

Aggression, perceived injury risk, and actual injury in combat sports and martial arts

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Abstract

Problem statement: The role of sports, particularly combat sports, in controlling aggression and shaping prosocial behaviors in young people remains unclear. The relationship between aggression, perceived risk of injury, and injury in combat sports and martial arts has been largely overlooked. **Approach:** A cross-sectional research design utilizing surveys and interviews was employed in this investigation. **Purpose:** This study aimed to explore aggression levels and perceptions of injury likelihood across combat sports, considering factors such as gender, skill level, performance, and injury status. **Results:** One hundred six combat sports athletes in fencing ($n = 28$), judo ($n = 32$), taekwondo kyorugi ($n = 26$), and poomsae ($n = 17$), with the mean age of 20.71 ($SD = 1.49$) and mean competition years of 7.64 ($SD = 4.49$), completed the Competitive Anger and Aggressiveness Scale. No significant differences were found between combat sports teams in anger, aggressiveness, total aggression, and perceived risk of injury. However, the males reported higher scores in aggressiveness ($H(105) = 5.40, p = .02$). When grouped into higher and lower aggression, the higher aggression group perceived a higher likelihood of getting injured during the season ($H(1) = 5.68, p = .017$). Injured athletes were also higher in the aggressiveness subscale compared to their uninjured counterparts ($H(1) = 5.40, p = .02$). **Conclusion:** Participation in combat sports such as judo, taekwondo, kyorugi, and poomsae, where respect and other ethical values are emphasized, is not likely to increase aggression in practitioners, hence, are recommended as a viable arena for developing prosocial values and behavior in young people. Coaches should exercise caution regarding players exhibiting aggressive behavior profiles and prepare to implement intervention strategies for athletes requiring support.

Key Words: Anger, Aggressiveness, Trauma, Combat Sports Athletes

Introduction

The idea of the goodness of sport appears to be an indubitable and unarguable fact as its benefits have been widely studied and recognized. These include physical and physiological (Linker et al., 2022), social (Czupich, 2020), psychological (Piñeiro-Cossio et al., 2021), and mental benefits (Eather et al., 2023). The promotion of sports and an active lifestyle for health benefits by influential international and national health and sports organizations has encouraged participation across all age groups. Likewise, sports participation is largely viewed as a venue for decreasing juvenile delinquency (Visek & Maxwell, 2010) and for effecting a positive change, physically and psychologically, including a reduction in aggression and an adoption of a non-violent attitude toward conflict (Lok et al., 2024). Several studies seem to point to this direction. For instance, Yang and colleagues (2023) reported reduced aggression in children and adolescents involved in sports intervention compared to a control group. The reduction in aggression, however, appears to be associated more with low-contact sports and the rate of reduction was more pronounced at the beginning of sport involvement. On the other hand, Visek and Maxwell (2010) cited several cases where increased aggressiveness and anti-social behaviors were observed in competitive sports or sports considered power and strength sports. It appears that exposure to competition can often lead to hostilities between rival teams or groups, and also from direct influence of significant others such as coaches. Nevertheless, current evidence (Yang et al., 2023) seems to tip the balance in favor of the aggression-reducing capability of sport participation.

In combat sports and martial arts (CSMA), the aggression-reduction capability remains one of the selling points of participation. However, there is lack of solid research to support this claim, as shown by the different conclusions derived from literature reviews. For instance, Lafuente and colleagues (2021) observed conflicting results in the literature with some studies observing either an increase in aggression and others, a decrease, while still others observe neither. For those who observed an increase in aggression, the style of martial arts made a difference. Although the above-mentioned authors' analysis did not fully support the relationship between typical combat sports and lower aggression, their analysis of traditional martial arts training did, especially in young people with behavioral problems. Individual studies on aggression, on the other hand,

