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Title:

Psychological Insights into School-age Greek Rowers at Interscholastic Regatta: a cross-sectional study

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Abstract

Background:

The PanHellenic Interscholastic Regatta presents a unique competitive environment for adolescent rowers, combining athletic performance with university admission bonus points. This dual-pressure context may influence athletes' psychological states, particularly competitive anxiety, self-confidence, and motivational orientation.

Methods:

A total of 132 school-age rowers (66 males, 66 females; aged 15–18 years) competing at the Panhellenic Interscholastic Regatta participated in the study. Athletes completed validated Greek versions of the Competitive State Anxiety Inventory-II (CSAI-II) and the Task and Ego Orientation in Sport Questionnaire (TEOSQ) approximately 30–60 minutes before competition. Differences across age groups were examined using ANCOVA with previous experience as covariate, while the relationship between the CSAI-II constructs and TEOSQ was assessed with point-biserial correlation coefficient.

Results:

Overall levels of anxiety and self-confidence were comparable to those reported in similar youth sport populations. No significant differences were observed between age groups in cognitive anxiety, somatic anxiety, or self-confidence ($p > 0.05$), regardless of accounting for prior experience. Goal orientation was not significantly associated with cognitive anxiety or self-confidence; however, a small-to-moderate significant negative relationship was found between task orientation and somatic anxiety ($r = -0.18$, $p < 0.05$), indicating that more task-oriented athletes experienced lower physiological symptoms of anxiety.

Conclusions:

School-age rowers competing in the Panhellenic Interscholastic Regatta demonstrated no differences in their psychological profiles across age groups, potentially due to prior competitive experience and similar sport exposure. Task-oriented motivation appears to have a weak-to-moderate relationship with somatic anxiety. These findings provide some information from an original and unexplored context on how to support young athletes in such environments.

Keywords:

competitive anxiety, self-confidence, goal orientation, rowing, adolescence, school sport

Background

In Greece, Secondary Education is divided into Lower (Gymnasio, 13 - 15 years of age) and Upper (Lykeio, 16-18 years of age). Following Upper Secondary Education, many students will attempt to gain entry to University, which is achieved through an exam taken simultaneously by all students that wish to study at the University ('Panhellenic exams').The result for each module examined provides a score and the sum of all modules will be the candidate's total score. That score is then judged against a threshold, individualized for each degree and determined by the available positions at each School or Department, the application numbers for each School or Department and the candidates' exam performance for each School. For example, Medicine and Architecture degrees typically have very high thresholds as they have limited positions available, the professions they lead to are very sought after and the candidates for these degrees typically score highly in the Panhellenic exams.

Many of these candidates will have been athletes at the time of the Panhellenic exam, and some with national or international success. To recognize these achievements, the Greek State has established a 'bonus' system, designed to support successful athletes, in which these athletes receive a percentage increment on their total scores (~20%), boosting their chances of being a successful candidate to the School or Department of choice, or even gain admission without exams. To be eligible for that bonus or entry, athletes must have achieved a) national or international success at their respective recognized federation's national or international competition, or b) success at officially recognized national school championships, organized under the auspices of the Ministry of Education, Religious Affairs and Sports. Therefore, school sport constitutes not only an important developmental step providing opportunities for physical development, social interaction and psychological growth but also an opportunity to enhance the athletes' chances to be admitted to University.

The Interscholastic Regatta represents one of the most prominent school-based rowing competitions, bringing together Secondary Education-age athletes from the last year of Lower (aged 15) to the last year of Upper (aged 18) from across the country compete at a national level. It constitutes not only a panhellenic competitive event for the athletes involved but also an important opportunity for those athletes competing to increase their

chances of academic progression into university education. This challenge is further perplexed by the racing structure of the competition, in that the athletes are separated into two categories (15-16 years old and 17-18 years old) for the final results meaning that a 15-year-old could be in the same heat as an 18-year-old while in the final results they are competing against an older (16 year old) participant. In other words, during the actual race the athletes don't realistically know who they are competing against in their heat. This is a situation that will not have been encountered in races outside the Interscholastic Regattas, where they would have been competing with same age opponents. Thus, competing at Interscholastic Regattas presents a somewhat different scenario than the 'standard' rowing competitions.

Competitive anxiety has been widely recognized as a critical psychological factor influencing athletic performance. According to the multidimensional theory of competitive anxiety (Martens et al., 1990), anxiety consists of two primary components: cognitive anxiety (worry and negative performance expectations) and somatic anxiety (physiological arousal), alongside self-confidence, which is conceptualized as a related but distinct dimension. In adolescent athletes, elevated cognitive anxiety has been associated with impaired attentional control, negative performance appraisals, and decreased sport enjoyment (Craft et al., 2003; Grossbard et al., 2009). In endurance-based and technically demanding sports such as rowing, where pacing, rhythm, and coordination are critical, excessive anxiety may disrupt concentration and motor efficiency, potentially compromising performance. Research in youth sport indicates that younger and less experienced athletes often report higher levels of pre-competitive cognitive anxiety compared to older counterparts, likely due to developmental sensitivity to evaluation and outcome pressure (Smith et al., 2006). Moreover, studies in endurance and team-based youth sports suggest that excessive anxiety can negatively affect decision-making, stroke efficiency, and perceived exertion regulation, whereas moderate levels of arousal may facilitate optimal performance when interpreted as facilitative rather than debilitative (Tenenbaum & Eklund, 2007). Research has consistently shown that higher levels of sport-specific self-confidence are linked to improved focus, greater persistence, and enhanced performance outcomes among adolescent athletes (Woodman & Hardy, 2003).

