

The Effect of Competition Anxiety on Shooting Performance in Basketball.

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Abstract

The purpose of this study was to see how time pressure affects anxiety and accuracy during a basketball performance. Previous research has looked into how both cognitive and somatic anxiety can lower performance by affecting how a player focuses and moves. We hypothesized players under time pressure would experience anxiety and shoot worse. We also thought players with more self-confidence would be fine. Ten players of a high school boys' basketball team did three trials: no pressure, a ten-second countdown, and a three-second countdown. Shot count, shot quality, somatic anxiety, cognitive anxiety, and self-confidence were measured. We found the trials did not create anxiety in the players and as a result, there were no differences in shooting. However, self-confidence was related to shooting performance. Our data suggests confident players may be protected against anxiety and pressure.

Young players sometimes get anxious in basketball, affecting their game performance (1). Sports performance anxiety affects up to 60% of athletes and since anxiety is common with many sports it is important to see how it affects the ability of young basketball players to play in a game. Research suggests performance anxiety can affect an athlete's attentional control, trigger somatic symptoms, shooting quality, and accuracy (2, 1, 3, 4). In this study, we gave the boys' basketball team at TNA a competitive anxiety questionnaire, and then they participated in three shooting trials: a control, low anxiety, and high anxiety. We tried to trigger anxiety by using time pressure (a verbal countdown shot clock) and also measured confidence to see if people with high self-confidence are protected from the effects of anxiety while shooting.

The way an athlete feels might affect their performance in both positive and negative ways. This is called the Inverted-U relationship (3).

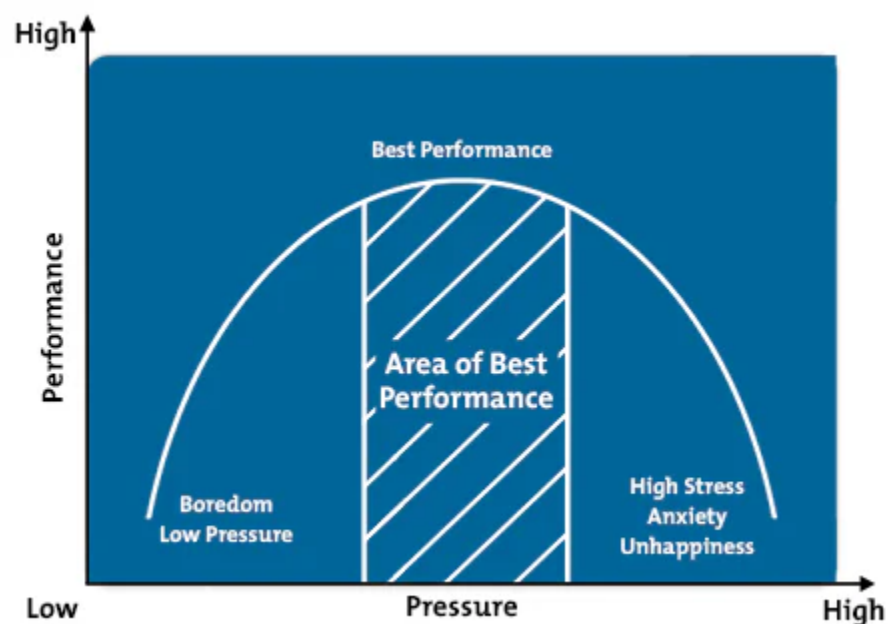


Figure 1. Inverted U Relationship. This graph shows that the highest or best performance is where athletes experience medium pressure. But, if they don't experience enough, or too much, they would get bored or too anxious to do well.

The Inverted-U explains how performance is affected by anxiety. When anxiety is low, performance is low because the person feels no pressure. But with a little bit of anxiety, an athlete is focused and ready to perform. But, with a lot of anxiety, they are overwhelmed and their brain impairs their motor control. In basketball, this can mean a player might focus on the wrong things with their eyes and might move their body in novice shooting patterns that are uncontrollable and negative (3, 2).

In our study we are interested in time pressure, or how quickly a player has to get a shot off. However, there is not that much research on it. Instead, researchers have studied shooting speed and accuracy (5). There were 15 participants whose trial was to shoot 3-pointers they

used a camera to measure speed and a scale to measure scoring quality. There was no relationship found between the speed of the ball and the quality of the shot. This fails to support Fitts Law, the theory that accuracy is negatively related to accuracy (5). We're not worried about the speed of the throws, we're more interested in if the Fitts Law pertains to how fast you have to make the shot which also correlates with the time pressure.

