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Determinants of Intention to Disclose Musculoskeletal Injury in Adolescent Athletes

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Context: Although research indicates that the key to minimizing the effect of musculoskeletal injury, improving care, and mitigating long-term effects is to improve early injury care seeking, little is known about barriers to early musculoskeletal injury disclosure and care seeking.

Objective: To identify which determinants predicted sport-related musculoskeletal (MSK) injury disclosure by adolescent athletes.

Design: Cross-sectional study.

Setting: Online survey.

Patients or Other Participants: A total of 564 adolescent athletes (58% male, age = 15.81 ± 1.8 years).

Main Outcome Measure(s): Online survey exploring determinants of age, gender, race, socioeconomic status, injury knowledge, attitudes, perceived social norms, and perceived behavioral control surrounding MSK injury disclosure, intention to disclose MSK injury, and actual behavior of disclosing MSK injury.

Results: Of the respondents, 457 (80.2%) reported having sustained ≥1 (mean = 3.2 ± 2.2; range = 1–10) MSK injuries related to sport. Those who endorsed having experienced an MSK injury disclosed not reporting or purposefully hiding 77% of their suspected MSK injuries. Several factors influenced a high intention to disclose MSK injury. Specifically, for each unit increase in total MSK injury knowledge ($\text{Exp}[\beta] = 1.061$, $\beta = 0.054$, $P = .020$, 95% CI = 1.031, 1.221) and attitude ($\text{Exp}[\beta] = 1.070$, $\beta = 0.064$, $P < .001$, 95% CI = 1.027, 1.115) score, 6% and 7% increases in the likelihood of a high intention to disclose an MSK injury, respectively, were observed. Moreover, for each unit increase in the social norm score ($\text{Exp}[\beta] = 1.178$, $\beta = 0.164$, $P < .001$, 95% CI = 1.119, 1.241), an 18% increase in the likelihood of a high intention to disclose an MSK injury was noted.

Conclusions: Designing interventions geared toward increasing the knowledge of signs and symptoms of MSK injury, improving attitudes surrounding disclosure, and better understanding the social context of disclosing MSK injuries may improve MSK injury disclosure behavior and reduce the associated social and economic burdens of these injuries.

Key Words: athletic injury, injury disclosure, injury prevention, youth athletes

Key Points

- Most participants reported a low level of knowledge regarding musculoskeletal injury symptoms and consequences.
- Fewer than one-quarter of the athletes indicated that they believed it was necessary to disclose an injury, even if it was bothering them, as long as they could still play.

An estimated 12 million individuals are affected annually by musculoskeletal (MSK) injury, accounting for approximately 20 to 25 million lost school and work days and US $33 billion in health care costs each year.[1,2] These MSK injuries are characterized by damage or injury to bones, ligaments, tendons, muscles, or nerves that vary in severity from minimally painful during high-intensity exercise to severely debilitating even at rest.[3] The key to minimizing the effect of MSK injury, improving care, and mitigating long-term effects is to improve early injury care seeking.[4,5] Early disclosure and care of MSK injury symptoms leads to early intervention, helping to offset the risk of developing a more debilitating injury that may plague the individual for years and decades to come.[5]

Despite being frequently discussed anecdotally among health care providers, little is known about the determinants of MSK injury disclosure in relation to both if and when an injury is reported and to whom an injury is disclosed.[4] Early symptoms, such as pain with activity, pain at rest, tightness, muscle fatigue, and stiffness, exist, are often excused as "just part of the process" due to the "no pain, no gain" philosophy that is prominent in sport circles.[6,7] Furthermore, it remains unclear what criteria individuals perceive must be met to necessitate disclosing an MSK injury, such as injury severity or level of disability.[5] Approximately 45% to 60% of US adolescents participate in organized youth sport.[8,9] Moreover, 70% of adolescents who compete in organized sports participate in multiple sports,

further increasing their sport exposure burden and risk of injury.[10] Adolescent athletes are particularly vulnerable to MSK injury.[11] A major contributor to this risk is their disproportionate size and athletic capacity and the large fluctuations in training volume frequently experienced by those participating in >1 sport.[12–15]

This is not the first time disclosure has been a major obstacle to the identification and treatment of sport-related injury. Approximately 1 decade ago, preliminary studies demonstrated that upward of 50% of adolescents did not report symptoms of a suspected concussion.[16–18] Early research on concussion disclosure behavior was guided by the Theory of Planned Behavior in examining several determinants, such as knowledge of symptoms and potential consequences, perceived social norms, perceived control over disclosure, and attitudes toward disclosure, as well as demographic identifiers, such as socioeconomic status, age, race, and gender.[18–20] Subsequent interventional studies targeting modifiable factors have resulted in increased intention to disclose concussion symptoms.[21] These findings related to both athletes' intentions toward and behaviors related to concussion disclosure suggest that researchers who desire to further understand determinants of MSK injury disclosure could start by leveraging the previously identified determinants.