looked at how CSMA themselves differed in terms of aggression. For example in comparing traditional karate practitioners to other CSMA, Mroczkowska, Kownacka, and Obmiński (2008) observed karatekas to have lower levels of aggressiveness compared to judo and wrestling practitioners. Meanwhile, boxers exhibited lower aggression than judoka practitioners and wrestlers (Singh et al., 2022). Comparing combat sports groups (judo, wrestling, taekwondo, and Kyokushin karate) vs martial arts groups (capoeira and aikido), the latter exhibited lower aggression components (Kostorz & Sas-Nowosielski, 2021). Although some studies observed no difference between national level combat sports athletes and non-athletes (Deva Adithiya et al., 2022), many observed combat sports athletes to be higher in trait aggression (Morvay-Sey, 2021), but those practicing traditional martial arts exhibited lower aggressiveness (Lafuente et al., 2021). In a recent Slovakian study, Gorner, Makarowski, and Miroslava (2021) observed those training longer in martial arts exhibited lower aggression, while in team sports such as basketball and junior soccer participants revealed a decrease in negative behavior as the duration of training shortens. This is in contrast with individual sports where longer duration of training resulted in negative feelings and behavior.

Overall, aggressiveness or aggression is still a major concern regarding its possible transfer beyond the context of sport especially for the young. Another equally if not more important concern is sport's injurious nature. In some of the most recent and largest epidemiological studies to date, the occurrence of injury seems to be a common and persistent problem. For instance, Black and associates (2021) reported high injury rates for young students participating in various sports and recreational activities, with almost one-third of the sample reporting an injury that required medical attention. On the other hand, Bickley, Hazim, Sy and Nute (2023) reported martial arts as the major cause of musculoskeletal injuries among patients seeking treatment in U.S. emergency rooms. In addition, aggression has been implicated as the cause of most injuries in sports such as ice hockey with body-checking, where it has become an accepted norm that participants might exert physical aggression on the field (Cusimano et al., 2016).

Several questionnaires have been developed to measure aggression and its related constructs. The Buss-Perry Aggression Questionnaire (BPAQ, 1992) is the most widely used in sports and combat sports studies. The questionnaire consists of four components of aggression which are inter-correlated: physical aggression, verbal aggression, anger, and hostility. Maxwell and Moores (2007) raised the question of specificity for sport of some of the scales of the BPAQ and developed the Competitive Aggressiveness and Anger Scale (CAAS). The authors identified several problems connected with measuring aggression and proposed to isolate two subscales – anger and aggressiveness as antecedents of aggression. Anger is defined as “the subjective evaluation that increased physiological arousal is a result of threat to one's physical or psychological well-being” (p. 182). Both external (e.g., a direct insult from an opposing player or a misjudgment of an official) and internal events (e.g., ruminating about a past defeat or an unjust call of an official) can provoke anger. Although some studies found a correlation between anger and aggression, anger is usually considered as an antecedent of aggression but not a *sine qua non* for it (Maxwell et al. 2009).

Although labelled as a negative emotion, anger is recognized to be facilitative of sport performance especially in boosting energy in the presence of fatigue allowing athletes to sustain their effort and maintain their focus. Meanwhile, aggressiveness is defined as “the disposition to become aggressive or acceptance of and willingness to use aggression” (ibid.). Whereas anger can be considered state-like, aggressiveness is a trait-like characteristic that precedes aggressive actions. Both anger and aggressiveness are found to precede aggression in sport. Tests of concurrent validity showed a moderate correlation between the subscales and total scores of the BPAQ and the CAAS. The choice in this study to use the CAAS is based on its sport-specificity and its being shorter with only 12 items compared to the 29-item BPAQ. From a practical point of view, this makes the CAAS more efficient to use in a sport setting to avoid survey fatigue from respondents.

