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Examining Classroom Learning Behaviors and Academic and Athletic Motivation in Collegiate Athletes

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College student-athletes balance the demands of both sport and school in the context of higher education; high levels of motivation are necessary for success in both spaces. Studies have evaluated learning styles and academic motivational outcomes in college student athletes but there is a need to explore how motivation impacts both academic and athletic success. The present study examined the relationship academic, student athletic, and career athletic motivation had with learning styles and major (STEM vs. non-STEM) using Self-Determination Theory as the theoretical lens. College Division I, II, III, and Club college athletes took the Grasha-Reichmann Student Learning Style Scale and Student Athletes Motivation toward Sports and Academics Questionnaire. Learning styles were grouped into intrinsic (independent, participant, and collaborative) and extrinsic (dependent, avoidant, and competitive) styles. There were positive relationships between intrinsic learning style and both student athletic ($r(147) = .19$, $p = .02$) and academic ($r(147) = .30$, $p < .001$) motivation. Extrinsic learning style was positively correlated with career athletic ($r(147) = .27$, $p = .001$) and student athletic ($r(147) = .16$, $p < .05$) motivation but negatively corelated with academic motivation ($r(147) = -.17$, $p = .03$). Athletes in STEM majors ($M = 3.88$, $SD = 0.36$) had significantly higher academic motivation than non-STEM majors ($M = 3.66$, $SD = 0.40$), $t(182) = 3.85$, $p < .001$. Athletes in non-STEM majors ($M = 4.00$, $SD = 0.88$) had significantly higher career athletic motivation than STEM majors ($M = 3.56$, $SD = 0.91$), $t(182) = -3.29$, $p = .001$. Findings suggest being more independent, participant, and collaborative in class is related to motivation both in school and in student athletic endeavors. Athletes pursuing a STEM major may show higher academic motivation than athletes pursuing non-STEM majors. Encouraging student-athlete learning autonomy via education/intervention could improve intrinsic motivation in sport and classes, though further exploration of these factors is necessary to fully understand their relationship in college student-athletes.

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When it comes to motivation, self-determination theory (SDT) consists of three basic psychological needs: autonomy (the ability to self-govern), competence, (feeling capable of doing a task) and relatedness (feeling supported by or connected to others; Ryan & Deci, 2020). Deci & Ryan (1985) also describe SDT as being comprised of two categories of motivation: intrinsic motivation (the inherent enjoyment of a task) and extrinsic motivation (performing a task that leads to a separable outcome). While there are various subcategories of intrinsic and extrinsic motivation, as they exist on a continuum (Ryan & Deci, 2000), the consensus is fostering intrinsic motivation is most important for human development (Ryan & Deci, 2020). In the present study, SDT is used as the guiding framework for understanding classroom learning behaviors and motivational outcomes across contexts. Specifically, this study examines learning approaches in academic and athletic domains in college student-athletes.

Literature Review

Motivation in Academia

Some argue the primary focus of education should be on developing intrinsic motivation in individuals (Niemiec & Ryan, 2009). Motivation to perform well is often associated with the term "achievement motivation"; however, Anderman (2020) notes the translation from research on achievement motivation to educational policy change needs to be more deliberate. Though many educators will support the argument that intrinsic motivation is important for student learning, the implementation of tools and strategies that facilitate more effective learning is an area that needs to be more explicitly addressed. Researchers have examined constructs like grit (i.e., perseverance of effort and consistency of interest) and intrinsic versus extrinsic motivation in long-term, challenging tasks (Karlen et al., 2019). Results indicated significance of student intrinsic motivation with regards to academic achievement and that educators can play an important role if the student needs external support. Tempelaar et al. (2015) explored the impact effort beliefs have on achievement goals and academic motivations. The study of first-year business and economics students in the Netherlands found effort belief constructs are powerful mediators when it comes to intrinsic and extrinsic motivation in academic achievement settings. Calderon et al. (2020) explored the relationship between intrinsic motivation and academic achievement in pre-service physical education teachers. They found a positive correlation between "active" factors such as perceived competence and interest/enjoyment of the subject material and academic motivation, while there was a negative correlation between "non-active" factors such as pressure/tension and academic achievement. This connection to competence, a key psychological factor that aligns with SDT, supports the notion that intrinsic learning strategies are beneficial for academic achievement. These studies demonstrate that multiple factors can contribute to motivation in academia; the connection to athletics and learning is a potential avenue to continue this exploration.

Motivation and Athletics

Just as with academics, motivation is a key component to creating success in athletic environments. Duda's (2004) efficacy of goal setting study explored the motivational implications of setting process, performance, and outcome goals, concluding that task-involving goal setting is the category that results in highest motivational gain. Adapted sports athletes were found to have higher life satisfaction if their psychological needs from SDT were met, indicating that there are positive outcomes associated with intrinsic motivation in multiple sport populations (Domingues et al., 2022). These studies examined various tools for and predictors of higher athletic motivation; however, there is evidence that context-specific learning is required to have the desired effect on intrinsic motivation (Wang et al., 2018). Therefore, research could benefit from understanding learning approaches and the way that learning principles are connected to motivational outcomes in both academics and athletics.

