

Competitive State and Trait Anxiety Among High School Swimmers and Non-Athletic Students: A Cross-Sectional Pilot Study

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ABSTRACT

Sports competitive anxiety impairs athletic performance and serves as a psychological barrier to athletic recovery. Besides somatic and cognitive variation, competitive anxiety can also be differentiated by its state or trait quality. There is a significant lack of studies on competitive anxiety in student athletes in high school settings, especially when differentiating between the two types of anxiety. This was a cross-sectional pilot study conducted at Deep Creek High School. The study protocol was approved by local IRB, and no identifying information was collected from participants. The Sport Anxiety Scale-2 (SAS-2) questionnaire, measuring trait anxiety, and Revised Competitive State Anxiety Inventory-2 (CSAI-2R) questionnaire, measuring state anxiety, were administered to a small convenience sample from Deep Creek High School, consisting of members of the school's swimming team (athletes) and non-athletic students. A total of 15 athletes and 6 non-athletes completed the SAS-2 and the CSAI-2R questionnaires. Athletes completed the CSAI-2R on a competition day and the SAS-2 on any day between two competitions. Non-athletes completed both questionnaires on an ordinary day. A *t*-test and Mann-Whitney *U* test were conducted to analyze questionnaire scores and swimmers demonstrated higher overall SAS-2 subscale scores and higher CSAI-2R scores in two subscales compared to non-athletes. Elevated components of both trait and state anxiety in swimmers support the potential presence of competitive anxiety among high school athletes. The study is limited due to its cross-sectional design, limited sample size, and self-reporting questionnaires. However, preliminary understanding of sports anxiety in high school athletes and distinctions between trait and state anxiety is essential for future research that can support targeted interventions that promote both athletic performance and psychological well-being.

Keywords: State anxiety; Trait anxiety; Athletes; Mental health; Sports anxiety

INTRODUCTION

Sports competitive anxiety, or performance anxiety, is characterized by intense feelings of emotional distress before, during, or after participation in a competition or involvement in a competitive environment. Anxiety impairs athletic performance and serves as a psychological barrier to athletic recovery (1). 8% of 756 adolescent student athletes were physician-diagnosed with depression or anxiety, with individual sport athletes

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reporting higher rates than team sport athletes (2). 33.6% of elite athletes report symptoms of anxiety and depression (3). 64.5% of student athletes 18-25 years of age reported elevated levels of anxiety (4).

Besides somatic and cognitive symptom variation, competitive anxiety can also be differentiated by its state or trait quality. State anxiety is experienced for a brief period of time, or how an individual currently feels, while trait anxiety is a stable tendency for one to feel anxious in daily life, or how an individual generally feels (5).

Literature has delved into researching state and trait anxiety in the context of sports psychology. Competitors with high trait anxiety respond to stressful sport situations by demonstrating high levels of state anxiety (6, 7). Additionally, correlations such as competition match outcomes being more closely related to trait anxiety compared to state anxiety have been established as well (8). The Sports Anxiety Scale-2 (SAS-2) and the Revised Competitive State Anxiety Inventory-2 (CSAI-2R) are the most recently developed and validated multidimensional metrics that assess trait and state anxiety, respectively, in athletes.

Despite current literature explaining the presence, potential causes, and connection between competitive trait and state anxiety, there is a significant lack of studies on competitive anxiety in student athletes in high school settings, especially when differentiating between the two types of anxiety (1, 9). This study aims to provide preliminary data on the presence of state and trait competitive anxiety in high school student athletes by comparing competitive anxiety scores in students based on athletic status as well as competitive environments. The null hypothesis states that subscale SAS-2 and CSAI-2R scores will not be significantly different between athletes and non-athletes. Knowledge of anxiety expression can help coaches and parents decipher the best methods to tackle competitive anxiety for their athletes.

METHODS AND MATERIALS

The study is a cross-sectional design conducted at Deep Creek High School. The study protocol was approved by the Deep Creek High School IRB. Written informed consent forms were obtained from all participants 18 years of age, and written informed assent forms, including parental or guardian permission, were obtained for all minor participants. The swim coach participated voluntarily without external pressure.

Permission to utilize the questionnaires was also obtained from the authors of the original CSAI-2R and SAS-2 papers.

The CSAI-2R and SAS-2 questionnaires were administered to members of the school's swimming team and non-athlete students from the same school. A total of 35 swimmers were approached between November 2025 and January 2026 to complete the questionnaires. 11 students not affiliated with a sports team were randomly emailed between the same time frame to complete the questionnaires as non-athletes.

