Motivation's impact on high-level high school students' ability to balance academic and athletic stress

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SUMMARY

All student-athletes are often faced with the choice of spending time on their academics or athletics. However, some students want to pursue their dreams of playing sports at the professional level, often causing stress and anxiety. We aimed to observe the relationship between motivation and stress in student-athletes playing a varsity sport. Participants included high school students from a small town in New Jersey enrolled in four or more AP/Honors courses. Two surveys, the Student-Athlete Motivation Toward Sports and Academics Questionnaire and Perceived Stress Scale, were given to students to measure their motivation and stress levels. Ultimately, there was no direct correlation between motivation and stress, but the results hint at the possibility of other factors contributing to students' higher stress at both the college and high school levels. Additionally, nonresponse bias and lack of randomization confine the results to the school studied. Further research to look at the factors affecting high-performing collegiate and high-school student-athletes is needed. Diving into this topic further with fewer limitations will benefit collegiate and high school athletes to lower their stress from balancing sports and academics. Possible solutions may result from this project and open new research opportunities discussing the higher stress in not only collegiate but ¬¬also high school students.

INTRODUCTION

Teenage students are frequently involved in extracurricular activities and sports. However, some lose track of their mental and physical health as they pursue their academic and athletic careers, resulting in many feeling mentally exhausted (1). Both college and high school students often struggle to lower their stress and raise their motivation so that they feel confident about their schedules. Researchers around the globe are looking for the factors that affect collegiate student-athletes. Many such as those conducted by Moen and Fogaca have found that students feel more stress and anxiety because of their imbalance between academics and sports (2, 3). Previous studies have focused on the impact of collegiate athletes in D1, D2, and D3 colleges, presenting that argument of the mental health and its impact on students (4). Gaston-Gayles conducted their studies by using motivation as a measurement to predict collegiate athletes' success in

college in both academics and athletics (5). Rodriguez and Gao et al. found that student-athletes of a specific gender, females, had a varying perception of the college experience of education and athletics (6, 7). Ines and Lopes Dos Santos contributed to this conversation by investigating the impact of stress coping mechanisms for collegiate athletes and new strategies to lower stress (8, 9). To add on to their research, Van Raalte and Ward conducted studies to understand and look at the impact of social support and interventions on collegiate student-athletes with high stress and anxiety (10, 11). Lopez-Garrido and Holden et al. furthered the data by providing results of how students perceive their locus of control on their lives and the external factors (12, 13). Finally, Madrigal and Pascoe researched the impact of stress on student-athletes (14, 15).

Based on these results, students believe that they must balance academics and athletics to achieve the minimum academic standard required for athletics participation. Many studies focus on the stress of university athletes trying to balance a dual career, but they overlook the factor of the time consumption of balancing these sports (1). Armani Davis researched the imbalance between academics and athletics. In her conclusion, Davis found that student-athletes had higher stress because they could not balance their career due to time constraints (16). Students who do not meet the requirements have an imbalance in their schedule by favoring sports over their academics, which could pull them off the team. Collegiate athletes were more committed to their sports than academics and did not assume self-accountability for these academics leading to the imbalance of their dual careers. Davis implied that university players gain more stress and lose motivation from the pressure of balancing their academic and athletic careers, and provided the critical study that would influence the movement of our project (16). Another study by Morgan Lehman found that D2 football players had many struggles balancing their education and athletics (17). Lehman offers a corroborative standpoint for Davis to discuss the different results in balancing academics and athletics by describing how other collegiate athletes have trouble balancing their academics and athletics (17). The imbalance among students will result in obstacles that prevent athletes from pursuing their degrees and getting opportunities in their desired fields. Students must keep their academics above a certain level to participate in their selected sport. The imbalance in their education and athletics will put their dual careers at risk and cause increased stress and lower motivation (1).