Rowing as a sport demands not only physical and strategical mastery (Legge et al., 2024) but also unique psychological skills to meet the demands of the sport (Rich et al., 2020). Constructs such as self-confidence may play a particularly important role to deal with the requirements of sustained physical effort, technical precision, and, in crew boats, coordinated teamwork under high levels of physiological fatigue. For young rowers, confidence can be shaped by previous competitive experience, perceived competence, coaching feedback, and the motivational climate created within the training environment (Horn, 2008). Consequently, as higher self-confidence develops, athletes tend to interpret pre-competition arousal as facilitative rather than harmful, which can support optimal pacing strategies and technical consistency during races (Woodman & Hardy, 2003). According to Nicholls (1989), athletes evaluate competence through two primary goal orientations; task and ego. Task-oriented athletes define success based on personal improvement, effort, and mastery of skills, whereas ego-oriented athletes define success through social comparison and outperforming others. It follows that in sports such as rowing, a task-oriented approach may be particularly beneficial because athletes must focus on controllable aspects of performance, including stroke technique, pacing strategy, and physiological effort. Research in youth sport further suggests that athletes who adopt stronger task orientations tend to demonstrate higher perceived competence, stronger self-confidence, and more positive emotional responses to competition (Lochbaum et al., 2016).

Although research specifically targeting youth rowing populations remains limited compared to other sports, findings from adolescent endurance and team sports suggest that fostering a task-oriented motivational climate may enhance self-confidence and buffer the negative effects of competitive anxiety (Harwood et al., 2015; Lochbaum et al., 2016). In the context of Panhellenic Interscholastic Regattas, the unique set-up and additional benefits of success are likely to impose different psychological demands on young athletes, as they are required to deal not only with the pressure of the desire to win the race but also the additional pressure of the potential university admission bonus points reward, if successful. Understanding the interplay between anxiety, self-confidence, and motivational orientations at each age group year is essential for developing effective coaching strategies and supporting the athletes accordingly. Therefore, the aim of the

present study was to assess levels of anxiety, self-confidence and motivational orientations among athletes competing in Panhellenic Interscholastic Regattas and to examine differences across age groups.

Methods

Participants

The Panhellenic Interscholastic Regatta took place in the Schinias Olympic Rowing and Canoeing Centre, and data was collected during this competition.

A formal *a priori* sample size calculation was not feasible due to the approach to the current study. Specifically, no participant list was available in advance, and recruitment was dependent on athlete attendance at this single competitive event. Therefore, a pragmatic approach was adopted, whereby all athletes present at the competition were considered eligible and were approached (with permission by the organising authority) to participate, aiming to recruit the maximum possible population at the event. Thus, all rowers present were given the opportunity to participate and data were collected from all those who agreed and provided informed consent, resulting in a sample of 132 athletes. The advantage of this approach is that it enhances the ecological validity of our data collection, as data collection happens under real competition situation. On the other hand, the lack of an *a priori* sample size determination is an acknowledged limitation of the study. The sample size obtained compares favourably with similar field-based studies (e.g. the mean sample size in studies using CSAI-II in the meta-analysis by Lockbaum et al. (2022) was 76, with a range of 8-416). Further, a sensitivity analysis was conducted to determine the effect size this sample would be able to detect. Given the achieved sample size (n = 132) and for an alpha level of 0.05 and power of 0.8, the study was sufficiently powered to detect a moderate effect size (f = 0.29) for a one-way ANOVA with four comparison groups (depending on the degree of imbalance between groups), and a moderate effect size for two-tailed correlation (ρ = 0.24).

Informed consent was given by both the participating rowers and the parents/legal guardians (where relevant). Ethical approval was obtained from the Institutional Ethics Committee (Approval no: 1028/8/11/2017) and data collection followed the Declaration of Helsinki's national and international ethical principles.

Measurements

The athletes were requested to provide demographic information (sex, school year, education level (Lower Secondary, Upper Secondary) and performance-related information (boat type (single scull, 1X; double scull, 2X; pairs without coxswain, 2-), the highest level of competition they had participated in (National, Balkan, European / World), years of training and the approximate number of races they had competed at the time of data collection).

Subsequently, the athletes completed the Greek version of the Competitive State Anxiety Inventory-II (CSAI-II) (Kakkos & Zervas, 1996) to measure anxiety. The initial CSAI-II uses 27 items to measure three key dimensions of anxiety; cognitive anxiety (such as worry or negative thoughts about performance), somatic anxiety (physical symptoms such as increased heart rate, sweating, or muscle tension) and self-confidence (the athlete's belief in their ability to succeed) (Martens et al., 1990). The Greek version of the CSAI-II is a translated and, following a series of factor analyses, reduced items version consisting of 15 items (Kakkos & Zervas, 1996). These items are divided equally among the same three dimensions and responses are rated on a 4-point Likert scale (1= not at all, 2= somewhat, 3= moderately so, 4= very much so). Each dimension has a minimum score of 5 and a maximum score of 20, with higher scores indicating higher levels of cognitive anxiety, somatic anxiety, or self-confidence. The questionnaire demonstrated good internal consistency with Cronbach's α ranging from 0.81 to 0.89 for intensity and 0.78 to 0.86 for direction (Kakkos & Zervas, 1996) and has been used in previous studies assessing these traits in Greek participants (e.g. Filippou et al., 2014; Thanopoulos & Platanou, 2016; Stavrou et al., 2006).

