# Anxiety Levels: Do they Influence the Perception of Time?

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## ABSTRACT

This study explored the relationship between anxiety levels (high vs. low) and performance on time estimation tasks. Participants in the experimental condition were induced into an anxious state by being led to believe they would have to present a speech while those in the control condition were labeled "audience members." Each participant then estimated the length of the same fixed duration. The speakers showed significantly higher state anxiety than did the audience members, however, no significant difference in time estimates was found, although the anxious participants tended to give shorter reports of the interval than did the non-anxious participants.

## INTRODUCTION

Time perception has been repeatedly shown to be sensitive to a wide variety of variables. From attention-deficit hyperactivity disorder (Barkley, Murphy, & Bush, 2001) to obesity (Faulkner, & Duecker, 1989), people with different character traits show predictable but subjective variations in the perception of time. The ability to accurately determine fixed time durations greatly influences our aptitude for carrying out desired goals such as completing a project by a deadline (Carstensen, Isaacowitz, & Charles, 1999); therefore, it may be considered a handicap to have a distorted view of time. As a result, it is important to understand what factors are critical in determining our ability to correctly assess the passage of time.

Time perception is the conversion of objective time into subjective time and the match or mismatch between the two (Hornik, 1984). In other words, time perception is the speed with which we view the world in comparison to the actual speed with which the world moves. This formula yields what has been labeled a Duration Judgment Ratio (DJR), which is the perceived time interval divided by the actual time interval (e.g., Chavez, 2004; Hancock & Weaver, 2005), as measured by time estimation tasks. For instance, if an individual viewed a 10 minute time period as eight minutes, his/her DJR would be 0.80.

Basic time estimation procedures can be divided into two groups, retrospective and prospective. Retrospective time estimation implies that participants are not informed that they are to estimate a time period until the duration they are to estimate has already passed, whereas prospective time estimation is utilized when participants know ahead of time that they are to estimate the duration of some event (Zakay, Block, & Tsal, 1999). Not only do these tasks differ in their procedure, but also in the underlying cognitive mechanisms used in each. Theorists think that retrospective time estimations are evaluated by what is called an "information processor," which assesses time by how many event segments are remembered. This is opposed to prospective time, which is judged by what is known as a "time processor," appraising time durations according to how many subjective time units are counted (Zakay, 1993).

Retrospective time estimation has been utilized in a number of experiments and has markedly revealed that time perception seems to be affected by unpleasant experiences (Westman, 1987). People exposed to extremely stressful (life-threatening) situations frequently report imprecise judgments of time, claiming that time either slows down or occurs as a single moment (Hancock & Weaver, 2005). This phenomenon has also been demonstrated under less extreme conditions, where people are simply exposed to normal levels of stress or displeasure. For instance, Hornik (1992) and Westman (1987) each revealed that participants induced into temporary positive, neutral, or negative moods experienced time in a different way. Generally, the groups that were in the negative mood condition tended to perceive time more slowly (by giving larger time estimates) than those in the neutral mood condition; in turn, the groups in the positive mood condition gave shorter time estimates and, thus, thought of time as moving more quickly than these other groups.

Hornik (1992) suggested that these findings make logical sense, theorizing that people in a negative mood wish for time to pass more quickly and, consequently, pay more attention to the clock (and time seems to pass more slowly). In contrast, people in a positive mood have the exact opposite reaction. A similar perspective was taken by Hancock and Weaver (2005) a few years later, when they noticed that when more attentional resources were being used up by nontemporal events, there were fewer resources left to devote to recording and assessing time. Segmentation theory (Zakay, Block, & Tsal, 1999) supports both of these notions, stating that, during situations

involving greater intensities of nontemporal information (workload), more individual events, or segments, are recorded. Furthermore, because retrospective time estimation depends on remembering sequences, those who remember the most sequences give the longest (retrospective) estimations of time.

Overall, discovering factors that interfere with the ability to perceive time accurately will help psychologists to predict when these distortions will occur and harness them for potential benefit (Hancock & Weaver, 2005). A specific example of an application of this type comes from a study of consumerism. Hornik (1992) posited that if marketing and advertising industries can provoke positive moods in their consumers, the consumers will judge time as passing more quickly; in turn, they will rate the service as being of a superior nature. Failing to evoke a positive mood may then result in lower ratings. As a result, this area deserves adequate exploration.

