

The effect of time constraint awareness on creativity test performance

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Research Article

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Abstract

Our perception of time is often a subjective dimension of our conscious awareness which varies across context and situational demands. It can be influenced by our internal psychological state and similarly, our creative potential can be affected by the interplay of our perception, mood, and situational factors. Our study aims to examine how participants' creativity can be limited or enhanced by their perception of time constraint introduced or unspecified as assessed by a simple form of Wallach-Kogan Creativity Test (WKCT). It is hypothesized that a pressure-inducing time constraint awareness condition would decrease the quality of participants' creativity test performance by demanding greater attentional resource and increasing test anxiety levels through a prevention-focused motivation. In contrast, the absence of pressure when a time constraint is unspecified would likely result in increased creativity through promotion-focused motivation by decreasing negative affect and anxiety level, which consequently enhances creativity. The results showed a small difference in test scores between participants in both informed and uninformed time constraint conditions with the former group performing better than the latter. It is interpreted that limitations in the study's design and the factor of anxiety could provide a beneficial motivation for enhancing creativity performance.

Time Constraint Awareness and Creativity

In an age when the complaint of insufficient time to complete one's tasks has become an all too common part of our conversations, the need and want for time is now perceived to be more important than it used to be in centuries past. Our perception of time is therefore closely associated with how we are gauging our ability and potential to succeed in our academic and career performance. It is also a vulnerable and flexible component of our conscious awareness that is subject to internal and external influences. In turn, time perception also impacts our attention, cognition and emotion.

Past research shows that the allocation of one's attention to simultaneously process the passage of time and perform a time-unrelated task can distort judgement of the duration of time (Brown, 1985). Numerous studies have reported that the more cognitively demanding a nontemporal task is, the shorter the duration of time is perceived. This is likely to lead to a prevention orientation whereby one is focused on the anxiety-inducing avoidance of unnecessarily wasting further time on the current task. A study by Friedman & Förster (2001) examined the opposing effects of prevention and promotion cues in negatively and positively affecting participants' creativity respectively. This is based on Higgins' theory of two distinct motivational orientations of prevention and promotion focus (Higgins, 1997). A prevention-focused orientation motivates one to attain security from a negative consequence such as failure. On the other hand, promotion focus leads to the motivation to obtain positive benefits and advancement. When one's perception of time is not limited by constraints, there remains the motivation for additional amount of effort to be invested into a task. An unbounded scope of time adequacy might draw one to seek reward by success in performance as well as associate the experience with positive relief and optimism, which also enhance creativity (Förster, 2012). Promotion-focused cues have been shown to facilitate creative thinking, insight and novelty (Friedman & Förster, 2001). Thus, it is hypothesized that the introduction of

time constraint would negatively affect creativity performance through a prevention-focused motivation which influences one's anxiety level, whereas the absence of such constraint would produce the opposite effect.

Method

Participants

There were 36 participants recruited from a second year psychology class at the University of British Columbia. The participants were each randomly assigned to one of two conditions, with 16 and 20 participants placed in the informed time constraint experimental condition and an uninformed time constraint control condition respectively. The response data of 5 control participants were excluded due to experimenter's error. The response data of one experimental participant was also excluded due to experimenter's failure to obtain accompanying manipulation check responses of the participant. The final response data included those of 15 experimental and 15 control participants.

Materials

In each condition, participants were presented with a double-sided creativity test question-and-answer sheet at the start of the experiment. A cellphone timer was used to time a 1-minute limit for participants to write their answers to the creativity test question on the sheet of paper given.

Design and Procedure

We employed a between-subjects random assignment design. The independent variable was participants' time constraint awareness and it was manipulated by creating two levels in which a time limit was either specified or unspecified. In the first experimental group, participants were exposed to a condition in which a time limit of 1 minute in duration was specified on the front instruction page of the test sheet for them to work on one simple similarities question modelled after Wallach-Kogan Creativity Test (WKCT) (Wallach, & Kogan, 1965). In the control condition, a time limit was intentionally not stated on the test instruction page for the purpose of excluding constraint awareness but were still told to stop writing at the end of a 1-minute interval. The test question asked participants to name as many similarities as they could between a dog and a man. At the end of the test, participants were requested to answer a few manipulation check questions about their anxiety level during the test. The dependent variable of participants' creativity performance was measured by their test scores calculated based on the answers generated.