Because of the preceding discussion and the sparsity of current investigations, the overall aim of the present study was to provide fresh insight in this ever-relevant topic. Specifically, we analyzed the relationships between the aggression scale, its subscales, and the perceived risk of sustaining an injury as well as examined their relationships across gender, types of combat sports, skill level, performance, and injury status. In general, aggression studies in sports reveal that being male (Obmiński et al., 2020), young (Sofia & Cruz, 2017), taking part in high-contact sports (Bovolon et al., 2024), and high level of competition (Maxwell et al., 2009) generally led to higher aggression levels than their counterparts. Considering this scenario, the authors hypothesized that the level of aggression for the different combat sports included in our study that practice some form of meditation or adhere somehow to a martial art-related philosophy would be the same. Our second hypothesis was that the male combat sports athletes included in our study would exhibit higher aggression than female combat sport athletes. Third, we hypothesized that aggression would differentiate the participants by skill, performance, and injury status. To our knowledge, there are no existing studies in CSMA that assessed the relationship between aggression, perceived likelihood of injury, and injury status. The results of the study would support the promotion of CSMA as a viable arena for developing prosocial values and behavior in young people. Furthermore, identifying athletes with aggressive tendencies can help coaches make timely decisions and interventions.

Methods

Ethics statement

This study was conducted following the Declaration of Helsinki. The data collection for this study was approved by the corresponding author's Research Committee. Necessary permissions from the sports director and team coaches of the institutions were obtained to have access to the athletes. Teams were met separately on different days, upon which the purpose and details of the study were explained to the athletes. They were also informed of their rights to withdraw from the study at any time without consequence. Those who agreed to participate were asked to sign an informed consent form before completing the survey. For convenient recording purposes, the participants completed the questionnaire online, which was accessed by the participants only after submitting their consent form.

Research design

A cross-sectional research design using the survey method and interview were used in this investigation. This combination approach aimed to improve the ecological validity of this study.

Participants

In total, 106 combat sports athletes (male = 54.7% and female = 45.3%) participated in the study consisting of fencing ($n = 29$), judo ($n = 33$), taekwondo kyorugi (kyorugi, $n = 26$), and taekwondo poomsae (poomsae, $n = 18$). The participants were student-athletes from a well-known top university in the Philippines. They compete annually in a prestigious league composed of eight reputable universities in and around the capital of the country. The age of the participants ranged from 17 to 24 years old ($M = 20.65 \pm 1.53$), and competition years ranged from 0 to 18 years ($M = 7.49 \pm 4.54$). Despite this wide range, almost 70% of the athletes classified themselves as intermediate in terms of skill. By our definition, having an intermediate skill means participating in local regional and national tournaments as well as international invitational tournaments. Some studies based skill on belt color, but because different types of CSMA have different standards and promotion schemes, we chose to base it on experience. As it is, most of our participants reported a moderate level competition experience. Almost one-third of the athletes (32.1%) declared having an injury at the time of the data collection and, while 29.3% felt they were likely to get injured during the season, 36.8% were ambivalent. More details about the participants are shown in the first column of Table 2.

Instruments and data collection

To assess aggression levels, the combat sports athletes completed the CAAS (Maxwell & Moores, 2007). The CAAS is a 12-item questionnaire consisting of six items measuring the subscale anger and six items measuring aggressiveness and uses a five-point Likert scale with the following definitions: 1 = almost never; 2 = occasionally; 3 = sometimes; 4 = quite often; 5 = almost always). Some of the items are modified to fit the judo context. For example, item number 3 "I get mad when I lose points." under the Anger subscale was changed to "I get mad when my opponent receives a point." The original item does not happen in judo where instead of losing points, contestants get a penalty which does not necessarily affect the points they already got although it may affect the outcome of the match. Second, the word "game" was changed to "match" and "official" to "referee." All items under the aggressiveness subscale were retained. Scores on the subscales were multiplied by item severity before calculating total scores as intended by the scale designers. Total aggression scores in this study ranged from 23.34 (low) to 78.21 (high) while total anger and aggressiveness ranged from 9.87 to 47.70 and 13.47 to 56.73, respectively. Internal reliabilities for these subscales in earlier studies range from $\alpha = .78 - .83$ for anger and $\alpha = .83 - .85$ for aggressiveness (Maxwell & Moores, 2007; Maxwell, Visek, & Moores, 2009). In this study, the internal consistency reliability of the item scores for the subscales anger and aggressiveness were acceptable with the coefficient omega at .79 and .77, respectively.