There were calls regarding demand for increased information of the relationship between goal orientation and competitive state anxiety in different sports (Wu et al, 2025). To provide some more information with regards to the relationship of competitive state anxiety during the Interscholastic Regatta and the goal orientation of the rowers and understand the interrelationship of these constructs for this population (Ommundsen & Petersen, 1999), the Greek version of Task and Ego Orientation in Sport Questionnaire (TEOSQ) (Karteroliotis and Stavrou, 1996) was used to measure the athlete's dispositional goal orientation. The original TEOSQ uses 13 items to assess the degree to which an individual is task-oriented (7 items) or ego-oriented (6 items) in the context of

sports and physical activity (Duda & Nicholls, 1992). The Greek version of TEOSQ also contains 13 items and asks athletes to reflect when they feel successful in their sport and respond to each item on a 5-point Likert scale (1= strongly agree to 5= strongly disagree).The scores from the respective task-orientated and ego-orientated items are averaged, with lower scores indicating a stronger respective orientation. The reliability coefficient of the questionnaire was reported as high with a value of 0.76 for task-orientation and 0.74 for ego-orientation (Karteroliotis & Stavrou, 1996) and has been previously used in studies with Greek participants as the sample (e.g. Stavrou et al., 2015).

The decision to use questionnaires was based on the optimal balance between collecting the information required and practical restrictions, as described in the sample size justification earlier. The ability to engage with the athletes for more than 15 minutes shortly before their race would be extremely restricted, while as the sample size was uncertain, interviews may have been impractical. All questionnaires were completed on paper at a dedicated, quiet spot. Completion took place approximately 30-60 minutes prior to the athlete's race without interfering or interrupting their regular race preparation. To capture their state of mind for the CSAI-II, the athletes were asked to complete the questionnaire thinking about their state at that moment and make rapid decisions on the options provided (Wu et al., 2025). For the TEOSQ, the athletes were requested to complete the questionnaire thinking about when they felt most successful at a performance and respond to the questions with that in mind (Ommundsen & Petersen, 1999). Overall, participants took approximately 10 minutes to complete all questionnaires.

Statistical Analysis

The age groups were formed representing a school year (Lower Secondary: L3 = 15-year olds, Upper Secondary: U1 = 16-year olds, U2 = 17-year olds, U3 = 18-year olds) and compared. Sex, boat type and highest level of competition were compared between age groups using chi-squared test of independence (χ^2) and where differences were found, the groups' synthesis was examined using standardised residuals with Holm-Bonferroni correction. Years of training and number of races were examined with a one-way analysis of variance (ANOVA). Normality of the residuals was examined with visual inspection of the Q-Q plot and confirmed. Homogeneity of variance was examined using Levene's test

and confirmed. Where differences were found, they were followed with pairwise comparisons, with Holm-Bonferroni correction.

Debate exists with regards to the analysis of questionnaire data in a parametric or non-parametric approach, with the identification of the level of measurement determining the choice of test (Carifio & Perla, 2008; Norman, 2010). It has been strongly suggested that Likert responses produce interval-level responses (Carifio & Perla, 2008), while the global score achieved in the questionnaires (summing or averaging of all the relevant questions scores), results in a large range of scores, which can be considered continuous (Carifio & Perla, 2008; Norman, 2010). Therefore, the questionnaire data was analysed using parametric methods.

Normality of the residuals for all CSAI-II constructs was examined with visual inspection of the Q-Q plot and confirmed. Homogeneity of variance was examined using Levene's test and confirmed, while homogeneity of the regression slopes was examined through the interaction of age groups and the covariates and confirmed. Subsequently, the age groups were compared in all CSAI-II constructs with a one-way analysis of covariance (ANCOVA),with years of training and number of races used as covariates. Where differences were found, they were followed with pairwise comparisons, with Holm-Bonferroni correction.

To examine the relationships between goal orientation and CSAI-II constructs, athletes were classified according to their TEOSQ scores (i.e. if ego-orientation score>task-orientation score, the participants was characterised as task oriented and vice versa). It is worth clarifying that the present approach is not equivalent to e.g. median-split dichotomisation, as it is based on the theoretical distinction suggested by the TEOSQ itself. Therefore, and although some loss of power is inevitable due to the classification of continuous scores into categories, it is not as pronounced as dichotomisation (reported to lose ~40% power; Cohen, 1983), while it enables the analysis of state anxiety in relation to the orientation dominance. The point-biserial correlation coefficient(r_{pb}) was used, with 0.1, 0.3 and 0.5 considered, small, medium and large, accordingly. To control for any influence of years of training or number of races, these were controlled for and partial correlation was also run.