Results

The creativity test scores of participants were calculated based on three components of fluency, flexibility, and uniqueness of their answers (Lau & Cheung, 2010). Fluency is the total number of answers given by each participant with a score of 1 assigned for each answer. Flexibility is the number of categories which

each participant's answers can be group into, e.g. physical characteristics, cognitive abilities, and emotional needs. The criterion for an answer to be assigned a uniqueness score of 1 was its relative frequency (or percentage P), as calculated from the formula below, has to be less than or equal to 5.0%. The frequency of an answer has to be a whole number less than 1.55 to meet $P \leq 5.0\%$. Thus, an answer which occurred at most once from among all participants' pool of answers was assigned a uniqueness score of 1. The final test score of each participant was the sum of fluency, flexibility, and uniqueness scores.

$$P = \frac{\text{frequency of an answer given by participants}}{\text{total number of participants}} \times 100\%$$

The results showed that the creativity test scores of informed time constraint experimental group participants ($M = 12.67$, $SD = 5.08$) were lower than the scores of control group participants who were not informed of a time constraint ($M = 11.6$, $SD = 3.44$) (see Figure 1). The range of scores of experimental group participants was also greater than that of control participants and they differed by 3 points of test score (see Figure 2 and Figure 3). In consideration of the small effect size of Cohen's d value of 0.246, a t -test was used to determine whether the null hypothesis was true for the study's outcome. Thus, a t obtained value was calculated to be 0.673 which was lower than the critical t value of 1.701 with 28 degrees of freedom and a significance level of 0.05. The research hypothesis was therefore not supported. An analysis of post-experiment manipulation check responses showed that about half of all experimental group participants were anxious during the test while about a quarter of all control group participants were anxious (see Figure 4 and Figure 5). The likelihood of creativity performance enhancing effect of test anxiety would be discussed.

Discussion

The results were inconsistent with the study's hypothesis that the presence of time constraint awareness would negatively affect participants' creativity performance. On the contrary, the experimental condition participants who were explicitly informed of a time limit performed better with a higher mean of test scores than control condition participants. There are a number of reasons which could account for such outcome. Firstly, a small sample size which was made up of university students who were frequently exposed to time-limited course assessments such as midterm and final exams with goals to achieve good grades may have effectively predisposed student participants to perform better in test-anxiety-inducing situations. Secondly, the finding that only 47% of the experimental condition participants reported that they were anxious during the study's test raises the question of whether test anxiety attributable to awareness of test time limit was effectively induced during the experiment. The ease of task and content of the test question, e.g., interactive characteristic(s) between a human and a pet animal, could have mood-induction effect to enhance pleasant affect and creative performance. It may be worth considering whether formal examination questions which are phrased creatively in terms of content and language style and structure to enhance examinees' mood and affect could be beneficial on

their performance and test scores. On the other hand, a study by Baas, De Dreu, and Nijstad (2011) proposed that anxiety which resulted from persistence in pursuing prevention-focused goals, as opposed to a state of relief and/or relaxation from closure of goals fulfilled by successfully evading an unpleasant consequence, could promote similar levels of creativity as promotion-focused cues. Their hypothesis was supported by the study's results as prevention-focused participants performed similarly as well on an insight problem-solving test as promotion-focused participants when the absence of closure of goals did not produce a state of deactivation in regulatory focus and mood. The authors argued that the closure of positive goal pursuits under a promotion orientation would continue to maintain an enhanced activation in mood, which is associated with increased creativity, whereas the outcome is opposite with closure of prevention-focused goals, leading to reduced activation brought about by relief and security. This helps explain the plausibility of highly stimulating test anxiety being a positive motivating factor of creativity under a prevention-focused condition. Furthermore, anxiety-induced motivation could provide further enhancement on cognitive processing aspect of test performance as indicated by experimental participants' higher test scores.

In addition to the factor of possible anxiety-induced activation of persistent unfulfilled goal pursuit contributing to comparable creativity performance by both groups of participants, there are limitations in the study's design which could have accounted for the ceiling effect produced by a weak independent variable. Firstly, the creativity test was made up of one question which asked for a list of similarities between a dog and a man. It could have been an easy task for university students who were in a psychology research methods class. The awareness of time constraint may not have been induced strongly with just a printed reminder on the test question sheet. A stronger manipulation could be utilizing a timer which produces an audible sound effect at certain intervals over the course of the test duration or to have the experimenter verbally reminding the time limit. Secondly, while a short test duration of one minute has been sufficient to create an anxiety-inducing time pressure event for experimental participants, it may not have been long enough to generate above-average positive valence of emotions commonly associated with higher level of creativity. In investigating the effect of time constraints on participants' statistics test anxiety and performance, Onwuegbuzie and Seaman (2010) discovered that participants from both high and low anxiety groups performed better when they were told that they have unlimited time to complete the test. An explicit statement of unlimited test duration would not be possible and realistic for the unspecified time constraint condition when our research course only permit a maximum experiment duration of 5 minutes and thus sets a limitation for this study. Thirdly, in addition to generating less test anxiety, the time constraint unspecified control condition could have easily led participants to procrastinate due to uninformed test expectation and emotional relief with a lack of motivation to expend cognitive effort to perform well. This also suggested that the reduced activation of regulatory focus and state of mood, whether it is promotion or prevention focused, could decrease one's creative performance.