While the speed of the ball doesn't matter, there's a lot more technique while shooting in basketball. Skilled shooters activate their quiet eye, which means they focus directly on the target, and then when they shoot they suppress their vision because they don't want the ball in front of them to mess up their shooting (2). Research suggests that anxiety messes up this process. Anxiety can cause reduced suppressed vision, which is when you are staring at both the ball and your hands longer and that would cause a lower free-throw success rate. In the study, 10 players were doing free throws and used a piece of equipment called the eye tracker to see what they looked at and how long. They would do two trials of 10 baskets and 10 misses. One with a normal pace of shooting and then another with anxiety by trying to trigger them by telling them that they did badly the first time to make them nervous. They found support for Attentional Control Theory (ACT); this is when people are anxious, they look at the wrong thing (2). Anxiety can lead to having a bad performance in the game depending on what they are concentrated on.

Anxiety can lower performance, but, anxiety is more than just thoughts, it is also the physical body. There are two main types of anxiety, which are cognitive and somatic (1). Cognitive is what has to do with the brain, which could create bad thoughts towards shooting or create self-doubt. Somatic is about the body and physical symptoms like trembling or sweating. Researchers studying gymnasts found that the intensity and direction of cognitive anxiety correlated to the intensity and direction of somatic anxiety (1). Also, people with higher self-confidence tended to have lower cognitive anxiety scores, not somatic scores. Therefore, in our project, we think if people are made to feel anxious (by the time pressure), they might experience cognitive and somatic anxiety, and they do worse. But people with self-confidence, have a lower chance of being anxious while shooting and therefore might do better.

If an athlete experiences cognitive anxiety, their body can be affected (3). This plays out in how a player moves. Researchers studied to see if players' shooting performance changes due to anxiety and if their pre-shot routine is necessarily affected. They triggered anxiety by filming them and saying it would be watched later, and also made it a competition with gift cards, so people would be nervous. Physically, when players were under pressure they had novice behaviors. Shooters tended to misposition their elbows and knees. The team's actual shooting performance was a little worse under pressure, but not significantly. In our study, there is no pre-shot routine due to the countdown clock, therefore we think their motor control (brain controlling the body) will be affected. If a little pressure is good, but too much pressure is bad, then if there is too much pressure that means the player might focus inward and lose motor control (3).

While researchers can artificially trigger anxiety by creating competitions or threatening they will be judged by the players' coach, anxiety also just happens in the course of a real season (4). Smith measured both the state and trait anxiety levels and shooting performance of college basketball players in real games. She measured trait anxiety, which is one's stable

baseline level of anxiety, and state anxiety, which is when it changes based on the situation/ moment. Both were measured before the game and their field goal percentage was recorded. She found a correlation between general anxiety (state or trait) and competition anxiety (while playing). Competition anxiety was related to game field goal percentage so more anxious people, then to make fewer shots. This suggests in our study that people with high-performance anxiety will tend to not improve, they will be self-conscious, but people with low anxiety will desire achievement and will increase their skills.

Overall, the research says that anxiety can be caused if they are playing badly in a game, and if they don't have as much anxiety they would do better in a game because of their motor control and suppressed vision (2, 3). This study contributed to understanding competition anxiety by examining how time pressure can affect someone's anxiety. What makes my study different, is that no one looked at time pressure yet even though time pressure is widespread in basketball. We had 10 participants from the boys' basketball team fill out a Competitive State Anxiety Inventory before the practice about their feelings and how they deal with being under pressure during a game. Then, we asked them to shoot 10 baskets across three trials: one control trial where they could do what they wanted, a second with low time pressure 10s, and lastly one with 3 seconds of timed pressure. We hypothesize the time pressure will increase anxiety and trigger worse shooting quality. Also, we hypothesized that people with higher self-confidence will do better compared to less confident players.

Methods and Materials

A total of 10 high school Basketball players from the boy's team from The Neighborhood Academy participated in the study. All participants from the study were African American, males from grades 9th to 12th and between the ages of 15-18.

