The Effect of Self-Focus on Time Perception

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Abstract

The focus of an individual's attention can be externalized on environmental stimuli or it can be directed inward to the self (Carver, & Scheier, 1981). Self-focused attention has many implications for emotion, behavior, and value development. In recent literature, researchers have examined perception of time and how time perception is altered (Matthews, Syewart, & Wearden, 2011; Penney, Gibbon, & Meck, (2000). The present study was an examination of the effects of self-focused attention on time perception. Participants completed three tasks, one that directed attention to the self, and two more that were either boring or engaging but that did not elicit attention to the self. Participants performed these tasks while either in front of a mirror or not. Results showed that participants who completed tasks in front of a mirror significantly overestimated the amount of time elapsed compared to the no mirror condition. This suggests a relationship between directing attention inwardly to the self and the individual's perception of time.

The Effect of Self-Focus on Time Perception

Many stimuli we encounter in the world capture our attention, causing us invest in the activities that occur around us as we live our daily lives. Attention is a cognitive process in which we selectively focus on a specific point, while ignoring other stimuli. Our focus can be directed outward to environmental objects, but it can also be directed *inward* towards the self (Carver, 1979; Carver, Blaney, & Scheier, 1979). Researchers call attention that is directed inwardly *self-awareness* (Duval & Wicklund, 1972; Duval & Silvia, 2002; Chadwick, Duval, & Silvia, 2004).

In the social cognition literature, two basic forms of self-focus have been examined:

1. Self-consciousness, which is the predispositional form of self-focus. Research shows that people show individual differences in their tendencies to self-focus (Carver & Scheier, 1981).
2. Self-awareness, which in the literature generally refers to self-focus that is elicited by one's situation (Duval & Wicklund, 1972). In laboratory experiments, self-awareness is created by exposing participants in experiments to self-focusing stimuli, such as mirrors or audio recordings of one's own voice.

Researchers have generally examined self-focus in the context of self-attention theory (Carver & Scheier, 1981; Duval & Wicklund, 1972; Mullen (1986); Wicklund & Duval, 1971). Self-attention theory explains the mechanisms by which individuals regulate their own behavior to match a norm or standard that are present in a particular situation. Theoretically, self-focus is required in order for someone to regulate his or her own behavior. According to self-attention theory, before an individual will regulate his

or her behavior to match a norm or expectation, he or she must be self-focused, must be aware that a standard or norm exists for the particular situation, and must believe that he or she can do what is necessary to match the standard (typically referred to as an "good outcome expectancy.") Because of the importance of self-focus in the regulation of behavior, the existence of both outward stimuli that can create self-focus and the predispositional tendencies that some people already possess to be habitually self-focused are important, and have been the object of much research. Consequently, many studies have been performed to examine the effects of both situational and predispositional self-focus (Carver & Scheier, 1981; Davis, 1982; Fenigstein, Scheier, & Buss, 1975; Higa & Daleiden, 2008; Silvia, McCord, & Gendolla, 2010; Matthews & Green, 2010; Winkielman, 2002; Zental, Arlene, & Lee, 1998).

Researchers have found that self-focused attention also varies with individual differences. Research shows that some people are habitually more self-focused than others (Carver & Scheier, 1981; Fenigstein et al., 1975). Individuals who tend habitually to turn their attention inward to focus upon themselves are described as being high in *self-consciousness*. For these individuals, this habitual self-focus consists of characteristically focusing their attention inward: They scrutinize their behavior, and consider their own thoughts, attitudes, beliefs and responses to others. At the opposite end of the spectrum are those who exhibit little tendency to focus on their own motives or thoughts, or how they appear to others. As one can imagine, extreme self-consciousness could manifest as a strong tendency to be highly ruminative, or even obsessive; however, researchers have generally focused on normal everyday human behavior. Some people tend to be habitually self-focused on what is happening inwardly, but most people focus

inwardly at least part of the time.