In consideration of the above factors which could have affected the outcome of this study and an explanation for the positive effect of test anxiety on time constraint informed participants' performance, it can be concluded that for a simple and short duration test on creativity, the impact of time constraint

awareness on participants' performance is minimally positive. The degree of such impact could also be moderated by the state of one's activated mood and whether one is motivated to be promotion or prevention focused. Nevertheless, based on the proposed curvilinear relationship between stress and performance, it is questionable whether a higher level of anxiety being activated during a creativity test would produce a similar positive effect on performance (Baas, De Dreu, & Nijstad, 2011; De Dreu, Baas, & Nijstad, 2008). Future research should also look into the effect of long duration anxiety on creativity levels and how well such findings could generalize to real-life university course assessment systems.

Declarations

Allen Ko, Mehar S. Bhogal, Merri R. Tan, Spencer-Margaret Dawson, Tyler Jay and Rowena L. T. Kong contributed to data collection and analysis.

Conflict of Interest:

The authors have no conflicts of interest to declare.

Ethics Statement:

This experimental research project was approved by the University of British Columbia Research Ethics Board for the purpose of the researcher(s) in fulfilling course assessment requirements under the guidance of instructor supervision. Informed consent forms were read and completed by student research participants, followed by debriefing after experimental procedures that were carried out in compliance with the standard and requirements of the ethics board.

Competing Interests:

The authors declare no competing interests.