The participants were given a survey known as the Competitive State Anxiety Inventory (CSAI), which measures cognitive and somatic anxiety and self-confidence (6). The survey consisted of 27 statements in total about either stress or anxiety levels. For example, the statement "I feel at ease" measures self-confidence. "I feel tense in my stomach," measuring somatic anxiety, and "I'm concerned about performing poorly" is for cognitive anxiety. Each one has choices 1-4, matching "not at all" to "very much so". This produces scores ranging from 9-36 for each category (cite the thing).

To conduct the study, first, we introduced the experiment to the boy's basketball time during their normal practice time. Players filled out the CSAI before starting. Next, they were randomly split into three groups and each group started at a station. The stations are regular shots (no pressure), some pressure (counting down from 10), and more pressure (counting down from 3). Each station had 10 attempts. Players will be scored based on the quality of the shot: 0 for a miss, 2.5 for a bounce and miss, 7.5 for a bounce and going in the net, and a 10 for all net. The primary researcher and two assistants ran the stations. After finishing the station, they took the CSAI again and then went to the next station. The team's coaches were present watching players.

Differences in shooting quality using a one-way ANOVA test for correlated samples. Individual differences were found using a Tukey post-hoc test. The abbreviation M is the mean,

and SD is the standard deviation. All tests were calculated using vassarstats.net with a 0.05 significant threshold. The relationship between accuracy and self-confidence was tested using a Pearson r-test.

Results

In this experiment, we tested whether time pressure triggers anxiety and lowers shooting performance during practice. We had the boys' basketball team do three trials: one with no pressure, one with 10s pressured, and one with 3s of pressure. I expected that the players with higher pressure would do worse. Also, we expected that self-confidence would help protect against this anxiety, and the players would do better.

The first thing we wanted to know was if time pressure created anxiety. For cognitive anxiety, there was no significant difference between the no-pressure (M=15.5, SD=7.4), low-pressure (M=13.5, SD= 6.3), and high-pressure (M= 14.3, SD=7.2), ($F(2,18) = 1.65, p = 0.43$). We also looked at somatic anxiety and found that no time pressure anxiety for somatic anxiety there was no significant difference between the no-pressure also (M=12, SD=3.5), low-pressure (M=11.8, SD= 3.82), and high-pressure (M= 11.9, SD=3.1), ($F(2,18) = 0.9, p = 0.91$). This means that the time pressure did not trigger consistent changes in anxiety (**Table 1**).

	Control	Low-Pressure	High-Pressure	p-value
Cognitive Anxiety	M=15.5, SD=7.4	M=13.5, SD= 6.3	M= 14.3, SD=7.2	0.43
Somatic Anxiety	M=12, SD=3.5	M=11.8, SD= 3.8	M= 11.9, SD=3.1	0.91
Shot Quality	M=11.4, SD=3.6	M=13.4, SD= 4.7	M= 13.7, SD=3.8	0.22
Shot Count	M= 4.3, SD= 1.1	M= 5, SD= 1.3	M= 4.6, SD= 1.3	0.33

Table 1. Time pressure did not cause an increase in anxiety. *The table shows the different types of anxiety and both the quality and quantity of the shot across the three stations. Anxiety scores come from the Competitive State Anxiety Inventory (CSAI) and quality.*

Our first hypothesis was that higher pressure would mean worse shooting. We wanted to know if there was a difference in the quality of their shot between the no-pressure (M=11.4, SD=3.6), low-pressure (M=13.4, SD= 4.7), and high-pressure (M= 13.7, SD=3.8). Shot quality came from a point scale (0=missed, 1=hit rim and miss, 2= hit rim and go in, and 3=basket). There was no significant difference between the conditions for the quality of the shot ($F(2,18) = 1.67, p = 0.22$). While the high-pressure condition seemed to do the best, the differences in the groups were not significant (**Table 1**).

As part of this first hypothesis, we also looked at the shot count, or how many baskets players made. There was no difference in total shot count ($F(2,18) = 1.18, p = 0.33$). The low-pressure station (M= 5, SD= 1.3) was the highest, followed by the high-pressure (M= 4.6, SD= 1.3) and the control (M= 4.3, SD= 1.1, **Table 1**).