Many questionnaires analyzed how much stress student-athletes feel balancing academics and athletics. Marouf et al. explain how the Sheldon Cohen Perceived Stress Scale (PSS) provides valuable information that compares students

(18, 19). They found that extroverted people tend to get moderately stressed, while introverted people tend to have lower stress. In the data collection, they also found that 30 people responded with low stress, 18 with high stress, and 114 with moderate stress (18). There is a noticeable difference between university players in academics and those balancing both sports and academics. Another questionnaire that investigates the difference between participants is the Student-Athlete Motivation Toward Sports and Academics Questionnaire (SAMSAQ) (20). While using this survey in Italy, Corrado Lupo et al. found that collegiate students' motivation was affected by gender, age, competition level, type of sport, educational area, and year of attendance (20). For example, researchers found that collegiate athletes spent 34 hours per week on athletics and an additional 38.5 to 40 hours per week on academics (20). Time management helps students manage their time efficiently, but it seems that most student-athletes need more motivation to continue their careers of earning their degrees and championships (21). The questionnaires' data collection implied that collegiate athletes feel higher stress and lower motivation than regular collegiate athletes.

Even though a select number of studies focus on athletes of all different ages, there needs to be more studies focused on high school students and their motivation and stress when balancing academics and athletics. Our research added to the gap of high school students in the discussion of all student-athletes. Even though there is a distinct association between high-level classes and athletics at the collegiate level, that avenue still needs to be discovered in high school students. High-level courses are usually composed of four or more "AP" or "Honors" classes. Ultimately, the focus of 10th, 11th, and 12th graders in this research was to explore the amount of stress and motivation in high-level performing high school student-athletes.

Our study focuses on the imbalance of high-performing students' stress and motivation levels in a high school, something widely understudied by many researchers. For our study, high-performing or high-level students are those with four or more AP/Honors courses since most students in the selected high school will take three or fewer throughout their sophomore, junior, and senior years. For our investigation, it was crucial to understand to what extent motivation impacts high-level high school students and their ability to balance the stress of academics and athletics. We observed students from 10th, 11th, and 12th grade from a single high school. Based on data from previous studies, our hypothesis was that if students have more high-level classes, then students will have more stress and less motivation to balance their dual careers in high school. Though some say specific stress and motivation are beneficial for students, some stress is unhealthy and could harm students, especially developing high schoolers. For our study, the stress described is unhealthy and can have negative effects on high school student-athletes. Motivation, on the other hand, is what drives student-athletes to keep up with demanding activities, even though it can be very challenging at times.

RESULTS

Questionnaires were distributed to 10th, 11th, and 12th graders to complete in their English classes. The exclusion of 9th graders was necessary for this research because of their lower involvement in higher level classes and varsity sports. Because of this, there is a more likely chance of biasing the data towards lower stress and high motivation. All responses calculated for each questionnaire returned the sum for each student. For the SAMSAQ, composite scores from 30 to 80 indicate low motivation, 81 to 130 indicate moderate motivation, and 131 to 180 indicate high motivation. For the PSS, a score from 0 to 13 indicates low stress, from 14 to 26 indicates moderate stress, and from 27 to 40 indicates high stress. Then, based on the low, moderate, and high motivation or stress ranges, each student was labeled with their range and sorted together. We compared the selected high school students as a whole and in their individual grades.

We looked at SAMSAQ and PSS levels in 12th graders. The expected means for the SAMSAQ and PSS were 108.71 ± 8.59 and 18.5 ± 7.27, respectively (**Figure 1**). Using the data collected, we determined that the value representing motivation significantly differed from the expected value (p = 7.532 x 10-9). We also determined that the value representing stress was not significantly different from the expected value (p = 0.471) (**Table 1**).

Additionally, we looked at 11th grade, 10th grade, and all students combined. The expected means for 11th graders were 110.97 ± 9.53 and 17.32 ± 7.39, respectively (**Figure 2**). We determined that the value representing motivation significantly differed from the expected value (p = 6.634 x 10-19). We also determined that the value representing stress was not significantly different from the expected value (p = 0.0567) (**Table 1**). For 10th grade, the expected means for the SAMSAQ and PSS were 115.83 ± 10.04 and 23.33, respectively. (**Figure 3**). We determined that the value representing motivation significantly differed from the expected value (p = 2.21 x 10-8) (**Table 1**). Also, we determined that the value representing stress was not significantly different from the expected value (p = 0.278) (**Table 1**).