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Figures

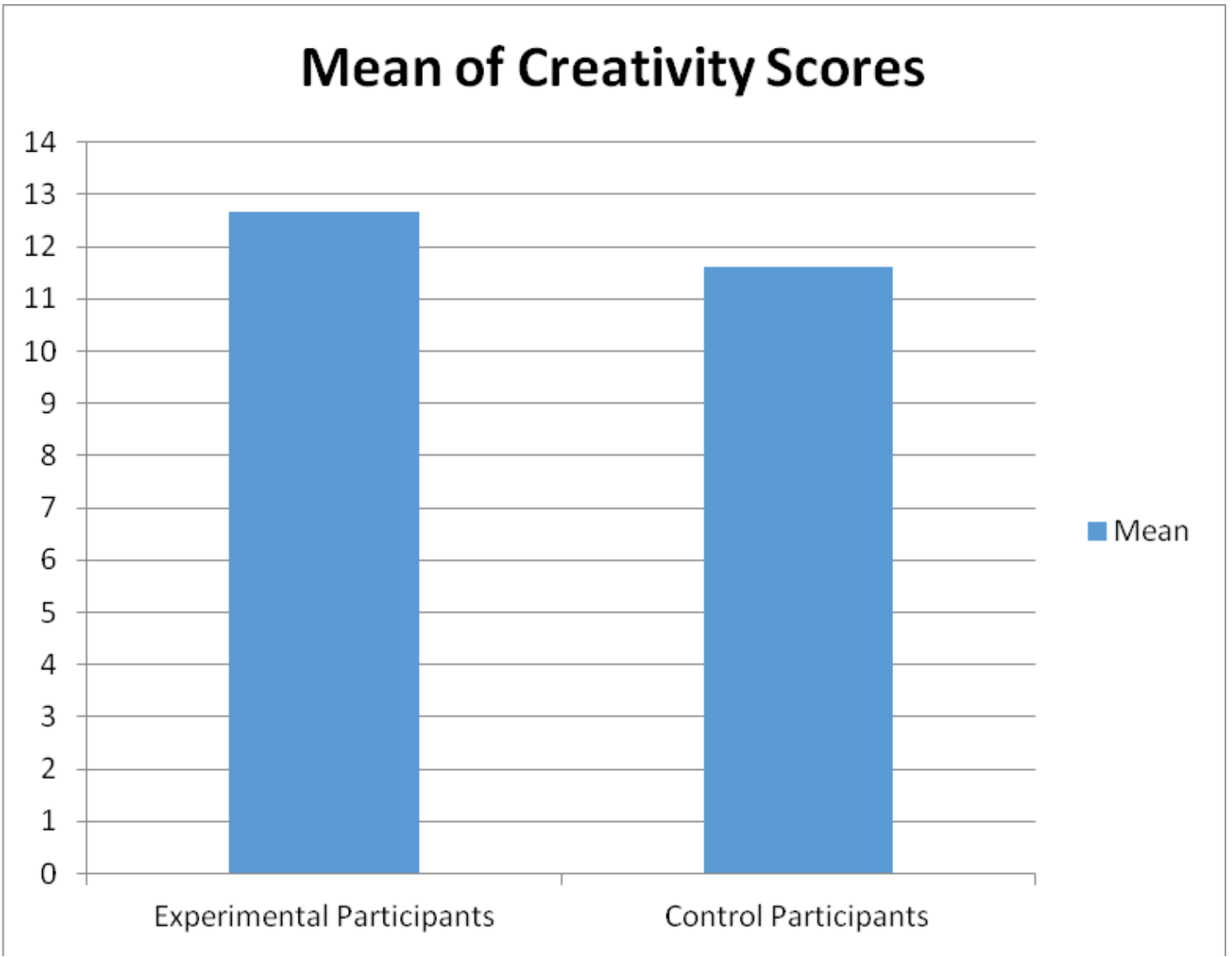


Figure 1

The mean of creativity scores of participants in experimental and control groups.

Frequency of Experimental Condition Participants' Scores

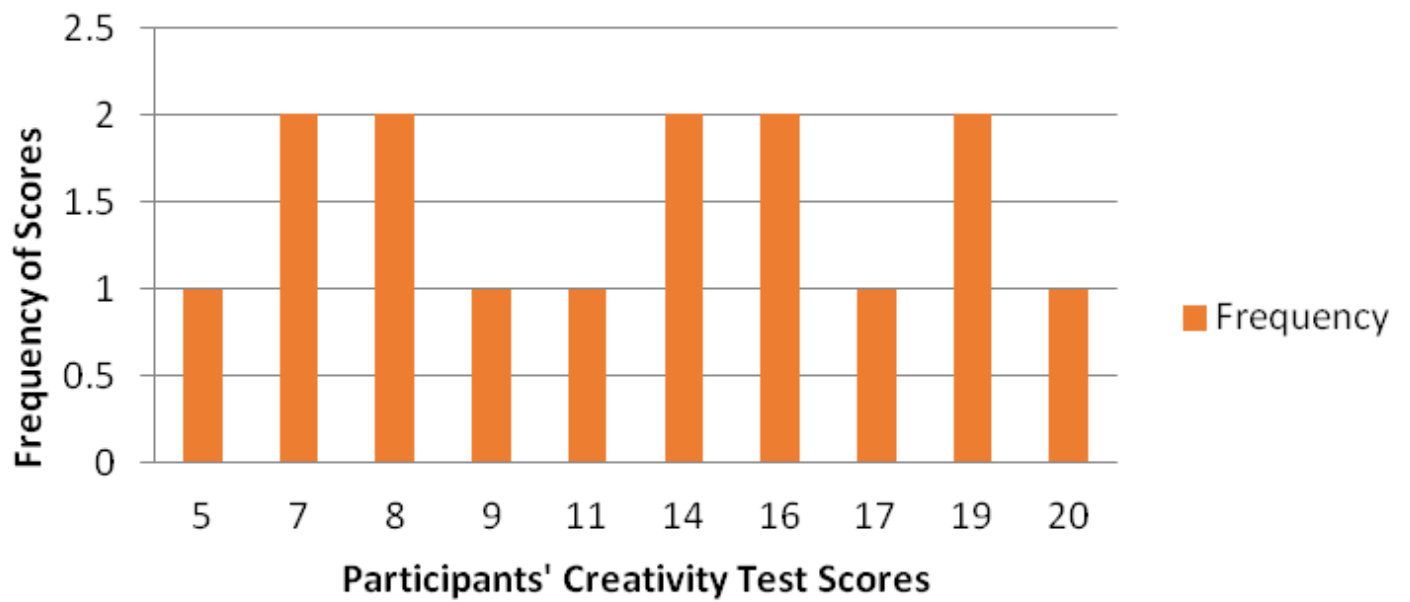


Figure 2

Graph of frequency distribution of creativity test scores of experimental condition participants.

