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Health Literacy among Adolescent Athletes across Rural and Urban Communities and Evaluating Scores aside State-Mandated Concussion Education

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Abstract:

Context: Low health literacy disproportionately affects individuals and communities that are socially disadvantaged or have geographical barriers to healthcare. For injuries like concussion, pre-participation education is typically mandatory, but it is unclear if the reading level of these educational documents are suitable to meet health literacy needs of adolescent athletes across urban and rural communities.

Objective: To assess differences in health literacy among adolescent athletes in urban and rural communities and compare scores to the state-mandated concussion education handout.

Design: Cross-sectional.

Setting: High School Athletics.

Patients or Other Participants: Participants included 270 adolescent athletes total that attended urban (n=157) and rural schools (n=110).

Main Outcome Measure(s): The Rapid Estimate of Adolescent Literacy in Medicine-Teen (REALM-Teen) was used to assesses a participant's ability to read common medical words and lay terms for body parts and illnesses. The tool consists of 66 words divided into three lists and scores can range from 0-66. Scores are tabulated into a health literacy score for each participant, equating to a grade-specific reading level.

Results: Urban adolescent athletes had a higher total REALM-Teen score than rural participants (t=3.868, p<.001). Urban adolescents had higher mean scores than those from rural locations for each individual REALM-Teen list; score differences were statistically significant for Lists 2 and 3 (t=2.888, p=.004; t=4.012, p<.001, respectively). Only 26% (n=41) of urban and 12.7% (n=14)

rural adolescent athletes scored at a reading level that aligns with the health literacy level necessary to read/comprehend the state-provided concussion education handout.

Conclusions: Urban adolescent athletes had better health literacy compared to their rural peers; however, irrespective of rurality, over half of participants had low health literacy for their appropriate age/grade in high school (≤7th grade). Ensuring that health information is provided at an appropriate reading level for the target audience is essential to increasing health literacy.

Key Words: health literacy, teenagers, adolescents, rural health, health information

Key Points:

- Adolescent athletes in urban communities have higher health literacy than their peers in rural communities.
- Health literacy was low overall among adolescent athletes in this study. Over 50% were at or below a 7th grade reading level, which is below the 10th grade reading level of the state-mandated concussion education handout.
- Health literacy is essential as patients with higher health literacy are better equipped to make informed health decisions and navigate healthcare, and this is highly important in rural communities where athletic training presence may be limited.

INTRODUCTION

Health-related factors between rural and urban communities have been well studied.[1,2] Adults in rural communities have an increased risk for developing coronary heart disease, diabetes, obesity, chronic disease, and other comorbidities as compared to their city-dwelling peers.[1-4] These findings could be a byproduct of inadequate health care resources in rural communities often marked by geographical isolation to hospitals, low numbers of practicing health care providers, and an overall lower socioeconomic status (SES).[5-7] Children in these communities, particularly adolescents (10-19 years old), face commensurable health risk factors[8] given their dependence on parents/guardians and, very little control over their social determinants of health. While there is a myriad of health disparities between urban and rural communities that are uncontrollable at the individual level, one health-related factor that can be intervened upon though intentional education is health literacy.

The Centers for Disease Control and Prevention (CDC) defines health literacy as the level to which a person has the ability to understand, apply, and communicate health information and services to make informed healthcare decisions.[9] Health literacy has been investigated in adults, however, few studies[10-12] have been conducted in adolescent populations. Overtime, adolescents are faced with increased physical, cognitive, and emotional development and more opportunities for personal autonomy. As they strive towards adult independence, it is important to equip adolescents with an adequate level of health literacy so they can play a more active role in making informed healthcare decisions for themselves. For adolescents participating in sports particularly, a better understanding of health-related information may be increasingly necessary due to the inherent risk of injury posed by athletic involvement. Having increased health literacy regarding injuries commonly sustained during sport (e.g., concussions, muscle strains, ligament

sprains, etc.) could empower adolescent athletes to use their knowledge to identify an injury occurrence and seek care quickly; thus, potentially mitigating the exacerbation of sport injuries and increasing overall activity levels for teenagers.[13,14]