For all the students, the expected means for the SAMSAQ and PSS were 111.44 ± 9.57 and 18.88 ± 8.20, respectively (**Figure 4**). We determined that the value representing the motivation was significantly different from the expected value (p = 3.329 x 10-35) (**Table 1**). We also determined that the
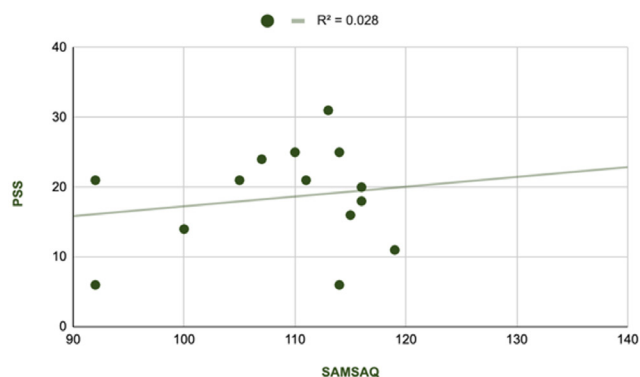

Figure 1. No Correlation Between SAMSAQ and PSS for 12th Grade Students. SAMSAQ and PSS scores of all 12th graders that were qualified and met the requirements to fit in this study. No correlation was observed between motivation and stress (R^2 = 0.028).

	12th Grade		11th Grade		10th Grade		10th-12th Grade	
	SAMSAQ	PSS	SAMSAQ	PSS	SAMSAQ	PSS	SAMSAQ	PSS
Average	108.714	18.5	110.968	17.3	115.833	23.3	111.439	18.9
SD	8.59	7.27	9.53	7.39	10.04	10.13	9.57	8.2
T-Test	14.154	-0.74	20.679	-1.99	14.083	1.14	28.732	-1.03
P-Value	7.5×10^{-9}	0.47	6.6×10^{-19}	0.05	2.2×10^{-8}	0.28	3.3×10^{-35}	0.31
Significant	Yes	No	Yes	Yes	Yes	Yes	Yes	No

Table 1. Final average results of each individual grade and all participants together. Average value for either the SAMSAQ or the PSS. T-tests were conducted against expected values of 75 and 20 for the SAMSAQ and PSS, respectively. SD = standard deviation.

value representing stress was not significantly different from the expected values (p = 0.3058) (**Table 1**).

The p-values for the SAMSAQ and PSS were calculated to reject or accept the hypothesis. All values were stored in **Table 2** for a clearer representation of the stated values, comparing the grades and the levels for the PSS and SAMSAQ (**Table 1**). This was necessary when making the comparison between individuals and grades.

DISCUSSION

Our study sought to understand to what extent motivation impacts high-level high school students and their ability to balance the stress of academics and athletics. Overall, we added all the values up, and the total showed that each grade's mean landed in moderate motivation and moderate stress; all the students' mean also landed in moderate motivation and moderate stress. These two means lands in the middle category of both scales, implying no strong association, based on our findings, between motivation and stress within the selected high school and specific grades at this school. While our study's inconclusive results show no direct association between academics and athletics, it can offer insight for other researchers exploring this topic. Even though we focused on just the stress and motivation of high school students balancing high-level academics and athletics, we did not consider the different factors that could change the results of our study. There could be several other factors such as peer pressure and family stress that may affect motivation and stress in student-athletes.