In order to assess individual differences in self-focus, Fenigstein et al. (1975) developed the self-consciousness scale (SCS). The completed version of the SCS consists of 23 items with each item rated on a scale from 0 (“extremely uncharacteristic of me”) to 4 (“extremely characteristic of me”). In their research, Fenigstein et al. found that both genders behaved highly similar in terms of self-focused behavior, and thus gender-specific scales were not required. Scale items were separated into three categories, dividing scales into those that measured private self-consciousness, public self-consciousness, and social anxiety, three independent constructs.

Private self-consciousness refers to the tendency to focus on one's own thoughts, beliefs, and attitudes. Fenigstein et al. (1975) suggest that it is similar to the Jungian concept of introversion, in which the introvert is described as being specifically focused on thoughts and reflections related to the self. In contrast, public self-consciousness involves an emphasis on the self as a social object. A person who is high in public self-consciousness is especially focused on his or her "public persona." This individual is focused on the public aspects of oneself; his or her attention is directed to how he or she presents to others.

According to Fenigstein et al. (1975), public self-consciousness is not to be confused with social anxiety. Hence, a separate scale to measure social anxiety is included with the self-consciousness scale. According to Fenigstein et al., research validating the SCS has shown social anxiety it to be a construct that is independent of both private and public self-consciousness. It is important to understand that to be self-conscious is not merely a form of anxiety. Theoretically, self-consciousness refers

merely to one's habitual tendency to focus his or her attention inward, on either the private or public aspects of the self, independent of any emotional response. Because private self-consciousness, public self-consciousness, and social anxiety are all independent constructs, an individual can be high or low in *both* private and public self-consciousness. In addition, he or she may also be high or low in social anxiety. Again, the three constructs are independent of each other.

Many experiments have examined the effects of private and public self-consciousness in the social cognition literature. Theoretically, individuals who have a predisposition to be high in public self-consciousness tend to focus on themselves as social objects (Scheier, Buss, & Buss, 1978). They characteristically are more aware of how people perceive them and tend to display more sensitivity to the reactions of other people. Fenigstein (1979) demonstrated that women high in public self-consciousness who were assigned to a negative social interaction condition were more sensitive to group rejection than women who were lower in public self-consciousness, who tended to react more negatively. Later, high self-consciousness women demonstrated less attraction to the group and were less likely to associate with them. Interestingly, the researchers found that whereas high public self-consciousness seemed to lead to a magnified experience of rejection, participants who were high in public self-consciousness did not seem affected by *acceptance* by another person. Fenigstein (1979) also shows that self-esteem is only weakly correlated to public self-consciousness and therefore is also an independent construct.

Private self-consciousness refers to a state in which an individual attends to his or her thoughts, feelings, and motives (Scheier et al., 1978). In 1976, Scheier tested male

participants who were either high and low in private self-consciousness to examine the effects of private self-consciousness on aggressive behavior. Half were in the presence of a mirror and the other half were not. In both conditions, participants were either angered or not angered by an experimental accomplice. Scheier found that men who were high in private self-consciousness tended to aggress more than those who were lower in private self-consciousness. Aggression was intensified when participants were angered in the presence of a mirror, compared to the no mirror condition. Scheier's study demonstrates that self-focus increases awareness of, and sensitivity to, one's internal emotional state. This increased sensitivity to one's emotions has implications for overt behavior, because the person who is more aware of his or her emotions may tend to respond to that emotional state by exhibiting behavior that is consistent with the emotion.

As stated earlier, a situational state of self-focus, called self-awareness, can be induced by using self-focusing stimuli, such as mirrors or audio recordings of one's own voice. Theoretically, self-focus stimuli are thought somehow to remind the individual of his or her status as a social object (Duval & Wicklund, 1972). Research findings suggest that use of self-focus stimuli, such as mirrors, produces results similar to those of private self-consciousness (Carver & Scheier, 1981; Scheier et al., 1978).

