

Attitudes Toward Injury-Prevention Program Participation Based on Race and Collegiate Division in Female Athletes

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Context: Injury-prevention programs (IPPs) have been effective in reducing lower extremity injury rates, but user compliance plays a major role in their effectiveness. Race and collegiate division may affect attitudes toward participation in IPPs and compliance in female collegiate athletes.

Objective: To compare attitudes toward IPPs based on race and collegiate division.

Design: Cross-sectional study.

Setting: Survey.

Patients or Other Participants: A total of 118 female collegiate athletes (age = 19.71 ± 1.47 years, height = 169.46 ± 9.09 cm, mass = 69.57 ± 11.57 kg) volunteered.

Main Outcome Measure(s): Participants completed the Health Belief Model Scale and the Theory of Planned Behavior Scale (TPBS) on 1 occasion. The Health Belief Model Scale contains 9 subscales (perceived susceptibility, perceived consequences, fear of injury, perceived benefits, perceived barriers, community-led self-efficacy, individual self-efficacy, general health cues, external health cues), whereas the TPBS has 5 subscales (perceived benefits, perceived barriers, perceived social norms, social influence,

intention to participate). The independent variables were race (White versus Black, Indigenous, and other people of color [BIPOC]) and National Collegiate Athletic Association division (I and III). Mann-Whitney *U* tests were used to detect differences in attitudes toward IPP participation based on race and collegiate division.

Results: White female athletes perceived fewer TPBS barriers to participation in IPPs ($P = .003$) and more community-led self-efficacy when compared with BIPOC female athletes ($P = .009$). Division I athletes perceived a greater fear of injury ($P = .002$) and more general health cues ($P = .01$) than Division III athletes.

Conclusions: For lower extremity IPPs, BIPOC and Division III female collegiate athletes may need different implementation strategies. Individuals who identify as BIPOC may benefit from interventions focusing on solutions for common barriers to participation and improving community-led self-efficacy, and Division III athletes may benefit from interventions focusing on education related to the risk of injury and general preventive health behaviors.

Key Words: perceptions, lower extremity injury, compliance, adherence, diversity

Key Points

- Female athletes who identified as Black, Indigenous, or other people of color perceived more barriers to participation and less community-led self-efficacy when compared with White female athletes, indicating that interventions should target solutions to barriers and improving community-led self-efficacy.
- Division III female athletes perceived a lower fear of injury and fewer general health cues than Division I athletes, suggesting that interventions should include education on the risk of injury and general preventive health behaviors.

Lower extremity injuries are common in collegiate athletics.¹ Specifically, female collegiate athletes have an increased risk of anterior cruciate ligament injuries when compared with their male counterparts.² These common injuries lead to many negative short- and long-term consequences, such as functional limitations, participation restrictions, the early development of osteoarthritis, and decreased health-related quality of life.^{3–6} Female athletes are more likely to sustain a noncontact anterior cruciate ligament mechanism that could potentially be prevented with the use of injury-prevention programs (IPPs).^{2,7} Injury-prevention programs were developed to target strength, range of motion, balance, and agility in order to decrease the occurrence of injury. Injury-prevention programs have been effective in both reducing the risk of lower extremity injury and leading to improvements in functional performance.^{8–10}

The most significant limitations of IPPs are a lack of adoption and lack of adherence to the programs by users.¹¹ The Health Belief Model and the Theory of Planned Behavior have been used to provide insight into why users may fail to participate in IPPs.^{12,13} The Health Belief Model has 6 theoretical constructs (perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, self-efficacy) thought to directly predict participation in a preventive health behavior.¹⁴ The Theory of Planned Behavior has 3 theoretical constructs (attitudes, perceived subjective norms, perceived behavioral control) that are thought to indirectly predict engagement in a preventive health behavior through intention to participate in the behavior.¹⁵ Use of these theories to assess attitudes toward IPP participation may provide a more robust understanding of the influential factors associated with participation.