As such, the primary purpose of our study was to identify and predict potential determinants of sport-related MSK injury disclosure in adolescent athletes. We hypothesized that a high intention to disclose an MSK injury and the actual behavior of disclosure would be influenced by each individual's race, ethnicity, gender, knowledge of injury signs and symptoms and consequences of the injury, attitudes toward disclosure, perceived social norms, and perceived control over disclosure based on findings from concussion disclosure literature.

METHODS

Research Design

This study used a cross-sectional survey administered via an online platform (Qualtrics, Inc) as part of a larger study to assess the intention to disclose both the symptoms of MSK injury and the symptoms of concussion. In this article, we report the results of only the MSK injury components. Specifically, the survey included items designed to evaluate proposed determinants of intention to disclose symptoms of MSK injury. Proposed determinants were age, gender, race, socioeconomic status, presence of an athletic trainer, and MSK injury-specific behavioral factors (MSK injury history, MSK injury-related knowledge, attitudes, perceived social norms, and perceived control). The study was approved by the institutional review board at the University of Texas at San Antonio before participant recruitment.

Sample and Participants

Because the study was conducted with minors in high school and middle school settings, permission was given for the research team to provide the survey link to administrators at the selected schools, but no direct interaction with the participants was authorized. Potential participants were approached by administrators at their respective schools and invited to complete the survey via email. Select schools also made additional announcements; however, this was site dependent as we were not allowed to have any contact with the surveyed population. An estimated 1300 high school and 750 middle school student-athletes were eligible to participate in the study. The survey was distributed on the campuses of 4 high schools and 3 middle schools that were strategically identified as representing the diverse characteristics of student-athletes. Each school was located in a large metropolitan city in the southern portion of the United States. Three of the 4 high schools and 2 of the 3 middle schools were located in largely affluent, predominately White school districts, whereas the fourth high school and third middle school were located in an intercity school district. All students had access to athletic trainers on an as-needed basis, but only the 3 suburban high schools employed full-time athletic trainers. Of the estimated 2050 eligible individuals, a total of 564 (27.5%) consented to participate and completed all aspects of the survey. A detailed description of the survey was provided to participants on the first page, and they were asked to indicate that their parents consented to their involvement and that they had read the description and provided assent to participate before beginning the survey. Only those individuals who clicked to consent, moved to the second page of the survey, and indicated that they had read the instructions were allowed to proceed with the survey.

Survey Instrument

The survey instrument was based on previously validated items and included questions concerning participant demographics, the presence of an athletic trainer, MSK injury history, and sport participation. In addition, MSK injury knowledge, attitudes toward disclosure of MSK injury, and perceived social norms surrounding MSK injury disclosure were assessed using modified existing scales to predict MSK injury disclosure behavior.[17,18,22] Additionally, single-item measures of perceived control over disclosure and intention to disclose future MSK injury were included.

The MSK injury history and disclosure were evaluated by first giving participants the following definition of *MSK injury*: "Musculoskeletal injuries are ANY injury to the muscles, tendons, ligaments, cartilage, and/or bones. They can include, but are not limited to, sprains, strains, dislocations, tears, ruptures, and fractures." After reading the definition, participants were asked, "Given the definition above, have you ever had an MSK injury related to sport or other activities (Yes/No)?" Those who answered *yes* were asked follow-up questions: "How many MSK injuries have you had?" and "How many of these injuries did you report/disclose to a medical professional or someone in authority at the time of injury?" Lastly, all participants were asked, "How many injuries have you purposefully hidden or not reported?"

Their MSK injury knowledge was assessed using 41 *yes, no*, or *maybe* items concerning symptom recognition, potential signs and symptoms, potential long-term side effects, effects of premature return to play, and consequences of incurring multiple MSK injuries. Correct answers were scored as 2 points, and incorrect answers were scored as 0 points; participants who selected *maybe* were given 1 point. Potential scores ranged from 0 to 82, with a maximum composite score of 82 (higher scores meant better MSK injury knowledge).

The MSK attitude questions were adapted from previously used and validated concussion attitude questions.[18,20,22] Eight validated items scored on a 7-point scale reflect attitudes toward and perceptions of MSK injury disclosure. Answers to all

8 items were summed, resulting in a composite attitude score ranging from 1 to 56, with higher scores representing more favorable disclosure attitudes toward MSK injury disclosure. For example, the previously validated concussion attitude question read, "Disclosing possible concussive symptoms to a medical professional or someone in authority during physical activity is . . .," whereas the MSK attitude question replaced the phrase "concussive symptoms" with "musculoskeletal symptoms," followed by the same 8 items. Athletes were asked to rate their attitudes to each item on a 7-point scale: *cowardly* (1) to *brave* (7), *shameful* (1) to *prideful* (7), *harmful* (1) to *beneficial* (7), *extremely difficult* (1) to *extremely easy* (7), *bad* (1) to *good* (7), *unimportant* (1) to *important* (7), a *waste of time* (1) to *worthwhile* (7), and *weak* (1) to *strong* (7).