To demonstrate that mirrors can induce self-awareness, Carver and Scheier (1978) conducted an experiment that placed participants in either a mirror condition or a no-mirror condition. Participants were then asked to complete Exner's self-focus sentence completion task (SFSC; (Exner, 1973), a measure of situational self-focus. The SFSC task essentially involves asking participants to write about themselves. Later, the number of first-person pronouns used is counted, which provides a reliable index of situational

self-focus (Exner & O'Brien, 1969). In Carver and Scheier's (1978) study, Exner's SFSC was administered to participants who were either in front of a mirror or not. Results showed that the SFSC responses showed more self-focused responses overall in the mirror condition than in the no mirror condition. Moreover, participants in the mirror condition exhibited a level of self-focused responding on a par with participants in the study that were predetermined to be high in private self-consciousness, which was also measured using the SCS (Fenigstein, Scheier & Buss, 1975). These findings provide strong validation for the idea that mirrors induce high situational self-focus.

In the same study, Carver and Scheier (1978) also demonstrated that audience presence affects self-attention. The audience consisted of a trained confederate who accompanied the participant while the SFSC questionnaire was completed. The confederate gazed in the general direction of the participant without appearing to be examining responses. Results showed that in the presence of an audience, self-focus was significantly greater than when an audience was not present.

Self-focused attention has been found to enhance behavioral congruency with deeply held individual values such as honesty, helpfulness, and loyalty (Schwartz, 1992; Schwartz & Bilsky, 1987, 1990). Values are considered to be central to the self and contribute to one's sense of identity. The degree to which a particular value is central to the self varies between individuals, as does the specific value held. Theoretically, self-focused attention tends to activate values that are central to the self (Verplanken & Holland, 2002). Therefore theoretically, focusing on the self should enhance centrally held values.

Given my review of the self-attention literature so far, it is clear that many studies

demonstrate that an important effect of self-focus—habitual or induced—is to increase awareness of one's internal state. This state can be emotional, or a focus on one's attitudes or beliefs. For instance, Beaman, Klentz, Diener and Svanum (1979) explored the relationship between self-awareness and "cheating" behavior by observing Halloween trick-or-treaters. The trick-or-treaters were instructed to only take one piece of candy from an unmonitored bowl that either had an ostentatious mirror behind it or not, depending on condition. Some trick-or-treaters were asked what their name was and where they lived, whereas other trick-or-treaters remained anonymous. Beaman et al. argued that self-awareness was induced by the presence of the mirror and subsequently decreased the rate of trick-or-treaters that took more than one piece of candy when their name and address was relinquished. Those trick-or-treaters who remained anonymous or who took candy from a no mirror bowl did not exhibit significant cheating or non-cheating behavior. Overall results showed that cheating was observed when the individuals were not self-aware, compared to when they were self-aware.

The major premise of my present study is to examine the effects of self-focus on another internal phenomenon: time perception. Perception of time, like emotional states or assessment of one's values, happens internally as well. Presumably, focusing on the passage of time while it occurs is a process that by its nature requires self-focus. This raises the question: What happens when people focus on the passage of time when they are self-focused versus when they are not?

Recently, many researchers have begun to examine how people perceive the passage of time, resulting in a large literature. Arguably, every person has experienced days in which time flew, or dragged on endlessly. Obviously, the actual time elapsed

from day to day remains constant. So why does perception of that time vary from person to person, or from situation to situation? In the research literature, some proposed explanations for these variations in time perception are stimulus intensity, engagement with the stimulus, biological effects, and emotional states (Gil, Rousset, & Droit-Volet, 2009; Matthews, Stewart, & Wearden, 2011; Pfaff, 1968; Zakay & Block, 1998)

Although self-focused attention has not been explicitly linked to time perception, there have been interesting implications involving time perception related to internal clocks, the theoretical term for the system of internal mechanisms people possess to monitor time (Church, 1984). Several models for the internal clocks that we use to perceive time have been proposed by researchers interested in scalar expectancy theory or SET (Gibbon, Church, & Meck, 1984). In the research literature, SET has been used in many studies to successfully model the way that people perceive time (Caselli, Laboli, & Nichelli, 2009; Grommet, Droit-Volet, Gil, Hemmes, Baker, & Brown, 2011; Penney, Gibbon, Meck, 2000; Matthews et al., 2011).