This study explored the relationship between time perception and (state/trait) anxiety levels. State anxiety is similar to arousal in that it is a temporary state of physiological excitability that waxes and wanes according to specific incidences (Mind Garden, Inc., 1994). On the other hand, trait anxiety is a more stable characteristic which represents how prone an individual is to becoming stressed; in other words, trait anxiety levels are highest for those who are most easily induced into a state of apprehension and foreboding. Whereas state anxiety results from an external stimulus, trait anxiety tends to be its own cause and is often out of sync with reality (Barlow, 1988).

To further investigate factors that induce a distorted perception of time, I investigated whether any interference in time estimation could be found among people at opposing ends of the anxiety spectrum. My hypothesis predicted that participants with higher anxiety scores would overestimate the passage of time whereas those with lower scores would underestimate time.

## METHOD

*Participants*

The participants consisted of 62 volunteers from an introductory psychology course who each received extra credit in return for their participation. All participants were traditional college students, ranging in age from 18 to 23, and there were nearly equal numbers of men and women in the study (28 men and 34 women). With the exception of 2 African American students, the entire sample was Caucasian.

*Materials*

Participants' average levels of anxiety were assessed with the State-Trait Anxiety Inventory (STAI) Form Y. This assessment is well established and is the most commonly used measure of anxiety worldwide (Mind Garden, Inc., 1994). It has been demonstrated to be both highly reliable as well as valid (Metzger, 1976). Twenty 4-point Likert scale questions assess trait anxiety and a separate but similar set of twenty questions assess state anxiety. The trait anxiety statements include items such as "I lack self-confidence," and "I feel pleasant," and participants state how representative these statements are of them in general, on a day-to-day basis (from 1-Almost Never to 4-Almost Always). The state anxiety statements include items like "I am relaxed," and "I feel at ease," using the same Likert scale, but asking participants to respond according to how they feel at the very moment they are filling out the survey.

*Procedure*

Upon arriving, I told participants a cover story that my research purpose was focused on finding connections between anxiety levels and the quality of public speaking skills. I then claimed that some of the participants would have to prepare and present their own speeches during the next hour. Giving a speech in front of an audience is a tactic that has been used by many to induce stress in participants (e.g., Jelicic, Geraerts, Merckelbach, & Guerrieri, 2004); therefore, half of the participants were randomly assigned to this condition while the other half were assigned to the control group (where no acute stress was intended). I assigned participants to their respective conditions by handing out packets denoting whether they were speakers or audience members. Included in this packet were speech guidelines, rating guidelines, a demographic page, and the STAI.

Following receipt of the packet, speakers were told that they would soon be asked to leave the room and prepare a speech on American foreign policy which they would later present to the rest of the group. Meanwhile, audience members were told they would use this preparation time to relax. Prior to preparing, however, all participants were asked to fill out the demographic information as well as the STAI. Furthermore, they were told they would view a video of a prior participant's speech to get a feel for what was expected (since there was a video camera in the room to convince them that each of their speeches would also be videotaped). In reality, the speech that was played on tape was recorded by a confederate reading a script off of a Microsoft Office PowerPoint slide show. Because all participants would watch this video, it would serve as the objective time interval which they would be asked to

judge. The only difference was whether they believed they would have to give a similar presentation to the class afterward.

After the 8 minute 58 second video ended, each student was asked to fill out a sheet rating the quality of the videotaped speech. Of course, this was simply to distract them from the true purpose of the study. At the bottom of the sheet, I asked everyone to estimate how long they thought the speech they had just witnessed lasted, to the nearest minute and second. The 8 minute 58 second time interval was chosen because previous research shows that time distortions can be more pronounced over long durations (Bschor, et al., 2004). Because participants were unaware that time estimation was the variable of interest, I chose not to ask the participants to remove their watches, cell phones, or other time-displaying devices during the experiment. Past researchers show this strategy to work (Hornik, 1992) while others choose to take the risk of revealing the true purpose of the study (e.g., Bschor, et al., 2004; Stine, O'Connor, Yarko, Grunberg, & Klein, 2002). After all time estimations had been made, I debriefed the participants as to what the study was actually about, and revealed to them that nobody would actually be required to present a public speech, which came as quite a relief to most of them.

