



# Variation in aggression levels in selected combat sports and martial arts

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**Abstract:** Scientific research frequently addresses the complex issue of aggression, which significantly influences societal perceptions of sports and martial arts. The effects of training and athletes' conduct during competitions necessitate thorough investigation and examination. This study aims to assess aggression levels in specific sports and martial arts, including wrestling, Brazilian jiu-jitsu (BJJ), and mixed martial arts (MMA), and compare these findings with a control group consisting of athletes from other disciplines and non-athletes. The research employed a diagnostic survey method involving 181 male participants aged 16 to 48, comprising 134 martial arts practitioners and 47 non-athletic students. The results revealed that MMA competitors exhibited notably higher levels of overall and physical aggression compared to other groups. This finding suggests that aggression levels may be influenced by the type of sport practiced and the pedagogical approach adopted by coaches during training sessions. Coaches should also consider the social, emotional, and educational aspects of their younger athletes' development.

**Keywords:** aggression, combat sports, martial arts

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## INTRODUCTION

Sports and martial arts constitute a popular form of physical activity for individuals of all ages [1,2]. Their specific regimen offers numerous benefits, both for health and physical fitness [3] as well as for acquiring invaluable self-defense skills [4]. Extensive scientific research indicates that practicing sports and martial arts stimulates physical development in children and school-aged youth [5,6] while for adults, it improves the quality of life [7-9]. Practitioners of sports and martial arts often follow ideological principles that extend beyond combat skill alone. Training is used as a form of psychophysical self-improvement [10-12] and as a path to excellence and character development [13].

Although practicing sports and martial arts brings many benefits, there are also differing opinions on the matter [4]. According to Kuśnierz [14], individuals who do not engage in any sports discipline exhibit higher levels of aggression than the studied groups of athletes. Norwegian studies suggest that combat training increases antisocial behavior and should be prohibited for individuals under the age of sixteen [15,16]. Indeed, certain combat sports, due to their rules and philosophical orientation related to their objectives, can be more aggressive, such as boxing or MMA, compared to others, such as aikido or judo [17,18]. Patenteu [19] posits that MMA athletes demonstrate the highest level of aggression among the studied groups practicing sports and martial arts.

Due to the frequent participation of children and youth in training, scientific research has focused on the issue of aggression and negative emotion, wherein the literature presents diverse perspectives and varying results [20-22]. Previous studies [15,16,23-25] indicate a reduction in aggression levels as a consequence of long-term training, advocating regular physical activity defined as body movement induced by skeletal muscle contraction that increases energy expenditure above the basal level [26]. In contrast, Endersen [15] demonstrated the development of aggressive behaviors resulting from training. Research [27] suggests that athletes training in martial arts exhibit higher levels of aggression compared to individuals leading a sedentary lifestyle.

Aggression refers to behavior associated with harmful actions directed toward an individual, a group of people, or objects. It leads to negative consequences for both physical and mental health, often affecting both the victim and the aggressor [28]. According to Buss and Perry's [29] theory, four components of aggression are distinguished: physical aggression, verbal aggression, anger, and hostility. Aggressive behaviors are shaped in combat sports because athletes learn techniques involving kicks, punches, or, in the case of grappling sports, chokes and joint locks – actions that are perceived as aggressive by society [24,30-34]

This study aims to examine the level of aggression in selected disciplines of sports and martial arts, such as Wrestling, Brazilian Jiu-Jitsu, and Mixed Martial Arts (MMA), and to compare the results with a control group of athletes practicing other sports as well as with physically inactive individuals. It is hypothesized that MMA athletes will display the highest levels of overall aggression and its subscales (H1). It is also assumed that individuals not practicing any sport will show higher levels of aggression compared to the examined groups of athletes (H2)