According to SET, we have an internal clock that consists of an internal "pacemaker" that is attached to an "accumulator" by a "switch." The main assumption in the SET model is that the pacemaker emits "pulses" at some high, constant rate, which allows us to mark time. According to the theory, at the time an engaging stimulus occurs, such as a picture, the switch "closes" and the pulses flow into the accumulator. Once the stimulus duration completes, the switch then "opens" and the flow of pulses stop. The basis of judgment of the duration of a task or stimulus exposure is dependent on the number of pulses stored in the accumulator. However, the pacemaker rate does not always emit pulses at the same rate.

Gibbon, Church, and Meck (1984) explored this phenomenon by applying time tests to rats. The rats were exposed to light in an operant chamber where they were initially trained to respond after 4 seconds of darkness. Following training, rats were presented with varying durations of darkness. It was found that the rats were more likely to respond when the light was extinguished for the conditioned 4 seconds. When the duration increased or decreased from the 4 seconds, the probability of responding tended to decrease. The rats were posited to make estimates of time based on reinforcement delivery, so when the light was turned off for all other durations except 4 seconds then the probability of responding was therefore lower. Gibbon et al. suggested that the change in response rate was related to the differences in expectancies, which theoretically altered the pulses emitted that regulate the time perceived.

In 2000, Penney, Gibbon, and Meck examined time perception related to visual (pictures), and auditory (tones) stimuli. Participants were asked to determine the time elapsed after either a visual or auditory stimulus was presented. Participants consistently estimated visual signals to have a shorter duration when compared to an equivalent auditory duration. Penney et al. argued that visual stimuli may not be able to hold attention as easily and thus "flickering" occurs. "Flickering," in the context of SET, occurs when the switch to the accumulator opens and closes. When flickering occurs, less accumulation occurs and thus perception of actual time elapsed is perceived as shorter. Penney et al. argued that the switch remains open only while attention is actually paid to the stimulus. The auditory system is also a primarily time-dependent mechanism whereas visual processes are more spatially focused. Therefore, time determinations for auditory stimuli are more accurate due to the processing mechanism as compared to

visual stimuli.

Some researchers have proposed that stimulus intensity also may change the rate of the pacemaker, or time regulator (Zelkind, 1973). However, recent research shows that the absolute magnitude of stimulus intensity is not directly related to perceived duration of time. Instead, it is the perceived *difference* between the stimulus and the corresponding context in which the stimulus occurred that is theoretically important to the rate of the pacemaker (Matthews et al., 2011).

Matthews et al. (2011) examined how participants perceived the passage of time with visual stimuli. Each participant was shown a square for a set period of time and was then asked to estimate the elapsed time. The square stimulus had either a black or white background with either a smaller bright or dim gray square in the middle. Matthews et al. found that participants judged a bright stimulus against the black background to last longer than a dim one. The effect was reversed when the background was white. If the flow of pulses into the accumulator depends on the amount of attention paid to the stimulus (Zakay et al., 1998), then the more difference between the stimulus and its environment, the more attention will be demanded (Matthews et al, 2011). So, generally speaking, the more attention needed to process a stimulus event, the greater flow of pulses into the accumulator per unit time. Time perception researchers have attempted to demonstrate that the latency of the theoretical switch opening and closing varies from individual to individual, causing differences in time perception (Carlson & Feinburg, 1968; Wearden, Edwards, Fakhri, & Percival, 1998).

Research on SET suggests that internal clocks are greatly influenced by both external factors and emotional states, both of which can significantly alter perception of

time (Gil, Rousset, & Droit-Volet, 2009). Time of day seems also to play a significant role in altering time perception as the temperature of the body varies (Pfaff, 1968). Typically in the afternoon, the body is the warmest compared to the morning and evening. Specifically, research shows that increased body temperature alters time perception judgments. Researchers have theorized that the internal clock accelerates as temperature increases, leading to further speculation that time estimates will be higher at warmer temperatures (Pfaff, 1968).