Our second hypothesis was that higher self-confidence would lead to better performance, especially under pressure. We used the self-confidence from before the experiment began and correlated it with the quality of the shot and the quantity. As seen in Table 1, the higher the self-confidence, the higher the quality in the control group, but not the quantity. For the low and high-pressure conditions, higher self-confidence led to better quality and quantity. More confident people tended to shoot better under pressure (**Table 2**).

	Control Count	Low-Pressure Count	High-Pressure Count
Self Confidence	$r = 0.41, p = 0.12$	$r = 0.65, p = 0.02$	$r = 0.60, p = 0.03$
	Control Quality	Low-Pressure Quality	High-Pressure Quality
Self Confidence	$r = 0.65, p = 0.02$	$r = 0.71, p = 0.01$	$r = 0.57, p = 0.04$

Table 2. Basketball shot count and quality have a significant relationship with self-confidence. The table shows significant positive relationships except for the first graph, the top left, which was not significant. Shot count is based on a point system of how many shots they make. Shot quality is a score based on quality, from 0 (a miss) to 3 (in the basket with no bounce on the rim). R-test $t, p < 0.05$.

We were curious if the anxiety at the moment (measured just after they finished each station), would affect both the quality of the shot and amount of baskets they made. An r-test found no significant relationships between any of the station's performance and the player's anxiety (Table 3). This makes sense because we found that time pressure did not trigger consistent changes in anxiety, so players didn't feel like the time pressure would affect them and therefore their anxiety probably didn't affect how they performed.

	Control Count	Low-Pressure Count	High-Pressure Count
Cognitive Anxiety	r= -0.13, p=0.36	r = -0.25, p=0.24	r=-0.34, p=0.17
Somatic Anxiety	r= -0.27, p=0.23	r= -0.28, p = 0.21	r= 0.05, p=0.45
	Control Quality	Low-Pressure Quality	High-Pressure Quality
Cognitive Anxiety	r=0.23, p=0.26	r= -0.40, p=0.13	r=-0.32, p=0.18
Somatic Anxiety	r=0.22, p=0.27	r=-0.42, p=0.11	r= 0.07, p=0.41

Table 3. Basketball shot count and quality have no significant relationship with cognitive and somatic anxiety. This table shows no significant relationship between any of the trials.