All participants who returned the consent/assent form were provided with both questionnaires by the student researcher or coach (for athletes). Questionnaires were attached together and marked with a random identification number (ID number). The swim coach distributed the CSAI-2R questionnaires to the athletes on the day of a non-state qualifying swim meet and were asked to answer the questionnaire before the athlete competed. Athletes were also asked to answer the SAS-2 questionnaire on any day in between two swim meets. The student researcher provided the non-athletes with both questionnaires and were asked to fill them out on any unspecified day.

The CSAI-2R contains 17 questions, and the SAS-2 contains 15 questions; the questionnaires require about a total of 15 minutes to complete. Each question consists of a statement and 4-point Likert scale. Both questionnaires are broken down into subscales of measurement. CSAI-2R measures cognitive anxiety, self-confidence, each measured by 5 questions, and somatic anxiety, measured by 7 questions. Cognitive anxiety and self-confidence have a score range of 5 to 20, and somatic anxiety has a score range of 7 to 28. SAS-2 measures somatic anxiety, worry, and concentration disruption, each of which are measured by 5 questions. All three subscales have a score range of 5 to 20.

Participants completed the questionnaires independently, and no athletic history or identifying information, such as name, student ID, age, gender, or grade, was collected. Questionnaires were returned to coaches and the student researcher in a sealed envelope to ensure confidentiality, which was provided to participants. Data was entered into Microsoft Access and analyzed using the statistical software STATA version 18.5 (StataCorp LLC, College Station, TX, USA) Continuous variables are presented as mean $\pm$ standard deviation (SD). State and trait anxiety subscale scores were compared between the swimmers and non-athletes using independent-sample *t*-tests. Because of

the relatively small sample size, nonparametric Mann–Whitney *U* tests were also performed as a sensitivity analysis. Box-and-whisker plots were generated to visually compare score distributions, medians, interquartile ranges, and potential outliers between athletes and non-athletes. There was no missing data, therefore, no imputation or other methods for handling missing values were required. Two-sided *p*-values are reported, and statistical significance is defined as $p < 0.05$.

RESULTS

A total of 21 participants, 15 swimmers and 6 non-athletes, provided consent and completed the SAS-2 and CSAI-2R questionnaires, resulting in a consent and completion rate of around 43% for the athletes and 54% for the non-athletes. Participants were in grades 9–12, as well as between the ages of 14 and 18. Mean scores $\pm$ standard deviation (SD) and *p*-values derived from the *t*-tests are presented in Table 1. The Mann–Whitney *U* tests produced results consistent with those of the *t*-tests, with similar *p*-values and no differences in statistical conclusions.

For SAS-2, swimmers demonstrated significantly higher somatic anxiety (10.73 ± 3.65 vs. 6.67 ± 1.86 , $p = 0.02$) and worry scores (14.2 ± 4.21 vs. 7.5 ± 2.88 , $p = 0.002$) among swimmers, while concentration disruption scores were not significantly different between groups (7.27 ± 3.10 vs. 7.33 ± 3.38 , $p = 0.96$).

Similarly, for CSAI-2R, swimmers scored significantly higher on somatic anxiety (14.8 ± 4.16 vs. 9.83 ± 2.48 , $p = 0.01$) and cognitive anxiety (11.13 ± 2.99 vs. 6.5 ± 1.22 , $p = 0.001$).

Self-confidence scores were also higher among swimmers compared to non-athletes (11.33 ± 3.11 vs. 8.5 ± 1.87), reaching borderline statistical significance ($p = 0.05$).

Overall, within trait anxiety, swimmers exhibited elevated median somatic anxiety and worry scores and similar median concentration disruption scores compared to non-athletes. Within state anxiety, athletes displayed higher median somatic anxiety, cognitive anxiety, and self-confidence scores compared to non-athletes (Figure 1 and 2).