## MATERIAL AND METHODS

### *Participants*

A sample of 181 men participated in the study, aged between 16 and 48 years old ( $M = 27.02$ ,  $SD = 8.68$ ), including 134 (74.03%) martial arts athletes (ranging in training internship between 1 and 31 years,  $M = 7.99$ ,  $SD = 5.79$ ), and 47 (25.97 %), students of technical university, not practicing martial arts or any other discipline. Among martial arts fighters, 45 practiced Brazilian Jiu-Jitsu (BJJ); ranging in training internship between 2 and

3 years,  $M = 9.30$ ,  $SD = 6.25$ ), 43 trained in Mixed Martial Arts (MMA; ranging in training internship between 1 and 22 years,  $M = 4.47$ ,  $SD = 4.28$ ), and 46 represented Wrestling (ranging in training internship between 3 and 31 years,  $M = 10.00$ ,  $SD = 5.11$ ). The control group included 48 male Informatics students. They were divided into two groups based on self-reported engagement in physical activity: Physically Active ( $n = 35$ ) and Inactive ( $n = 13$ ). One student Table 1 shows the demographic characteristics of the total sample.

### Measures

The Buss-Perry Aggression Questionnaire (BPAQ) is a 29-item tool to assess four dispositional components of aggression in the following scales: Physical Aggression (PA; 9 items), Verbal Aggression (VA; 5 items), Anger (A; 8 items), and Hostility (H; 8 items). The questionnaire was developed in 1992 and was widely used and validated around the world, including Poland. Participants rate on a 5-point Likert response scale to what extent the present item is characteristic of them (from 1= Extremely uncharacteristic of me to 5 = extremely characteristic of me). In the present study, the internal consistency was appropriate for the BPAQ total score (Cronbach's  $\alpha = 0.89$ ) and for subscales PA ( $\alpha = 0.75$ ), A ( $\alpha = 0.72$ ), and H ( $\alpha = 0.80$ ), while low for VA ( $\alpha = 0.53$ ).

Table 1. Demographic characteristics of participants

Variable	Categories	n	%
Education	Primary school	20	11.05
	Junior high school	1	0.55
	Secondary high school	52	28.73
	Vocational education	9	4.97
	During Bachelor's degree studies	36	19.89
	During Master's degree studies	12	6.63
	Higher education completed	51	28.18
Self-reported economic status	Excellent	12	6.63
	Very good	42	23.20
	Good	102	56.35
	Average	18	9.95
	Not satisfactory	7	3.87
Samples	Brazilian Jiu Jitsu (BJJ)	45	24.86
	Mixed Martial Arts (MMA)	43	23.76
	Wrestling	46	25.41
	Not practicing	47	25.97
Physical activity and sports	No active	13	7.18
	Physical activity	35	19.34
	Sport activity	133	73.48
Frequency of physical or sport activity during last week	0	47	25.97
	1	1	0.55
	2	24	13.26
	3	35	19.34
	4	32	17.68
	5	15	8.29
	6	15	8.29
	7	12	6.63

The demographic questions were presented to assess age (in years), sex (Women, Men, Other), self-reported economic status (Excellent = 4, Very good = 3, Good = 2, Average = 1, Not satisfactory = 0), Education (Primary school = 0, Junior high school = 0, Vocational education = 1, Secondary high school = 2, During Bachelor's degree studies = 3, During Master's degree studies = 4, Higher education completed = 5). In addition, two questions were presented with Yes/No answer options regarding physical activity ("Do you engage in regular physical activity?") and sports ("Do you practice any sports?"). Those who declared to be engaged in sports were asked to answer what sport they practice (open question), how many years they practice sports, what is the average number of training per week (range 1-7), the average number of hours during training, and to indicate the highest rank in the competitions they have participated in in their life.

### *Procedures*

The research was conducted between June and October 2024 using a diagnostic survey method and a survey technique. The paper surveys were completed by the players in sports halls after completing their training sessions. The research was conducted in the following clubs: Forca Brava Opole, LKS Orzeł Namysłów, and Next Level Opole. A total of 214 people took part, of which 33 people were rejected due to incompletely completed surveys. Another exclusion criterion from the study was the age of the participants under 16 years of age.