Learning Styles

Understanding academic learning is often connected to individuals possessing a learning style; however, heavy reliance on learning styles has been criticized. A content analysis on 20 introduction to education and educational psychology textbooks found that most introduction to education textbooks took a positive approach to learning styles, while most educational psychology textbooks took a neutral or negative stance (Wininger et al., 2019). Additionally, about half of the textbooks defined learning style as a students' favored approach to learning, while the other half defined it as a student's modality preferences (Wininger et al., 2019). The definition of learning style used in this study follows the "favored approach to learning" (Wininger et al., 2019, p. 234) interpretation of the term; this definition shifts focus from learning style being innate to being teachable, learnable behaviors.

There is a preconceived notion that identifying with a "dominant" learning style and matching teaching methods to that style is an effective approach for learning intervention, when in fact, there is little empirical support for this claim (Newton & Miah, 2017). Explicit categorization fails to account for multiple, intersecting, underlying mechanisms of learning that could influence motivational outcomes. For the sake of the present study, it is important to view learning as a continuum where individuals can lean on multiple approaches to achieve success. The Grasha-Riechmann Student Learning Style Scale (GRSLSS) aligns with this multifaceted approach; the six learning style subscales can have varying strengths, and individuals can be strong or weak in multiple areas simultaneously. The GRSLSS styles are independent (e.g., having confidence in one's own learning abilities), avoidant (e.g., lacking enthusiasm about class), collaborative (e.g., sharing ideas and talents with others), dependent (e.g., relying on authority for learning direction), competitive (e.g., wanting to outperform others in the class), and participant (e.g., taking initiative and actively engaging with material). The definitions of these learning styles align well with the intrinsic and extrinsic motives characteristic of SDT. Ryan and Deci (2000) specify that in education, classroom conditions should allow students to feel connected (relatedness), effective (competent), and agentic (autonomous) in learning skills to

strengthen intrinsic motivation. The independent, collaborative, and participant style items indicate confidence in abilities and social interactions, which are common characteristics associated with intrinsic motivation. The dependent, competitive, and avoidant style items show an unwillingness to engage in classroom practices without a separable outcome to influence the individual, aligning more with the definition of extrinsic motivation.

Application of the GRSLSS learning style scale has yielded useful results in academic contexts. Asci et al. (2016) found the avoidant learning style was associated with lack of note-taking skills in pharmacology students, and the collaborative learning style was most common in these higher-education learners. Employing team-based learning strategies influenced kinesiology students' styles after four semesters of class, resulting in decreased avoidant and dependent and increased participant learning style alignments (Meeuwsen et al., 2005). Both studies illustrate that learning style, defined as the approach one takes to learning skills/material, is not a fixed characteristic in individuals and are associated with teachable, skill-related behaviors. Moving forward, research can apply this learning style model to the intersection of academic and athletic contexts and provide additional insights on college student-athlete learning behaviors.

Student-Athlete Learning and Motivation

Student-athletes are a unique population that experience the intersection of learning, academic motivation, and athletic motivation directly. Duda and Nicholls (1992) were some of the first researchers to examine achievement motivation dimensions in both schoolwork and sport. Their study showed that task-orientation was the main predictor of satisfaction in schoolwork. Curry et al. (1997) examined hope as a motivational factor in collegiate athletes and nonathletes from the same university, finding that athletes had higher levels of hope than nonathletes. This shows that motivational factors may differ between athlete and nonathlete populations, demonstrating a need to study academic motivation specifically in student-athletes to better understand factors that influence their willingness to succeed in the classroom. Lucas and Lovaglia (2008) evaluated student-athletes' expectations for success in athletics compared to academics, and overall, the athletes were less motivated to perform academically compared to the nonathlete control group. Addressing these deficits in academic motivation in college athletes can benefit the overall development of student-athletes. When Gaston-Gayles (2004) developed the Student Athlete's Motivation Toward Sports and Academics Questionnaire (SAMSAQ) as a means of measuring academic motivation, student athletic motivation, and career athletic motivation, there was a shift to examining motivation in multiple areas simultaneously. This prompted more researchers to study student-athlete motivation with both academic and athletic motivation in mind. Using the SAMSAQ, Tudor & Ridpath (2018) examined perceived motivational climate and motivation, discovering a task-involved climate in sports predicted both high sport motivation and high academic motivation. Continued application of the SAMSAQ with different constructs can contribute further to research on relationships connected to college student-athlete motivation.