Because of well-documented racial disparities in health and health care, it is important to determine if differences exist in IPP perceptions across racial groups (eg, White versus Black, Indigenous, and other people of color [BIPOC]).¹⁶ Limited research has shown higher injury rates in BIPOC individuals; however, evidence indicates that racial disparities are similar to those in other health areas, with BIPOC individuals having worse outcomes compared with their White counterparts.¹⁷ Several groups determined that the risk of injury may not differ among races, but outcomes were worse for BIPOC individuals.^{18–20} Persons who are BIPOC were at an increased risk for poor outcomes of common sport-related injuries, such as concussion and anterior cruciate ligament tears.^{18–20} Understanding if differences in IPP perceptions exist is important for evaluating if culturally targeted strategies are warranted.

In addition, attitudes toward IPPs may differ based on the division of National Collegiate Athletic Association (NCAA) sport. The different levels are provided with very different resources, including equipment, facilities, and staff. Specifically, Division I schools had double the number of athletic trainers (ATs) compared with Division III schools, and ATs at Division I schools cared for fewer athletes than those at Division II or III schools.²¹ These differences in resources may affect attitudes toward IPPs. Additionally, exposure and injury rates varied based on the division level. Division I female athletes had approximately 33.9 injuries per 1000 athlete-exposures, whereas Division III female athletes had 25.6 injuries per 1000 athlete-exposures.²² These differences in injury rates and access to resources between Division I and III universities may lead to different attitudes toward participation in IPPs.

Attitudes toward IPPs may vary based on race and collegiate division. If differences do exist, implementation strategies may need to be modified to increase adoption and adherence in these populations. Therefore, the purpose of our study was to determine if attitudes toward participation in IPPs differed based on race and collegiate division. We hypothesized that White female athletes would have more positive attitudes toward participation in IPPs when compared with BIPOC athletes. Additionally, we hypothesized that Division I athletes would have more positive attitudes toward IPP participation than Division III athletes.

METHODS

Participants were recruited through team meetings at a Division I and a Division III university. Volunteers were included in the study if they were over the age of 18 and currently involved in an intercollegiate athletic sport at the university. Female athletes were specifically recruited to allow for an accurate comparison because the Division III university only offered female athletics.

The study design was cross-sectional; participants completed questionnaires using paper and pen on 1 occasion. The research was approved by the institutional review board. Individuals received a questionnaire packet containing the questionnaires and a letter explaining the purpose of the investigation. Consent was assumed if the participant chose to complete the questionnaire after reading the letter. The questionnaires were completely anonymous, and participants did not provide their names. They completed a demographic questionnaire in which race and division level were identified. Next, they completed the Health Belief Model Scale (HBMS; Supplemental

Table 1, available online at <https://dx.doi.org/10.4085/1062-6050-0195.23.S1>) and the Theory of Planned Behavior Scale (TPBS; Supplemental Table 2) to assess attitudes toward participation in IPPs. Respondents placed the completed questionnaire in a folder provided by the researcher.

The demographic questionnaire evaluated race, gender, history of musculoskeletal injury, history of exposure to any form of an IPP, sport, and year in school. The HBMS and TPBS were used to characterize attitudes toward participation in IPPs. The HBMS contains 37 items and is made up of 9 subscales (perceived susceptibility, 5 items; perceived consequences, 5 items; fear of injury, 3 items; perceived benefits, 5 items; perceived barriers, 5 items; community-led self-efficacy, 3 items; individual self-efficacy, 3 items; general health cues, 6 items; external health cues, 2 items). The TPBS contains 20 items and is made up of 5 subscales (benefits, 5 items; barriers, 3 items; social norms, 4 items; social influence, 3 items; intention to participate, 5 items). Response options for both scales range on a 7-point Likert scale from *strongly agree* (3) to *strongly disagree* (−3). Positive responses for all of the subscales are thought to be associated with an increased likelihood of participation, with the exception of perceived barriers on each scale, for which a negative response would be associated with an increased likelihood of participation. Psychometric properties of both scales have been confirmed in a similar physically active population.²³