### *Statistical analysis*

The parametric properties of the aggression scale were examined using mean, standard deviation, skewness, and kurtosis, as well as reliability analysis (Cronbach's alpha). The assumption of normal distribution of aggression was tested using the Kolmogorov-Smirnov test, which showed that the distribution was close to normal for the total BPAQ score of aggression ( $D_{K-M} = 0.07$ ,  $p = 0.28$ ), verbal aggression ( $D_{K-M} = 0.09$ ,  $p = 0.15$ ), anger ( $D_{K-M} = 0.07$ ,  $p = 0.27$ ), and hostility ( $D_{K-M} = 0.08$ ,  $p = 0.19$ ). Only the results on the scale physical aggression ( $D_{K-M} = 0.12$ ,  $p = 0.01$ ) turned out to be significantly different from the normal distribution, therefore in this case the Kruskal-Wallis test was used as a nonparametric equivalent of one-way ANOVA. Associations between demographic variables and aggression scales were examined using Spearman's Rho correlations, which is considered a better option than the Pearson correlation if categorical variables (such as sports involvement, education, economic status, and age with a non-normal distribution) are analyzed. One-way analysis of variance was conducted to find statistically significant differences in composite score of the total aggression, verbal aggression, anger, and hostility scales, between the groups of men representing specific martial arts (MMA, BJJ, and wrestling) and the nonathlete sample. The post-hoc Bonferroni test, and partial eta-square ( $\eta^2_p$ ) were used to assess effect size (a value of 0.01 indicates a small effect, 0.06 a medium effect, and 0.14 a large effect). A non-parametric Kruskal-Wallis was performed for physical aggression scale, with Dwass-Steel-Critchlow-Flinger post-hoc pairwise comparison, and epsilon-squared ( $\epsilon^2$ ) effect size (values range from 0 to 1, with higher scores indicating a larger effect size). All analyses were performed using JASP ver. 0.19.1.0 for Windows.

## **RESULTS**

Figure 1 shows the Spearman correlation table between aggression and demographic variables. Positive correlations were found between the total aggression score and all of its subscales, including physical aggression, verbal aggression, anger, and hostility. Younger participants had higher scores on total aggression, verbal aggression, and hostility.