Student-Athlete Majors

Early studies on student-athlete majors examined degree aspirations and degree attainment in collegiate football, men's basketball, and other intercollegiate players (Briggs, 1996). Though it is interesting in this Briggs (1996) paper that football and basketball athletes had lower degree aspirations than their athlete counterparts, the degree that these athletes were pursuing was not specified. Studies that examine specific majors of college student-athletes may be more useful in understanding major trends. More recent literature surrounding college student-athlete majors focuses on academic clustering (i.e., situations where members of the same team pursue the same major; Fountain & Finley, 2011). In Fountain and Finley's (2011) longitudinal study, there was evidence of many DI football players, and mostly minority players, migrating to a specific set of academic majors as they progressed through college. This may be because of interference between athletic and academic demands such that the athlete is not capable of pursuing a degree with strict academic requirements or time-intensive coursework, but more evidence is needed to fully support this claim. Foster & Huml's (2017) study offers a potential explanation for choosing a major unrelated to career goals; their study found college student-athletes who factored athletic responsibilities into their major choice also had stronger levels of athletic identity. This places a higher responsibility on athletic counselors to inform athletes of other opportunities beyond sport to ensure that career path is also considered when choosing a major. Evidence from existing literature supports the notion that academic/student affairs professionals can influence student-athletes' major selection process (Navarro 2015). A closer examination of student-athlete major groupings could provide interesting insights, informing academic professionals about which athletes could use more guidance in choosing their major. Comparing the type of major (i.e., STEM vs. non-STEM) is a novel avenue that could provide new insights to differences in academic motivation among student-athlete groups.

Purpose

College student-athletes must balance the demands of high-level sport with the rigorous demands of higher education. Though the research on academic motivation, athletic motivation, and learning styles is abundant separately, little research has been dedicated to their intersection as it relates to the life of college athletes. Student-athletes perform in an environment where these three principles overlap, justifying a need to examine this population. Literature suggests teaching format and learner preferences should match (Awla, 2014), but more can be done to understand what behavioral adjustments learners should make to facilitate more effective classroom learning. Similar principles can be found in athletic settings. When studying leadership styles and classroom climate on learning motivation for a basketball class, Jiang and Jia (2017) found leadership styles such as individualized leadership, charismatic leadership, and intellectual stimulation had a positive effect on intrinsic motivation for student learning. Again, adjustments can be made to facilitate intrinsic motivation and learning, but the nuances of how to accomplish this need further study. There are few studies addressing the intersection of a student-athlete's major

with their motivation, but a deeper understanding of major choice could provide insight on groups of student-athletes that could benefit from additional supports. The present study aims to address these gaps.

The purpose of this study was to examine relationships between the learning style behaviors of college athletes and their levels of motivation in their sport and the classroom. The term "learning style" is operationally defined as "favored approaches to learning" (Wininger et al., 2019, p. 234) as aligned with the GRSLSS subscales and thus reflects the classroom learning behaviors of the college student-athletes being studied. Researchers explored the following question: Is there a relationship between learning style and academic, student-athletic, and career athletic motivation?

It was hypothesized that athletes with strong independent, collaborative, and participant learning style scores have a positive correlation to academic, student athletic and career athletic motivation, namely because of the alignment of these learning style behaviors with the intrinsic motivation component of SDT (Hypothesis 1). Conversely, it was anticipated the athletes with strong dependent, avoidant, and competitive learning style scores have a negative correlation to academic, student athletic, and career athletic motivation due to these styles' alignments with the extrinsic motivation component of SDT (Hypothesis 2). With regards to student-athlete majors, it was hypothesized that athletes pursuing a STEM major (e.g., those pursuing a BS) demonstrate higher academic motivation than athletes who are in non-STEM majors (e.g., those pursuing a BA; Hypothesis 3).

Methods

Participants

Using a G-power analysis for a correlation and a medium effect size of .30 at a probability of $p < .05$, the goal was to obtain responses from 130 athletes across a variety of sports and institutions. A total of $N = 257$ individuals started the survey. After removing the cases that did not consent to participate or were not eligible (i.e., those under 18), there were a total of $N = 234$ participants with some valid data. The age range of the participants was between 18-31 years old ($M = 19.88$, $SD = 1.91$). The gender distribution was 55% women, 43% men, and 2% identifying as non-binary/third gender. Over half of the participants identified as Caucasian (56%), with five other races represented. Twenty-nine percent of the participants identified as Hispanic/Latinx. A majority (77.4%) of the participants attended the same southwestern Division I academic institution, with 10 other institutions also being represented within the sample. The most common academic classification among participants was freshman at 37%. Baseball players had the largest representation by sport at 25%, followed by water polo at 14% and volleyball (indoor and/or beach) at 10%. There were 16 other sports represented. Most of the participants (61.5%) competed at the Division I level, though Division II, III and club athletes were also represented. Self-reported GPA ranged from 1.20-4.40 with an average GPA of 3.43. A comprehensive breakdown of the demographics can be found in Table 1.