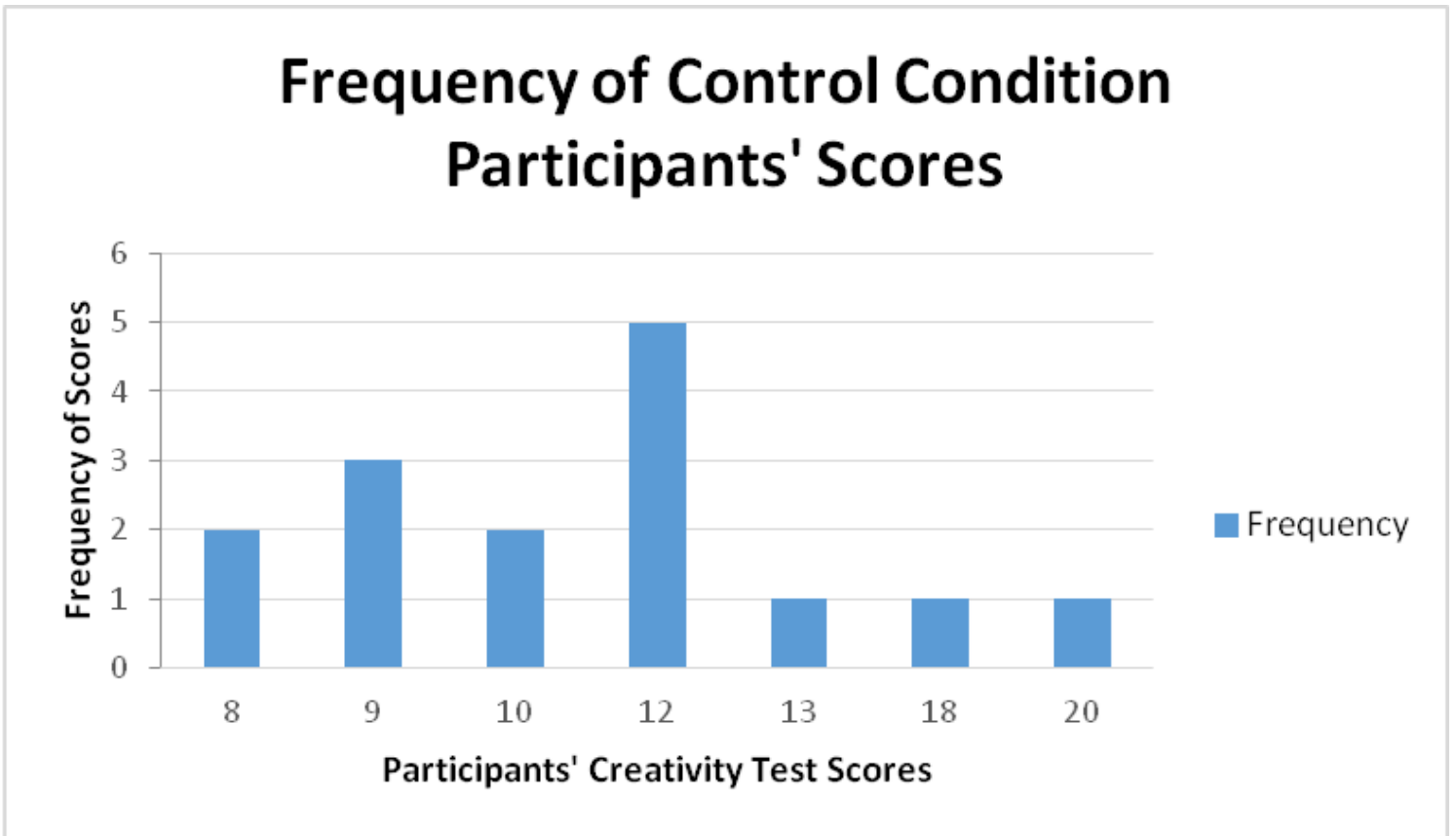


Figure 3

Graph of frequency distribution of creativity test scores of control condition participants.

Manipulation Check Question: Were experimental condition participants anxious during the experiment?

