAg

Hann, D., Winter, K., & Jacobsen, P. (1999). Measurement of depressive symptoms in cancer patients: Evaluation of the center for epidemiological studies depression scale (CES-D). *Journal of Psychosomatic Research, 46*(5), 437-443.

Hartmann, E., Kunzendorf, R., Rosen, R., & Grace, N. G. (2001). Contextualizing images in dreams and daydreams. *Dreaming, 11*(2), 97-104.

Involuntary Memory (2007). In John H. Mace (Ed.). Malden, MA, USA: Blackwell Publishing.

James, W. (1984). *Psychology: Briefer Course*. Cambridge, MA, USA: Harvard University Press.

Killingsworth, M. A., & Gilbert, D. T. (2010). A wandering mind is an unhappy mind. *Science (New York, N.Y.), 330*(6006), 932.

Klinger, E. (1971). Structure and functions of fantasy.

Klinger, E. (1999). Thought flow: Properties and mechanisms underlying shifts in content.

Klinger, E. (2009). Daydreaming and fantasizing: Thought flow and motivation.

Kripke, D. F., Risch, S. C., & Janowsky, D. (1983). Bright white light alleviates depression. *Psychiatry Research, 10*(2), 105-112.

Kunzendorf, R. G., Hartmann, E., Cohen, R., & Cutler, J. (1997). Bizarreness of the dreams and daydreams reported by individuals with thin and thick boundaries. *Dreaming, 7*(4), 265-271.

MacLeod, A. K., & Conway, C. (2007). Well-being and positive future thinking for the self versus others. *Cognition and Emotion, 21*(5), 1114-1124.

Mason, M. F., Norton, M. I., Van Horn, J. D., Wegner, D. M., Grafton, S. T., & Macrae, C. N. (2007). Wandering minds: The default network and stimulus-independent thought. *Science (New York, N.Y.), 315*(5810), 393-395.

McVay, J. C., & Kane, M. J. (2009). Conducting the train of thought: Working memory capacity, goal neglect, and mind wandering in an executive-control task. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 35*(1), 196.

McVay, J. C., & Kane, M. J. (2010). Does mind wandering reflect executive function or executive failure? Comment on Smallwood and Schooler (2006) and Watkins (2008).

Mitterschiffthaler, M. T., Fu, C. H., Dalton, J. A., Andrew, C. M., & Williams, S. C. (2007). A functional MRI study of happy and sad affective states induced by classical music. *Human Brain Mapping, 28*(11), 1150-1162.

Monje, F. J., Cabatic, M., Divisch, I., Kim, E. J., Herkner, K. R., Binder, B. R., et al. (2011). Constant darkness induces IL-6-dependent depression-like behavior through the NF-kappaB signaling pathway. *The Journal of Neuroscience: The Official Journal of the Society for Neuroscience, 31*(25), 9075-9083.

Neisser, U. (2014). *Cognitive Psychology: Classic edition*. New York, NY, USA: Psychology Press.

Proust, M. (2013). *Swann's Way: In Search of Lost Time* Yale University Press.

Publication Manual of the American Psychological Association (2009). (6th ed.). Washington, DC, USA: American Psychological Association (APA).

Radloff, L. S. (1977). The CES-D scale a self-report depression scale for research in the general population. *Applied Psychological Measurement, 1*(3), 385-401.

Rasmussen, A. S., & Berntsen, D. (2013). 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*(2), 187-200.

Rasmussen, K. W., & Berntsen, D. (2014). "I can see clearly now": The effect of cue imageability on mental time travel. *Memory & Cognition, 42*(7), 1063-1075.

Robinson, M. D., & Ryff, C. D. (1999). The role of self-deception in perceptions of past, present, and future happiness. *Personality and Social Psychology Bulletin, 25*(5), 596-608.

Russell, J. A., Weiss, A., & Mendelsohn, G. A. (1989). Affect grid: A single-item scale of pleasure and arousal. *Journal of Personality and Social Psychology, 57*(3), 493.

Schlagman, S., Kliegel, M., Schulz, J., & Kvavilashvili, L. (2009). Differential effects of age on involuntary and voluntary autobiographical memory. *Psychology and Aging, 24*(2), 397.