When participants missed less than 10% of the scale data, multiple-imputation SPSS (version 24; IBM Corp) was used to estimate missing data points. The smaller number of participants who identified as BIPOC prevented the researchers from being able to perform analyses on individual races; therefore, the participants were categorized as the BIPOC group. The independent variables were race (White or BIPOC) and division (I or III), and the dependent variables were attitudes toward participation in IPPs as measured through the HBMS and TPBS subscales. Total scores were calculated by summing scores for the items within each subscale; *strongly agree* was assigned a 3 and *strongly disagree* was assigned a −3. Medians and interquartile ranges were then computed for the TPBS and HBMS subscales. The data were not normally distributed, and separate Mann-Whitney *U* tests were performed to detect differences in attitudes based on race and division. The nonparametric effect size (ES) indicated the magnitude of the difference and was conducted using the following equation: z/\sqrt{n} .²⁴ Effect size was interpreted as *small*, ≤ 0.10 ; *moderate*, ≤ 0.30 ; or *large*, ≤ 0.50 .²⁴ The α was set at $P \leq .05$ for all analyses.

RESULTS

A total of 118 female collegiate athletes volunteered to participate in the study (Tables 1 and 2). The BIPOC group consisted of American Indian ($n = 1$), Black or African American ($n = 28$), other ($n = 4$), and mixed race ($n = 7$) athletes. One participant did not select race and was not included in analyses related to race. The Division I athletes participated in volleyball ($n = 11$), basketball ($n = 11$), lacrosse ($n = 37$), and softball ($n = 22$), and the Division III athletes participated in volleyball ($n = 6$), basketball ($n = 7$), equestrian ($n = 3$), soccer ($n = 10$), softball ($n = 9$), and unreported ($n = 2$). Division I athletes consisted of freshmen ($n = 20$), sophomores ($n = 23$), juniors ($n = 20$), seniors ($n = 13$), fifth-year seniors ($n = 1$), graduate students ($n = 3$), and unreported ($n = 1$). Division

Table 1. Participant Demographics Based on Race

Variable	Group	
	White (n = 77)	Black, Indigenous, or Other People of Color (n = 40)
	Mean \pm SD	
Age, y	19.70 \pm 1.45	19.74 \pm 1.57
Height, cm	169.06 \pm 8.83	170 \pm 9.26
Mass, kg	68.47 \pm 9.96	71.67 \pm 13.54
	Yes/No, No.	
	Yes/No	No.
	Mean \pm SD	
History of injury	57/19	32/8
Previous exposure to injury-prevention program	65/12	29/11

III athletes included freshman (n = 18), sophomores (n = 6), juniors (n = 6), and seniors (n = 7).

A few statistically significant differences were noted when comparing attitudes toward IPPs in White and BIPOC female athletes (Table 3). White female athletes (median [interquartile range] = 0.00 [4.00]) perceived fewer TPBS barriers to participation in IPPs than BIPOC female athletes, with a moderate ES (2.00 [3.00], $P = .003$, ES = -0.27). Additionally, White female athletes (6.00 [4.00]) perceived more community-led self-efficacy than BIPOC female athletes, with a moderate ES (5.00 [4.00], $P = .009$, ES = -0.24). No other statistically significant differences were observed in attitudes toward IPP participation between races ($P > .05$).

Several differences were noted in the attitudes toward IPPs between Division I and Division III female athletes (Table 4). Division I athletes perceived a greater fear of injury (median [interquartile range] = 2.00 [7.00]) versus Division III athletes, with a moderate ES (-2.00 [8.5], $P = .002$, ES = -0.29). Additionally, Division I athletes (14.00 [6.00]) perceived more general health cues than Division III athletes, with a moderate ES (12.00 [6.50], $P = .01$, ES = -0.23). No other differences in attitudes toward IPP participation between collegiate divisions were seen ($P > .05$).

DISCUSSION

Our main findings were the differences in attitudes toward participation based on race and collegiate division. Female athletes who were BIPOC perceived more barriers to participation and less community-led self-efficacy than White female athletes. Additionally, Division III female athletes perceived less fear of injury and fewer general health cues than Division I athletes. These outcomes suggest that alternative implementation strategies may need to be used for athletes who align with these demographic variables.

