RELATIONSHIP OF AGE CATEGORY, GENDER AND TYPE OF SPORTS TOWARDS KNOWLEDGE AND ATTITUDE OF SPORT-RELATED CONCUSSION AMONG MALAYSIA SPORT SCHOOLS' ATHLETES

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Abstract

Sport-related concussions pose significant health risks to athletes across various sports. Understanding the relationship between internal and external factors and sport-related concussions is crucial for developing effective prevention and management strategies. This study investigates the relationship of age category, gender, and type of sport (contact and non-contact sports) on knowledge and attitudes toward sport-related concussions among Malaysia sport school athletes. The study included 439 athletes aged 13 to 17 years from sports schools nationwide, using the RoCKAS-ST-M questionnaire to assess their knowledge and attitudes. The data was analyzed using Pearson Correlation. Results indicates that all parameters have low relationship toward knowledge and attitude of SRC despite their significant relationships ($p < 0.05$). No clear relationships are found between knowledge and attitude of sport-related concussion with age category, gender and type of sports variables in this study therefore the findings emphasize the need for specialized education programs in Malaysian sports schools to improve concussion knowledge and attitudes among all student-athletes.

Keywords: sport-related concussion, knowledge, attitudes, gender, age

INTRODUCTION

Sport-related concussion is an incidence that may occur during sport competition especially in contact games. It occurs due to high amplitude of force to the head which direct the possibility to cause huge impact to the brain (Ingram et al., 2024; Patricios et al., 2023). Following this event, an athlete might complaints of at least two identical clinical manifestations including severe headache, dizziness, alteration in conscious levels and hypersensitive to light (Ingram et al., 2024; Iverson et al., 2012). In some cases, the athlete also suffers from concussion are emotional disturbance (Iverson et al., 2012).

Concussion is sustained to receive special concern in sport medicine in many consecutive years (McCrory et al., 2017). This trend may suggest the serious impact following episodes of concussion on the same athlete. In most cases, athletes who suffering knock to the head will be sidelined from the game immediately. For further safety action, the athlete will be omitted to continue playing and closely monitor for 24 to 28 hours. It is important to prevent a second incidence in the consecutive games. The

recurrent concussion in a short period of time might lead to more serious injury to the brain and longer recovery duration (Van Ierssel et al., 2020).

To identify the clinical features, the athlete supposedly equipped with knowledge related to sport-related concussion and understand the suitable action to be taken following the incidence. Therefore, proper intervention could be provided earlier and more effective after the accident. Consistent findings from the previous studies reported good or satisfactory knowledge and attitude on SRC especially among elite and senior athletes. However, based on the review, lack of studies had been currently conducted among school athletes. In Malaysia, only one article available which suggested Concussion Attitude Index (CKI) was significantly difference between age category (Under 15 VS. Under 18) among school athletes meanwhile Concussion Knowledge Index showed otherwise (Fairus et al., 2020).

Apart from the age category, Fairus et al (2020) also reported that gender obtained no significant difference in the respective population. Lack of evidence of CKI and CAI among school athletes suggested that it requires more effort for exploration. In fact, none of studies are found to determine the relationship between athlete's demographic and CKI and CAI. Therefore, the objective of this study is to establish the relationship between demographic status such as gender, age category and type of sports towards the knowledge and attitude of SRC.

METHODOLOGY

This is a cross-sectional observational study was conducted among student-athletes from State Sport Schools in Malaysia. A total of 439 student-athletes, aged 13 to 18 years, were voluntarily enrolled in the study. The sampling frame included (1) athletes from state sport schools, (2) aged between 13 and 18 years, (3) actively involved in sports either contact or non-contact events, and (4) representing at least school level. No exclusion criteria were set in this study.

A Rosenbaum Concussion Knowledge and Attitude Scale Students version Malay edition (RoCKAS-ST-M) questionnaire was used to evaluate the knowledge and attitude towards sport-related concussion among students.The RoCKAS-ST-M has been validated and found reliable for use among secondary school students (Fairus et al., 2020). The internal consistency of the RoCKAS-ST-M is moderately satisfactory, with Cronbach's alpha scores for the Concussion Knowledge Index (CKI) and Concussion Attitude Index (CAI) ranging from 0.40 to 0.66. The reliability values for CKI and CAI are high, exceeding the ICC reliability value of 0.60 (Fairus et al., 2020).

The RoCKAS-ST-M has five-part questionnaire. Part 1 assesses the knowledge of concussion etiology and consequences via 18 true/false items. Meanwhile, Part 2 evaluates the knowledge through three items presented in two sports case scenarios. Furthermore, Parts 3 and 4 each consists of 15 items measuring attitudes towards concussion, utilizing a 5-point Likert scale ranging from "strongly disagree" to "strongly agree." Lastly, Part 5 includes a checklist of the eight most reported post-concussive symptoms. Scores are assigned based on the safety of the response, with the safest option awarded 5 points and the least safe option awarded 1 point. The data was analyzed using Pearson Correlation.