Schlagman, S., Kliegel, M., Schulz, J., & Kvavilashvili, L. (2009). Differential effects of age on involuntary and voluntary autobiographical memory. *Psychology and Aging, 24*(2), 397.

Singer, J. L. (1966). *Daydreaming: An Introduction to the Experimental Study of Inner Experience*. New York, NY, USA: Random House.

Smallwood, J., Beach, E., Schooler, J. W., & Handy, T. C. (2008). Going AWOL in the brain: Mind wandering reduces cortical analysis of external events. *Journal of Cognitive Neuroscience, 20*(3), 458-469.

Smallwood, J., Fitzgerald, A., Miles, L. K., & Phillips, L. H. (2009). Shifting moods, wandering minds: Negative moods lead the mind to wander. *Emotion, 9*(2), 271.

Smallwood, J., Nind, L., & O'Connor, R. C. (2009). When is your head at? An exploration of the factors associated with the temporal focus of the wandering mind. *Consciousness and Cognition, 18*(1), 118-125.

Smallwood, J., Obonsawin, M., & Heim, D. (2003). Task unrelated thought: The role of distributed processing. *Consciousness and Cognition, 12*(2), 169-189.

Smallwood, J., & O'Connor, R. C. (2011). Imprisoned by the past: Unhappy moods lead to a retrospective bias to mind wandering. *Cognition & Emotion, 25*(8), 1481-1490.

Smallwood, J., O'Connor, R. C., Sudbery, M. V., & Obonsawin, M. (2007). Mind-wandering and dysphoria. *Cognition and Emotion, 21*(4), 816-842.

Smallwood, J., & Schooler, J. W. (2006). The restless mind. *Psychological Bulletin, 132*(6), 946.

Smallwood, J., Schooler, J. W., Turk, D. J., Cunningham, S. J., Burns, P., & Macrae, C. N. (2011). Self-reflection and the temporal focus of the wandering mind. *Consciousness and Cognition, 20*(4), 1120-1126.

Song, X., & Wang, X. (2012). Mind wandering in Chinese daily lives–an experience sampling study. *PLoS One, 7*(9), e44423.

Stawarczyk, D., Cassol, H., & D'Argembeau, A. (2013). Phenomenology of future-oriented mind-wandering episodes. *Frontiers in Psychology, 4*.

Stawarczyk, D., Majerus, S., Maj, M., Van der Linden, M., & D'Argembeau, A. (2011). Mind-wandering: Phenomenology and function as assessed with a novel experience sampling method. *Acta Psychologica, 136*(3), 370-381.

Taylor, S. E., & Brown, J. D. (1988). Illusion and well-being: A social psychological perspective on mental health. *Psychological Bulletin, 103*(2), 193.

Varendonck, J. (1921). *The Psychology of Day-Dreams*. London, UK: George Allen & Unwin.

Watkins, E. R. (2008). Constructive and unconstructive repetitive thought. *Psychological Bulletin, 134*(2), 163.

Table 1

Music Utilized to Maintain Mood State

Happy music	Composer	Sad music	Composer
Symphony No. 9: Ode To Joy	Beethoven	Adagio in Sol minor	Albinoni
Carmen: Chanson du Toreador	Bizet	Adagio for Strings	Barber
Messiah---Hallelujah Chorus	Handel	Kol Nidrei	Bruch
The Planets: Jupiter	Holst	Funeral March	Chopin
Allegro---A Little Night Music	Mozart	Solveig's Song---Peer Gynt	Grieg
Rondo Allegro---A Little Night Music	Mozart	Concerto de Aranjuez	Rodrigo
Orpheus in the Underworld Overture	Offenbach	Suite in A minor	Sinding
William Tell Overture: Final	Rossini		
Blue Danube	Strauss		
Radetzky March	Strauss		
Libiamo ne' lieti calici	Verdi		

Table 2

Correlations between Mood and Mind-Wandering Variables (n = 80)