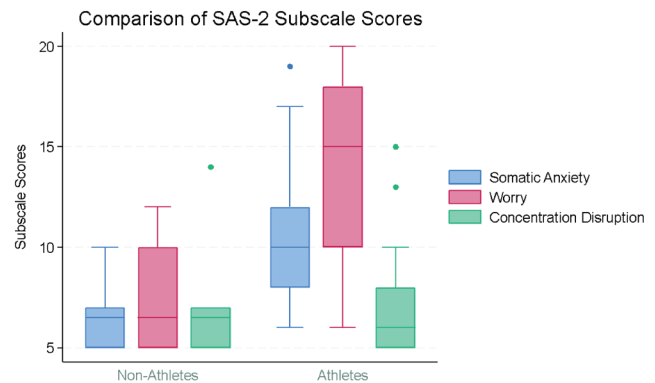


Figure 1. Comparison of SAS-2 (Sport Anxiety Scale-2) subscale scores between athletes and non-athletes. The box plot shows the median somatic anxiety, worry, and concentration disruption scores in athletes ($n=15$) and non-athletes ($n=6$), along with upper and lower quartiles. *P*-value for somatic anxiety is 0.02, worry is 0.002, and concentration disruption is 0.96.

Table 1. Comparison of mean SAS-2 (Sport Anxiety Scale-2, measuring trait anxiety) and CSAI-2R (Revised Competitive State Anxiety Inventory-2, measuring state anxiety) subscale scores between athletes and non-athletes. Scores are mean $\pm$ SD (standard deviation).

Anxiety Scores	Athletes (n=15)	Non-Athletes (n=6)	P-Value
SAS-2 Somatic Anxiety	10.73 ± 3.65	6.67 ± 1.86	0.02
SAS-2 Worry	14.2 ± 4.21	7.5 ± 2.88	0.002
SAS-2 Concentration Disruption	7.27 ± 3.10	7.33 ± 3.38	0.96
CSAI-2R Somatic Anxiety	14.8 ± 4.16	9.83 ± 2.48	0.01
CSAI-2R Cognitive Anxiety	11.13 ± 2.99	6.5 ± 1.22	0.001
CSAI-2R Self-Confidence	11.33 ± 3.11	8.5 ± 1.87	0.05

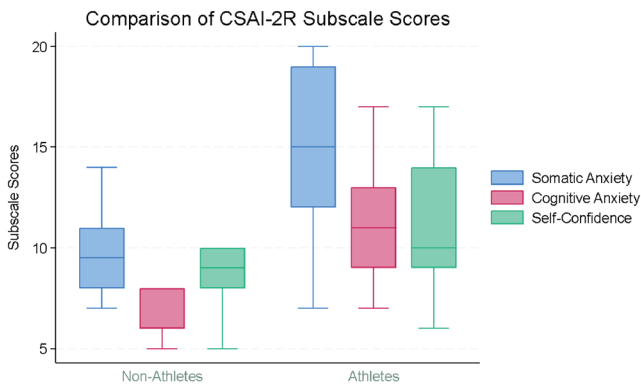


Figure 2. Comparison of CSAI-2R (Revised Competitive State Anxiety Inventory-2) subscale scores between athletes and non-athletes. The box plot shows the median somatic anxiety, cognitive anxiety, and self-confidence scores in athletes ($n=15$) and non-athletes ($n=6$), along with upper and lower quartiles. P -value for somatic anxiety is 0.01, cognitive anxiety is 0.001, and self-confidence is 0.05.

DISCUSSION

Stressors such as sport specialization, athlete identity, perfectionism, and overtraining in youth sports have caused a rising trend of performance anxiety. Furthermore, unique factors based on the individual athlete, sport, or environment can influence the development, severity, progression, and persistence of competitive anxiety (1). Somatic symptoms of such competitive anxiety include muscle tension, increased heart rate, flushing, tremors, and sweating. Cognitive symptoms can consist of self-preoccupation, poor performance, negative evaluation, social comparison, expectations, and demands from others (10, 11).

There has been limited literature on mental health problems and the well-being of high school athletes. The present study examined competitive anxiety among high school swim team athletes compared to non-athlete peers using the Revised Competitive State Anxiety Inventory-2 (CSAI-2R) and the Sport Anxiety Scale-2 (SAS-2). Because data were collected in January during an active swim competition season, the findings provide a timely snapshot of both state and trait competitive anxiety in adolescent athletes under real performance conditions.