Table 1
Demographic Information

	n	%
Age		
18	68	29.1
19	46	19.7
20	26	11.1
21	41	17.5
22	25	10.7
23	7	3.0
24	5	2.1
26	1	.4
27	1	.4
31	1	.4
Gender		
Men	101	43.2
Women	129	55.1
Non-binary / Third Gender	4	1.7
Race		
Black or African American	8	3.4
Caucasian	132	56.4
Asian	20	8.5
Native Hawaiian or Pacific Islander	2	.9
Other	26	11.1
Prefer not to state	12	5.1
Multiple Selected	30	12.8
Ethnicity		
Hispanic/Latinx	68	29.1
Not Hispanic/Latinx	146	62.4
Prefer not to state	9	3.8
Year in School		
Freshman	87	37.2
Sophomore	26	11.1
Junior	43	18.4
Senior	37	15.8
5th Year Senior	12	5.1
6th Year Senior	1	.4
Graduate Student	13	5.6

Sport		
Baseball	59	25.2
Soccer	20	8.5
Volleyball (Indoor, Beach)	24	10.3
Rugby	14	6.0
Track and Field/XC	13	5.6
Water Polo	34	14.5
Basketball	5	2.1
Archery	16	6.8
Multiple Sports	4	1.7
Swimming	4	1.7
Softball	8	3.4
Football	1	.4
Karate	1	.4
Golf	2	.9
Tennis	2	.9
Bowling	1	.4
Gymnastics	1	.4
Equestrian	2	.9
Fencing	1	.4
Ice Hockey	1	.4
Lacrosse	1	.4
Sport Level		
Division I	144	61.5
Division II	23	9.8
Division III	2	.9
Club	47	20.1

Measures

Motivation

The SAMSAQ was used to assess both academic and athletic motivation in the student-athletes. The questionnaire consists of three subscales: academic motivation (16 items), student athletic motivation (8 items), and career athletic motivation (5 items). Each of the items contains a statement the athlete rates on a 6-point Likert scale. The scale ranges from very strongly disagree (1) to very strongly agree (6). One of the items in the academic motivation subscale is "I am willing to put in the time to earn excellent grades in my courses." An example of a student athletic motivation item is "It is important for me to do better than other athletes in my sport." For the career athletic motivation subscale, one of the items is "My goal is to make it to the professional level or the Olympics in my sport." The mean subscale scores were calculated to evaluate the athlete's academic, student athletic, and career athletic motivation. Previous studies have determined the scale has internal consistency (Gaston-Gayles, 2005). In the current study, Cronbach's alpha for the academic motivation subscale was .50, for student athletic motivation was .64, and for career athletic motivation was .59.

Learning Styles

The GRSLSS was used to assess attitudes and feelings towards the courses that each athlete is taking at their institution. The scale consists of 60 statements that participants rate on a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5). Each item in the scale corresponds to one of the following learning style dimensions: independent (i.e., "I am confident in my ability to learn important course material"), avoidant (i.e., "I often daydream during class"), collaborative (i.e., "The ideas of other students help me to understand course material"), dependent ("Teachers should tell students exactly what material is going to be covered on a test"), competitive (i.e., "Students have to become aggressive to do well in school"), and participant (i.e., "Classroom activities generally are interesting"). There are 10 items in each subscale. Mean subscale scores were calculated to assess the strength with which the individual's classroom behavior aligns with each of the six learning styles. Baykul et al. (2010) have previously studied the internal consistency for the scale with respect to applications in both English and Mathematics. For the current study, Cronbach's alpha was independent = .59, avoidant = .72, collaborative = .78, dependent = .61, competitive = .77, and participant = .73. In addition, Cronbach's alpha for the intrinsic subscale was .80 and for the extrinsic subscale was .70.

Demographic Information

Demographic information was collected from each athlete at the beginning of the survey. This included age, gender, race, ethnicity, institution, year in school, GPA, major, sport, and college division.

Procedures

The athletes were recruited via flyers with a QR code that linked directly to the survey. The flyer was presented to them in-person, projected onto a screen in a classroom, or emailed to them from coaches, case managers, or other team support staff. A total of three coaches, one case manager, and 16 support staff were involved in the dissemination of the survey. Snowball sampling was utilized by asking the study participants to share the survey with their current and former teammates who also met inclusion criteria. The first author also used personal networks, asking classmates to assist with the outreach and distribution of the survey. Emails were sent to 21 peers to be passed along this way.

The first page of the survey had the informed consent document; a digital signature was required prior to beginning the survey. Once signed, the survey progressed from demographic information, to the SAMSAQ, to open-ended questions, and then to the GRSLSS. The survey took approximately 15 minutes to complete.

Data Analysis

Normality checks were conducted prior to running the analyses. First, frequency data was generated to ensure all values reported fell within the expected values for each variable. Then, histograms and boxplots were created for all eleven subscales. This included the career athletic, student athletic, and academic motivations subscales of the SAMSAQ and the independent, participant, collaborative, competitive, dependent, and avoidant subscales of the GRSLSS. Normality checks were also conducted on the calculated intrinsic and extrinsic learning style variables. All the histograms appeared normally distributed, but there were some outliers in the data according to the boxplots. The seven outliers were adjusted to the value of the subscale's mean score based on guidance from Aguinis et al. (2013).