## RESULTS

To confirm that participants in the speaking condition experienced the high levels of state anxiety that were intended, an Independent Samples *t*-test was used to compare the mean STAI scores of these participants with those in the control condition. Overall, there was a significant difference in the level of state anxiety experienced [$t$ (60) = 4.91, $p$ = 0.00], with the experimental group meeting the expectations of reporting much higher levels of state anxiety [speakers = 51.90 ($SD$ = 12.87); audience members = 36.55 ($SD$ = 11.74)]. In contrast, the two groups were found to show equivalent levels of trait anxiety [$t$ (60) = 0.81, $p$ = 0.42]. Despite the variables of anxiety being manipulated in the proper directions, an Independent Samples *t*-test showed no difference in the time estimations between the two conditions [$t$ (60) = -0.87, $p$ = 0.39], although there was a tendency for the speaking group to give shorter estimations of time than the audience members [speakers = 510.90 ($SD$ = 157.32); audience members = 544.00 ($SD$ = 140.41)]. Furthermore, no differences were found between the time estimations of men and women, or between participants of different ages.

## DISCUSSION

Anxious moods were successfully manipulated by convincing participants that they would have to give a public speech, a task known for inducing state anxiety (Smith, Sawyer, & Behnke, 2005). This task had no influence on trait anxiety, however, since a person's overall disposition should not be influenced by situational circumstances. Regardless of the condition participants were in, there was little variability in the time estimations reported. Both groups had mean time estimations within 30 seconds of the actual 538 second interval, showing a surprising amount of unanticipated accuracy. Implications of this finding are that, contrary to prior research (e.g., Westman, 1987), the perception of time is not always affected by negative dispositions and may even be affected in the opposite direction.

This tendency for situational anxiety to cause an underestimation of time could be due to the use of a longer time interval than has typically been used (e.g., Stine, 2002) or to the fact that group size varied dramatically from one experimental session to the other. For instance, one group consisted of 3 participants, while other groups had up to 20 participants present. It's no surprise that a public speech is less anxiety-provoking if one believes only a few people will hear it, as opposed to a large crowd (Tucker, 1971). An even more intriguing alternative for why the speaking group underestimated as opposed to overestimated the time interval is that they were anxious, but also hoping to put off the future rather than hurry through it. In other words, they may have convinced themselves that the video was shorter than it actually was because they wished for time to pass slowly in order to postpone the future (of having to give a speech). As a result, they paid less attention to the clock, carrying out the opposite function that Hornik (1992) proposed to explain why participants with negative temperaments usually overestimate time durations. With such an established difference between how men and women typically differ in retrospective time estimation tasks (Block, Hancock, & Zakay, 2000), it's surprising that not even these differences were elicited by this study's methods.

Future research could use a different approach to induce anxiety so that the anxious state involves worrying about the present instead of the future to negate the possible effects of apprehension. Additionally, longer durations of time should be used to enhance differences in subjective reports of time perception. If possible, multiple intervals of time should be evaluated to determine whether there is an interaction between the level of anxiety and the length of time to be estimated. Previous research shows that negative moods have an impact at short durations (e.g., Stine,

2002), this study shows no influence on intermediate durations, and long durations (30 or more minutes) are yet to be determined. Creative ways to measure such intervals should be attempted.

It is unclear to what extent the current study has helped to unravel the many mysteries of time perception. Other researchers have considered a plethora of effects that physical features such as race, gender, and age can have on human experience (e.g., Hancock, Vercruyssen, & Rodenburg, 1992). Relatively little focus has been paid, however, to the role that psychological differences can play in experiencing reality. Studying the differing perceptions of human beings has a wide array of implications; specifically, employers could benefit greatly in their hiring processes by understanding how their applicants do and do not perceive different aspects of the world. As there are an infinite number of psychological dimensions to study, each piece of research in this area can contribute only one small step in the colossal journey into the unique human mind. The role of this study has been to understand how time is perceived by individuals who are at opposing ends of the spectrum for anxiety-trait qualities. For 9 minute intervals, there appears to be no difference in time perception at all.

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