For the ANOVA and ANCOVA analyses, effect sizes of partial omega-squared (ω^2_p) were calculated and interpreted as small, moderate and large for values of 0.01, 0.06 and 0.14, respectively. For the correlations, Fisher's z was calculated and interpreted as small, medium and large for values of 0.1, 0.3 and 0.5, respectively. All Holm-Bonferoni corrections were based on the possible (6) pairwise comparison between the age groups. Significance was set at an alpha level of 0.05. All analyses were conducted using JASP V0.95.4 (https://jasp-stats.org/).

Results

The full sample descriptive statistics for the demographic information, performance-related information and questionnaire scores can be seen in Table 1.

Table 1. Descriptive statistics of the demographic and performance-related information for the full sample. Data presentation format is indicated at each variable.

Descriptive characteristics	**Value**
Demographic information	
Age (years; mean ± SD)	16.2 ± 1.1
Sex (count)	
Male	66
Female	66
Educational level (count)	
Lower Secondary	43
Upper Secondary	89
Performance-related information	
Boat type (count)	
1X	24
2X	51
2-	57
Highest level of competition (count)	
National	100
Balkan	20
European / World	12

Years of training (mean ± SD)	3.7 ± 1.5
Number of races(mean ± SD)	18.2 ± 12.3

Lower Secondary includes 15-year olds; Upper Secondary includes 16-18-year olds; 1X, single scull; 2X, double scull; 2-, pairs without coxswain.

There was no difference in sex distribution amongst the four groups ($\chi^2_3 = 2.030$, $p = 0.556$) or boat type ($\chi^2_6 = 4.687$, $p = 0.585$), but there was a differenceof highest level of competition ($\chi^2_6 = 52.72$, $p < 0.001$, Cramer's V = 0.447), with standardised residuals confirming that L3 had significantly more athletes at National level ($z = 3.65$, $p = 0.005$), U1 significantly more athletes at Balkan level ($z = 3.43$, $p = 0.005$) and U3 significantly more athletes at European / World level ($z = 6.33$, $p = 0.004$) and significantly athletes less at National level ($z = 3.43$, $p = 0.005$). The actual frequencies per age group appear in Table 2.

Table 2. Frequencies of athletes across groups and highest level of competition.L3 = 15-year olds, U1 = 16-year olds, U2 = 17-year olds, U3 = 18 year olds.

Age group	**National**	**Balkan**	**European / World**
L3	41	2	0
U1	31	13	4
U2	22	4	0
U3	6	1	8

The groups were significantly different in years of training ($F_{3,128} = 9.615$, $p < 0.001$, $\omega^2_p = 0.164$) and number of races ($F_{3,128} = 9.311$, $p < 0.001$, $\omega^2_p = 0.159$). The descriptive statistics for all demographic and performance-related variables per age group appear in Table 3.

Table 3. Descriptive statistics for demographic information and performance-related information per age groups. L3 = 15-year olds, U1 = 16-year olds, U2 = 17-year olds, U3 = 18-year olds. Data is presented as mean ± SD unless otherwise stated.

	L3 (n = 43)	**U1 (n = 48)**	**U2 (n = 26)**	**U3 (n = 15)**
Demographic information				