Participants were also asked to respond to questions regarding current injury and their perceived likelihood of getting injured during the season, 'How likely do you think you will be injured during your sports season?' For the interview, the most and least experienced members from each team were interviewed to supplement the results of the self-report questionnaire. Eight athletes were interviewed with an average of 28 minutes per interview. The interview questions were semi-structured and allowed respondents to express their views about the nature of their sport in terms of aggression, situations they consider aggressive, reactions to aggressive opponents, as well as motivations in participation. Although the coaches nominated potential interviewees, participation in the interview was voluntary, and separate informed consent was sought from the volunteering athletes.

Statistical analysis

Although the skewness values of the main variable total competitive aggression (.962) and subscale competitive anger (.855) fell within the acceptable range (-1 to +1), the subscale competitive aggressiveness (2.03) did not. The Shapiro-Wilk test also revealed that all the above variables are less than .05 ($p < .001$), indicating non-normal data. Because transformations did not adequately improve the distribution of data, non-parametric tests were used. Spearman's rank correlation coefficients were computed to examine the relationships among the main variables. The Mann-Whitney U and the Kruskal-Wallis tests were computed to compare the main variables by sex and presence of injury, and by combat sport and skill level, respectively. The level of significance for all statistical analyses was set at alpha .05.

Results

Correlations for the dependent variables of competitive anger, competitive aggressiveness, total aggression, and athletes' perceived risk of injury are presented in Table 1. Spearman's coefficient shows a moderate, positive correlation (Dancey & Reidy, 2020) between anger and aggressiveness, which was statistically significant ($r_s(104) = .420, p < .001$). Meanwhile, anger had a significant strong, positive correlation with total aggression ($r_s(104) = .874, p < .001$). Anger and the perceived risk of injury showed a weak, positive correlation, which was significant ($r_s(104) = .256, p = .008$). The aggressiveness subscale also had a significant strong, positive correlation with total aggression ($r_s(104) = .780, p < .001$). However, it had a weak, positive correlation with the perception of injury risk, which was non-significant ($r_s(104) = .163, p = .094$). Total aggression and the perceived risk of getting injured had a low, positive correlation which was significant ($r_s(104) = .256, p = .008$).

Table 1 Correlation coefficients among outcome variables

	2 Aggrev	3 Agresn	4 PerRsk
1. Anger	.42**	.87**	.26*
2. Aggressiveness		.78**	.16
3. Aggression (total)			.26*
4. Perceived risk			

* $p < .01$. ** $p < .001$

Descriptive statistics for the aggression subscales, total aggression, and the perceived risk of injury by gender, combat sport type, skill, and injury status are presented in Table 2. The male athletes had higher scores in aggressiveness and total aggression but the Kruskal–Wallis test only showed a statistically significant difference in aggressiveness ($H(105) = 5.40, p = .02$). Though not significant, female combat sports athletes had higher mean scores than their male colleagues in the anger subscale ($p = .18$) and on the perceived risk of sustaining an injury ($p = .71$). We observed no differences among the combat sport types in anger, aggressiveness, total aggression, and the perceived likelihood of getting injured. However, when the athletes were grouped into higher and lower aggression levels, the higher-aggression-level group had a significantly higher risk of sustaining an injury ($H(1) = 5.68, p = .017$). The aggression scale did not differentiate the CSMA athletes by skill level or by performance. However, a significant difference between injured and non-injured groups was observed in the aggressiveness subscale ($H(1) = 5.40, p = .020$). Though not statistically significant, the perception of risk of injury was higher in the injured group and lowest in the elite group.

Table 2 Means, number of cases, and standard deviations for anger, aggressiveness, total aggression, and perceived risk of injury by gender, combat sport type, and injury status