The MSK injury perceived social norms consisted of 7 validated 7-point scale items measuring each participant's perceptions of their organization's expectations, social referent expectations, and their peers' actions concerning MSK injury disclosure. Answers were summed, resulting in an MSK composite social norm score ranging from 1 to 49, with higher scores representing more favorable perceived social norms surrounding MSK injury.

Perceived behavioral control over disclosing an MSK injury was explored using a single 7-point scale question regarding how much control student-athletes believed that they had over disclosing MSK injury. A perceived control score was categorized as higher (score of 6 or 7), indicating agreement regarding having control over MSK injury disclosure, or lower (score of 1 to 5), indicating some agreement to strong disagreement regarding having control over MSK injury disclosure.

Intention to disclose an MSK injury consisted of a single 7-point scale question on a student-athlete's intention to disclose the symptoms of an MSK injury. Intention scores were categorized as higher (score of 6 or 7), reflecting agree or strongly agree with intentions of disclosing symptoms of MSK injury, or lower (score of 1 to 5), reflecting somewhat disagree to strongly disagree with intention to disclose symptoms of MSK injury. In addition to the intention to disclose future MSK injury, prior MSK injury disclosure behavior was also measured by asking the following question to anyone who reported having had an MSK injury: "How many of these musculoskeletal injuries did you report/disclose to a medical professional or someone in authority at the time of injury?" Subsequently, these data were transformed into a disclosure percentage ([number of injuries participant reported disclosing at the time of injury/total MSK injuries participant disclosed having sustained previously] × 100).

Data Analysis

General descriptive statistics were used to describe the demographic information of participants (age, gender, race, academic grade, primary sport, estimated household income, and MSK injury history; Table 1). We conducted Cronbach α tests to determine the internal consistency for each of the summative domains in the survey (MSK knowledge, MSK attitudes, and MSK social norms). Before running models, variables were examined for multicollinearity. The *disclosure percentage* was defined as the number of previous MSK injuries disclosed by each athlete divided by the total number of previous injuries the athlete recalled having sustained. Intention to disclose an MSK injury was converted into a categorical variable and dichotomized as *high* (6 or 7) or *low* (0 to 5) to explore differences between those who reported a higher intention to disclose an injury and those who reported a lower intention to disclose, in accordance with previous literature.[22] Last, a multivariate binomial regression mode including gender,

Table 1. Participants' Demographic Information

Variable Name	Question	No. (%)
Age[a]	What is your current age (in years)?	570 (100)
Gender	What is your gender identity?	567 (100)
	Male	332 (58.5)
	Female	201 (35.5)
	Transgender	21 (3.7)
	Prefer not to disclose	9 (1.6)
	Other	4 (0.7)
Race	Which of the following races/ethnicities best describes you?	568 (100)
	White	405 (71.3)
	Black or African American	65 (11.4)
	Latino or Hispanic	28 (4.9)
	American Indian or Alaskan	25 (4.4)
	Asian	24 (4.2)
	Native Hawaiian or Pacific Islander	13 (2.3)
	Multirace	5 (0.9)
	Other	3 (0.6)
Year	What is your current academic year?	566 (100)
	Sixth grade	33 (5.8)
	Seventh grade	75 (13.3)
	Eighth grade	167 (29.5)
	Freshman	133 (23.5)
	Sophomore	48 (8.5)
	Junior	61 (10.8)
	Senior	49 (8.7)
Sport	What is your primary sport?	566 (100)
	Baseball	39 (6.9)
	Basketball	98 (17.3)
	Bowling	21 (3.7)
	Cross-country or track	27 (4.8)
	Diving or swimming	56 (10.0)
	Fencing	23 (4.1)
	Field event (track and field)	28 (5.0)
	Field hockey	35 (6.2)
	Football	38 (6.7)
	Golf	5 (0.9)
	Gymnastics	19 (3.4)
	Ice hockey	37 (6.5)
	Lacrosse	7 (1.2)
	Rifle	17 (3.0)
	Rowing or crew	35 (6.2)
	Skiing	17 (3.0)
	Soccer	19 (3.3)
	Softball	12 (2.1)
	Tennis	8 (1.4)
	Volleyball	10 (1.8)
	Water polo	4 (0.7)
	Wrestling	6 (1.1)
	Other	5 (0.9)
Income	Estimated family household income per year, $	548 (100)
	>50 000	73 (13.3)
	50 000–75 000	172 (31.4)
	75 000–100 000	159 (29.0)
	100 000–150 000	100 (18.3)
	>150 000	44 (8.0)
Musculoskeletal injury history	Have you ever had a musculoskeletal injury?	562 (100)
	Yes	457 (81.3)
	No	105 (18.7)

[a] Mean = 15.81 ± 1.8, median [interquartile range] = 16.2 [15.5–17.3] y.