We hypothesized that White athletes would have more positive attitudes toward IPP participation than BIPOC athletes. White athletes showed more positive attitudes in 2 constructs: perceiving fewer barriers to participation and more community-led self-efficacy. This indicates that BIPOC athletes perceived more challenges to participating in IPPs. Barriers to IPP participation for BIPOC athletes may be related to instances of discrimination in athletic, college, or similar settings. The experiences of BIPOC (specifically Black) female athletes at predominately White institutions are well documented. Occurrences of racism and sexism are not uncommon, and many Black female athletes feel alienated from their

Table 2. Participant Demographics Based on Collegiate Division

Variable	Division I (n = 81)	Division III (n = 37)
	Mean \pm SD	
Age, y	19.58 \pm 1.33	20.00 \pm 1.77
Height, cm	171.01 \pm 8.42	166.55 \pm 9.47
Mass, kg	69.42 \pm 9.02	69.89 \pm 15.41
	Yes/No, No.	
	Yes/No	No.
History of injury	63/18	26/10
Previous exposure to injury-prevention program	68/13	27/10

White counterparts.^{25–28} To tackle racism and sexism, coaches and staff must work to create a sense of belonging for everyone and address concerns about discrimination. These experiences of discrimination, stemming from historical injustices, are major contributing factors to racial health disparities in the use of preventive and health care services and health outcomes.²⁹ Implementation of IPPs targeting BIPOC athletes via culturally sensitive and responsive strategies may be beneficial to overcome these barriers. There is a potential that presentation of the common barriers and strategies to overcome those barriers may be helpful for BIPOC female athletes. Additional research is needed to develop and evaluate these targeted efforts.

Athletes who were BIPOC also perceived less community-led self-efficacy, indicating less comfort with participating in an IPP that was led by a coach, strength coach, or AT. Race and racial concordance between patient and provider promote racial equity; when racial identities are shared, health outcomes are better.³⁰ For IPPs, a lack of race and racial concordance with the facilitator may explain the low comfort level for BIPOC athletes and result in a lack of trust in a facilitator of a different race. Individuals who commonly facilitate IPPs in the collegiate setting include ATs, coaches, and strength coaches. In 2023, more than 80% of ATs, 72% of coaches, and 75% of strength coaches in the NCAA were White, which does not reflect the racial and ethnic composition of their student-athletes (approximately 62% White).³¹ The inequity of racial diversity between the student-athletes and individuals in these roles may be driving the lack of community-led self-efficacy expressed by the BIPOC female athletes. More work is needed to create a diverse workforce in collegiate athletics. Another implementation strategy may be for the individuals in the roles of AT, coach, or strength coach to invest more time in building trusting relationships with their athletes.

We hypothesized that Division I athletes would have more positive attitudes toward participation in IPPs than Division III athletes. Division I athletes had more positive beliefs in only 2 areas: perceiving more fear of injury and fewer general health cues. Division I athletes were more fearful of injury when compared with Division III athletes. Individuals with a higher fear of injury are more likely to be interested in preventing injuries, which makes this a facilitator of IPP participation. The most likely reason why Division I athletes displayed more fear was the higher rates of injury occurring at this level than in Division III athletes.²² Also, the stakes may feel higher at the Division I level due to the potential loss of a scholarship, whereas Division III athletes do not experience the same pressure due to the absence of scholarships. According to the

Table 3. Differences in Attitudes Toward Injury-Prevention Programs Based on Race

	Group, Median (Interquartile Range)			
Variable	White	Black, Indigenous, or Other People of Color	P Value	Effect Size
Health Belief Model Scale				
Perceived susceptibility	3.00 (10.00)	3.00 (10.75)	.81	−0.02
Perceived consequences	−1.00 (7.50)	−2.50 (7.75)	.33	−0.09
Fear of injury	1.00 (8.50)	0.00 (10.50)	.26	−0.10
Perceived benefits	10.00 (6.50)	8.00 (11.75)	.15	−0.13
Perceived barriers	−4.00 (5.50)	−3.00 (6.00)	.20	−0.12
Community-led self-efficacy	6.00 (4.00)	5.00 (4.00)	.009	−0.24
Individual self-efficacy	2.00 (7.00)	2.00 (7.75)	.85	−0.02
General health cues	14.00 (5.00)	13.00 (8.00)	.25	−0.11
External health cues	0.00 (4.50)	1.00 (5.50)	.90	−0.01
Theory of Planned Behavior Scale				
Perceived benefits	12.00 (4.00)	12.00 (5.75)	.83	−0.02
Perceived barriers	0.00 (4.00)	2.00 (3.00)	.003	−0.27
Social norms	10.00 (4.00)	8.50 (5.00)	.24	−0.11
Social influence	9.00 (3.00)	8.00 (3.00)	.08	−0.16
Intention to participate	10.00 (6.00)	9.93 (7.50)	.32	−0.09