	Anger	Aggressiveness	Aggression (total)	Perceived risk of injury
Factors	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Gender				
Male (n=58)	20.47 (6.57)	21.28* (8.62)	41.75 (12.76)	2.90 (1.02)
Female (n=48)	22.88 (8.35)	17.86 (5.73)	40.73 (12.02)	3.00 (1.17)
Combat sport				
Fencing (n=29)	23.55 (8.28)	20.16 (7.50)	43.71 (13.39)	2.72 (1.10)
Judo (n=33)	20.40 (7.39)	18.44 (5.29)	38.83 (9.75)	2.85 (.94)
Kyorigi (n=26)	21.83 (7.41)	22.47 (10.40)	44.30 (14.38)	3.35 (1.23)
Poomsae (n=18)	20.09 (6.16)	17.44 (5.74)	37.53 (10.86)	2.89 (1.02)
Skill				
Beginner (n=20)	20.72 (8.18)	16.94 (4.05)	37.66 (9.48)	2.75 (.85)
Intermediate(n=72)	21.83 (6.91)	19.88 (8.09)	41.71 (12.74)	2.99 (1.17)
Advanced (n=12)	21.10 (10.39)	21.14 (4.48)	42.24 (12.38)	3.08 (.79)
Elite (n=2)	22.86 (2.69)	33.76 (18.12)	56.62 (20.82)	2.50 (2.12)
Performance				
Non-medalist	22.83 (7.59)	19.74 (8.00)	42.58 (12.64)	3.20 (1.16)
Medalist	20.79 (7.37)	19.72 (7.43)	40.51 (12.26)	2.79 (1.02)
Injury status				
No injury	20.48 (7.31)	19.17 (7.95)	39.65 (12.77)	2.81 (1.00)
With injury	22.45 (7.57)	20.19* (7.36)	42.65 (12.00)	3.05 (1.15)

* $p < .05$.

Interviewed athletes expressed that aggression may be necessary in their CSMA, but “not too much.” It was mainly used as a strategy to show “dominance,” “control,” or “intimidation,” but generally not to hurt an opponent. Only two athletes were willing to do so when they felt their own safety was at risk or winning was at stake. Broadly, aggression was described as actions that violate the rules of the sport such as “shouting at the opponent” or “pushing.” Although most participants shunned prohibited acts to avoid penalty, they were willing to do acts that were either against the rules or not quite part of the rules but may inflict pain or harm as long as the referee had no cognizance of their intentions. For example, an advanced judo athlete was falling on his opponents with more force after a throw, applying more force than necessary while doing arm lock holds, or delaying the release of such holds even after the referee had called a stop. Meanwhile, an intermediate to advanced kyorugi athlete did not use physical aggression after being hit by a very aggressive opponent but illegally held his arm as a response. The beginners or less experienced athletes had different reactions when provoked by an opponent. They initially got angry, but kept it or their emotions to themselves and concentrated more on the game and execution of their techniques, trying to perform better. Most of the athletes reported having some form of meditation before and/or after training that helped them focus, relax, and have the right mindset. Almost all of the athletes mentioned “respect” toward teammates, coaches, and referees as an essential part of their sport. It was enough reason for them to follow the rules and show cooperation either in training or competition. Older members of the team must be respected by bowing to them and following their lead. The same judoka described above would not complain or antagonize the referees simply because they were also his seniors.

Discussion

This study aimed to analyze the relationships between the aggression scale, its subscales, and the perceived risk of sustaining an injury as well as to examine these factors across gender, types of combat sports, skill level, performance, and injury status. Overall, our results showed a positive relationship between anger, aggressiveness, total aggression, and perception of risk of injury. Aggression and its related constructs were generally similar in the different CSMA. Meanwhile, male athletes were significantly higher in aggressiveness and the injured group also reported higher scores in this subscale. Those categorized in the higher-aggression-level group perceived a higher likelihood of injury during the season. Aggression levels were generally similar for all combat sport types in this study. The positive relationships between the aggression scale and subscales support the theoretical assumptions of the survey used in this study, i.e., anger and aggressiveness are antecedents of aggression (Maxwell & Moores, 2007). The moderate correlation between the two subscales showed that although they were related, they were not the same construct. Whereas anger can be considered state-like, aggressiveness is a trait-like characteristic that precedes aggressive actions. Meanwhile, the low but significant correlation of anger and total aggression with perceived likelihood of getting injured points to other essential determinants of this factor. Our results showed a somewhat similar level of aggression across combat sport types. However, when compared with other studies in the literature that used the same instrument, the aggression scores in our sample were comparatively lower than those observed in the other studies (Table 3) except for those performed on non-athletes (Maxwell et al., 2009). Interestingly, the low anger scores of athletes in our study who on average had low-level skills and those in another study on elite CSMA athletes (Barczak et al., 2019) were almost similar, while studies on elite non-CSMA athletes reported the highest scores (Maxwell & Visek, 2009; Visek et al., 2010). This trend is similar to the aggressiveness scores, where our CSMA group reported the lowest scores among athlete groups while the elite non-CSMA groups reported the highest scores. Considering the characteristics of the participants in the different studies, the low level of competitive experience of the athletes in our study likely contributed to these low results. Due to a lack of difference in aggression among the fencing, judo, kyorugi, and poomsae groups, we retain our first hypothesis.