Table 2. Participants' Musculoskeletal Injury Disclosure Beliefs

When Do You Feel That You Should Report a Musculoskeletal Injury (Select All That Apply)? (n = 570)[a]	No. (%)
Once it is so bad you can't play anymore	213 (37.4)
Even if you can still play but it is bothering you a little and affecting your game	142 (24.9)
Even if it is not affecting your game play but it still hurts a little	99 (17.4)
Right when it first happens or you first start feeling the pain but only if it seems serious	306 (53.7)
Right when it first happens or you first notice the pain even if it doesn't seem like much	208 (36.5)
After a while if it keeps getting worse	207 (36.3)

[a] Items are reproduced in their original format.

race, ethnicity, knowledge of injury signs and symptoms and consequences of injury, attitudes toward disclosure, perceived social norms, and perceived control over disclosure was used to identify which of the hypothesized determinants influenced higher intentionality for MSK injury disclosure.

RESULTS

Athlete Beliefs, Knowledge, Attitudes, Perceived Social Norms, and Control Over MSK Injury Disclosure

When asked to select all the reasons that apply to when an MSK injury should be revealed, 54% of athletes chose when the pain was initially felt but only if the injury seemed serious. In contrast, 37% of respondents reported that an MSK injury should be disclosed at the first sign of pain if it was not thought to be too serious. Last, 17.4% of participants believed that an MSK injury should be reported if it only hurt a little and was not affecting their game play (Table 2).

Athlete knowledge total scores ranged from 4 to 72 out of a possible 82 (mean = 44.8 ± 10.03; Table 3). Higher scores indicated greater knowledge of MSK injury symptoms and consequences of injury. Respondents' attitude scores toward disclosure of MSK injury ranged from 8 to 56 out of a possible 56 (mean = 34.9 ± 6.6), with higher attitude scores representing more favorable attitudes (Table 4, Figure 1). Participants' social norms received scores ranging from 12 to 42 out of a possible 49 (mean = 27.8 ± 6.8), and higher scores represented greater perceived support and social acceptance for MSK injury disclosure (Table 5). Last, respondents endorsed an average of 4.5 ± 1.7 (range = 1–7) related to perceived control over MSK injury reporting, with higher scores indicating more control, which would be equivalent to *somewhat agree* (Figure 2).

Athlete Reporting Behaviors

In total, 457 (80.2%) of the athletes described having sustained ≥1 MSK injury related to sport; the mean number of MSK injuries was 3.32 ± 2.2 (range = 1–10). When asked how many of those injuries were not reported to a coach or a health care provider, respondents noted having not reported or purposefully hidden 77%.

Determinants of a High Intention to Disclose an MSK Injury

Student-estimated household income, knowledge of MSK injury symptoms and consequences, attitudes toward MSK injury disclosure, and perceived social norms surrounding the disclosure of an MSK injury were significant predictors of a high intention to disclose MSK injuries (Table 6). Specifically, for each unit increase in total MSK injury knowledge (Exp[β] = 1.061, β = 0.054, P = .020, 95% CI = 1.031, 1.221) and attitude (Exp[β] = 1.070, β = 0.064, P < .001, 95% CI = 1.027, 1.115) scores, 6% and 7% increases in the likelihood of a high intention to disclose an MSK injury, respectively, were observed. Moreover, for each unit increase in the social norm score (Exp[β] = 1.178, β = 0.164, P < .001, 95% CI = 1.119, 1.241), an 18% increase in the likelihood of a high intention to disclose an MSK injury was seen. However, gender (Exp[β] = 1.116, β = 0.066, P = .54, 95% CI = 0.776, 1.606), race (Exp[β] = 0.848, β = 0.059, P = .091, 95% CI = 0.700, 1.028), presence of an athletic trainer (Exp[β] = 0.912, β = 0.042, P = .615, 95% CI = 0.637, 1.306), and MSK injury history (Exp[β] = 1.544, β = 0.641, P = .187, 95% CI = 0.810, 2.943) were not significant predictors of a high intention to disclose future MSK injury.

DISCUSSION

We demonstrated 3 primary findings. First, most participants reported a low level of knowledge regarding MSK symptoms and consequences. Second, fewer than one-quarter of athletes believed it was necessary to disclose an injury, even if it was bothering them, as long as they could still play. Third, several previously identified determinants of high intention to disclose signs or symptoms of a concussion, such as knowledge of signs and symptoms, injury consequences, attitudes toward disclosure, and perceived social norms surrounding disclosure, were significant predictors of a high intention to disclose an MSK injury.