Currently, one of the most polarizing injuries in youth sport is concussion given the potential long-term effects that are still largely unknown.[15,16] Early identification, disclosure, and care initiation are key elements for optimizing concussion management, as delayed care seeking has been associated with increased symptom severity and overall recovery time.[17] Given their invisible nature and the lack of validated, objective concussion assessments, diagnosis is largely determined through patient-reported symptoms. Due to this, concussion underreporting remains a persistent issue among adolescent athletes. Previous research has found that over 30% of high school athletes reported previously continuing to play in a game while experiencing concussion-like symptoms.[18] When considering why adolescents do not report suspected concussions, common reasons remain not recognizing a concussion was sustained at the time of injury, not wanting to lose playing time, and being worried about letting their team down.[19,20] These findings suggest that adolescent athletes may not have a suitable level of health literacy to enable them to recognize that they or a teammate had sustained a concussion or they do not possess the depth of knowledge to understand that the risks of continuing to play outweigh the undesirable, temporary sport and social discomforts they will face throughout the recovery period.

Within the United States (US), all states have concussion laws in place that include athlete education as a primary tenet to increase concussion health literacy. Concussion awareness interventions fall under secondary public health prevention by providing information to help quickly recognize and remove athletes from participation after a suspected concussion, minimizing acute impact and preventing further injury from occurring.[21] Previous studies have

assessed the effectiveness of concussion educational programming for increasing adolescent health literacy, however, results are mixed and lack data supporting long-term information retention.[22] When considering the impact of urban versus rural community contexts on health literacy specifically, the state of Alabama is of particular interest given that 55 of 67 counties in the state are rural according to the Alabama Department of Public Health.[23] Additionally, Alabama is located in the Black Belt region of the US which is marked by high poverty, a greater proportion of individuals from underrepresented racial groups, and lower access to adequate healthcare. The Alabama High School Athletic Association (AHSAA) requires athletes and their parent/guardian to read and sign a concussion educational handout annually in accordance with their state law. This document is the only piece of state-required concussion education for high school athletes and is written at minimum a 10th grade reading level according to metrics using the Flesch-Kincaid scale.[24] Although the AHSAA concussion education handout aims to empower students with a suitable level of concussion health literacy, it is unclear if the reading level of this document is suitable to meet this objective for adolescent athletes in both urban and rural communities across Alabama.

Ensuring that health information is provided at an appropriate reading level for the target audience is essential to increasing health literacy, especially considering the strong correlation between health literacy and health outcomes.[25] Prominent health organizations recommend patient education materials be written at a 5th grade or lower reading level. However, readability and comprehension are not equivalent. Comprehension levels are often found to be two or more grades lower than an individual's reading level.[26] These findings indicate that even if education materials meet the 5th grade reading level recommendation, patients may still not be able to understand and apply such information which is the very essence of health literacy. Further,

research has found that adult urban populations have higher health literacy than their rural counterparts but, rurality is not the strongest determinant of health literacy.[27] Studies suggest race/ethnicity, age, education, gender and socioeconomic status (SES) all play a key role.[27] Additionally, there is a direct relationship between health literacy and health behaviors even after controlling for sociodemographic variables[28] in adolescents. This highlights the importance of health literacy for health-promoting behaviors in adolescents, which is especially critical for those who participate in sport and inherently have an increased risk of physical injury.

The purpose of this study was to assess the health literacy of urban and rural community adolescent athletes and compare scores to the state-mandated concussion education handout. We hypothesized that based on rurality, adolescents' health literacy level would be below that of the state-mandated handout with urban adolescents having higher literacy levels than rural adolescents.