Research suggests that emotion also influences time perception in a variety of ways (Droit-Volet, Mermillod, Cocenas-Silva, & Gil, 2010; Gil, Niedenthal, & Droit-Volet, 2007). Research shows that presentation of an emotionally-charged stimulus can lead either to underestimation or overestimation of time passage, because attention is more focused on the stimuli than on the passage of time. Gil et al. (2007) showed participants pictures of people expressing either anger or neutrality. Following the picture, participants were asked to rate the duration of time as either short or long. Results revealed that time was overestimated when the angry expression was displayed, compared to the neutral expression. Gil et al. suggested that angry faces elicit an arousal mechanism, causing the pacemaker to produce more pulses and thus perceive more time as passing.

If a stimulus, such as food, elicits strong enjoyment or dislike, there will presumably be a stronger emotional response versus if the person has no preference with regard to the stimulus. To demonstrate this, Gil et al. (2009) presented participants with neutral, liked, and disliked food pictures and asked participants to rate the time duration of the presented stimulus as either short or long (compared to a standard). Results

showed that, compared to a neutral food picture, participants underestimated the duration of ratings for liked and disliked food pictures. Gil et al. theorized that the underestimation of time was due to the loss of pulses in the accumulator. They argued that the underestimation could be attributed to an attention mechanism, because the pictures of liked and disliked food diverted attention *away* from time and *to* the pictures. Interestingly, stimuli that are more *disliked* tended to make participants perceive the elapsed time as even less (i.e., the tendency to underestimate increased) compared to time estimate for enjoyable food (Gil et al., 2009). This general tendency to underestimate the duration of negative stimuli is highly variable from person to person, however, depending on the significance of the stimuli to him or her (Gil et al., 2009). However, research findings are not consistent: Some researchers have suggested that in instances of trauma, such as viewing pictures of mutilated bodies, people may be more likely to overestimate time passage, due to overstimulation (Angrilli, Cherubini, Pavese, Manfredini, 1997; Gil,et al., 2007). Research generally shows that a neutral stimulus seems to lead to the most accurate time perception (Gil et al., 2009).

The literature that I have reviewed demonstrates two important points: First, self-focused attention has important effects on behavior, altering behavior as a consequence of whether one is in a self-focused state or not (Beaman et al., 1979; Scheier, 1976; Schwartz, 1992; Schwartz & Bilsky, 1987, 1990). Second, the time perception literature demonstrates repeatedly that self-focused attention (although time perception researchers do not generally refer to it as such) is intimately connected, and indeed, necessary for, time perception—whether time perception is accurate or not (Carlson & Feinburg, 1968; Gil et al., 2007; Gil et al., 2009; Matthews et al, 2011; Pfaff, 1968; Wearden, Edwards,

Fakhri, & Percival, 1998).

Although my experiment is largely exploratory, there are some important connections from both the self-focus and time perception literature that lend to some probable interactions. Self-focused attention is the concept that an individual's focus is directed inward to the self and can be induced through external aids, such as mirrors, (Carver & Scheier, 1978; 1981). Time perception can be altered as a result of the direction of the individual's focus. If a stimuli, such as food or a picture, elicits a strong emotion, such as enjoyment or anger, or if the stimuli demands a great amount of attention, then time perception has been altered from the real time passage compared to a neutral stimulus (Gil et al., 2007; 2009; Matthews et al., 2011). Even though the self is not an external stimulus, it is still a focus of attention and therefore time perception should be dependent on it; causing either overestimation or underestimate of time passage.

As attention is directed towards the self, there should be less attention paid towards the passage of time. The intensity of self-focused attention, in the presence of a self-focusing device, should be rather large because there is constant streaming of inward focus. Using a self-focusing device, such as a mirror, is a relatively non-invasive technique; this allows participants to engage in a task while in its presence. Other self-focusing device options, such as a tape recording of one's own voice may interfere with participant's ability to accomplish a task and thus is not an optimal choice. Although a self-focusing device induces self-focused attention, there is also potential that participants are dispositionally high in private self-consciousness and should be accounted for. The intensity of self-focus should be directly proportional to the inaccuracy of time

perception. So the more intense the self-focus, the more attention is drawn towards the self and away from time and thus the more inaccurate time perception should be. Consequently, those low in self-consciousness or without a self-focusing device should be more accurate in perceiving time passage.