Variable	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*
1. Total MW	---													
2. Number of Retro MW	.33**	---												
3. Number of Pros MW	.52**	-.63**	---											
4. Proportion of Pros MW	-.03	-.91**	.81**	---										
5. Depression Scores	.10	.03	.06	.04	---									
6. Valence Pre	.07	.21*	-.14	-.24*	-.47**	---								
7. Valence Post	-.20*	.01	-.18	-.09	-.42**	.48**	---							
8. Arousal Pre	.21*	-.12	.28**	.21*	-.15	-.21*	.09	---						
9. Arousal Post	.07	-.16	.20*	.17	-.18	.10	.19*	.35**	---					
10. Mean Valence	-.08	.13	-.18	-.19	-.51**	.85**	.87**	-.06	.18	---				
11. Mean Arousal	.18	-.17	.30**	.23*	-.20*	-.08	.17	.85**	.06	.06	---			
12. Change in Valence	-.27**	-.19	-.05	.13	.03	-.47**	.55**	.29**	.10	.06	.24*	---		
13. Change in Arousal	-.14	-.01	-.11	-.05	-.01	.28**	.07	-.66**	.47**	.20*	-.17	-.19*	---	
14. *M* Emo Content of MW	-.13	.10	-.19*	-.18	-.34**	.47**	.67**	-.03	.26*	.66**	.12	.22*	.24*	---

Note. * p <.05. ** p <.01.

Table 3

Correlations between Variables when Separating Prospective and Retrospective Mind-Wandering (n = 41)

Variable	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
1. Depression Score	---											
2. Proportion of Pros MW	.01	---										
3. Valence Pre	-.54**	-.04	---									
4. Valence Post	-.44**	-.09	.55**	---								
5. Arousal Pre	-.08	.05	-.14	.11	---							
6. Arousal Post	-.06	.08	.10	.13	.26	---						
7. Average Valence	-.56**	-.08	.86**	.90**	-.00	.13	---					
8. Average Arousal	-.09	.08	-.05	.15	.87**	.71**	.07	---				
9. Change in Valence	.04	-.07	-.33*	.61**	.26	.05	.20	.22	---			
10. Change in Arousal	.03	.00	.20	-.02	-.77**	.42**	.09	-.35*	-.21	---		
11. *M* Emo Content for Pros MW	-.33*	-.13	.45**	.61**	-.05	.13	.61**	.03	.27*	.13	---	
12. *M* Emo Content for Retro MW	-.42**	-.01	.41**	.62**	.59**	.19	.04	.30*	.31*	.18	.71**	---

Note. * p <.05. ** p <.01.

Figure Captions

Figure 1. The Affect Grid used to record the current mood state of each participant.

Figure 2. An example of a “happy-happy” facial expression pairing for the facial emotion discrimination task.

Figure 3. 3-way interaction: mood condition X time for emotional valence.

Figure 4. 3-way interaction: mood condition X time for arousal.

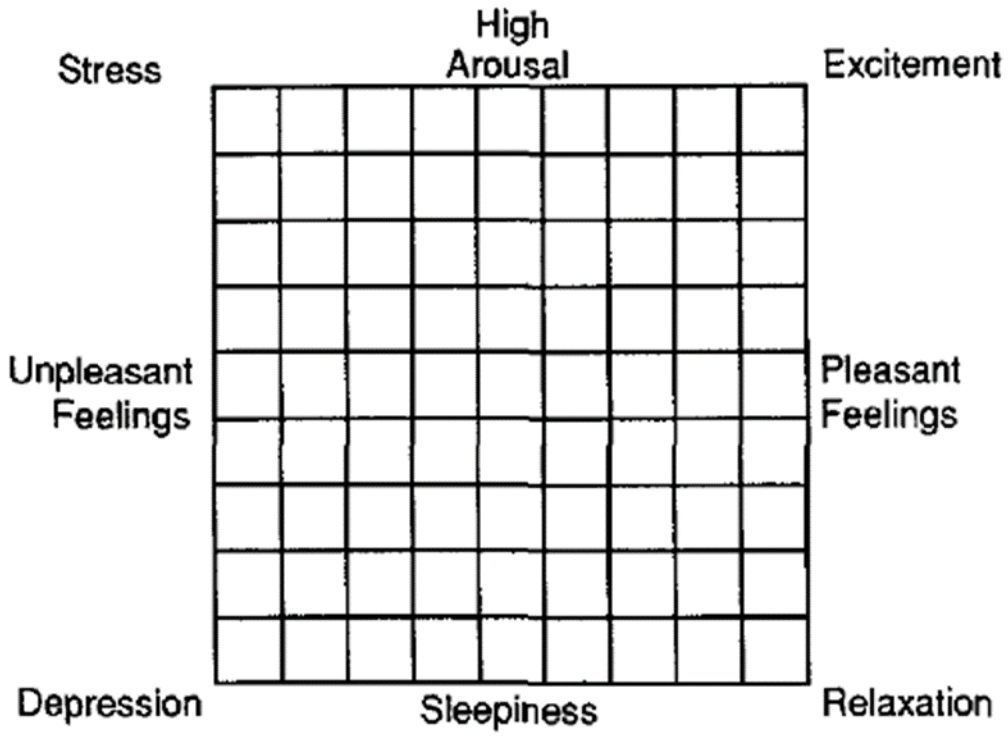
High
Arousal
Stress
Excitement
Unpleasant
Feelings
Pleasant
Feelings
Depression
Sleepiness
Relaxation