Table 3 Comparison of aggression scores in this study and other studies using the CAAS

	Subjects	Anger	Aggressiveness	Aggression (total)
This study	CSMA athletes	21.56	19.73	41.29
Maxwell & Moore (2007)	Athletes different sports	25.84	24.30	50.14
Maxwell et al. (2009)	Active individuals	22.56	12.85	35.41
Maxwell & Visek (2009)	Elite rugby, football	27.54	33.72	61.26
Visek et al. (2010)	Elite student-athletes	30.16	36.37	66.53
Sofia & Cruz (2017)	Athletes different sports	24.49	24.69	49.18
Barczak et al. (2019)	Elite CSMA athletes	21.29	24.53	45.82

Note: CAAS – Competitive Anger and Aggressive Scale.

While some studies observed that male and female judokas had comparable levels of general aggression (Wojdat et al. 2017), others observed males to have higher physical aggression (Obmiński et al., 2020; Wojdat et al. 2017) or higher in all aggression components except for anger (Kostorz & Sas-Nowosielski 2021). This latter finding was also true for taekwondo (Kostorz & Sas-Nowosielski 2021) but not for fencing (Dințică & Păunescu 2014). Caution should be observed in comparing these studies as they used different aggression scales. Because we observed that male and female CSMA athletes in our study differed only in aggressiveness but not in anger and total aggression, we could say that our second hypothesis was only partially correct. The significantly higher aggressiveness observed in males indicated more willingness to aggress given the opportunity. As confirmed in our interviews, a male kyorugi athlete was willing to use unacceptable behavior (e.g., prohibited holding) upon feeling threatened by an opponent (e.g., thinking the opponent was trying to injure them). Meanwhile, female interviewees tended to ignore any provocation and prefer to concentrate on their game (e.g., be faster during attacks) or on controlling their emotions. It should be noted that there is a lack of gender balance in the literature with most studies using only males as subjects.

The lack of differences in the aggression of CSMA athletes of different skill levels in our study is reflected in some studies (Kostorz & Sas-Nowosielski 2021) but not in others where experience is defined in terms of years of participation. For instance, the capability of CSMA to reduce aggression has been reported in judokas with at least five years of experience, who scored higher in prosocial behavior, i.e., self-efficacy, honesty, and humility as well as being more open compared to team sports athletes (Stankovic et al., 2022). Although not significant, the judokas in our study with an average of five years of training had low scores in aggression and its components, corroborating this finding. Length of career was played a factor in lower levels of aggression in Polish judokas (e.g., Janowska et al., 2018). However, only female judokas were less aggressive as the length of their career increased (Wojdat et al. 2017).

The effect of length of career on aggression was not true for the kyorugi athletes in our study who, despite having the highest mean years of experience (10.65 ± 3.69) compared to judo and fencing, reported the highest total aggression scores. Meanwhile, boxers had lower physical aggression (Chen et al. 2019) and Brazilian jiu-jitsu athletes had lower general aggression as their training years increased (Mickelsson, 2021). Despite the attraction of CSMA as a popular strategy to reduce or regulate aggression especially in adolescents, Moore, Woodcock and Dudley (2024) called for caution as their randomized controlled trial did not show any positive effects.