Due to the length of the survey (i.e., over 100 questions), there was a significant drop-off in the number of participants that completed the entire survey. As stated above, the survey was presented in the following order: demographics, SAMSAQ, open-ended questions, and then the GRSLSS. To run the data for hypotheses 1 and 2, participants were required to complete the entire survey, since the GRSLSS was the last component and needed to be complete for the correlations to run. Many participants elected not to complete the open-ended questions and therefore did not begin any part of the GRSLSS that followed. Hypothesis 3 could be analyzed so long as participants completed the SAMSAQ, which was situated before the open-ended questions, resulting in less drop-off. Different subgroups of the data were used to address each hypothesis to include as much valid data as possible for each research question.

The data was analyzed using SPSS. After removing cases that did not complete 96% or more of the scale (i.e., only 1-2 data points missing maximum), the total participants for hypotheses 1 and 2 was $n = 149$, in which sufficient power was still maintained. Then, a Pearson's r correlation was run to assess the relationships between eight learning style scores and the three SAMSAQ subscales. The first six learning styles are the individual styles in the GRSLSS: participant, avoidant, inde-

pendent, dependent, collaborative, and competitive. The other two subscales are the calculated intrinsic and extrinsic groupings. Participant, collaborative, and participant learning styles were grouped into an "intrinsic" score, and dependent, competitive, and avoidant learning styles were grouped into an "extrinsic" score. The three SAMSAQ subscales are career athletic motivation, student athletic motivation, and academic motivation. To test the third hypothesis, independent *t*-tests compared the three types of motivation (career athletic, student athletic, and academic) in students with STEM majors to students in non-STEM majors. STEM majors were defined as Bachelor of Science degrees and non-STEM majors were defined as Bachelor of Arts degrees. After removing cases that did not complete 96% or more of the scale (i.e., only 1-2 data points missing maximum), the total participants for hypotheses 3 was $n = 196$.

Results

Correlations Between Learning Styles and Motivation

Career Athletic Motivation

Out of all six individual learning styles, the only significant correlation was a positive relationship between competitive learning style scores and career athletic motivation, $r(147) = .32$, $p < .001$. There were no significant results indicating that any of the intrinsic leaning styles were positively correlated with career athletic motivation as predicted. Additionally, there was no evidence that any of the individual extrinsic learning style scores were negatively correlated with career athletic motivation.

Student-athletic Motivation

There was a significant, weak, positive correlation between independent learning style scores and student athletic motivation scores, $r(147) = .17$, $p = .04$, as well as participant learning style scores, $r(147) = .19$, $p = .02$. There was no evidence that individual extrinsic learning styles were negatively correlated with student athletic motivation. Overall, there was a positive relationship between the intrinsic learning style score and student athletic motivation ($r(147) = .19$, $p = .02$).

Academic Motivation

There was a significant, moderate, positive relationship between participant learning style scores and academic motivation scores, $r(147) = .39$, $p < .001$. There was a significant, moderate, negative correlation between avoidant learning style scores and academic motivation, $r(147) = -.32$, $p < .001$. This aligns with hypothesis 2: that extrinsic learning styles are negatively corelated with motivation levels. There was a positive relationship between intrinsic learning style scores and academic ($r(147) = .30$, $p < .001$) motivation. Additionally, the extrinsic learning style scores were negatively correlated with academic motivation ($r(147) = -.17$, $p = .03$).

Additional Correlations

In sum, hypotheses 1 and 2 were partially supported through the significant results identified above. There were additional significant correlations found that did not align with hypotheses. This included positive correlations between extrinsic style scores and student athletic motivation (r (147) = .16, $p < .05$) and career athletic motivation (r(147) = .27, p = .001). There was also a positive correlation between dependent learning style scores and student athletic motivation (r(147) = .22, p = .006). Table 2 includes a summary of correlations between all subscales in the study.

Differences Between Academic Majors and Motivation

Hypothesis 3 (n = 196) predicted athletes pursuing a STEM major (BS) would demonstrate higher academic motivation than athletes in non-STEM majors (BA).

Majors were placed in the non-STEM category if the major is a Bachelor of Arts (B.A.) at the institution the athlete is studying at, while majors in the STEM category were the Bachelor of Science (B.S.) degrees. There were 107 participants placed in the STEM category and 77 participants placed in the non-STEM category. Eleven participants were undeclared, and one participant listed "Bachelor's degree" without specifying a major. These 12 cases were omitted from the analysis because their majors could not be categorized. It is important to note that some majors overlap in this breakdown; this is because some majors (e.g., Business, Marketing) are a B.S. at some institutions and a B.A. at others. The categorization of majors from each participant response was checked via institutional course catalogs available online. 5.6% of the responses were split using this procedure.