METHOD:

Participants: The population of interest in this cross-sectional study consisted of adolescent athletes attending high school. Our study sample comprised of 270 adolescent athletes between the ages of 13 and 18 years. Eligible participants had to be listed on an active sport roster at their respective schools. Athletes from nine high schools across six counties in Alabama were recruited to participate. Athletes attending urban schools (n=157) came from four high schools and athletes attending rural schools (n=110) came from five high schools. All nine schools were classified as Title I schools. Rurality was based on the respective school's geographic location using the Alabama Department of Public Health county map and was then calculated based on the US Department of Agriculture's rural-urban commuting code (RUCA). RUCA codes within

the range of 1-3 were categorized as urban and RUCA codes within the range of 4-10 were categorized as rural.

Instrumentation: The Rapid Estimate of Adolescent Literacy in Medicine-Teen (REALM-Teen)[29] was utilized as the primary screening measure of assessing health literacy. This tool is a valid and reliable instrument for assessing adolescent literacy skills and reading ability that is below grade level, and it is a tool most appropriate in health care settings.[29] It is designed to evaluate an aspect of overall health literacy such that appropriate patient education materials or oral instructions may be effectively used. REALM-Teen assesses an individual's ability to read common medical words and lay terms for body parts and illnesses. The REALM-Teen takes 2-3 minutes to administer and score, and consists of 66 words divided into three lists (22 words per list), each increasing in difficulty.

In this study, participants read each word listed aloud, and the instrument was scored based on the correct pronunciation of each word. Researchers were trained prior to data collection to determine correct pronunciation. English was the primary language for all participants and scores were not penalized for dialect or accent. The raw REALM-Teen score, which can range from 0-66, was tabulated into a health literacy score for each participant, equating to a grade-specific reading level (See Table 1). Notably, the test does not measure the individual's understanding of the word's meaning.

Procedure: Institutional Review Board approval was obtained from <<BLINDED>>. Parent consent and child assent were ascertained prior to data collection. Participants met one-on-one with a member of the research team to complete the test before or after their athletic practice. Prior to the REALM-Teen administration, participants were asked to self-report their age, gender, and race/ethnicity. Each participant was handed a laminated REALM-Teen instrument

with all 66 words listed. Individuals could hold the sheet of paper in any way that allowed them to see and read effectively. Researchers held the scoring sheet so it was not visible to the participant. Each participant was given verbal instructions prior to completing the REALM-Teen and researchers circled any words that participants pronounced incorrectly or did not attempt to pronounce. The circled words were tabulated and subtracted from 66 to determine each participant's raw score.

Statistical Analysis: All demographic variables were analyzed using descriptive statistics. REALM-Teen score totals were used as the outcome of interest for all statistical analyses. An independent samples t-test was employed to determine score differences based on rurality. Chi-square tests were computed to determine where proportional differences between rurality groups may lie between REALM-Teen scores based on individual words within each list. Data were analyzed using SPSS and statistical significance was set *a priori* $p \leq 0.05$.

RESULTS:

Participant demographic information with respect to age, gender, race/ethnicity, and rurality is provided in Table 2. A total of 270 adolescent athletes were evaluated, with a majority being age 15 (n= 71, 26.3%). The majority of participants self-identified as male (n=240, 88.9%), and Black/African American (n=258, 95.6%). There were no significant group differences noted in distribution of age, race or gender by rurality.

REALM-Teen Total and List Score Differences on the Basis of Rurality

The average REALM-Teen raw score among participants was 55.47. Mean total and individual list REALM-Teen scores for the urban and rural cohorts are provided in Table 3. Urban participants had a higher total mean REALM-Teen score than their rural counterparts, and this difference was statistically significant (t=3.868, p<.001). The urban cohort also had a higher

mean score than the rural cohort for each of the individual REALM-Teen lists. For List 2 and List 3, the score differences were statistically significant (t=2.888, p=.004; t=4.012, p<.001, respectively), but for List 1, the score difference was not statistically significant (t=1.840, p=.067). Across both urban and rural cohorts, the mean list scores were lowest for List 3 and highest for List 1. This progressive decrease in mean score can be credited to the increase in difficulty of the terms as participants move from List 1 to List 2 and finally to List 3.