Figure 1.

Figure 2.

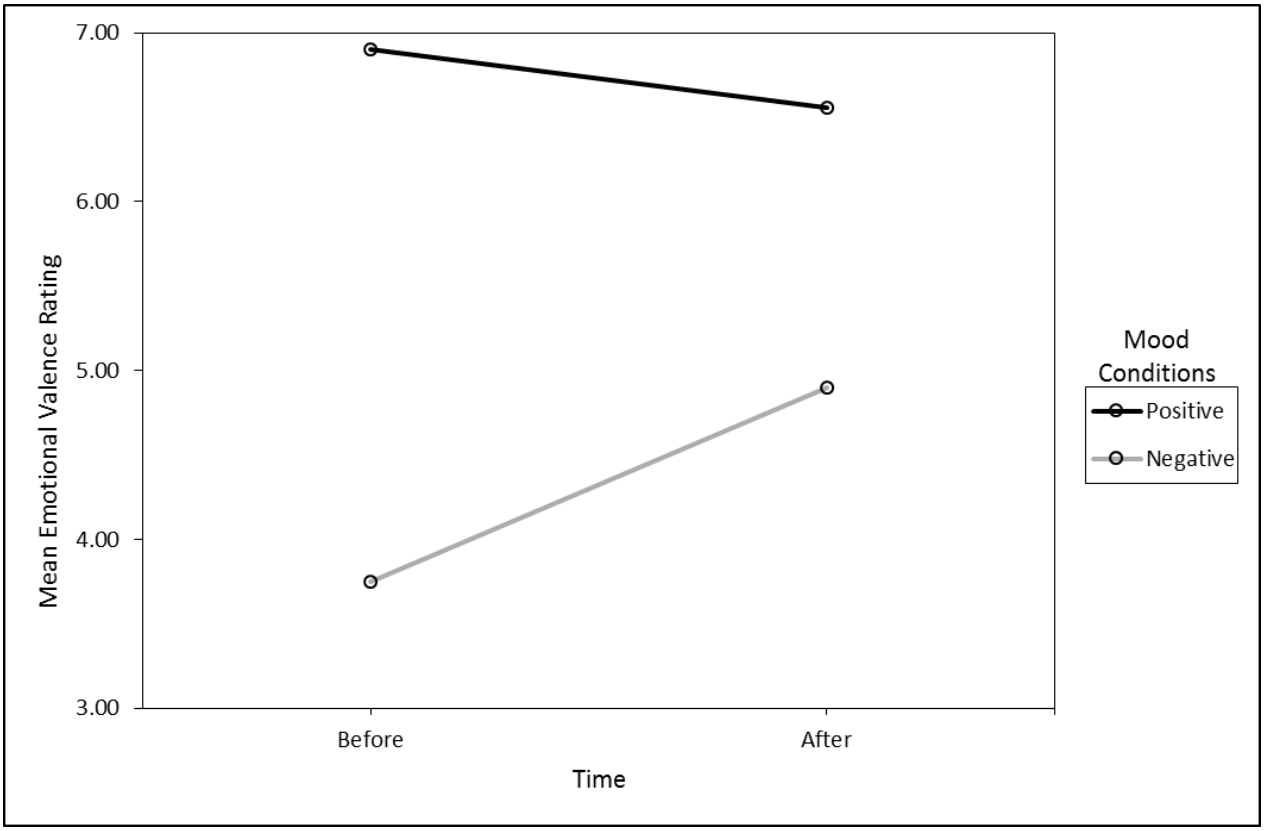
7.00
6.00
5.00
4.00
3.00
Mean Emotional Valence Rating
Before
After
Time
Mood Conditions
Positive
Negative

Figure 3.