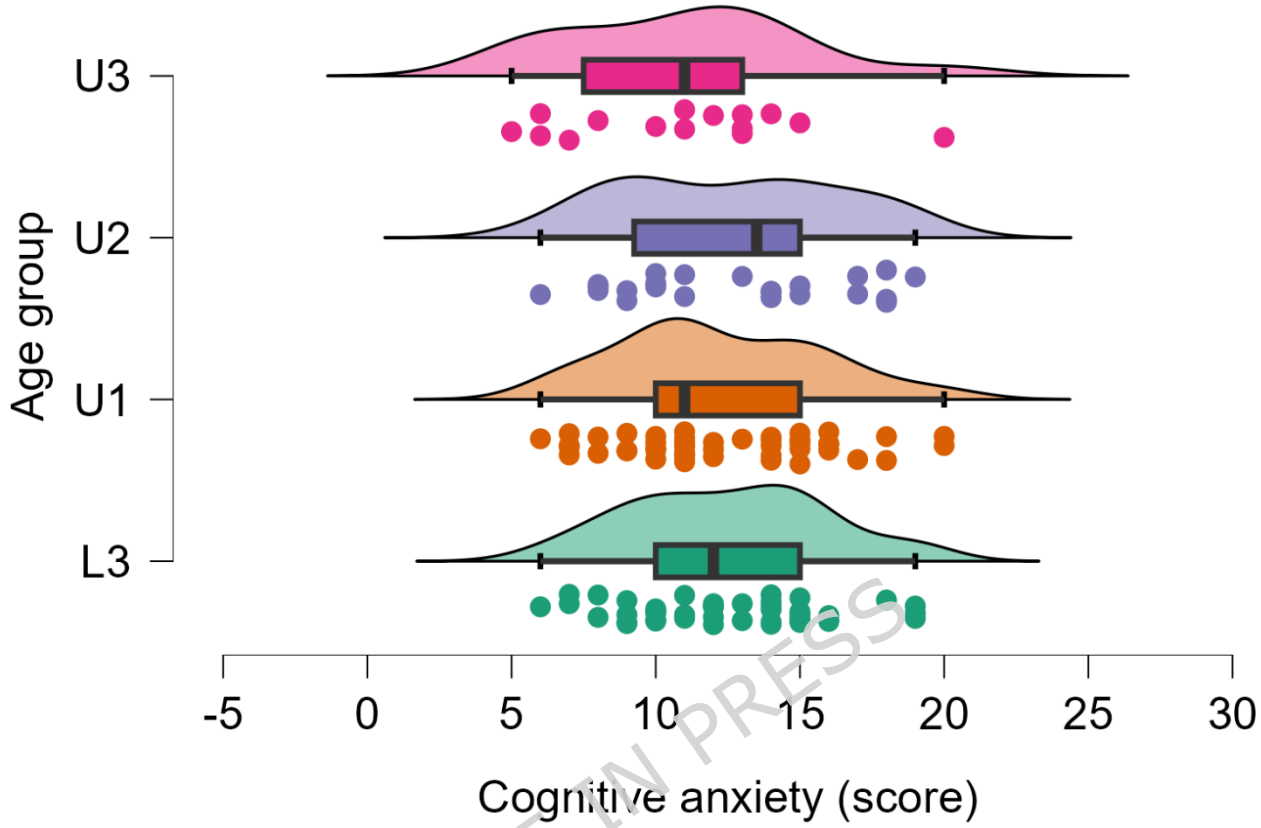
Sex (count)				
Male	20	24	12	10
Female	23	24	14	5
Performance-related information				
Boat type (count)				
1X	7	11	4	2
2X	16	15	11	9
2-	20	22	11	4
Years of training	3.0 ± 1.0^{U1,U3}	4.0 ± 1.3^{L3,U3}	3.5 ± 1.6^{U3}	5.0 ± 1.8^{L3,U1,U2}
Number of races	11.7 ± 5.6^{U1,U2,U3}	19.8 ± 11.8^{L3}	20.5 ± 15.0^{L3}	28.1 ± 14.3^{L3,U1}

1X, single scull; 2X, double scull; 2-, pairs without coxswain. ^{L3}, ^{U1}, ^{U2}, and ^{U3} indicate significant difference ($p < 0.05$, Holm-Bonferroni adjusted) with L3, U1, U2 and U3, respectively.

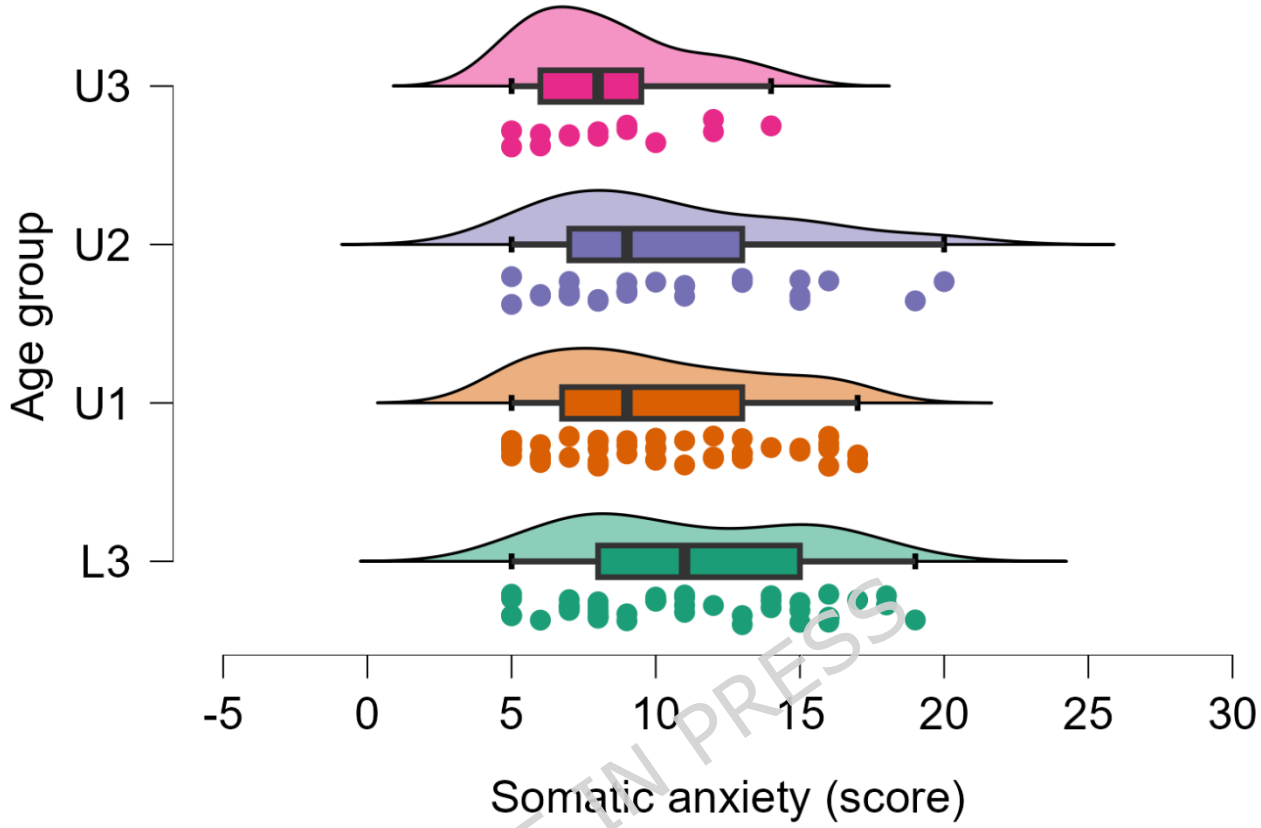
Internal consistency for all questionnaire measures in our sample was acceptable (Cronbach's α> 0.7); specifically, CSAI-II returned Cronbach's α of 0.79 (95%CI: 0.737 to 0.851), 0.85 (95%CI: 0.815 to 0.893) and 0.86 (95%CI: 0.818 to 0.893) for cognitive, somatic and self-confidence constructs respectively, TEOSQ returned Cronbach's α of 0.74 (95%CI: 0.651 to 0.822) and 0.85 (95%CI: 0.805 to 0.894) for ego- and task-orientation, respectively and TSCI returned Cronbach's α of 0.91 (95%CI: 0.872 to 0.930).