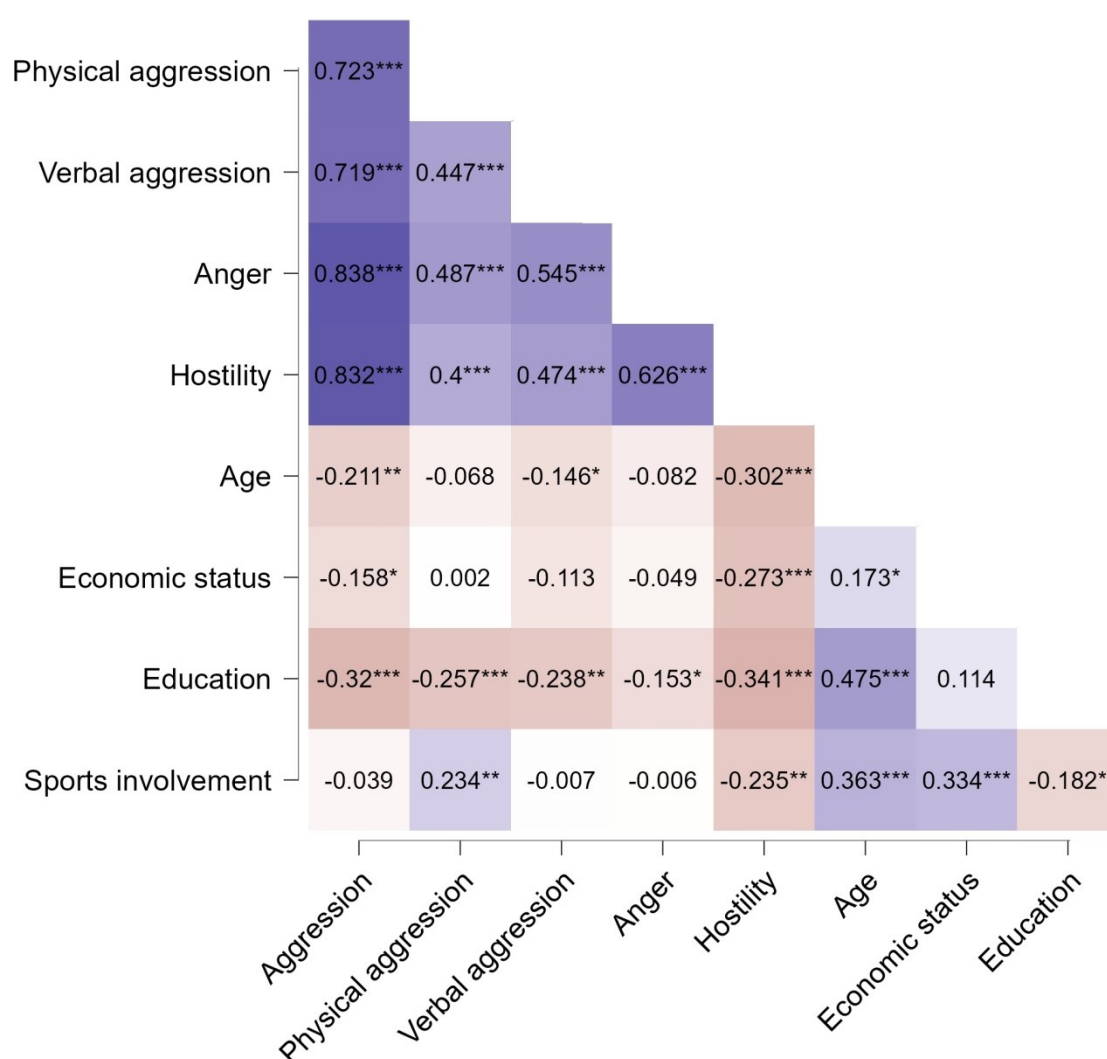


Figure 1. Spearman's Rho heat-map of correlations between aggression and demographics. Violet shows positive correlations, while red with negative associations. \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .  $N = 181$ .

Positive correlations were also found between age and self-rated economic status, education, and sports involvement. Self-rated economic status was negatively associated with total aggression scores and the hostility subscale. Education was negatively associated with all aggression scales, including the BPAQ total score, physical aggression, verbal aggression, anger, and hostility. Thus, higher aggression is shown by individuals with lower levels of education. Sports involvement is positively associated with physical aggression but negatively with hostility levels. Age is negatively correlated with overall levels of aggression, verbal aggression and with hostility, which indicates that younger athletes are more aggressive.

Figure 2 shows the levels of selected psychological variables in groups representing selected martial arts. Results on aggression and its four components-physical aggression, verbal aggression, anger, and hostility-are presented and compared on three groups of active practitioners of sports and martial arts such as Mixed martial arts (MMA), Brazilian jiu jitsu (BJJ), and Wrestling, and a control group of peers not involved in any sport. The analysis of the results began by presenting the overall level of aggression of the subjects (Figure 2a). The post-hoc comparisons revealed that MMA sample scored significantly higher in the total aggression than BJJ ( $p < 0.05$ ). The other differences in aggression between groups were insignificant.