Ethical approval was obtained from the Ethics Committee of the Research Management and Innovation Centre at Universiti Pendidikan Sultan Idris (Approval No. 2022-0463-01). Before data collection, permissions were secured from the respective school authorities, and informed consent was obtained from all participants. Authorization to conduct the study was obtained from the Ministry of Education Malaysia through the approval of ERAS 2.0 (Reference No. KPM.600-3/2/3-eras [11449]).

RESULTS

A total of 439 secondary school athletes from various sports backgrounds participated in this study. Table 1 presents the demographic characteristics of the participants, categorized into contact sports and non-contact sports. The average age of the participants was 15.41 ± 1.47 years, with ages ranging from 13 to 18 years (variance of 5). Specifically, the average age for contact sports participants was $15.39 \pm$

1.43 years, and for non-contact sports participants, it was 15.43 ± 1.10 years. Both groups exhibited a narrow age difference. The gender distribution was relatively balanced, with 227 males (52%) and 212 females (48%). Among those involved in contact sports (n = 264), there were 135 male and 129 female participants. For non-contact sports (n = 175), there were 92 male and 83 female participants. In terms of ethnicity, the study included four major groups. Most of the respondents were Malay (n = 390). The Chinese population had the least participation, with only six respondents. Additionally, there were 15 Indian and 28 Borneo participants.

Regarding the level of sports participation, the highest level at which the participants competed was recorded. Nineteen respondents (4%) represented Malaysia at the international level. One hundred and fifty participants (35%) competed at the national level. Additionally, 125 participants (28%) represented their state in competitions, while 145 respondents (33%) competed at the district and school levels.

Table 1 Demographic status of the participants

Profile	Contact Games (n = 264)	Non-contact Games (n = 175)	Total (n = 439)
*Age (years)	15.39 ± 1.4	15.43 ± 1.1	15.41 ± 1.47
Gender,*n*(%)			
Male	135 (31%)	92 (21%)	227 (52%)
Female	129 (29%)	83 (19%)	212 (48%)
Race,*n* (%)			
Malay	240 (55%)	150 (34%)	390 (89%)
Chinese	2 (1%)	4 (1%)	6 (2%)
India	11 2%)	4 (1%)	15 (3%)
Others	11 (2%)	17 (4%)	28 (6%)
Level of Sport Participation, *n* (%)			
District & below	73 (17%)	72 (16%)	145 (33%)
States	76 (17%)	49 (11%)	125 (28%)
National	102 (24%)	48 (11%)	150 (35%)
International	13 (3%)	6 (1%)	19 (4%)

The relationship between age groups (U-15 and U-18) and attitudes towards concussion among contact and non-contact athletes was analyzed in this study. A multiple linear regression analysis was performed to evaluate this relationship. The analysis of age groups (U-15 and U-18) and knowledge of concussion yielded a correlation coefficient (r) of 0.06 with a p-value of 0.21, indicating no significant association between age and concussion knowledge among the athletes. Conversely, the relationship between age groups and attitudes towards concussion was found to be weak but statistically significant, with a correlation coefficient (r) of 0.14 and a p-value of 0.003. This suggests that while there is an association between age and attitudes towards concussion among athletes involved in contact and non-contact sports, the strength of this association is relatively weak.

On the other hand, the relationship between gender and knowledge of concussion found significance p-value of 0.01, however the correlation was weak (r=0.12). Similarly, the poor correlation (r) was reported with 0.10 although the p-value was 0.05. Meanwhile, the relationship between type of sport (contact and non-contact) and knowledge of concussion found significance p-value of 0.21, however the correlation was weak (r=0.06). Similarly, the poor correlation (r) was reported with 0.14 although the p-value was 0.003.

Table 2 Relationship between knowledge and attitude towards age, gender and type of sports

		r	*p*
Knowledge	Age category (U15, U18)	0.06	0.21
	Gender	0.12	0.01*
	Type of Sports (Contact; Non-contact)	0.10	0.05*
Attitude	Age category (U15, U18)	0.14	0.003*
	Gender	0.10	0.05*
	Type of Sports (Contact; Non-contact)	0.12	0.01*

DISCUSSION

The low number of concussive reporting incidence among sports school athletes is always relatable to less knowledge sport-related concussion (Pennock et al., 2020). These facts remain an issue but rarely discussed about the level of knowledge and attitudes of sport-related concussion. Jo et al. (2024) has found that there is a significant research hole regarding the association between secondary school student athletes return to school and gender as well. A few studies also found dynamic relationships in gender, age and types of sports level (Jo et al. 2024; Musko & Demetriades, 2023). As the results from previous incidence of sports concussion in the events or tournaments, results have shown low impacts athletes' attitudes towards concussion signs and symptoms.