Knowledge of Symptoms and Consequences of MSK Injury

When asked about the consequences of MSK injury, more than 70% of participants answered either *yes* or *maybe* to whether "no bad things" could happen if someone continued playing "through the pain," returned to sport or physical activity too soon, or had multiple MSK injuries during their lifetime. This finding suggests that MSK injuries may not be perceived as significant or meaningful unless they cause significant disability or pain sufficient to substantially restrict an athlete's ability to participate. This idea is in direct conflict with the idea that early disclosure and early treatment of injury could help reduce the overall burden of MSK injury.[23] Therefore, adolescent athletes may benefit from education related to the potential side effects and consequences of "playing through the pain," returning too early, or sustaining multiple MSK injuries over time without proper recovery.[7,11]

In addition to a lack of understanding regarding the consequences of MSK injury, respondents lacked a clear understanding of MSK injury symptoms, such that no single listed symptom was correctly identified as an indicator of MSK injury by >50%. Although many of the listed symptoms may also reflect another condition and might have elicited a *maybe* answer, early evidence of a general lack of knowledge concerning MSK injury symptoms among adolescent athletes was present.

A lack of knowledge of the symptoms and consequences of MSK injury may also play a role in the prevention, treatment, and risk of reinjury. For example, certain injuries, such as ankle

Table 3. Participants' Knowledge of Musculoskeletal Injury and Consequences

Knowledge Item (n = 570)[a,b]	Frequency of Answer			
	Yes	No	Maybe	Percentage Correct
Do you consider the following a primary sign or symptom of musculoskeletal injury?				
Pain at rest	258	92	217	45.5
Pain during nonsport activity (ie, walking, going to the store, etc)	201	119	247	35.4
Pain during sport activity	236	118	209	41.9
Pain that goes away during activity (or after warmup)	181	140	241	31.8
Pain following sport-related activity	214	138	207	38.3
Pain at night	181	138	246	32.0
Radiating pain or pain that travels	183	154	222	32.7
Restricted movement	230	138	193	41.0
Muscle weakness	209	133	221	37.1
Compensating to perform tasks	188	150	223	33.5
Soreness less than 48 hours	163	189	209	33.7
Soreness greater than 48 hours	182	165	215	32.4
Bilateral soreness (soreness on both sides of body)	192	155	211	27.8
Swelling	231	111	218	41.3
Bruising	208	159	193	37.1
Joint pain	213	132	216	38.0
Headache	158	201	201	28.2
Trouble falling asleep	182	200	178	32.5
More emotional	176	157	228	31.4
Irritability	153	199	208	27.3
Sadness	149	209	205	36.4
What do you think can happen to someone who does not report/disclose a possible musculoskeletal injury and continues playing "through the pain"?				
No bad things	149	187	229	33.1
More likely to get another musculoskeletal injury	216	92	258	38.2
Current injury could worsen	214	116	230	38.2
Decreased athletic performance	224	117	224	39.3
May put others (ex, teammates) at risk of injury	207	122	236	36.6
I do not know what might happen	183	177	206	32.3
What do you think can happen to someone returning to their sport or physical activity too soon after a musculoskeletal injury?				
No bad things	159	181	227	27.9
More likely to get another musculoskeletal injury	213	121	230	37.8
Current injury could worsen	212	124	227	37.2
Decreased athletic performance	227	114	226	40.0
May put others (ex, teammates) at risk of injury	191	136	239	33.5
I don't know what might happen	172	162	231	30.2
What do you think can happen to someone as a result of multiple musculoskeletal injuries over their lifetime?				
No bad things	159	166	238	42.2
Develop long-term problems (ex, chronic pain, tissue degeneration, arthritis)	213	111	236	38.0
Need for surgery	179	119	265	31.8
More likely to get another musculoskeletal injury	208	134	219	37.1
Forced to retire from sport	219	109	233	39.0
Difficulty with everyday activities	213	103	249	37.7
Changes in social life	178	124	260	31.7
I don't know what might happen	175	177	207	30.7

Abbreviation: ex, example.
[a] Items are reproduced in their original format. Respondents could choose >1 item per category.
[b] High score = 72/82. Mean = 48.8 ± 10.07, median [interquartile range] = 47 [40–55].

sprains, medial tibial stress syndrome, shoulder impingement, and many more, have several early signs and symptoms. If these symptoms are recognized by the athlete and reported in a timely fashion, the total injury burden, such as time loss and economic expense, associated with the treatment of chronic injuries, such as chronic ankle instability, shoulder impingement, and low back pain, could be dramatically reduced. For each unit increase in total MSK injury knowledge, there was a 6% increase in the likelihood of a high intention to report MSK injuries. Incremental increases in knowledge could be addressed through proper educational efforts and may serve as a starting point for targeted intervention programs geared at promoting and encouraging early disclosure of MSK injury.