When the age groups were compared for the psychological characteristics, there were no differences in cognitive ($F_{3,128}$= 0.837, p = 0.476, ω^2_p = 0.000, overall mean±SD = 12.3±3.6; Figure 1A) or somatic ($F_{3,128}$= 2.255, p = 0.085, ω^2_p = 0.028, overall mean ± SD = 10.2 ±3.9; Figure 1B) anxiety or self-confidence ($F_{3,128}$= 1.294, p = 0.280, ω^2_p = 0.007, overall mean ± SD = 14.7 ±3.6; Figure 1C). When the above analyses were repeated with the inclusion of years of training and number of races as covariates, the pattern did not change. There were no significant changes in cognitive ($F_{3,126}$= 0.666, p = 0.574, ω^2_p = 0.000) or somatic ($F_{3,126}$= 2.086, p = 0.105, ω^2_p = 0.024) anxiety or self-confidence ($F_{3,126}$= 1.178, p = 0.321, ω^2_p = 0.004).

A



B



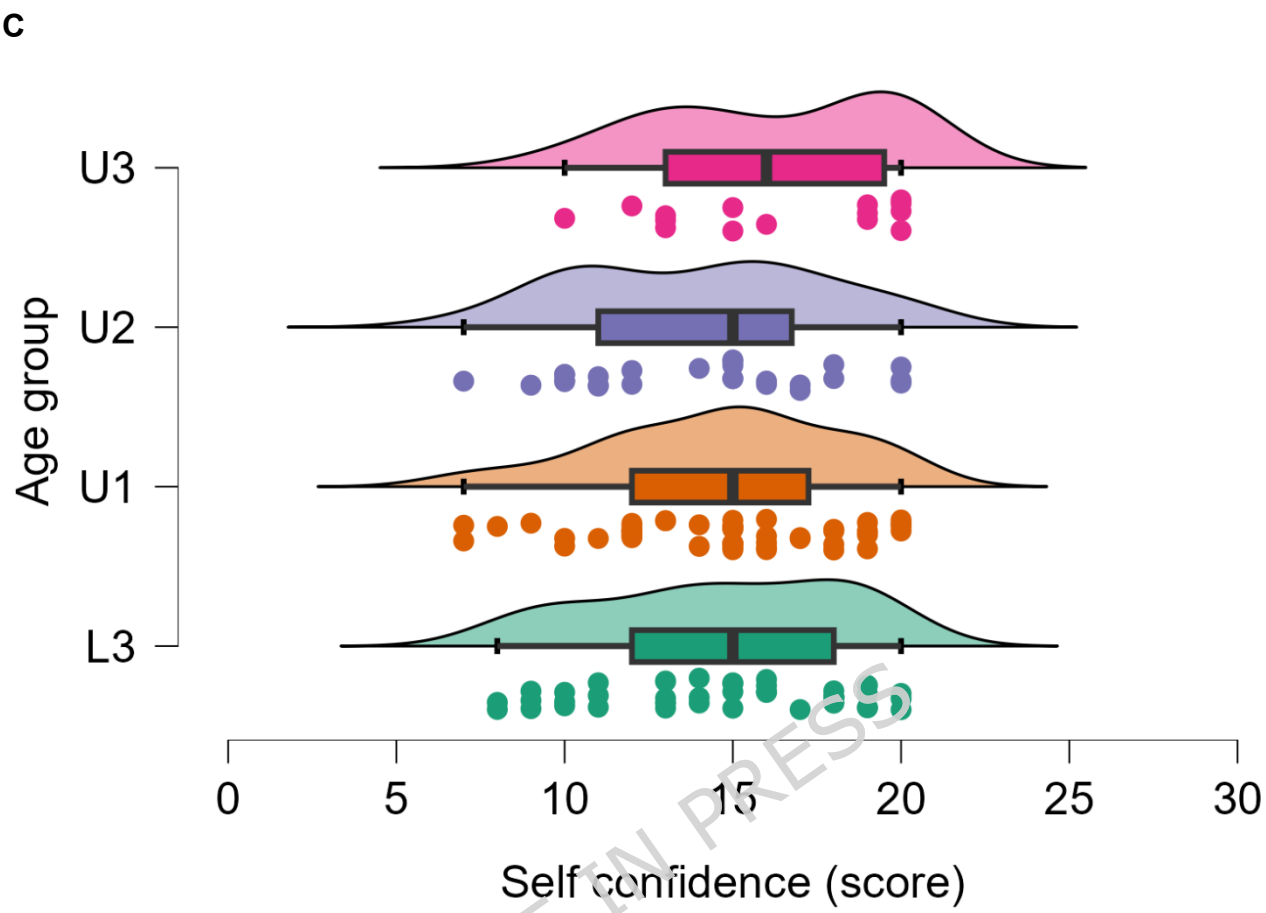


Figure 1. Raincloud plots of the three CSAI-II constructs across the four age groups. The plot presents a density plot (indicating shape and spread of the data), a boxplot (indicating the median and interquartile range of the data) and the individual raw data points. Panel A, cognitive anxiety; Panel B, somatic anxiety; Panel C, self-confidence. L3 = 15-year olds, U1 = 16-year olds, U2 = 17-year olds, U3 = 18-year olds

Finally, the r_{pb} between goal orientation and CSAI-II constructs was -0.108 (95%CI: -0.274 to 0.064, p = 0.216, Fisher's z = 0.109) for cognitive anxiety, -0.181 for somatic anxiety (95%CI: -0.342 to -0.011, p = 0.037, Fisher's z = 0.184) and 0.065 for self-confidence (95%CI: -0.107 to 0.233, p = 0.461, Fisher's z = 0.065). When years of training and number of races were controlled for in the partial correlation, the results did not materially change, with r_{pb} of -0.114 (95%CI: -0.276 to 0.057, p = 0.195, Fisher's z = 0.115) for cognitive anxiety, -0.190 for somatic anxiety (95%CI: -0.359 to -0.025, p = 0.030, Fisher's z = 0.192) and 0.085 for self-confidence (95%CI: -0.078 to 0.257, p = 0.334, Fisher's z = 0.086).

Discussion

The aim of this study was to assess anxiety, self-confidence and motivational orientations among athletes competing in Panhellenic Interscholastic Regattas and to examine differences across age groups. This is the first study to do so, in a setting that athletic achievement translates to increased chances for admission to University education, rather than merely athletic success. Our results describe the cognitive anxiety, somatic anxiety and self-confidence that the rowers demonstrate at the Greek Interscholastic Regattas and report no differences in the age groups anxiety profiles. Further, only somatic anxiety presented a significant but small to moderate relationship with goal orientation, with lower somatic anxiety associated with task orientation.

The age group performance-related results were not surprising. The increase in years of training and number of races competed reflects the higher age and longer involvement with rowing. Most, if not all rowers, will belong to a rowing club and have trained and competed regularly with their clubs. The Greek Interscholastic Regatta competition is an additional National-level competition in their calendar. That is, the rowers do not specifically start rowing or train for the Regatta nor the schools offer such programmes. As a result, the older rowers will have trained longer and competed in more races as part of their club training.