There were a few potential factors that may have affected sports school athletes' behaviour or decision-making. Young athletes are more prone to have concussion compared to elder athletes even with first experience of sports concussion event (Ingram et al., 2024; Van Ierssel et al., 2020). Besides, sports school athletes will experience the signs and symptoms for a longer period (Eisenberg et al., 2013), and usually might need an ample time to recover compared to adults (Davis et al., 2017). The appearances of any of those signs and symptoms such as forgetfulness, loss of consciousness, seizures, ataxia, poor balance, disorientation, or altered behavior (Echemendia et al., 2023), shall be expelled from team for immediate medical response. Biggest concern is most of the young athletes may as well at risk of SRC at pre-, peri- and post concussive injury that led to neurodivergent as early as teenager ages (Ingram et al., 2024) due to repeated brain damage that interferes with normal neural functioning. Therefore, it is highly recommended for all sports organizations to provide an ample time for a proper assessment and accommodation off-field, in a peaceful setting away from distractions. However, when there are increase in age, there are changes in risk too, however there is no strong justification that may interfere across different types of sports, leading to a weak observed relationship.

Previous study indicates that, number of participations of female athletes are increasing in various sports events another novice or professional (Musko & Demetriades, 2023). As refer to gender categorical, this delicate relation between sport types and physical development may be the cause of a weak connection. The differences in the knowledge of concussions between male and female athletes, often due to unequal engagement with programs attempting to prevent occurrence. Despite female had greater risk of concussion (Abrahams et al., 2014), their knowledge and attitude on the concussion are considered greater than male (Musko & Demetriades, 2023). In accordance with existing studies, female is more likely to be diagnosed with SRC and experience more longer duration time of recovery yet have a higher initial symptom burden (Jo et al., 2024). Meaning that, the higher the risk female athletes to have sport concussion injury (Ingram et al., 2024). Para sports also face up the same risk towards SRC just like non-Para sports either male or female athletes with disability (Singh et al., 2024). Moreover, there is evidence that biomechanics and neck strength, hormonal impacts, and social variables may all be involved (Musko & Demetriades (2023). Yet, females may have a greater risk for

concussion due to anatomical differences compared to men athletes. Upon that, female sport school athletes will be playing with less aggressive in sports compare to men. Therefore, the overall weak relationship could stem from this complex interplay of physical maturity and sport types.

Certain sports cultures can minimize or recognize injuries like concussions as an expected consequence of performing any of the sport. Elite or leisure sports activities are two different levels of sports which contribute to SRC data worldwide. As young athletes compete in higher level sports events, the situation also will become more pressurized (Brenner, 2016: Post et al., 2017). Both contact and non-contact sports face up to their own challenges and difficulties. Athletes involved in contact sports commonly get musculoskeletal injuries, neurological conditions and cognitive impairments. Compared to non-contact sports, nevertheless this type of sports is reported lower in physical disabilities or cognitive impairments statistics.

Under report concussive syndrome involved the communications between secondary school student athletes, coaches, and teammates, as an individual's preferably keeps up the battle (Pennock et al., 2020). Few reasons that usually discussed are fear of losing the play time, stigma on sign of weakness among teammates, lack of knowledge towards SCR, being pressurize to win the game, sports publicity, passionate to the game, denied the injury, trust issue to medical staffs, peer and family influence (Yoon & Petrie, 2023; Rao & Hong, 2020; Chen et al., 2019).

After all, not every potential explanation for an athlete under reporting of SRC is due to a lack of knowledge about the SRC. Previous studies have shown that those athletes are close bonds to their identity, influence from peers and misunderstood on possible risk of SRC's which may cause to death. By eliminating these hurdles via proper SRC education, modifying the social norms of sports, providing athletes extra assistance from coaches and medical personnel, athletes will tend to be more motivated to put their health at first place and willingly to report concussion symptoms if any.

Nearly 50% of participants in 26 studies underreported sports-related concussions (SRCs), according to a study by Pennock et al. (2020). Even while athletes frequently have a basic awareness of the signs of concussions, they frequently act contrary to these facts. Furthermore, there is currently no effective, academically proven concussion prevention program in Malaysia established specifically for secondary school athletes. The imbalance between concussion understanding and behavior is made clear by this gap, underlining the importance of for more effective and practical training and educational programs (Pennock et al., 2024).

Although concussions happen in many kinds of events, their frequency has often been underreported, in part because of things like a lack of awareness regarding the signs of concussions. A key reason for school athletes' underreporting is believed to be the lack of knowledge (Mortellaro, 2020). Moreover, a lack of knowledge generates negative attitudes about concussions, which lessens the likelihood that symptoms will be reported (van Vuuren et al., 2020; Register-Mihalik et al., 2017). Due to a lack of knowledge, many athletes also omit to inform coaches concerning their symptoms (Cournoyer & Tripp, 2014).

There is not enough of studies on young athletes in Malaysia, particularly among secondary school students. Research like Shaffer et al. (2024) have shown that normative data for concussion diagnostic instruments, such SCAT5, are constrained, which limits the use of these tools for young athletes. Furthermore, only 70% of SRCs that were medically reported were recorded in databases that were accessible to the public, underscoring the need for improved documentation and instruction (Bretzin et al., 2024). Therefore, better care of concussions in young and non-elite athletes depends on raising awareness of the condition and establishing clear rules for returning to play.

CONCLUSION

No clear relationships are found between knowledge and attitude of sport-related concussion with age category, gender and type of sports variables in this study. These findings suggested that all variables should be given special attention to this issue. The minimal score for both knowledge and attitude might contribute to the recent results.

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