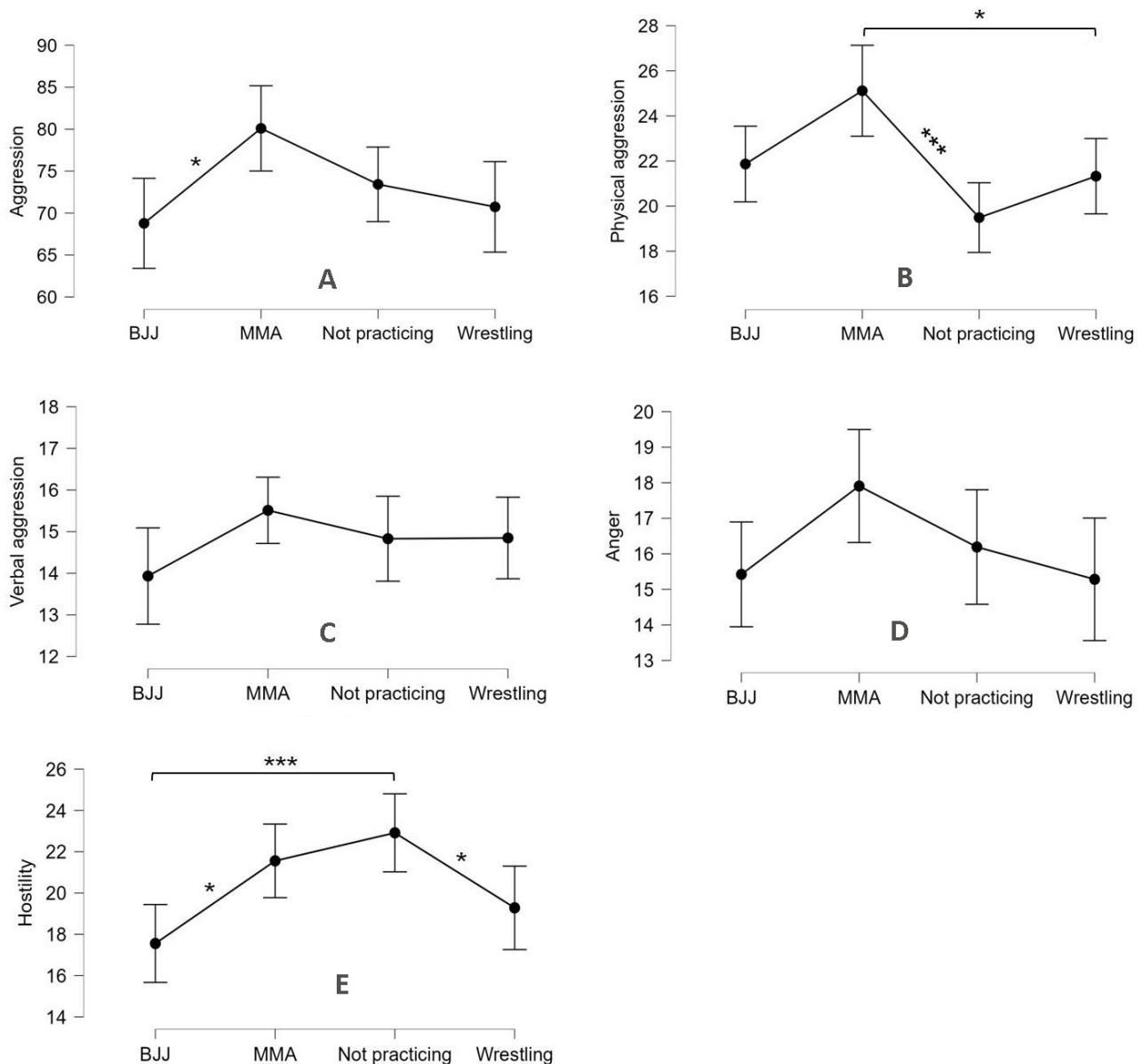


Figure 2. Levels of selected psychological variables in groups representing different martial arts: A) Aggression; B) Physical aggression; C) Verbal aggression; D) Anger; E) Hostility. Statistical significance \* $p < 0.05$ ; \*\*\* $p < 0.001$