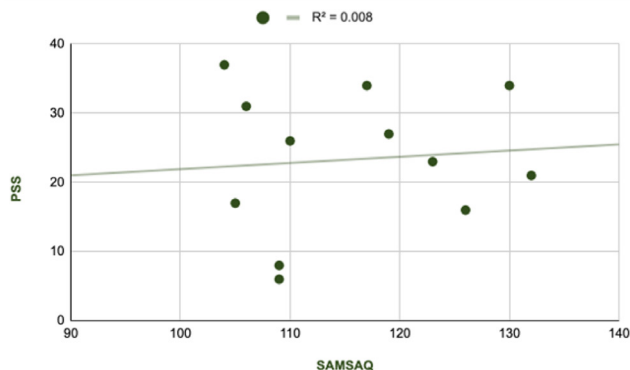Our original hypothesis was that higher motivation

Figure 2. No Correlation Between SAMSAQ and PSS for 11th Grade Students. SAMSAQ and PSS scores of all 11th graders that were qualified and met the requirements to fit in this study. No correlation was observed between motivation and stress (R^2 = 0.001).

leads to less stress, and lower motivation leads to more stress. However, our results did not provide support for this hypothesis. Even though our study only included students in varsity-level sports and those who take four or more Honors/AP-level classes, we cannot determine a clear relationship between stress and motivation in these high-performing student-athletes. However, we can assume that there is an underlying message for all researchers: the study of motivation and stress that affect students is developing as new studies unfold. We can add new research to the discussion of balancing academics and athletics. Our research focuses on high school students at the selected high school. While this cannot apply to every other high school in the US, we can introduce new research on high school students to fill in the gap of this topic.

Many limitations have affected our study and other completed studies. Initially, we expected many 10th, 11th, and 12th graders to respond to our survey. However, many 10th graders had to be removed from the list because they did not play a varsity-level sport or did not have four or more AP/Honors classes. Additionally, many 12th graders did not respond, so there was bias in the results because of nonresponse. This limited number of participants changed

Figure 3. No Correlation Between SAMSAQ and PSS for 10th Grade Students. SAMSAQ and PSS scores of all 10th graders at Selected High School that were qualified and met the requirements to fit in this study. No correlation was observed between motivation and stress (R^2 = 0.008).
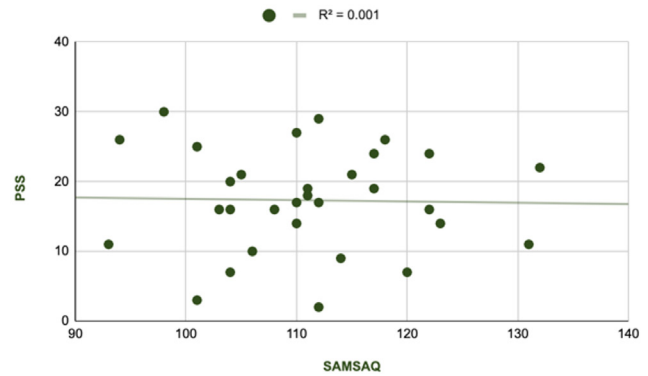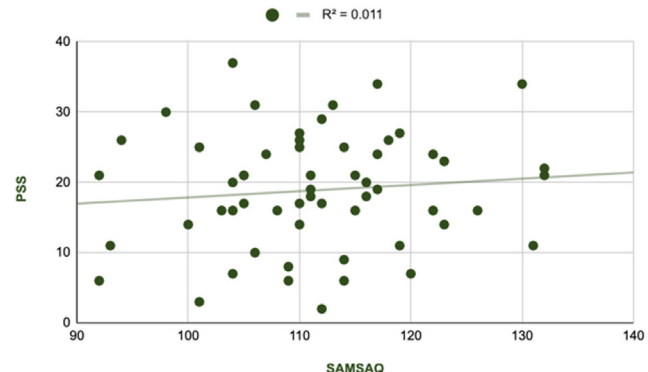

Figure 4. No Correlation Between SAMSAQ and PSS for Students in all Grades. SAMSAQ and PSS scores of all qualified students at Selected High School that met the requirements to fit in this study. No correlation was observed between motivation and stress (R^2 = 0.011).