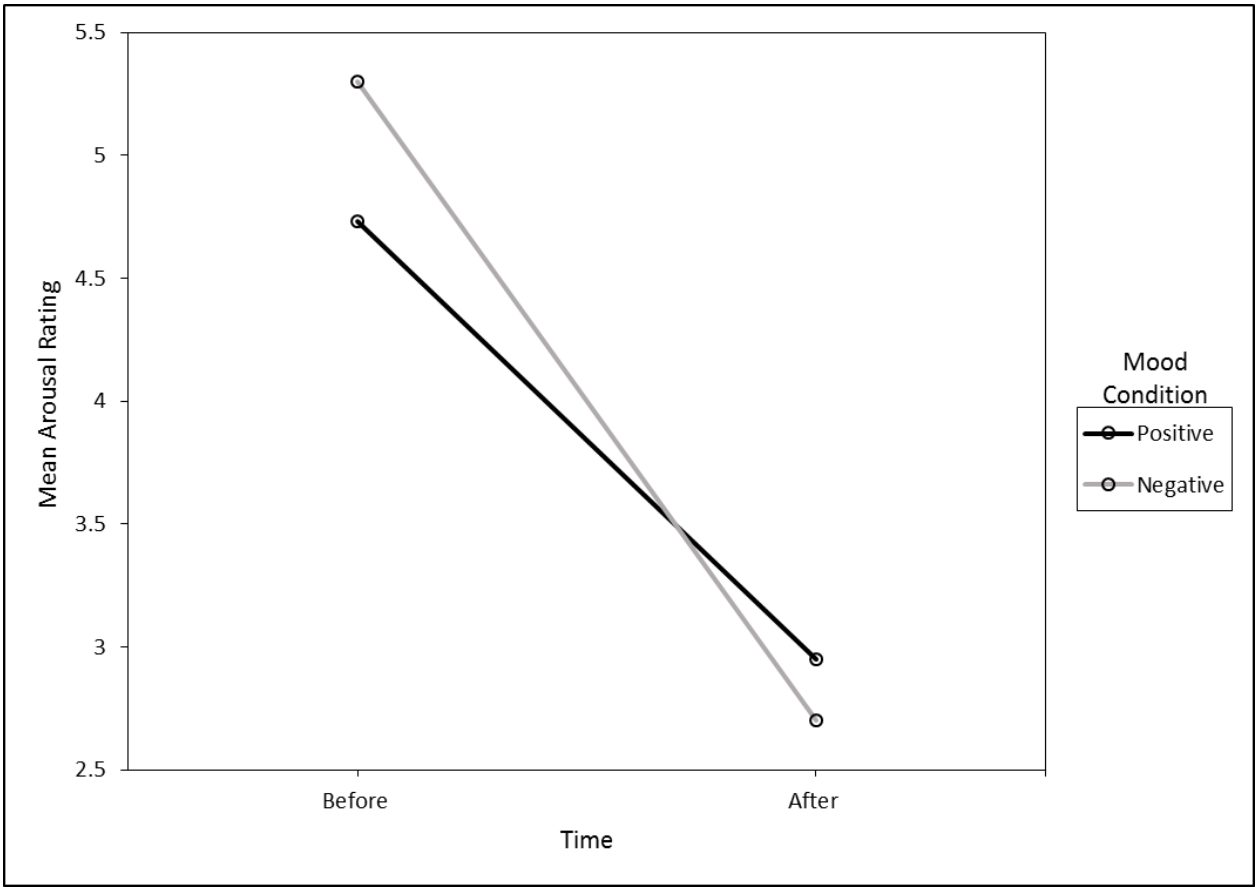
5.5
5
4.5
4
3.5
3
2.5
Mean Arousal Rating
Before
After
Time
Mood Condition
Positive
Negative

Figure 4.