The Kruskal-Wallis showed significant effect for physical aggression, with medium effect size,  $\chi^2 = 18.30$ ,  $p < 0.001$ ,  $\varepsilon^2 = 0.10$  (Figure 2b). The DSCF post-hoc test showed, that MMA group scored significantly higher in physical aggression than non-athletes ( $p < 0.001$ ) and athletes practicing wrestling ( $p < 0.05$ ). The Brazilian jiu-jitsu athletes did not differ in physical aggression from any other group, including wrestling and MMA athletes, as well as the non-sports sample. The next component analyzed was verbal aggression (Figure 2c). The highest value was again obtained by MMA fighters, while the lowest value was obtained by BJJ fighters. The group of non-training peers and wrestlers showed equal values - at an average level. However, these differences were statistically insignificant. Similarly to verbal aggression, insignificant differences in anger were presented between martial arts athletes and non-athletes. The highest value of anger was manifested by the MMA group. The second highest value was obtained by the non-trainers.

Next, BJJ fighters obtained a slightly higher value of anger compared to wrestlers, who obtained the lowest value. However, all these differences were statistically insignificant (Figure 2d). The highest value of hostility was obtained by the group of non-athletes (Figure 2e). This was followed by MMA fighters, and wrestlers. The lowest level of hostility was obtained by the group practicing BJJ. Moreover, the post-hoc test showed that BJJ athletes scored significantly lower in hostility than the MMA sample ( $p < 0.05$ ), and non-athletes ( $p < 0.001$ ), but they do not differ from wrestlers. Significant differences were also found between wrestlers and men not-practicing sports ( $p < 0.05$ ).

## DISCUSSION

The objective of the study was to investigate the level of aggression in selected sports and martial arts, specifically wrestling, Brazilian jiu-jitsu, and mixed martial arts, and to compare the results with a control group comprising athletes practicing other sports and physically inactive individuals. Mixed martial arts (MMA) competitors who engage in full-contact combat utilizing various techniques with their hands, legs, or on the ground were deliberately selected for the study. Among the different fighting styles, MMA practitioners are the most susceptible to injuries and health risks, which influence their behavior in sports competitions [35]. The combat of Brazilian jiu-jitsu (BJJ) competitors, who employ techniques such as joint locks or chokes and train according to the principles of this discipline, and wrestlers, representatives of the Olympic discipline where combat involves grips and throws, proceeds somewhat differently. The findings indicated that MMA competitors exhibited the highest level of aggression overall and in three subscales (physical, verbal, and angry aggression). At the same time, individuals who did not practice any discipline demonstrated the highest level of hostility among the studied groups. In martial arts and combat sports, aggression is associated with the element of competition and effectiveness; to succeed in combat, competitors must engage aggressively and energetically. This type of aggression is permissible and strictly regulated by the rules of the given discipline. Aggression in combat sports can often be conflated with sportsmanship [36], defined as fighting spirit or an attitude associated with sports anger, which facilitates victory in combat and the achievement of favorable results [37]. The selection of diverse fighting styles was motivated by the specificity of training and an attempt to analyze the long-term effects of training in the context of aggression.

The obtained results are consistent with the research of Rydzik [38], who utilized the BPAQ questionnaire to examine and compare the level of aggression in MMA and Oyama karate athletes. Statistically significant differences were observed in all types of aggression, which were higher in MMA. The predominant form of aggression in the assessed athletes was physical aggression, followed by verbal aggression, with hostility exhibiting the lowest level. Rydzik concludes that it would be beneficial to incorporate mental training into the regimen of MMA athletes to enhance self-control and differentiate between aggression in sports combat and everyday life [39]. MMA athletes in the studies of Anastasiou [40] and Yang [41] also demonstrated the highest level of aggression among the examined individuals. An increase in the level of aggression was observed as a result of training, and a decrease in the group of BJJ athletes, indicating that the specificity of training in a given discipline is of significant importance in the context of aggression. The results corroborate the hypothetical assumptions (H1) adopted in this study.