Sampling Cohort	10th	11th	12th
# Queried	~150	~150	~150
# Responded	12	31	14
Female : Male	4 : 8	13 : 18	7 : 7

Table 2. Sampling cohort. Due to some limitations in the method, certain factors like the number of AP/Honors classes, the number of sports played, and limiting the survey to certain students caused a lower number in the actual data that was counted towards the study.

the result; for example, the average for motivation and stress levels could be higher or lower than the average we got from our data. Besides the number of participants, our study did not adjust for certain factors that could affect the motivation and stress of players. Stress can fluctuate more because of the resources available to student-athletes with stress. These effects can positively or negatively affect the results found in our study. The time students are analyzed also affects how the students perceive motivation and stress. If university players believe they have more on their plate, it can increase their perceived stress, while those with less can perceive less stress. This factor significantly impacts stress and motivation levels and can provide a different result that could show a correlation. Additional factors may include peer pressure, personal or family problems, and responsibilities outside academics and athletics (e.g., work). Even though we did not include factors like stress interventions, when students were given the survey in our study, we expanded on the gap between high school students. We focused on high schoolers and their motivation to balance the stress of their dual careers in academics and athletics. Finally, we based our study on the assumption that more motivated people tend to have less stress. However, on a broader scale, this may not hold true, and therefore we cannot specifically select one factor that shows the correlation between stress and any other factors.

Future research in this field should control other factors that could affect stress and motivation for both high school and collegiate athletes. Removing these factors may clarify the correlation between stress and motivation for student-athletes. If we find out that there is no correlation between the two, then we can study other factors to find causes of higher stress and lower motivation. This research can take in-person interviews with athletes to understand and witness their stress or attitudes first-hand. In these consultations, psychologists, or those who study non-verbal expressions, can observe how students react to certain statements or questions that discuss their stress and motivation. In studies that move to eliminate variables, these interviews can include questions about anxiety, depression, or other mental health or physical factors that can change students' perspectives. Additionally, these interviews are personalized and can help students in both a broad and narrow sense by understanding that others have the same problems and that there are people here to help.

Freshmen can be tested for this experiment but were not for multiple reasons. In this selected high school, freshmen have fewer Honors classes and no AP classes nor play a varsity-level sport. However, future research could make a major change by collecting data from those who do not have four or more AP/Honors classes or do not play a sport. A change like this increases the number of participants,

bringing the significance level to a higher degree. Another way to narrow the results is to account for different factors: gender, age, number of hours that they play their sport, number of hours they spend on homework, etc. Finally, a key factor to consider for studies like this would be to have a control group. This group would be the baseline to help see if there is an association or correlation between stress and motivation for students who play no sports, some sports but are not considered student-athletes, and student-athletes heavily involved in their respective sports. In addition, there could be changes made to obtain information about specific levels of sports such as Freshmen and Junior Varsity and the impact on those student-athletes.

Further research can investigate the similarities and differences between high school and collegiate athletes and may assist researchers, coaches, parents, and students in finding support systems that can benefit students. With more studies examining the results and their potential solutions, we can focus on helping student-athletes improve their mental and physical health.

METHODS AND MATERIALS
Participants

For our study, we surveyed students who participated a varsity-level sport and four or more Honors/AP classes. Due to the constraint of the course load, we exempted freshmen, as they are usually not allowed to have AP classes and most often play on freshmen teams.

The sampling cohort in this project included students from 10th, 11th, and 12th grade. There were roughly 120 students in each grade, for a total of around 360 14 to 18-year-old students. All students who participated in this research played one or more of the following sports: cross country, cheerleading, field hockey, football, soccer, volleyball, basketball, ice hockey, ski, swim, track, wrestling, baseball, golf, lacrosse, softball, or tennis. Out of the possible 360 students, only a total of 108 students responded to the survey. Out of that 108, only 57 matched the requirements of the study and were counted in the results (**Table 2**).

To reach all 360 students, we sent an email with survey to all English teachers to distribute in their 10th, 11th, and 12th-grade classes (**Appendix A**). English is a core class that every student takes each school year. By making English classes our target, we isolated students and ensured no repeats in the surveys.