Based on my review, I designed an experiment to examine the effects of self-focused attention induced using a mirror, on perception of time. In my study, I designed a series of tasks that either directed attention towards the self or not. The self-directed task was an "essay planning" task that I designed to encourage participants to focus on a deeply-held value and thus enhance self-focused attention. I also designed two non-self-directed tasks: one that was engaging (a word search puzzle) and a second that was relatively boring (sorting shapes into piles).

The purpose of having different types of tasks was in part exploratory: The essay task was specifically designed to promote self-focused attention, whereas the other two tasks were not. However, it is possible that an engaging task may focus attention on some aspect of the self inadvertently. For example, participants who are especially good at word searches may become aware of, and think about their skills in this area while they are doing the task. Consequently, I also designed a somewhat absorbing (in that one is "kept busy") but relatively boring task to provide a comparison.

I predicted that participants in the mirror condition should tend to be less accurate in perceiving the time passage as they should be more self-focused than participants in the no-mirror condition. Thus participants in the no-mirror condition should be the most accurate overall in their perception of time. I also predict that there should be greater inaccuracy in time perception for the self-directed task versus the non-self -directed tasks,

because self-directed tasks should increase self-focus.

Method

Participants

Houghton College undergraduate students participated in this study. There were a total of 25 participants, 5 men and 20 women. I randomly assigned participants to either a mirror or no mirror condition (the control). The control condition consisted of 14 participants and 11 participants comprised the mirror condition. Task was manipulated within subjects. I treated my participants in a manner consistent with APA ethical principles and obtained IRB approval.

Procedure

When participants came into the lab, they were seated at a long table to face me, with their backs to the individual cubicles in which they would later engage in the experimental tasks. All participants executed the experimental tasks in small cubicles that were approximately 6 x 6 feet. Participants assigned to the mirror condition were in a room that contained only a mirror, desk, and chair. The mirror was placed ostentatiously in front of the participant, providing a clear view of his or her head and torso during completing of the task. A sign was prominently placed on the mirror, which indicated that the mirror was placed there for the purposes of another experiment. This note was signed by a psychology faculty member. The rooms used for the no mirror control condition contained only a desk and chair.

I greeted the participants, and explained the nature of the task. According to my description, the purpose of task was to gain an understanding of why people perceive time differently as they complete different kinds of tasks. I encouraged participants to

concentrate on the task and to avoid thinking about whether their perception of elapsed time was accurate or not. I told them that time accuracy and task performance were not important and that only *perception* of time was crucial. I emphasized that the procedure was not a test, and that they would not be compared to other participants with the goal of seeing "who was more accurate." My purpose was to reduce anxiety and reduce competition.

After giving instructions, I asked participants to remove any time keeping devices including watches, cell phones, etc. I instructed them to stand in front of their assigned cubicles, but to enter only when instructed. This ensured that all participants were only permitted seven minutes for each task.

Upon entering the cubicles, participants were asked to complete three tasks, which were contained in packets placed in the room. The presentation of tasks was counterbalanced. In one task, I asked participants to think about a value that they held deeply and that was extremely important in their life. When they identified that value they were asked to write it down and begin planning an essay in which they would describe that value and why it was important to them. No specific outline was required; it was rather an open-ended response that allowed the participant to organize his or her thoughts in any way that felt comfortable. I encouraged participants to concentrate on the value. This task was designated the "self-directed" task, designed to examine the passage of time while participants were explicitly focused on a specific aspect of their self-concepts, the value.

Another task was designated a non-self directed/boring task. This task was designed deliberately so as not to be engaging; further, it was designed so as not to direct

attention to aspects of the self. This task involved sorting through a bag containing paper cutouts of various shapes (circle, square, star, etc.). To complete the task, the participant had to group each shape with other cutouts of the same shape in separate piles. Once the participant completed the sorting of all the shapes, he or she was instructed to put the cutouts back in the bag, to mix them up, and to start again. I asked participants to continue this process until I instructed them to stop. I instructed them to sort as quickly as possible, and to count the number of times that they put the papers back in the bag to begin the process again.