Swimmers' (ages 13-19) anxiety state were reported to score a mean of 11.1, 9,9 and 13.9 for cognitive anxiety, somatic anxiety and self-confidence, respectively, before their race at the annual national swimming competition (Thanopoulos & Platanou, 2016). Similarly, athletes from 4 different individual sports (track and field, swimming, shooting and cycling; ages 16-38 years old) reported to score a mean of 11.0, 9.7 and 14.8 for cognitive anxiety, somatic anxiety and self-confidence, respectively, before competing (Stavrou et al, 2006). The sample in our study has comparable cognitive anxiety, somatic anxiety and self-confidence scores to these previous studies, confirming that the participants in the study were in a similar state prior to their race.

The present results showed a lack of difference in any of the CSAI-II constructs between the age groups. Previous literature has shown older swimmers (16-19 years old v 13-15 years old) to demonstrate lower cognitive anxiety and higher self-confidence (Thanopoulos & Platanou, 2006). In contrast, Martinez-Gallego et al. (2022) reported

lower cognitive and somatic anxiety in tennis players below the age of 14 years of age in comparison to their older (>14 years of age) counterparts. Regardless of the direction of the difference in age groups, the present results demonstrated that the four age groups were not different in any of the CSAI-II constructs.

Possible reasons for the contradicting results could lie in prior experience or the sport examined. The age range in the present study (15 to 18 years old), makes the current group to only 'match' one of the age groups in the Martinez-Gallego et al. (2022) study (the >14 years of age group) and almost exclusively the 16-19 years old in the Thanopoulos and Platanou (2016) study. The more homogenous age groups in the present study may imply that at those ages, athletes have managed to sufficiently cope with competition anxiety, perhaps due to familiarization with competition races. This can be supported by the fact that for all groups, over 50% of the participants reported having completed at least 10 races previously. With the Hellenic Rowing Federation organizing 4-6 regattas per year, this means that most rowers in the sample would have had two full seasons of competition, enabling them to familiarize themselves with pre-competition anxiety. Indeed, the inclusion of years of training or number of races did not impact the results. Thus, a plausible explanation for the lack of differences between the groups is sufficient experience in competitions. This rationale coincides with a study by Alföldi et al. (2022) who reported low CSAI-II scores in a 15-18 year old group, consisting of male and female rowers, with a training experience between 1-7 years, indicating that prior experience can relatively quickly help the rower to cope with pre-competition anxiety.