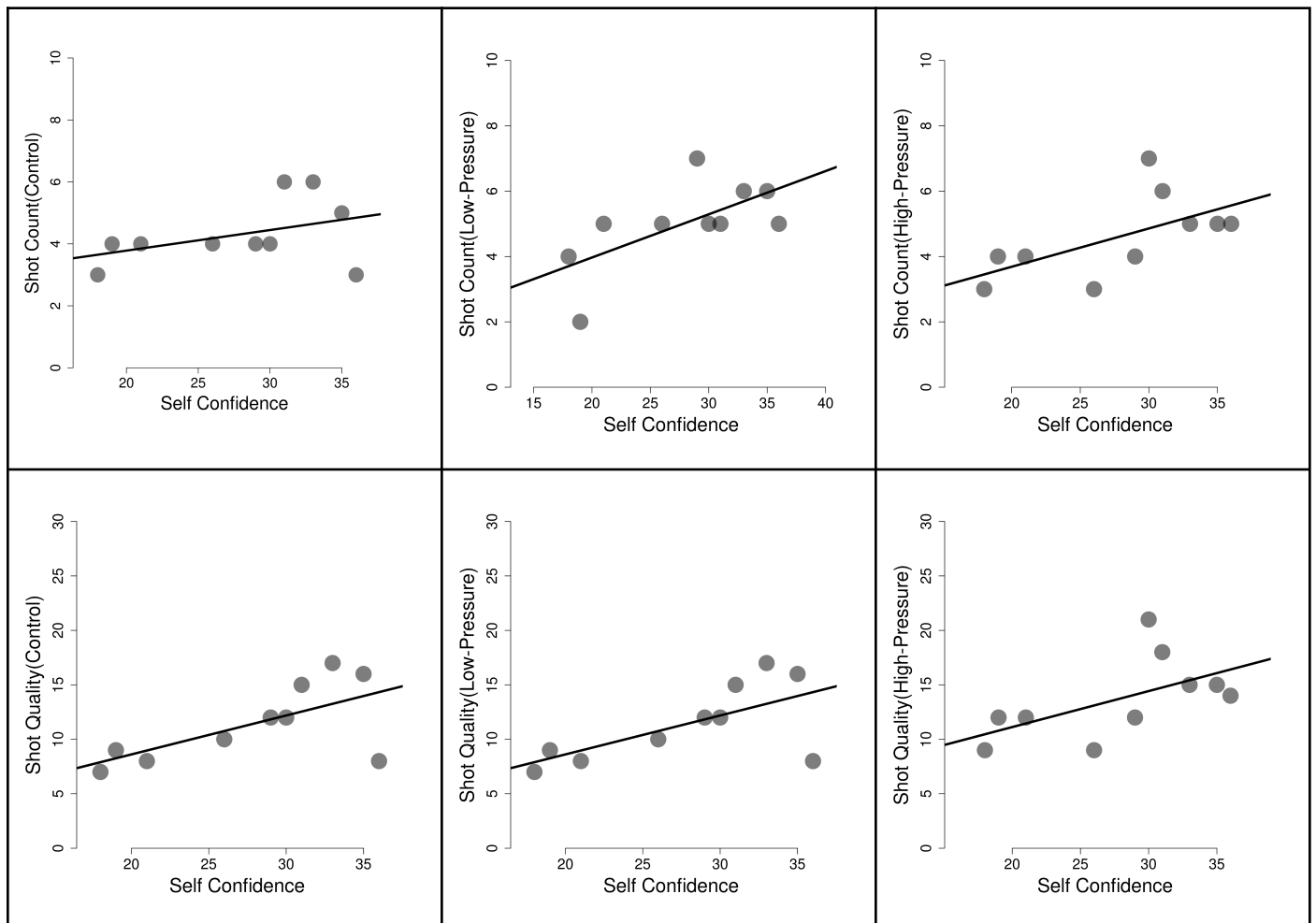


Figure 2. Basketball shot count and quality have a significant relationship with self-confidence. The scattered plot shows significant positive relationships except for the first graph, the top left, which was not significant. r-test t, p<0.05.

Discussion

In this study, we determined whether time pressure affects anxiety and accuracy in people's basketball performance. Our first hypothesis was that higher pressure would mean worse shooting. This hypothesis was not supported because the time pressure did not cause an increase in anxiety and time pressure did not significantly affect their shot quality and quantity. (Table 1). Our second hypothesis was that higher self-confidence would lead to better performance, especially under pressure. This was supported because there was a significant positive relationship between self-confidence and shot count for the low-pressure and high-pressure conditions. Also, there were significant positive relationships between self-confidence and shot quality for the control, low-pressure, and high-pressure conditions (Figure 2). Finally, we found no relationship between anxiety and shooting performance (Table 3).

Our results are consistent with research on the inverted U relationship. The inverted U suggests that athletes do their best with some pressure or anxiety not too much and not too little (3). In our study, anxiety is not related to the shooting performance, and therefore the players in this experiment had the right amount of pressure leading to their performance. This suggests that even amateur high school athletes can survive under pressure and can deal with it just fine. Not all pressure or anxiety leads to poor outcomes.

Our results build on other research on self-confidence and anxiety (1). Competitive gymnasts with high self-confidence had lower cognitive anxiety scores, but not somatic. However, researchers did not measure performance. We found self-confidence was related to more shots made and higher quality shots in basketball. Taken together, research suggests self-confidence is an important part of the success of competitive amateur athletes. Coaches should encourage the development of their skills and confidence so they thrive under pressure and avoid anxiety.

Our study had some limitations. The first limitation was that I couldn't find helpers who would be consistent and help me with the trials for my experiment because I feel like we could've had some better results with the time-pressure trials, but the coaches stepped in and helped. We suggest that future researchers gather reliable people to help if multiple stations occur. Another future improvement we would make is to record with a video all the trials just to make sure I didn't miss any baskets. This would have been a better chance to make sure we were scoring everything correctly how we wanted to for our project. Having a video could also let researchers look at player's motions and movements, which might be important.

According to our research, we determined whether time pressure affects anxiety and accuracy in people's basketball performance. Therefore, the time pressure did not cause an increase in anxiety and time pressure did not significantly affect their shot quality and quantity. Students, Parents, and Faculty should focus on keeping their players confident and positive to be protected against anxiety and pressure.

Works Cited

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