There were several specific terms driving the difference in mean total REALM-Teen scores between the rural and urban cohorts. Seven terms from List 2 demonstrated statistically significant proportional differences between cohorts: 'calories' (χ^2=5.144, p=.023), 'marijuana' (χ^2=5.098, p=.024), 'pelvic' (χ^2=11.573, p=.001), 'prevention' (χ^2=4.072, p=.044), 'ointment' (χ^2=10.108, p=.001), 'diabetes' (χ^2=5.333, p=.021), and 'calories' (χ^2=0.144, p=.023). Fourteen terms from List 3 demonstrated statistically significant differences between cohorts: 'nutrition' (χ^2=14.228, p<.001), 'alcoholism' (χ^2=5.094, p=.024), 'antibiotic' (χ^2=4.918, p=.027), 'delinquency' (χ=4.258, p=.039), 'pneumonia' (χ^2= 5.806, p=.016), 'diagnosis' (χ^2=11.382, p=.001), 'nausea' (χ^2=9.581, p=.002), 'acne' (χ^2=5.876, p =.015), 'hepatitis' (χ^2=5.621, p=.018), 'adolescent' (χ^2=9.269, p=.002), 'bulimia' (χ^2= 14.331, p<.001), 'anorexia' (χ^2=18.962, p<.001), 'bronchial' (χ^2=16.702, p<.001), and 'obesity' (χ^2=6.427, p=.011). Given that significant differences in individual list scores between the rural and urban cohorts only existed for List 2 and List 3, it follows that the terms driving the difference in mean total REALM-Teen score would stem from those two lists.

Finally, looking at the range of scores on the REALM-Teen between urban and rural groups and how those ranges compare to the five reading level categories, and the state-mandated concussion education handout, 26% (n=41) of urban adolescents and 12.7% (n=14)

rural adolescents scored at a 10th grade and above reading level. This reading level meets health literacy levels of the mandatory concussion education handout and is the literacy level category that most aligns with high school reading expectations. Among the urban cohort, 30.6% (n=48) scored at the 8th-9th grade category, 36.9% (n=58) scored at the 6th-7th grade category, and the remaining 6.4% (n=10) scored at the 4th-5th grade category or below. Among the rural cohort, 19.1% (n=21) scored at the 8th-9th grade category, 51.8% (n=57) scored in the 6th-7th category, and the remaining 16.4% (n=18) scored at the 4th-5th grade category or below.

DISCUSSION:

This study aimed to assess differences in health literacy between adolescent athletes from urban and rural communities and to compare health literacy scores to the state-mandated concussion education handout. Roughly 20% of adolescent athletes who completed the REALM-Teen had a literacy level sufficient to read and complete the state-mandated concussion education handout. Urban adolescents scored higher on the REALM-Teen compared to their rural peers and the difference between cohorts was roughly 4 points. Approximately 53% of the adolescents scored at a 7th grade or below literacy level and this comprised of a greater proportion of adolescents from rural communities. This demonstrates there was a clear misalignment with health literacy scores in over half of the participants based on age and grade in high school (≤7th grade) irrespective of rurality. Though 16% of the participants were 9th graders or freshmen in high school, and possibly among the adolescents scoring at or below grade-level, it should be noted that they were still expected to read and acknowledge the state-mandated concussion education handout written at a higher reading level. Ultimately, the results of this study indicated that the state-mandated concussion education handout in Alabama has a reading level that exceeds that of the target audience of adolescent athletes, thus, potentially decreasing its

effectiveness of increasing healthy literacy related to this pathology. Moving forward, the development and revision of concussion education and awareness materials must be foundationally informed by the needs, resources, and healthy literacy levels of the individuals and communities it seeks to serve. Given that health literacy has been identified as a key to neutralize social determinants of health,[30] tools like the REALM-Teen could be utilized by athletic trainers and school districts to gain a baseline of general health literacy of the target audience. They can then use that information to select or generate concussion educational materials that are at the appropriate reading level to promote the most favorable transfer of health information to their athletes.