Another plausible explanation for the lack of differences is the number of participants. The sample size (and further loss of power due to the unbalanced group sizes) means that the possibility of a Type II error cannot be excluded. The moderate detectable effect size ($f = 0.29$) reported in 'Participants' was based on the four groups being equal. The sizes of the groups, however, varied considerably which, as a result, would increase the effect size the analysis would be able to detect (Maxwell, Delaney & Kelly, 2018). It is conceivable, therefore, that this relatively experienced group of participants could have differences in the CSAI-II constructs but of a smaller magnitude than what we were able to detect.

Although anxiety has been extensively examined, there are still discrepancies in studies' findings, attributed to the individual impact and complex interactions between e.g. differences in settings, type of sport, perceived competition importance and such other situational factors (Palazzolo, 2020; Barrett et al., 2023; Wu et al., 2025).The present findings add to the corpus of literature on anxiety and self-confidence, by examining school-age rowers in a unique competition scenario, the Greek Interscholastic Regatta and reporting their anxiety and self-confidence. Conversely, the specificity of the competition and the sample selection bias mean the findings can be applied in similar settings only and not be generalized in different settings (e.g. international competitions or younger / older age groups).

Similarly, calls for more research into the relationship between goal orientation and state anxiety have been made (Wu et al., 2025). In the present study, no relationship between goal orientation and cognitive anxiety or self-confidence was found, but there was a significant, small-to-moderate relationship showing lower somatic anxiety associated with task orientation. This finding is in agreement with a previous report examining anxiety and goal orientation (Rawat et al., 2023). In a sample consisting of various sport players, somatic anxiety had a small to moderate relationship with task orientation. In contrast, task orientation was related to self-confidence in a group of track and field athletes (Wu et al., 2025). Similarly to the point earlier, the discrepancies maybe due to the different sample composition. Therefore, we suggest that future studies should attempt to examine similar aspects in well-defined samples, which may provide more specific information on the psychological profiles of specific sports. The caveat of such an approach is discussed below.

The data collection taking place during the Interscholastic Regatta, has certain benefits and limitations. We were able to collect data from a large number of participants who were available at the same space and time, creating a very standardized situation and homogenous sample. At the same time, there is a clear sampling bias. The potential participants at the Interscholastic Regatta were those athletes that a) wanted to participate in School rowing, b) were ranked top in their respective local qualifying competitions (and, thus, more likely to represent more confident, less anxious athletes), before they progressed to the final one, and c) were able to participate (e.g. were able

to travel to the competition venue). Further, from those participants, our convenience sample was self-selecting and we have no knowledge of whether there was a systematic refusal to participate (e.g. older participants being less willing to participate). These limitations create uncertainty around the sample being representative of the population. Thus, along with the uniqueness of the competition, the results should be carefully interpreted and considered for similar type athletes and competitions only, rather than more widely for school-age rowers or school-age athletes, limiting their generalizability. Further, the data collection taking place taking place at the competition, meant that the TEOSQ questionnaire was administered at a time where situational anxiety could affect it. Notwithstanding the completion instructions given, we cannot be certain that the answers provided had not been affected by the situational anxiety. Therefore, it is conceivable that the answers were somewhat shifted towards ego-orientation more than they would be during e.g. a training session. Future work should verify these findings by completing TEOSQ in a natural, non-competitive setting.

Conclusions

The study examined anxiety and self-confidence of rowers at an Interscholastic Regatta, differences between age groups and the relationship of those variables to goal orientation. The results indicate that rowers demonstrated similar to frequently seen levels of anxiety (both cognitive and somatic) and self-confidence, while no differences between age groups were found. Sufficient prior experience and homogenous sample characteristics are proposed as responsible for the lack of differences between the age group. These findings can serve as source of information for coaches supporting rowers competing at the Interscholastic Regatta to help their athletes manage their competition anxiety better regardless of the age group they are in. Additionally, the study offers more information in the field of competition anxiety and its relation to goal orientation. The setting of the data collection poses certain limitations in the interpretation of the results and, thus, they should be considered for similar paradigms rather than in a wider context.

Declarations

Clinical trial number

Not applicable

Ethics approval and consent to participate

Ethical approval was sought and granted from the National and Kapodistrian University of Athens Ethics Committee (Approval no: 1028/8/11/2017). Informed consent was given by both the participating rowers and the parents/legal guardians (where relevant). All participants consented to their data being used for the purposes of this publication and the study was conducted in line with the principles of the Declaration of Helsinki.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests

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Authors' contributions

ED, SN, SK and MK substantially contributed to the conception, design and data acquisition. ED, SN and TMB substantially contributed to the data analysis and interpretation. ED, SN, MK and TB have drafted the work. ED, SN, SK, MK and TMB substantively revised. All authors read and approved the final manuscript.

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