Regarding H2, individuals who did not practice any sports discipline exhibited the highest level of hostility towards the studied groups of athletes. Kuśnierz [14] examined the level of aggression among athletes practicing sports and martial arts from disciplines such as boxing, capoeira, and Brazilian jiu-jitsu, as well as groups of peers who did not train. Analysis of the results revealed that a higher level of general aggression and hostility occurred in peers who did not train, which is consistent with the present research. Kuśnierz [14] posit that the level of aggression may be influenced by the specificity of

training, suggesting that disciplines involving full contact in combat may foster aggression. The obtained results regarding boxers and MMA fighters support this perspective.

The analysis of the relationship between aggression levels and education yields noteworthy findings. The results indicate statistically significant correlations, with the respondents' education level negatively correlated with all aggression scales, suggesting that individuals with lower educational attainment exhibit higher aggression. Research on aggression among students conducted by Morvay-Sey [42] demonstrated that vocational school students scored highest on the aggression scale compared to high school students. Lafuente [43], however, obtained contrasting results, showing no significant differences in aggression levels based on the educational attainment of participants engaged in sports and martial arts. The authors propose that the education level variable should be examined in conjunction with other socio-economic factors. Studies have also revealed a correlation between aggression and economic status, with observed relationships indicating that individuals of lower economic status display higher levels of aggression. This finding, however, is not corroborated by Hishinuma's [44] research, which posits that factors such as cultural norms, social influences, and attitudes towards violence may play a more significant role. The results of the study also indicate the existence of a negative correlation in terms of sports involvement and overall aggression, a result that, despite the lack of statistical significance, may indicate a tendency for aggression levels to decrease as training seniority increases. Previous studies show that athletes with longer training stints and those at the championship level exhibit lower levels of aggression than those with shorter training stints in sports and martial arts [45,46]. Therefore, regular participation in martial arts training over many years and adherence to training rules that include an element of pedagogical influence can result in a decrease in aggressive behavior.

#### *Limitations and future research*

Reflections related to the obtained results indicate the need for further research in various fighting styles where full contact or limited rules will be the differentiating factor. A fundamental problem is the small number of women training at the master level relative to men, this makes it difficult to conduct a reliable analysis between the sexes. Although age was not analyzed as a mediating or confounding variable in this study, the wide age range among MA&CS athletes may have influenced the results. The age structure of the groups is wide due to the large proportion of children and adolescents training in clubs, so it is difficult to study a large group of similar ages. Future research should take age into account when analyzing the relationship between sports and aggression levels.

## **CONCLUSION**

The conducted research indicates variations in the level of aggression between athletes engaged in combat sports and the non-training control group. The highest levels of aggression were observed in the MMA group, whose athletes compete in full-contact fights and are exposed to numerous injuries and health risks. In the control group, the highest level of hostility was detected. Unlike athletes, non-training individuals lack the opportunity to release their emotions, learn self-control, and develop the inner discipline that is a characteristic of martial arts practitioners. These elements may reduce aggression levels or contribute to better control over them. The dominant factor influencing aggression levels appears to be the style of combat and the associated rules (full contact, limited contact, or no contact). Athletes in contact sports, who face the risk of injury during combat, may favor more aggressive behaviors as a means of preventing harm. The topic of aggression remains relevant and open, as numerous factors can influence research outcomes. Coaches play a significant role in shaping athletes' behavior. The upbringing of athletes depends on the competence, qualifications, and actions of their coaches. Not only do combat sports and martial arts coaches teach techniques, but they also develop athletes holistically, ensuring their physical, mental, and emotional growth. Coaching approaches



in combat sports and martial arts can vary. Some of them prioritize athletic performance, while others focus on self-improvement and internal development.

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