Limited comprehension of medical information due to low health literacy contributes to various health disparities and serves as a risk factor for poor health outcomes among both adults and children.[31,32] Within rural regions of the US, the impacts of low health literacy among adolescents are particularly problematic because adolescents have increased autonomy of their behaviors. A survey administered among middle schoolers in rural Virginia demonstrated that students with lower health literacy reported significantly lower frequencies of health-promoting behaviors and significantly higher frequencies of risk-taking health behaviors than their peer counterparts with higher health literacy.[33] Additionally, those with lower health literacy had higher body mass index percentiles and lower quality of life in comparison to their peers with higher health literacy.[33] Similar discrepancies in youth holistic wellbeing related to health literacy levels may exist in rural Alabama, reflecting the health literacy disparities observed in our participants. While comprehension limits tend to promote these poor general health outcomes, low health literacy can also contribute to negative outcomes specific to care and recovery for concussion. At the collegiate level, athletes with limited health comprehension skills have greater

difficulty identifying the symptoms of concussion and understanding how to seek out further concussion testing and treatment when necessary.[34] These findings point toward the troublesome phenomenon of those with health literacy gaps, especially in the area of concussion knowledge, not fully comprehending how to recognize a concussion and seek appropriate care for the injury.

There is a paucity of literature on adolescent health literacy in general, however, rural-urban health literacy disparities and concussion knowledge across various sociodemographics have been well studied. Urban populations typically have higher health literacy[27] and these differences are more apparent when knowledge measures are used versus diverse measures of health literacy.[28,35] Additionally, social determinants including SES, education, age, gender, race/ethnicity have stronger associations with health literacy in rural areas where reduced health care access challenges exist.[28,35] This could be why research consistently demonstrates that adolescents in rural areas[36] and of a racial minority[37] have lower concussion knowledge. Poorer concussion knowledge is also compounded by a lack of athletic training access.[37,38] These patterns are present despite legislation requiring some form of concussion education be provided to youth sport participants across the US, including those in this study. Concerns specific to the attribution of health literacy could be an explanatory factor pertaining to reduced concussion knowledge across multiple social determinants.

While providing health information regarding concussion to adolescent athletes is crucial to health literacy, the mere existence of the materials is not enough. Care must be taken to ensure concussion information is presented in a way that is accessible based on the individual's current health literacy level, especially in adolescents where developmental processes are taking place and access to athletic trainers may be limited. Moreover, adolescents are still in a window of development where they still heavily rely on parents and caretakers for health-related problems

despite increased autonomy. For invisible injuries like concussion, however, parents and caretakers commonly rely on the adolescent athlete to report symptoms to trigger the need for care. Therefore, it is not the sole responsibility of the child or their parents and caregivers to have knowledge regarding this injury; everyone must possess the knowledge needed to act when a potential concussion is present. This is why the efficiency of state-mandated concussion education efforts are essentially important as it pertains to health literacy for this injury. Concussion knowledge disparities exist in parent populations[39], and notable disparities in general and musculoskeletal health literacy are present in parents of pediatric sports medicine patients.[40] Aside from parents, athletic training access is often limited in rural communities[41] where we simultaneously see reduced health literacy. On a national scale, one-third of secondary schools do not have access to a full-time or part-time athletic trainer[42] and reduced access is more pervasive in minoritized communities[43] and schools with an higher population on free-or-reduced lunch and lower median household income.[44,45] Athletic training access can contribute to health literacy efforts, and guidelines from the 2023 Practice Analysis recognizes health literacy as an essential professional responsibility. However, recent research has shown that athletic trainers are not formally assessing health literacy to provide patient-centered care and heavily rely on perceptions and assumptions.[46]