Attitudes Toward Disclosure and Perceived Social Norms

Overall, 77% of MSK injuries that participants sustained were either not reported or were purposefully hidden at the time of injury, suggesting a generalized perception of not

Table 4. Participants' Attitudes Toward Musculoskeletal Injury Disclosure

Item[a]		Mean ± SD	Median [Interquartile Range]
For the following, select the number closest to each word that describes how you feel about reporting symptoms of musculoskeletal injuries. Reporting possible musculoskeletal injury symptoms to a medical professional or someone in authority during physical activity is			
Bad (1)	Good (7)	4.46 ± 1.6	5 [3–6]
Unimportant (1)	Important (7)	4.52 ± 1.6	5 [3–6]
Waste of time (1)	Worthwhile (7)	4.35 ± 1.6	4 [3–6]
Weak (1)	Strong (7)	4.37 ± 1.6	5 [3–6]
Cowardly (1)	Brave (7)	4.28 ± 1.6	4 [3–5]
Shameful (1)	Prideful (7)	4.27 ± 1.6	4 [3–6]
Harmful (1)	Beneficial (7)	4.39 ± 1.6	4 [3–6]
Extremely difficult (1)	Extremely easy (7)	4.26 ± 1.6	4 [3–5]
Total attitude score		34.8 ± 7.9	33 [30–41]

[a] Items are reproduced in their original format.

needing to disclose most MSK injuries. Previous researchers in the concussion space have demonstrated the effectiveness of simple educational programing to improve the prevalence of injury disclosure. For example, up to a 40% difference was evident in the disclosure of concussion among individuals who had received educational programing compared with those who had not.[19] Documented success from educational programing designed to increase concussion reporting behavior indicates that practitioners interested in increasing the disclosure of MSK injury can start by mirroring these interventions.

In general, when participants were asked to rate their attitudes toward MSK injury disclosure, their scores were relatively low (34.8 ± 7.9 out of a possible 56) and similar to early observed attitude scores related to concussion.[19,20] However, many recent studies reflect improvements after educational programing and increased global awareness surrounding and supporting the disclosure of concussion symptoms to a health care provider.[24–27] Such attitude scores pertaining to MSK injury in the present population are close to the preliminary scores of concussion patients approximately 10 years ago before widespread educational efforts were implemented.[17,18] Our respondents' average score for each question in the attitude subcomponent was 4.4. Multiple interventional studies have shown the positive effect of educational interventions that not only target athlete knowledge of signs and symptoms but also focus on a socioecological framework incorporating interpersonal relationships between athletes and their coaches and peers, societal and community acceptance, and intrapersonal components surrounding athlete concerns about disclosing an injury.[19,28] For each unit increase in attitude score, the likelihood of a high intention to disclose an MSK injury increased 7%. Based on the concussion literature, attitudes toward MSK injury may be similarly improved by applying a socioecological educational framework that targets multiple levels of injury disclosure, such as policy and societal, community, and interpersonal and intrapersonal considerations.

In the same way, low perceived social norm scores in our adolescent athletes surrounding the disclosure of MSK injury were consistent with perceived social norm scores in the early concussion symptom reporting literature.[17,29,30] However, if we again look back across the past decade, we see several successful examples of reducing barriers to concussion symptom reporting through educational programing that seeks to improve the social context of accepting concussion disclosure as a positive factor.[29,30] For each unit increase in social norms, the likelihood of patients endorsing a high intention to disclose a future MSK injury increased 18%. Recent findings in the concussion literature support the theory that targeted educational programing aimed at improving the social context of injury disclosure may also benefit efforts to improve the early reporting of MSK injuries.

Table 5. Participants' Perceived Social Norms and Control Over Musculoskeletal Injury Disclosure

Item[a]	Mean ± SD	Median [Interquartile Range]
For the following, select the level of agreement that corresponds with how you feel about each statement.		
Schools like mine provide appropriate care for individuals with musculoskeletal injuries	4.61 ± 1.6	5 [3–6]
If I suffered a musculoskeletal injury, I would feel supported by my school	4.57 ± 1.6	5 [3–6]
When I experience symptoms of possible musculoskeletal injuries, people who are important to me would approve of me reporting them to a medical professional or someone in authority	4.77 ± 1.6	5 [4–6]
When other athletes I know experience symptoms of possible musculoskeletal injuries, they report them to a medical professional or someone in authority	4.49 ± 1.6	5 [3–6]
I should report symptoms of possible musculoskeletal injuries when I experience them to a medical professional or someone with authority	4.70 ± 1.7	5 [3–6]
Total social norm score	27.6 ± 6.6	27 [22–33]
I have control over reporting symptoms of musculoskeletal injuries to a medical professional or someone in authority		
Total perceived control score	4.48 ± 1.7	5 [3–6]

[a] Items are reproduced in their original format.