State anxiety (as measured by CSAI-2R) reflects momentary reactions to competition. At the same time, trait competitive anxiety (as measured by SAS-2) reflects a more stable predisposition. The study showed significantly elevated domains of state anxiety,

specifically somatic and cognitive anxiety scores, among swim team athletes as compared to the non-athletes. Since only the swim team was actively competing at the time of assessment, elevated state anxiety most likely reflects the competitive environment that the athletes were faced with and would be expected as a context-dependent response. This finding aligns with multidimensional anxiety theory, which proposes that anxiety fluctuates depending on situational demands and proximity to competition (10). It is important to note that the effect of immediate pre-competition arousal on the observed state anxiety difference between the swimmers and non-athletes may overshadow the effect of athletic status itself on the anxiety scores. Additionally, within the state anxiety subscales, the higher observed self-confidence in athletes could reflect a potentially positive effect of competition and may be explained by the concept that athletes display high levels of self-confidence as a coping mechanism to protect against anxiety responses (19).

Trait anxiety, on the other hand, reflects a more constant characteristic of perceiving competitive situations as threatening (12). Domains of trait anxiety, specifically somatic anxiety and worry scores, were also significantly elevated among swim team athletes as compared to non-athletes, potentially demonstrating a higher baseline level of anxiety among the swimmers. This may indicate the development of prolonged competitive anxiety or self-selection into competitive sport by individuals with certain psychological profiles. Looking at the trait anxiety subscales, concentration disruption was relatively low in athletes and comparable to scores for non-athletes. A potential interpretation could be that since both the athletes and non-athletes completed the SAS-2 questionnaire on an ordinary day, the occurrence of distractors that could interfere with concentration were the same for both groups.

Trait anxiety also helps predict the likelihood and intensity of state anxiety responses (13). This might provide an opportunity to recognize individuals who may benefit from interventions that combat baseline anxiety in order to mitigate anxiety during actual competitions. Overall, however, it is important to consider alternative explanations of higher swimmer anxiety scores that do not relate to athletic status or competitive participation, such as sex or age differences, amount or level of training, coach or academic pressure, prior non-athletic related anxiety, and the winter season.

Within state and trait anxiety, cognitive (represented as worry and concentration disruption in trait anxiety)

and somatic anxiety exist as particular measures of overall mental health. Cognitive anxiety has a negative linear relation with performance. Increased cognitive anxiety affects attention and decision-making, which results in poor performance (14, 15). However, somatic anxiety has an inverted-U relation with performance. Moderate somatic anxiety can result in physiological arousal, which can improve performance. However, very low or very high somatic anxiety can affect performance negatively as well (16). The study did show increased cognitive and somatic anxiety among swim team athletes, although performance outcomes cannot be quantified.

Preliminary findings of competitive anxiety among the sampled high school student athletes provide a framework for potentially broader psychosocial implications. Studies have shown that the mental health of incoming college freshmen has been declining for the last several years (17). Studies in college athletes have shown a lack of support and willingness of coaches to refer the athletes for mental well-being (18). Such resources are even more sparse for high school students. The results of this pilot study demonstrate the need for larger studies that assess competitive anxiety in a larger, more diverse sample of student athletes, which could lead to greater recommendations of assistance to address mental health concerns among high school athletes, especially in response to the influential role sports play in adolescent life (1).

Larger implications of this study are restricted due to the cross-sectional design of the study, limited sample size, self-reporting questionnaires, presenting the risk of social-desirability bias, and risk of convenience sampling and selection bias during recruitment. Additionally, the study was conducted in the month of January 2026, during which only the swim team had active competitions at Deep Creek High School, restricting results to one high school and one individual sport. There is also a lack of repeated testing at multiple competitions. Such aspects of the study limit the generalization of the results. Seasonal effects on anxiety, as the questionnaires were administered in winter, unequal number of athletes and non-athletes, lack of matching between athletes and non-athletes, possible influence of the swim team coach, and personal circumstances may have confounded the results. Lack of collected demographic and athletic history data prevents adjustment for such potential confounding variables and may have limited comparability between athletes and non-athletes. Absence of clinical thresholds scores that confirm the existence of anxiety may also constrain interpretation of results.

CONCLUSION

The findings of this study support the potential presence of competitive anxiety among high school athletes and underscore the importance of distinguishing between state and trait anxiety. The exploratory outcomes of this study support future research that will enroll high school students from additional athletic teams whose competitive seasons occur at different times of the year. Furthermore, longitudinal studies are planned to monitor psychological outcomes over time and assess seasonal and developmental changes in anxiety patterns. Such studies could pave the way toward developing targeted interventions in high schools that promote both athletic performance and psychological well-being.

CONFLICT OF INTEREST

The author declares that there are no conflicts of interest related to this work.

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