Based on the results of the independent samples t-test, with equal variances assumed, college student-athletes in STEM majors (M = 3.88, SD= 0.36) had higher academic motivation than those in non-STEM majors (M = 3.66, SD = 0.40), t(182) = 3.85, $p < .001$. The athletes in non-STEM majors (m = 4.00, sd = 0.88) had higher career athletic motivation than STEM majors (M = 3.56, SD = 0.91), t(182) = -3.29, p = .001. There was no significant difference in student athletic motivation between athletes with non-STEM majors (M = 4.79, SD= 0.59) and those with STEM majors (M = 4.63, SD= 0.56), t(182) = -1.95, p = .05. The data supports hypothesis 3, that athletes within STEM majors exhibit higher levels of academic motivation than those in non-STEM majors. These results suggest athletes who are pursuing a B.S. appear more motivated to do well in school than those pursuing a B.A., who may have higher motivation to pursue their athletic career.

Discussion

The purpose of this study was to evaluate the learning styles of college athletes and compare these learning approaches to career athletic, student athletic and academic motivation. Hypothesis 1 proposed the athletes with strong independent, collaborative, and participant (i.e., intrinsic) learning styles have a positive correlation to academic and athletic motivation. This was partially supported through positive correlations between independent, participant, and intrinsic learning styles with stu-

Table 2

Learning Style and Motivation Correlations

Subscale	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11
1. Independent	3.49	.47	–										
2. Avoidant	3.20	.60	-.02	–									
3. Collaborative	3.65	.63	.12	-.17*	–								
4. Dependent	3.69	.45	.07	-.19*	.42**	–							
5. Competitive	2.65	.66	.28**	.12	.17*	.16*	–						
6. Participant	3.49	.60	.19*	-.54**	.52**	.36**	.29**	–					
7. Intrinsic	3.54	.41	.53**	-.35**	.80**	.41**	.34**	.81**	–				
8. Extrinsic	3.18	.35	.19*	.57**	.19*	.42**	.77**	.03	.18*	–			
9. CAM	3.77	.92	.07	.14	-.01	-.04	.32**	-.01	.02	.27**	–		
10. SAM	4.73	.56	.17*	.004	.08	.22**	.10	.19*	.19*	.16*	.51*	–	
11. AM	3.78	.40	.09	-.32**	.15	.09	-.04	.39**	.30**	-.17*	-.38**	-.14	–

Note. *$p<.05$. **$p<.01$. Intrinsic styles: independent, collaborative, participant. Extrinsic styles: dependent, competitive, avoidant. CAM: Career athletic motivation. SAM: Student athletic motivation. AM: Academic motivation.

dent athletic motivation, and participant and intrinsic learning styles were positively correlated with academic motivation. Additionally, it was anticipated that athletes with strong dependent, avoidant, and competitive (i.e., extrinsic) learning styles will have a negative correlation to academic and athletic motivation (Hypothesis 2). Partial support was established though avoidant learning styles and extrinsic learning styles being negatively correlated with academic motivation.

A second aim was to compare levels of motivation in STEM vs. non-STEM majors. It was hypothesized that athletes who are pursuing a STEM major (BS) demonstrate higher academic motivation than athletes who are pursuing a non-STEM major (BA) due to the more demanding requirements of STEM majors and the difficulty that comes with also training (Hypothesis 3). The results of this study supported this hypothesis; it was found that college student-athletes in STEM majors had significantly higher academic motivation than those in non-STEM majors.

Learning Styles and Motivation

The participant learning style was positively related to student athletic and academic motivation. This implies that active involvement in classroom learning and activities is related to the motivation to do well in both the classroom and in sport. Similarly, intrinsic learning style was positively correlated with student athletic and academic motivation. Findings from similar studies indicate team cohesion and working towards a common goal is correlated with peer-initiated motivational climate in sports (McLaren et al., 2017). In other words, participating more on the field is related to higher athletic motivation. The results of this study suggest athletes can carry this value of cohesiveness/participation into classroom settings as well. This has implications for future studies, as targeting such buy-in through increased participation may enhance motivational outcomes in both settings.

The independent learning style was positively correlated with student athletic motivation, suggesting there is a relationship between classroom self-learning habits and motivation to do well in sports during college. According to SDT, autonomy is an important psychological need to foster intrinsic motivation in an individual (Ryan & Deci, 2020). Knowing how to engage in self-regulated learning is a way to improve autonomy in the classroom, and if this relationship between classroom independence and sport motivation exists, encouraging intrinsic learning strategies may benefit motivational outcomes in sport as well. The independent learning style subscale included items related to knowing what content is important, knowing how to study, and seeking to solve problems on one's own. According to Bartulovic et al. (2017), self-regulated learning behaviors can be effective in the development of athletes when used in sport settings. For example, the study found the use of self-monitoring was the most important process predicting membership as an elite athlete. Additionally, constituent processes like amount of effort and self-efficacy were also listed as important characteristics of elite athletes. These behaviors in sport can enhance athlete development, as athletes learn to be more aware of their actions in practice, track their implementation of skills in training, invest in their own improvement, and believe they have control over their sport outcomes. Further exploration

is needed to better understand the transferability of these overlapping behaviors (i.e., self-regulated learning, self-monitoring, self-efficacy) from classroom to sport and sport to classroom.