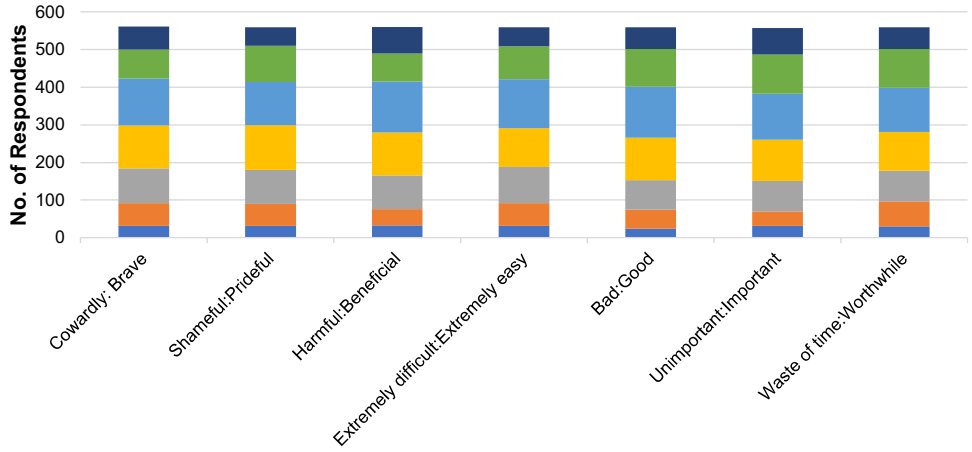

Figure 1. Attitudes toward musculoskeletal injury disclosure.

Determinants of a High Intention to Disclose MSK Injuries

Despite a general lack of investigation into determinants of MSK injury disclosure, a few elements, such as age and gender, have been implicated in influencing MSK injury disclosure.[7,31] Moreover, the authors of 1 study identified correlations in collegiate sport athletes between determinants of intention to disclose concussion injury, such as