The final task was a non-self directed/engaging task; this task was designed to be more engaging that the previously-described task. Participants were asked to work on two word searches, in which one was comprised of all neutral physical objects and the other search consisted of different types of animals. I told participants that it did not matter how fast they completed the word searches, or how many words they found. It was important only that the participant focused on the task as completely as possible.

For each task, after seven minutes elapsed, I knocked on the cubicle door and instructed the participant to answer questions on a questionnaire I gave them. I asked them to estimate how much time they worked on their task, as well as to rate other dimensions of the task, such as how boring it was, how much they enjoyed it and how much effort they expended on it. They were allowed as much time as they needed to answer the questions. Once they had completed this sheet they were instructed to open their door to indicate they were ready to move on to the next task. Each participant was then permitted to move on the next task and the seven minute period began again. This process repeated for each of the three tasks. Following the completion of all tasks, I

administered Feningstein et al.'s (1975) SCS scale and asked several demographic questions. Upon completion, I collected the packets and debriefed the participants.

Results

To test the hypothesis that self-focus and task type would affect perception of time, I performed a 2 X 3 mixed ANOVA, with one between subjects variable (Mirror Condition: Mirror vs. No Mirror) and one within subjects variable (Task: self-directed essay, boring non-self-directing sorting, and engaging non-self-directing word search). To analyze my data, I converted participants' estimates of the time spent on their tasks to a difference score, computed by subtracting seven min (the actual time given for the task) from their subjective estimates of time spent. Thus, positive values indicated an overestimation of time spent, and negative values indicated an underestimation of time spent.

Results of the mixed ANOVA showed a main effect of Mirror Condition, $F(1, 23) = 4.61$, $p = .043$. Specifically, participants in the mirror condition ($M = 1.024$) tended to significantly overestimate the time spent, compared to the no mirror condition ($M = -.847$). No other main effects or interactions were significant. This included no difference between private and public self-consciousness between the mirror and no mirror condition. The mixed ANOVA showed no effect of private self-consciousness, $F(1,23) = .089$, $p = .768$. Nor was there an effect of public self-consciousness, $F(1,23) = 2.08$, $p = .162$. Overall, in the mirror condition private self-consciousness ($M = .123$) tended to be higher than public self-consciousness ($M = -.706$). In the no-mirror condition private self-consciousness ($M = -.160$) tended to be lower than public self-consciousness ($M = .606$).

In addition to the mixed ANOVA, I also ran a series of paired samples *t* tests to examine the effect of self-focus on the ratings that participants made on the tasks. In each case, participants were asked to rate how much they enjoyed the task, how boring the task was, and how much effort they expended on it. Ratings were performed on 10-point scales, on which low values on the scale signified a low ratings on the dimension (i.e., low enjoyment, low boredom, low effort), and high values signified high ratings on the dimension. None of the differences on these variables were significant at the .05 level.

Finally, the effect of self-focus on the number of times participants sorted the stimuli on the sorting task was examined. Participants were asked to report how many times they sorted the stimuli they were given. The comparison approached significance, with participants in the mirror condition (M = 1.73) reporting fewer times sorting through the pile than participants in the no mirror condition (M = 2.14; $t(23) = -1.33$, $p = .198$, 2-tailed).

Discussion

Consistent with my predictions, I found that participants who were in the mirror condition tended to significantly overestimate the amount of time spent on their tasks, compared to the no mirror condition. Theoretically, the mirror induces self-focused attention (Carver & Scheier, 1981; Scheier et al., 1978) and directs attention in towards the self. Because the mirror induces constant inward focus, the participant directs his or her attention to the self and away from time passage, resulting in greater inaccuracy in the mirror condition compared to the no mirror condition (Penney et al., 2000, Gil et al., 2007). Theoretically, the fact that the mirror condition participants overestimated time

fits the hypothesis that their pacemakers were set at a higher rate and therefore their accumulators possessed more units per time compared to the no mirror condition participants (Gibbon et al., 1984). My results suggest that the self must serve as a significant object of interest, as there was significant attention diverted attention away from time.