While concussion education is delivered at the school or community level, the challenges for improving health literacy may be driven by decisions and mandates made at the state or organizational level. Organizational health literacy is characterized by organization-wide efforts to increase the ease of navigation, comprehension, and use of information and/or services to engage in health-related activities.[47] Further a healthcare system's organizational health literacy approach should be strongly informed by patient experiences, needs, and abilities in acquiring

and understanding health information and navigating the care-seeking process.[48] Given that concussion education for secondary school athletes is mandated by state-level departments of health and/or departments of education, achieving organizational health literacy becomes a significant challenge due to the variation of lived experiences, healthcare needs and access, and health literacy abilities of a broad population. State concussion laws and awareness approaches are likely plagued by some common organizational health literacy barriers, such as lack of time, resources, training, and an infrastructure of support to aid the implementation of health-literate concussion education practices at the school or community level.[47] While employing a one-size-fits-all concussion education approach at the state-level is not desirable, it may realistically be the only available option.

Employing the health literacy universal precautions[49] approach is viable a solution to this because subconscious biases are combatted by assuming all individuals will struggle to understand and use health information to some degree.[50] This strategy prevents the withholding of information or further explanation due to a false belief that the individual already fully understands the specific health topic. In addition, unorthodox strategies that serve to gamify concussion education, like Concussion Bingo,[51] may be most useful when attempting to provide comprehensible amounts of knowledge. Within sexual health education, the gamification of content has been shown to provide more engagement and knowledge retention than traditional print materials.[52] The development of similar active learning approaches to concussion education may lead to standardized practices that are better equipped to promote comprehensive concussion knowledge among adolescents where health literacy may be low.

In addition to gamifying concussion education, several other pedagogical approaches used in health education can be applied to concussion for adolescent athletes. Each approach

offers distinct strategies to engage students, enhance learning, and promote behavior change, while also improving health literacy. Traditional direct instruction is a teacher-centered approach, where the educator delivers content in a structured, lecture-based format.[53] This method is effective for providing foundational knowledge such as the dangers of playing with a concussion and the signs and symptoms of a concussion. In contrast, inquiry-based learning[54] fosters a student-centered environment, encouraging learners to ask questions and explore health-related issues through critical thinking and problem-solving. For students who benefit from hands-on experiences, experiential learning offers an approach that emphasizes learning through practical experiences,[55] such as role-playing scenarios related to concussion reporting and seeking appropriate care. Cooperative/collaborative learning[56] involves students working together in small groups to discuss concussion knowledge, fostering peer interaction and shared understanding. Constructivist pedagogy focuses on students building their knowledge of health concepts through active engagement, personal experiences, and social interactions.[57] For example, adolescents who have experienced concussions can share their signs, symptoms, and recovery processes, thus connecting personal experiences to broader health concepts. These diverse pedagogies collectively offer a comprehensive framework for implementing patient-education techniques that meet the health literacy needs of adolescents and enhance comprehension and retention of health information that can be used to make informed health-related decisions.

Regardless of the pedagogical approach used to teach information, it is imperative to increase health literacy by presenting information in a way that is clear, accessible, free of medical jargon, and tangible for all learners. The current study found differences between rural and urban adolescents in their understanding of the word "nausea." Therefore, instead of using

"nausea" when asking a concussed athlete if they are experiencing this symptom, healthcare providers could use simpler language such as "sick to your stomach" to ensure clearer communication and improve symptom recognition. Finally, those delivering health-related information need additional ways to disseminate information because our current health literacy values were overall low and below the reading level among most participants. To address this, educators can incorporate visual aids, videos, infographics, pictorials, and interactive activities that are below the 5th grade reading level to reinforce key concepts to improve comprehension.