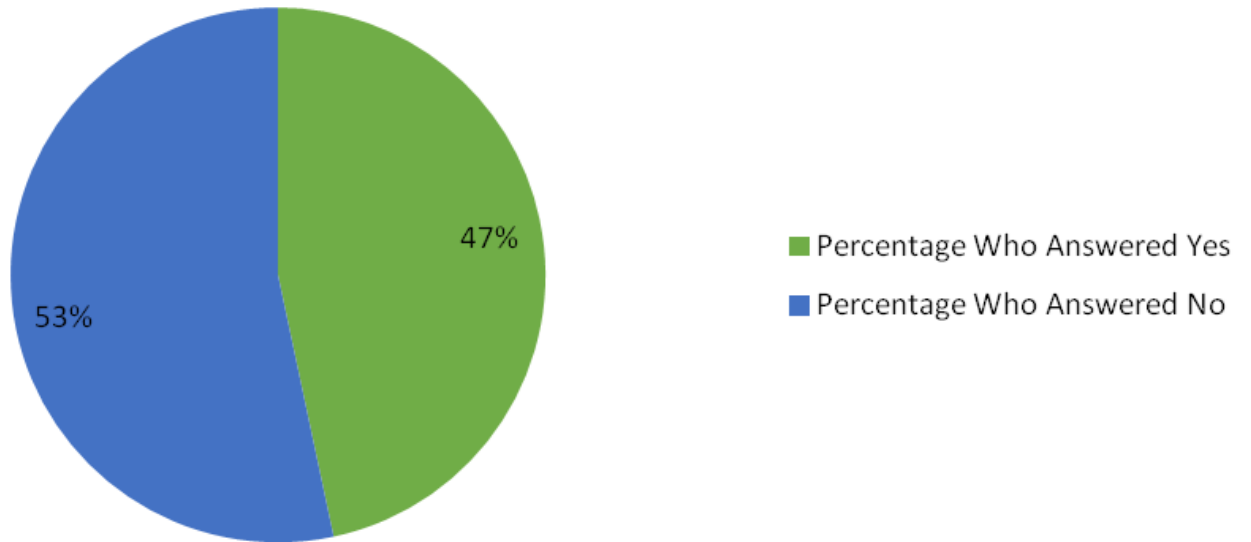


Figure 4

The percentage distribution of experimental condition participants who were anxious and not anxious during the experiment.

Manipulation Check Question: Were control condition participants anxious during the experiment?

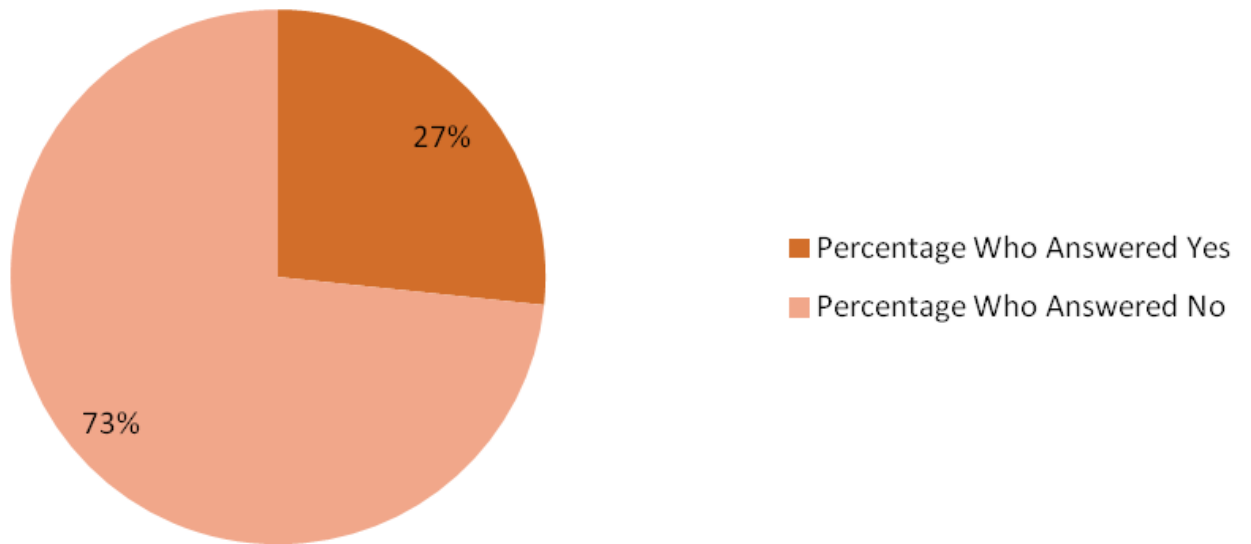


Figure 5

The percentage distribution of control condition participants who were anxious and not anxious during the experiment.