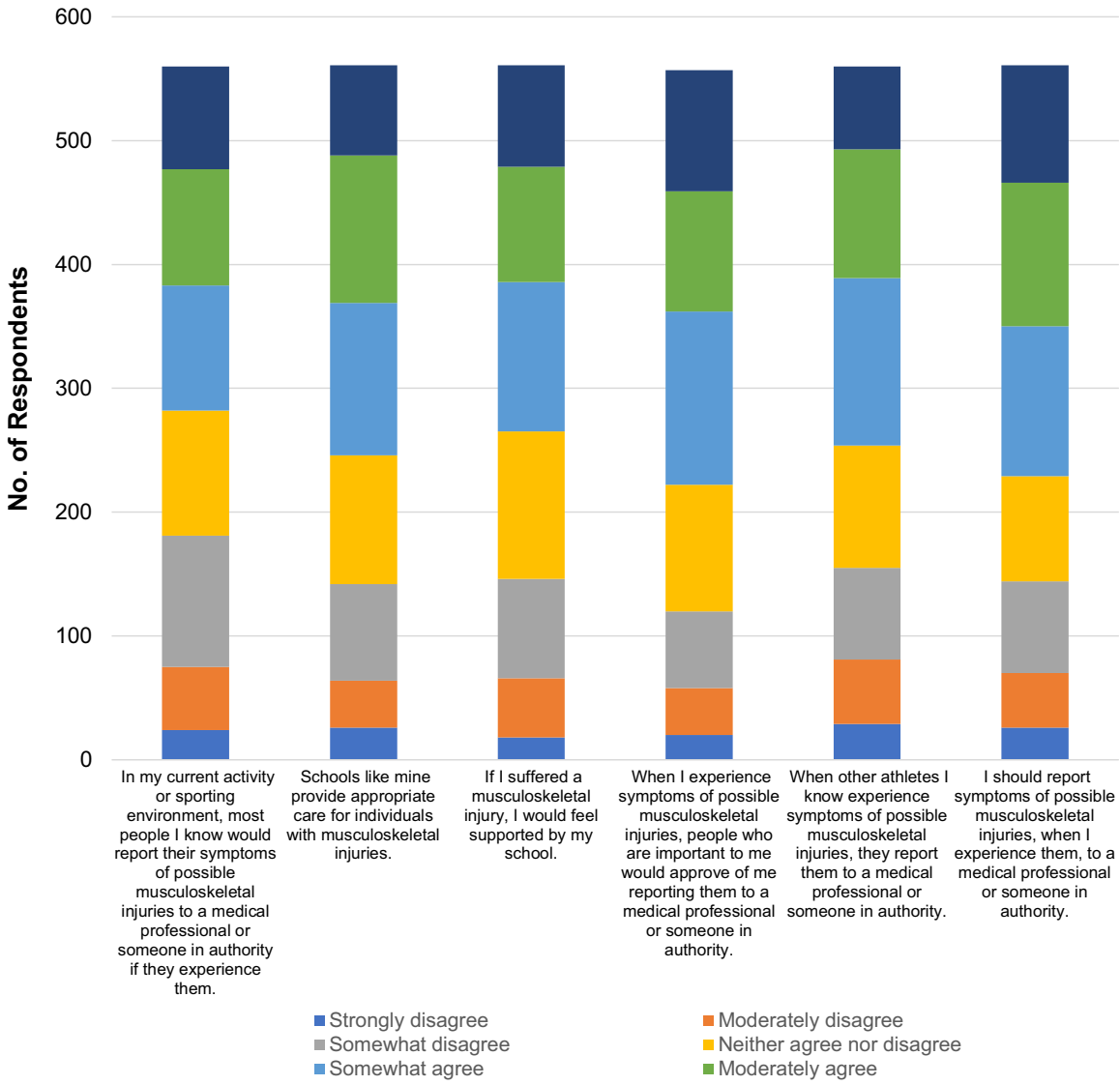

Figure 2. Perceptions of social norms surrounding musculoskeletal injury disclosure.

Table 6. Binary Logistic Regression Predicting a High Intention to Disclose a Musculoskeletal Injury

Variable	Exp(β)	β	*P* Value	95% CI
Musculoskeletal injury				
Injury history	1.544	0.641	.187	0.810, 2.943
Knowledge	1.061	0.054	.020	1.031, 1.221
Attitude	1.070	0.064	<.001	1.027, 1.115
Social norm	1.178	0.164	<.001	1.119, 1.241
Race	0.848	0.059	.091	0.700, 1.028
Household income	1.338	0.291	.035	0.035, 1.338
Athletic trainer presence	0.912	0.042	.615	0.637, 1.306
Constant	0.000	10.814	<.001	

knowledge of injury symptoms and consequences, attitudes toward injury disclosure, perceived social norms, perceived behavior control, and a high intention to disclose an MSK injury.[22]

We found that knowledge of MSK injury, attitudes toward MSK injury disclosure, and social norms surrounding the disclosure of MSK injury were all significant predictors of a high intention to disclose an MSK injury among adolescent athletes. Moreover, household income determined the MSK injury disclosure intention. With each unit increase in household income, the likelihood of endorsing a high intention to disclose future MSK injuries increased 34%. In contrast, other hypothesized predictors, such as gender, race, presence of an athletic trainer, and MSK injury history, were not significant predictors of a high intention to report an MSK injury. To our knowledge, this is the first examination of predictors of adolescent intentions to disclose an MSK injury. These results identify key starting points for researchers, coaches, parents, and relevant health care professionals interested in reducing the economic and social burden of MSK injury in adolescents: the development of educational programs pertaining to the symptoms of MSK injury, helping athletes understand the context in which MSK injury should be disclosed, and what type of information should be shared with a health care provider. Moreover, perceived social norms influenced MSK injury disclosure decisions. Thus, it is important to consider the entire socioecological framework targeting multiple levels of injury disclosure, such as policy and societal, community, interpersonal, and intrapersonal considerations.

Limitations

Although we worked with the school staffs who disseminated the survey, we did not have direct access to the participants, and therefore, do not know if each site promoted and distributed the survey in a similar fashion. Several other biases, such as response, social desirability, recall, and selection bias, may have also played roles in the outcomes. Every effort was made to reduce such biases by recruiting each student in the same manner and not targeting particular students or groups of students. Furthermore, participants were instructed that their individual responses would not be shared or linked to their identifiable information, and the results would be shared only as aggregate data to decrease the likelihood of their answers being biased out of fear of what others might think.

CONCLUSIONS

Adolescent athletes reported a low level of knowledge of the symptoms and consequences of MSK injury, with most (77%) of their past MSK injuries either going undisclosed or being purposely hidden. Also, several identified determinants of intention to disclose concussive injuries, including knowledge, attitudes, and perceived social norms, accounted for the intentionality of participants to report MSK injuries. Previous researchers demonstrated the success of multifactorial interventional educational programs targeted at improving the social context surrounding concussion disclosure and enhancing the knowledge of potential signs, symptoms, and consequences. These studies highlighted the significance of interventions designed to expand knowledge of an injury while improving the social environment, attitudes, and perceptions of injury disclosure and the context of sport participation to make disclosure of injury more socially acceptable.[21,32] Investigators who want to better understand the barriers and social context surrounding the disclosure of MSK injuries can learn from the interventional models applied to encourage concussion symptom disclosure. These models could serve as a starting point to enhance MSK injury disclosure behavior and reduce the social and economic burden of MSK injury.

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