In non-CSMA, Maxwell, Visek and Moores (2009) identified associations between higher levels of anger and aggression and higher levels of competition in rugby but low levels of play in contact (football and basketball) and individual sports (squash). Stated differently, athletes in the advanced competition level were inclined to have lower anger and aggression than beginners or intermediate players. Meanwhile, no such experience effect was observed among rugby players in the study conducted by Robazza and Bortoli (2007). There was no difference in the number of anger symptoms observed between high- and low-level athletes, but anger together with anxiety was viewed by the athletes as facilitative of performance rather than debilitating. It is regarded as a source of energy that should be geared toward positive game results.

In studies using different aggression scales (i.e., BPAQ), judokas had significantly higher levels of hostility, physical aggression, and anger compared to Brazilian ju-jitsu athletes (e.g., Janowska et al., 2018) and higher levels of aggressiveness compared to traditional karateka (Mroczkowska et al. 2008). The usual kata training in traditional karate, reinforced by meditation, helped control emotions leading to a reduction in aggressiveness. Earlier studies in taekwondo also claimed that this kind of traditional training, coupled with teachings about ethics and philosophy, lowers aggressiveness in practitioners (e.g., Nosanchuk & MacNeil, 1989). In contrast with common knowledge, CSMA practitioners practice restraint, adhere to a strict code of conduct, and abide by some form of ethical discipline. We are inclined to think that the generally lower aggression scores in our study were also influenced by not only the inclusion of some forms of meditation unique to each CSMA but also the emphasis on these values.

Having an existing injury may have made the athletes in the higher-aggression -level group of our study perceive an increased likelihood of another injury during the season. In a study on former Division 1 athletes, Kerr and colleagues (2014) observed that those who had recurrent concussions had higher aggression levels. When an athlete is willing to use force that may hurt an opponent, they likely do not discount the reality that they themselves may get hurt in the process. Taking into account the positive association between aggression and actual injury status of athletes in our study, but the lack thereof when it comes to skill and performance, we retain that aggression differentiated between injury status, but not between performance nor skill. Understandably, injured athletes may feel anger, frustration, and lower self-esteem, all of which may impact their behavior in training or competition. Tracey's (2003) qualitative study on Division III athletes, however, showed that despite the athletes' condition and emotional responses to injury, their attitude toward injury was generally positive. Coaches should be wary of players demonstrating an aggressive profile and be ready to make arrangements for interventions to be available for athletes in need.

Conclusions and Recommendations

Based on the preceding discussion, our study supports the notion that CSMA practitioners do not exhibit increased aggression. CSMA athletes generally adhere to the rules and avoid any form of aggression during matches. This is not only to prevent penalties for prohibited acts but also they also value the ethics, principles, and philosophy of their martial art. Coaches and senior practitioners play a crucial role in instilling and reinforcing the values of discipline, self-control, and respect among athletes. They are regarded as role models inside and outside the training hall, and their actions are usually justified in the eyes of their athletes. In general, male CSMA athletes are more likely to respond to provocation, while females tend to remain peaceful. Male athletes would benefit from being cognizant of triggers that might lead to unnecessary and harmful aggressive retaliations. The coaching staff can support male athletes in managing their emotions both during and outside of training or competition. Considering our observations regarding the positive long-term effect of CSMA on females, coaches are highly encouraged to make the training environment safe and conducive for this group of athletes to stay longer and active in the sport. Regarding injuries, more aggressive players are not only more likely to perceive a higher risk of injury, but are also more prone to being injured. The often concomitant negative feelings of having an injury may make athletes take random and uncalculated risks. To possibly mitigate injury risks, it is recommended that coaches exercise caution regarding players exhibiting aggressive behavior profiles and be prepared to implement intervention strategies for athletes who require additional support. In conclusion, participation in combat sports such as judo, taekwondo, kyorugi, and poomsae, where respect and other ethical values are emphasized, does not appear to increase aggression in practitioners, hence, are recommended as a viable arena for developing prosocial values and behavior in young people. Additional studies are warranted to determine other variables other than those presented in this study that may lead to positive effects of CSMA training on practitioners. Furthermore, considering the varied studies and divergent results in this topic, a new consensus on the definition of aggression and methodological standards is warranted to make comparisons between studies tenable.

Conflicts of interest The authors have no conflicts of interest to declare.

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