Community engagement is crucial in improving health literacy and health outcomes for required concussion education, particularly in rural adolescent athletes where access to health and medical resources is often limited. Increasing health literacy in these communities can be achieved by providing tangible resources such as educational materials, workshops, and easier access to healthcare professionals. These resources help bridge gaps in understanding, ensuring adolescents and families are equipped to recognize and manage health conditions like concussions. Advocating for the inclusion of athletic trainers in rural schools is another important step, ensuring immediate, professional care when injuries and concussions occur. Additionally, fostering community health benefits through partnerships with local health organizations, sports teams, and other community stakeholders creates a shared responsibility for adolescent well-being. This collaboration helps build trust and strengthen relationships among students, educators, parents, and healthcare providers, creating a supportive environment where health and injuries like concussions are taken seriously, and proactive measures are put in place.

Several limitations are necessary to discuss. First, despite being an accessible and reliable instrument, the REALM-Teen may not be the most comprehensive metric available to evaluate health literacy levels. The focus is only on pronunciation/reading ability, but correct

pronunciation does not guarantee that an individual understands the true meaning of the term or how to properly contextualize this meaning within a given scenario. Future studies should aim to examine this population with measures such as the Test of Functional Health Literacy in Adults (TOFHLA). Second, only athletes within Alabama were assessed in this study, so findings may not be generalizable to other states due to discrepancies in particular social determinants of health across state divides. More research needs to evaluate potential health literacy discrepancies on the basis of rurality for younger youth athlete populations and parents/caregivers.

Conclusion:

Rural adolescent athletes had lower health literacy compared to urban adolescent athletes in this study; however, health literacy was low overall among all participants. Additionally, health literacy scores of the participants was lower than the state-mandated concussion education handout, suggesting these print education materials may be falling short to meet the literacy needs of the youth sport participants they seek to serve in this state. There are organizational health literacy solutions for this shortfall. Low health literacy increases the likelihood of health inaction or misuse of health-care services and this could cause serious complications in our rural communities when a concussion incident occurs.[28] Repeatedly, low health literacy has been shown to disproportionately affect individuals and communities that are socially disadvantaged or have geographical barriers to healthcare.[31] Over decades we have seen concussion unfold as a public health matter due to its potentially catastrophic nature and increased knowledge among sport constituents has not translated to behaviors that empower adolescents in health decision making for concussion, including immediate injury identification and symptom disclosure. Assessing health literacy using a standardized tool and utilizing pictorial descriptions[58] and/or

functional or media health literacy content related to higher health-promoting behaviors[35] could be the missing link to leverage improvements in adolescent decision making as teens assume increased responsibility for their health.

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Table 1. REALM-Teen Score Interpretation

Raw Score	Grade Range Equivalent	Literacy Skills
0-37	3rd Grade and Below	These adolescents will have a 5-fold quarter likelihood of reading below grade level. They are reading below grade level and may be at risk of school failure.
38-44	4th to 5th Grade	
45-58	6th to 7th Grade	Will struggle with most patient education materials; may have skills to pass GED.
59-62	8th to 9th Grade	
63-66	10th Grade and Above	Will be able to read most patient education materials.

Table 2. Participant Demographic Statistics (n = 270)

	N	Percentage (%)
Age		
13	3	1.1
14	40	14.8
15	71	26.3
16	65	24.1
17	68	25.2
18	17	6.3
Missing	6	2.2
Gender		
Male	240	88.9
Female	26	9.6
Missing	4	1.5
Race		
Black/African American	258	95.6
White	7	2.6
Hispanic	1	0.4
Missing	4	1.5
Rurality		
Urban	157	58.1
Rural	110	40.7
Missing	3	1.1

Table 3. Urban and Rural REALM-Teen Scores

	Mean (SD)	Std. Error	t-value	p-value
List 1				
Urban	21.88 (0.55)	0.044	1.840	.067
Rural	21.73 (0.80)	0.076		
List 2				
Urban	21.08 (2.51)	0.200	2.888	.004*
Rural	20.02 (3.48)	0.332		
List 3				
Urban	14.48 (5.39)	0.430	4.012	.000*
Rural	11.75 (5.58)	0.532		
Total Score				
Urban	57.44 (7.64)	0.610	3.868	.000*
Rural	53.50 (8.92)	0.850		

* Significant at $p<.05$ level