The avoidant learning style was negatively correlated with academic motivation. When athletes reported daydreaming in class, procrastinating, etc., they also reported less motivation to perform well academically. According to Lucas and Lovaglia (2008), athletes can be less motivated to perform well in school than nonathlete counterparts. The researchers speculated this is due to expectations for professional sports careers; however, data from the present study did not find a significant relationship between avoidant learning style and career athletic motivation. Other factors may influence such a relationship, warranting a further exploration of this concept. Lack of engagement in class has been linked to poor motivation in the past; a study by Skinner et al. (2009) evaluated behavioral and emotional disaffection in students and found scores in these domains were correlated with lack of academic effort, or amotivation. The results in this study suggest student-athletes may be subject to similar patterns of decreased motivation when they are passive or disengaged in class. To combat this, there exists the potential of providing more advising appointments, which Nelson (1982) found was related to higher GPA compared to athletes who did not engage in as many advising appointments. Other interventions still need to be explored to increase academic motivation in athletes with avoidant classroom behavior. It is important to note there was not a significant correlation between avoidant learning styles and student athletic or career athletic motivation in this study. In fact, though the correlations were not significant, the relationship between avoidant and both types of athletic motivation were positive. This result suggests the extrinsic approach student-athletes may have in the classroom is not necessarily related to their motivation on the field, both in the context of being a student-athlete and in terms of pursuing professional sport careers. Though results from this study imply independent and self-regulatory learning approaches could benefit both academic and athletic motivation, there was no evidence suggesting the inverse, having extrinsic learning styles in the classroom, is a detriment to motivation in sport.

The dependent learning style was positively correlated with student athletic motivation. The content of the dependent learning style items indicates a heavy dependence on the teacher's responsibility to teach students (e.g., "Teachers should state exactly what they expect from students"). This result suggests student-athletes may place academic responsibility on the instructor, despite feeling motivated to succeed in their sport. When it comes to external support for students, Karlen et al. (2019) found educators play an important role; however, feeling a lack of social support from a professor is an external factor that is not always in a student's control. Instead, programs could help learners develop independence through teaching mindset change and how to adopt an internal locus of control for classroom learning.

The competitive learning style was positively correlated with career athletic motivation, suggesting competing with classmates may be related to the desire to continue sport beyond college into professional competition. Carless & Douglas (2012) stated some elite athletes strive for success across contexts and in multiple forms; it

follows that student-athletes could take their competitive, elite approaches to sport and bring that into classroom settings. It may be beneficial to implement competition into coursework activities to engage athletes in a more meaningful way. Doing so could increase interest in classroom activities and potentially improve academic motivation.

The calculated intrinsic learning style was positively correlated with student athletic and academic motivation. Collectively, the stronger the independent, participant, and collaborative approaches athletes took to classes, the more motivated these student-athletes were both on the field and in the classroom. This suggests a relationship between the internal approaches to success in the classroom and their motivation for success in their sport while in college. These athletes may be employing similar strategies for learning and success in both domains; therefore, interventions teaching athletes to employ intrinsic learning styles could benefit a student-athlete's holistic motivation. More studies should be conducted to properly assess whether similar learning approaches can be used to increase intrinsic motivation in both contexts.

The extrinsic learning style was positively correlated with career athletic and student athletic motivation but negatively correlated with academic motivation. The stronger the athletes felt that external factors (i.e., the professor, other classmates) influenced their classroom behaviors, the more motivation they reported for their sport, and the less motivation they reported for academics. This finding suggests athletes may be carrying their "depend on your teammates" or "coach tells me what to do" behaviors into the classroom. This may show through relying on classmates for notes or expecting the instructor to teach them everything they need to know. Though this may satisfy the relatedness psychological need, it also illustrates a lack of autonomy with learning practices. Athletes who demonstrate these tendencies could benefit from resources that increase autonomous learning, such as teaching note taking strategies or learning how to seek information and answers independently.

Major and Motivation

Institutional norms can pressure athletes to perform well athletically at the expense of their academic success (Simons et al., 1999). For example, athletes spend anywhere from 20-30 hours per week in their sport, which can take time and energy away from the classroom. Simons et al. (1999) explained how motivation to succeed academically and obtain a degree is weakened by the opportunity to leave school early to play professionally. Results from Hypothesis 3 suggest athletes pursuing a B.S. may be looking at long-term outcomes for a career related to their major and not necessarily to continue their sport playing professionally after college. These results suggest athletes who choose STEM majors already have high levels of academic motivation and may not require the same intervention/support as other athletes. This is consistent with the notion that student-athletes are like non-student-athletes in that they choose majors that align with their interests (Pendergrass et al., 2003). Such interest in the material can increase feelings of competence, which according to SDT, may contribute to the higher motivation in STEM major athletes.