Questionnaires

All respondents answered the questions from the PSS and the SAMSAQ. In the PSS, students answered questions about the frequency which they experience certain situations with a number from zero to four, corresponding to low to high frequency, respectively (22, **Appendix B**). After students replied to the ten statements, the results were analyzed and measured on a scale to show if the student had low, moderate, or high perceived stress (22).

To assess student-athletes' motivation, we used a modified SAMSAQ that excluded college degree selection, pursuit, and acceptance (**Appendix C**). The SAMSAQ uses a six-point Likert Scale, one being "very strongly disagree" and six being "very strongly agree" (10).

Collecting Data

For the survey, each participant completed both questionnaires included in the form. At the beginning of the form, students consented to the questionnaire. After that, student-athletes needed to specify if they have four or more Honors/AP classes and if they play a varsity-level sport. If a participant replied no to either question, it automatically submitted and completed the survey. We decided to exempt those not considered high-performing student-athletes from the study for this reason. On the other hand, if a participant replied yes to both eligibility questions, the survey displayed the SAMSAQ and the PSS questionnaires, and students submitted their scores at the end.

Storing

The Google spreadsheet stored the data collected from the surveys. For each response, we marked a time stamp, followed by each student's email and their answers to the survey (**Appendix D**). In the form, we required the submission of their name and email to prevent repeat responses. Additionally, we changed the spreadsheet only to have the scores and removed student emails once everyone responded to ensure participants remain anonymous.

Calculating Data

The scores obtained in reversed responses on select questions, where 0 = 4, 1 = 3, 2 = 2, 3 = 1, and 4 = 0, changed the total score of the PSS. These questions were four positive statements that participants answered. For the individual scores, the total PSS can range from 0 to 40, with higher numbers meaning higher stress.

Analysis

All data collected from these surveys were examined individually and as a whole. We compared students individually within grades and the school. We looked at the different scores from the PSS and the SAMSAQ. Because the questionnaires focused on two separate factors, we could not predict that one score would be lower or higher based on the other. However, we placed each point on a graph and tried to find a correlation, especially between grades. To calculate each score, we added the numbers based on the respective scale into a collective score and placed each value on a motivation versus stress graph. The comparison between grades illustrated how students differed between levels. Initially, we predicted that juniors would have more stress and less motivation than sophomores because of the more significant coursework load. On the other hand, seniors are likely to have more stress and motivation because they are completing their college essays and applications. The higher motivation came from seniors who put much effort into attending their dream college. Looking at individual scores and grade distinctions allowed me to compare students from various English classes.

In addition to the association, we conducted four t-tests to compare the expected and sample mean to see if the data collected was by chance or if there was significant data to pull from the research, using Cronbach's alpha of 0.1. Using the calculator, we conducted these four total t-tests using the sample mean, expected mean, standard deviation, and the number of students. Each test was conducted for 10th, 11th, and 12th grades individually. We conducted an additional t-test to compare all students to the expected means of both stress and motivation (**Table 2**). We used p-values of the data collected to see if it was significant to reject the null hypothesis that students would have less motivation if they played more sports and had more AP/Honors courses.

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APPENDIX

Appendix A: Email Sent to Teachers

My name is Manasvi Shah, and I am an AP Research student. For my school-year project, I am conducting research on the stress and motivation levels of high-level high-performing student-athletes in MLHS. These students include varsity-level members with 4 or more AP/Honors level classes.

English is a core class taken by every student in the school and is the scope of my study. I was hoping you could take this link: https://forms.gle/E7B1gEzenXUjvuVE8 and post an announcement in your classes for students to take. The courses that I would like to have answered the form are: English 10, English 10 Honors, AP Seminar, English 11, English 11 Honors, AP Language and Composition, English 12, English 12 Honors, and AP Literature and Composition.

This should take about 5 - 10 minutes for students to answer and if students do not wish to participate, they can opt out without any penalty. I wish to get responses by February 10th to have sufficient time to make up for obstacles such as not having enough responses.
Please let me know if you can do this for me. Thank you!