Interestingly there was no significant interaction of private self-consciousness and the mirror condition. The mirror is considered to be a self-focusing stimulus that is supposed to mimic private self-consciousness (Carver & Scheier, 1981; Scheier et al., 1978). Thus, there is expectancy for the mirror conditioned participants to have a significantly greater enhancement of private self-consciousness. Instead there was an insignificant tendency for mirror conditioned participants to be only slightly more privately self-conscious than the no mirror conditioned participants. This could be that the few participants were dispositionally high in private self-consciousness or there was not enough power in the sample to appropriately represent the mirror effect. This could be confirmed by administering a Self-Consciousness Scale both before and after the tasks.

The increased self-focus, theoretically induced by the mirror, not only affected time perception, but there was also a tendency for the participants when completing the boring non-self-directed task to begin the task fewer times than in the no mirror condition. This tendency was not significant, but can be potentially related to the direction of the participant's attention inward and away from the task. Perhaps because the no mirror condition participants were seemingly less focused on the self, they became more directly focused on the task at hand and therefore performed the task more times.

Mirror conditioned participants may have less attention centered on the task as attention is diverted, as well, to the self. These two competing stimuli may divide the focus of the participant and therefore cause task performance to decrease.

The results from my experiment only partially support my original hypotheses. My results showed that, inconsistent with my predictions, there was no significant effect of the different tasks. The lack of significant differences between the tasks is surprising because of the difference in task engagement. Both the essay and the word search task were designed to be engaging whereas the sorting task was designed to be boring. Engaging tasks, based on prior findings, should contribute to overestimation because the stimuli should capture his or her attention more fully, reducing the phenomenon of "flickering" (Penney et al., 2000). That is, the less engaging the task is, the less the individual's attention is captured and held, which should theoretically lead to increased flickering--and perceived shorter durations of time (Penney et al., 2000). However, it is also possible that self-focused attention elicited by the mirror was significantly stronger and overrode the effects of the tasks. Since self-focused attention, in the mirror condition, occurred across all tasks it may suggest the self-focused effect is more robust an effect than previously anticipated.

All my tasks were designed to avoid eliciting emotional tendencies, as that can cause the underestimation of time (Gil et al., 2009). However, the essay task, in which participants identified a strongly-held value, could have potentially caused an emotional reaction, which may have reduced the effect, which may help to explain my findings. Instead of producing overestimation, it is possible that there was underestimation of time passage in this task in the event that a positive or negative emotion was elicited (Droit-

Volet, Mermillod, Cocenas-Silva, & Gil, 2010; Gil et al., 2007; 2009). Determining a strong value is not a superficial endeavor and thus the journey contributing to its development is likely to be based on experience. Not all experience encounters are necessarily positive. Values can develop as a result of a negative experience causing more importance to be placed on a value that was lacking in a certain situation. For instance, the importance of honesty in relationships may become more deeply regarded after an individual was deceived. Writing about the value could potentially resurface these memories and potentially elicit negative memories causing an overall underestimation of time elapse (Gil et al., 2009).

All in all, there seems to be an underlying connection between self-focused attention and its effect on time perception. Self-focused attention significantly alters the accuracy of time perception by overestimation. Due to this discrepancy between the actual passage of time and the perception of time, it can be suggested that attention that is focused on the self steals focus away from time and thus disrupts the internal time clock. Based on previous literature, the overestimation tendency can be attributed to overstimulation (Angrilli, Cherubini, Pavese, Manfredini, 1997; Gil,et al., 2007). The self is a deeply rooted system with great complexities, so when attention is narrowed in on it, there may be numerous interrelationships visited which then induce overstimulation.

After examining the effects of self-focus on time perception, I would be particularly interested in replicating this study on a larger scale to increase power. An increased number of participants would help confirm current findings and help reveal any other interactions present that may not have been properly discovered based on the small

sample size. I would also be interested in expanding this research to include examining more emotional tasks and how that impacts the dynamic of self-focused attention and time perception. Would self-focused attention enhance the emotional effect of a given task? How would that in turn effect time perception? My present study suggests a large number of very interesting hypotheses for future research.

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