These results also suggest athletes pursuing a B.A. are the ones who may need extra tools, skills, or support to increase motivation in the classroom. The data show

athletes in non-STEM majors are more motivated to pursue their athletic careers, as indicated by the significantly higher career athletic motivation than STEM majors. This aligns with the notion that non-STEM majors are easier or provide more flexibility than STEM majors, which not only allows athletes to focus more on their sport, but also provides more options for class times during season when time commitments are restricting. The lower motivation may also result from lack of freedom to choose their major. Athlete clustering, defined as counselors placing large amounts of athletes on the same team in the same major/classes, is known to occur specifically in college football players (Fountain & Finley, 2009). Such lack of autonomy could be influencing the academic motivation of athletes whose major is decided for them. More investigation is required to understand the extent to which choice of major and motivation to succeed in the classroom are related in student-athlete populations.

Limitations

Though there were significant findings in the current study, there are some limitations to take into consideration. First, the population lacked diversity in a few ways. The athletes who took the survey were predominately white at 56.4% of the sample. This limits the generalizability of the results, as racial minorities may have different experiences than the experiences of the athletes in the present study. Similarly, most of the population was from the same southwestern school. A total of 77.4% of the sample attended this school, with 76.8% of those athletes competing at the Division I level, 18.2% competing for a club team, and 5.0% declining to report their sport level. Experiences of the athletes at this institution do not necessarily apply to other institutions across the country. Additionally, a larger portion of the data was collected from athletes who compete at the Division I level (61.5%), so this has limited applications to Division II and Division III institutions.

A methodological limitation of the present study is the SAMSAQ reliabilities were low compared to previous findings. Though Gaston-Gayles (2005) reported Cronbach's alpha values of .86 (academic motivation), .84 (student athletic motivation), and .79 (career athletic motivation, the present study had reliabilities of .50, .64, and .59 respectively. Researchers considered item deletion to improve reliability; however, most of the results were maintained with or without such deletion, so researchers opted to maintain the integrity of the original subscales. Results should be interpreted with caution given this low reliability. More iterations of this study with diverse athlete populations are required to further assess the patterns found in the current study's data.

Finally, the reliabilities of the GRSLSS subscales in the present study were moderate; however, they weren't entirely inconsistent with reliabilities in previous studies. Baykul et al. (2010) assessed reliabilities twice, and most of the reliability values here were similar. For example, the independent subscale had values essentially equal to that of the cited study. Though the present avoidant reliability was considerably lower at .72 instead of .82 (English) and .94 (Math), the remaining four subscales had reliabilities higher than reported in previous literature. Though consistent with previous work, it is still important to be cautious of conclusions drawn from a scale with lower reliability, particularly with the correlation between avoidant

learning style and academic motivation in this study. The lower avoidant subscale reliability should be taken into consideration when analyzing those correlations. It is important to reiterate that learning styles were evaluated to identify common patterns and trends, not to categorize individuals into a single, "dominant" learning style. Therefore, drawing conclusions from this study should not rely heavily on a single subscale.

Future Direction and Applications

College student-athletes are expected to learn and perform at high levels in both academic and athletic contexts. Therefore, it is reasonable to assume that approaches to learning in both domains are connected. Motivational outcomes are likely connected too. The findings in the present study are a start to understanding these interactions between academic and athletic learning behaviors. More information is needed to understand, develop, and teach effective learning approaches and skills to student-athletes. Future research on the intersection of athletic and academic motivation could focus on autonomy-supported learning strategies to figure out which learning approaches have better success outcomes for student-athletes. For example, interventions can be created to target self-efficacy as it relates to both athletics and academics. These would provide education on adaptive behaviors that apply to learning in both academics and athletics. Targeting the specific overlap of learning strategies (i.e., self-directed learning, seeking help outside of class/practice, developing a growth mindset) and demonstrating academic and athletic applications could help athletes understand the similarities for success between both contexts. This would increase learning competence and could help with the transfer of effective intrinsic motivation behaviors between the domains, enhancing the overall wellbeing of the athlete. Understanding how learning in sport is related to learning in the classroom is particularly important in college student-athletes who must manage the constant input of information from coaches, staff, professors, etc. daily. Understanding the processes behind learning at the college level can inform educators and coaches of more adaptive strategies for student-athlete motivational development.

Results from this study on differences between STEM and non-STEM majors could be used to inform academic stakeholders of the needs of college student-athletes. For example, advising centers could use this information to guide their targeted academic support and mentoring services. The major an athlete selects could be predictive of their professional goals, giving advisors some insight on the motivation of advisees who they may not have built rapport with yet. More studies could be created to better assess the predictive validity of athlete STEM vs. non-STEM major patterns and understand the directionality of this relationship. Understanding whether major choice predicts motivation levels or whether motivation levels influence major choice could help academic stakeholders identify potential motivational needs and areas for learning behavior development based on the major that athletes enroll in as freshmen.

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