Appendix B: SAMSAQ Full Questionnaire

1. I am confident that I can achieve a high-grade point average this year (3.0 or above).
2. Achieving a high level of performance in my sport is an important goal for me this year.
3. It is important for me to learn what is taught in my courses.
4. I am willing to put in the time to earn excellent grades in my courses.
5. The most important reason why I am in school is to play my sport.
6. The amount of work required in my courses interferes with my athletic goals.
7. I will be able to use what is taught in my courses in different aspects of my life outside of school.
8. I chose to play my sport because it is something that I am interested in as a career.
9. I have some doubts about my ability to be a star athlete on my team.
10. I chose (or will choose) my major because it is something I am interested in as a career.
11. Earning a high-grade point average (3.0 or above) is not an important goal for me this year.
12. It is important to me to learn the skills and strategies taught by my coaches.
13. It is important for me to do better than other athletes in my sport.
14. The time I spend engaged in my sport is enjoyable to me.
15. It is worth the effort to be an exceptional athlete in my sport.
16. Participation in my sport interferes with my progress towards earning a college degree.
17. I get more satisfaction from earning an "A" in a course toward my major than winning a game in my sport.
18. During the years I compete in my sport, completing a college degree is not a goal for me.
19. I am confident that I can be a star performer on my team this year.
20. My goal is to make it to the professional level or the Olympics in my sport.
21. I have some doubt about my ability to earn high grades in some of my courses.
22. I am confident that I can make it to an elite level in my sport (Professional/Olympics).
23. I am confident that I can earn a college degree.
24. I will be able to use the skills I learn in my sport in other areas of my life outside of sports.
25. I get more satisfaction from winning a game in my sport than from getting an "A" in a course toward my major.
26. It is not important for me to perform better than other students in my courses.
27. I am willing to put in the time to be outstanding in my sport.
28. The content of most of my courses is interesting to me.
29. The most important reason why I am in school is to earn a degree.
30. It is not worth the effort to earn excellent grades in my courses.

Appendix C: Sheldon Cohen Perceived Stress Scale Full Questionnaire

1. In the last month, how often have you been upset because of something that happened unexpectedly?
2. In the last month, how often have you felt that you were unable to control the important things in your life?
3. In the last month, how often have you felt nervous and "stressed"?
4. In the last month, how often have you felt confident about your ability to handle your personal problems?
5. In the last month, how often have you felt that things were going your way?
6. In the last month, how often have you found that you could not cope with all the things that you had to do?
7. In the last month, how often have you been able to control irritations in your life?
8. In the last month, how often have you felt that you were on top of things?
9. In the last month, how often have you been angered because of things that were outside of your control?
10. In the last month, how often have you felt difficulties piling up so high that you could not overcome them?

Appendix D: All Scores from the Study

Grade	SAMSAQ	PSS
10	104	37
10	105	17
10	106	31
10	109	8
10	109	6
10	110	26
10	117	34
10	119	27
10	123	23
10	126	16
10	130	34
10	132	21
11	93	11
11	94	26
11	98	30
11	101	3
11	101	25
11	103	16
11	104	16

Grade	SAMSAQ	PSS
11	104	7
11	104	20
11	105	21
11	106	10
11	108	16
11	110	14
11	110	17
11	110	27
11	111	18
11	111	19
11	112	2
11	112	17
11	112	29
11	114	9
11	115	21
11	117	19
11	117	24
11	118	26
11	120	7

Grade	SAMSAQ	PSS
11	122	16
11	122	24
11	123	14
11	131	11
11	132	22
12	92	21
12	92	6
12	100	14
12	105	21
12	107	24
12	110	25
12	111	21
12	113	31
12	114	6
12	114	25
12	114	20
12	115	16
12	116	18
12	119	11

Table S1. All sampling values. Shading represents low, moderate, and high levels for the respective categories. Lighter shades represent low while darker shades represent high. For better comparison, the table grouped each grade level together.