NCAA, Division I and II schools allocate more than 3.5 billion US dollars in scholarships each year, whereas Division III does not offer any scholarships.³² Although injury rates are slightly higher at the Division I level, it is still important for Division III athletes to be aware of the risk of injury with sport participation. Division III athletes might benefit from an implementation strategy that includes education on the risk of injury and long-term consequences of injury that frequently occur in their sport.

Division III athletes also perceived fewer general health cues than Division I athletes. General health cues represent participation in normal preventive health behaviors such as eating a balanced diet and scheduling regular physician visits. The lack of resources at the Division III level compared with the Division I level may have led to this discrepancy. Division I athletes tend to have access to more health care professionals who are likely educating them in these areas.²¹ Specifically, Division I athletes have access to more ATs than Division III athletes, with a lower AT:athlete ratio.²¹ Additionally, Division I athletes have access to more facilities when compared with Division III athletes.³³ An implementation

strategy related to general preventive health behaviors, such as education on nutrition and proper sleep habits, could be beneficial to Division III athletes.

This study had several limitations. First, more participants identified as White than as BIPOC. The smaller number of participants who identified as BIPOC prevented us from analyzing individual races and required the grouping of those participants as BIPOC. Results might differ in a larger group of BIPOC athletes, and specific differences might be more associated with specific races. Furthermore, we did not examine the ethnicity of participants (Hispanic or non-Hispanic). The students were from 1 private Division I and 1 private Division III school. The findings might vary based on the resources available at different types of schools and in geographic locations. Therefore, these outcomes may only be generalizable to private universities in the state of Georgia. Future researchers should include a larger, more diverse population.

Several differences in attitudes toward IPP participation based on race and collegiate division were present. Female collegiate athletes who were BIPOC perceived more barriers to participation and less community-led self-efficacy than

Table 4. Differences in Attitudes Toward Injury-Prevention Programs Based on Division

Variable	Group, Median (Interquartile Range)		P Value	Effect Size
	Division I	Division III		
Health Belief Model Scale				
Perceived susceptibility	3.00 (10.50)	3.00 (11.50)	.50	−0.06
Perceived consequences	−2.00 (8.50)	−2.00 (6.50)	.13	−0.14
Fear of injury	2.00 (7.00)	−2.00 (8.50)	.002	−0.29
Perceived benefits	10.00 (6.50)	8.00 (10.00)	.34	−0.09
Perceived barriers	−3.00 (5.00)	−4.00 (10.00)	.58	−0.05
Community-led self-efficacy	6.00 (5.00)	6.00 (5.50)	.54	−0.06
Individual self-efficacy	2.00 (6.50)	3.00 (6.00)	.17	−0.13
General health cues	14.00 (6.00)	12.00 (6.50)	.01	−0.23
External health cues	0.00 (5.00)	1.00 (4.50)	.21	−0.11
Theory of Planned Behavior Scale				
Perceived benefits	12.00 (4.00)	12.00 (5.50)	.83	−0.01
Perceived barriers	1.00 (3.00)	1.00 (4.00)	.42	−0.07
Social norms	11.00 (4.00)	8.00 (5.50)	.09	−0.16
Social influence	9.00 (3.00)	8.00 (3.00)	.20	−0.12
Intention to participate	10.00 (6.50)	10.00 (5.00)	.37	−0.08

White female collegiate athletes. Implementation strategies could provide solutions to common barriers seen to deter participation in IPPs and improve trust in those administering the IPP. Additionally, Division III collegiate athletes perceived less fear of injury and fewer general health cues when compared with Division I athletes. Implementation strategies could include education regarding the risk of injury and general preventive health measures, such as pursuing a yearly physical, proper sleep health, and appropriate nutrition.

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SUPPLEMENTAL MATERIAL

Supplemental Table 1. Health Belief Model Scale.¹⁴

Supplemental Table 2. Theory of Planned Behavior Scale.¹⁵

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