Comparing trait aggression among non-athletes and athletes divided into tactical subgroups and sport activities

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Abstract

Problem statement: Due to the nature of each sport, the rules allow different levels of contact. In sports of an aesthetic nature, there is no contact between the athletes, while in sports games there may be a fight against body-to-body during stealing the ball. In combat sports, however, the goal is to defeat the opponent within a regular framework by applying physical force, continuous or momentary contact. The question therefore arises as to whether there is a difference in the trait aggression of those who exercise different sports? Is there a detectable difference between athletes and non-athletes regarding trait aggression? **Approach:** We aimed to investigate whether the athletes are more aggressive than non-athletes and to examine the differences between the sports activities divided into tactical groups and measured them separately. **Material and Methods:** We used the Buss-Perry Aggression Questionnaire, subjects were 14-18 years old (N=1600) Hungarian students, divided into non-athlete (n=800) and athlete group (n=800). Athletes were divided into subgroups: aerobic (n=100); handball (n=100), basketball (n=100), football (n=100); wrestling (n=100), judo (n=100), karate (n=100) and swimming (n=100). Data were analyzed with IBM SPSS 24.0. software, criteria for considering statistical significance was $p \leq 0.05$. **Results:** Significant differences were found between the non-athlete and athlete group in trait aggression total score and in the subscales physical aggression, hostility, and anger. We found a significant difference in the trait-aggression total score between the non-athlete group and each sport group based on tactical division. The non-athlete group had a significantly higher value than each of the sports groups did. We found a significant difference in total scores between the non-contact and combat sports, the value of the combat sports was higher. Compared to the tactical sports groups regarding physical aggression we found a significant difference between combat sports and the representatives of the non-contact sports; combat sports and cyclic sport; non-contact sports and sports games. In the hostility subscale, we found significant differences between non-athletes and non-contact/draw sports and between non-athletes and sports games. Significant differences were found in the total trait-aggression score between the non-athletes and aerobic; non-athletes and judo; non-athletes and karate; non-athletes and basketball; non-athletes and handball and non-athletes and swimming. The values of the non-athlete group were significantly higher. **Conclusions:** Our hypothesis that trait aggression of athletes is lower was supported. Results show the tendency to do sport regularly make favorable personality changes via the reduction of the degree of aggression.

Keywords: Buss Perry Aggression Questionnaire, non-contact sports; combat sports, cyclic sport, sport games, non-athletes,

Introduction

Aggressive emotions (e.g., anger, fury) are well known to everyone, and have certainly witnessed or had been already suffering from aggressive manifestations. Most of the society develops norms that inhibit aggressive behavior and promote prosocial behavior. Despite the values shared by society or members of a group, aggression can still appear due to one's personality. Our research is related to the topic of what activities can help reduce the intensity of aggression lurking inside us. What role does sport play in regulating individuals' level of aggression with its historicity, set of rules, and stress-reducing role? According to Lorenz, „It was probably in highly ritualized but still serious hostile fighting that sport had its origin. It can be defined as the specifically human form of nonhostile combat, governed by the strictest of culturally developed rules. (...) the main function of sport today lies in the cathartic discharge of aggressive urge, besides that, of course it is of the greatest importance to keeping people healthy. (...) It educates man to conscious and responsible control of his own fighting behavior. (...) More valuable still is the educational value of the restrictions imposed by the

demands for fairness and chivalry which must be respected even in the face of the strongest aggression-eliciting stimuli. (...) Sport gives scope to a number of truly valuable patterns of social behavior which are essentially motivated by aggression and which, in all probability evolved under the selection pressure of tribal warfare at every dawn of culture." (Lorenz, 2005, 271-272).

While parties struggling in sport may use seemingly aggressive (assertive) forms of action within the framework of the rules of the sport with the intention of winning, these aggressive manifestations may differ in their objectives. In some sports, appropriate irregularities appear, these are called tactical fouls, but there is also unsportsmanlike, personal aggression, which is not tolerated by the referees. Outsiders, but often, even sports commentators, misuse the term aggression instead of assertive action in sporting activities. Due to the nature of each sport, their rules allow different levels of contact. In sports of an aesthetic nature, there is no contact between the athletes, while in handball, for example, there is a fight against body-to-body during the formation of situations and stealing. Yet this is not the primary goal of the sport. In combat sports / martial arts, however, the goal is to defeat the opponent within a regular framework by applying physical force, continuous or momentary contact. There is also a high level of contact in rugby or American football due to the specifics of the sport. The question, therefore, arises as to whether there is a difference in the trait aggression of those who play different sports, possibly the contact athletes also show more aggressive traits in their personalities than those who do other sports.

Laymen, spectators often assume that athletes are more aggressive than non-athletes. Some sports may be more aggressive than other sports, due to the degree of contact, the nature of the sport, or the opportunities provided by the rules. This assumption is particularly characteristic of martial arts or combat sports practitioners. However, research points out that aggressiveness is weaker among martial arts and combat sport practitioners compared to normative value (Kostorz and Sas-Nowosielski, 2021) and aggressive motivation is also weaker among athletes compared to non-athletes (Masoudnia, 2007; Rahimizadeh et al, 2011). Several authors have examined the differences in aggression between athletes and non-athletes (Lemieux et al, 2002; Steyn and Roux, 2009). Results of the researches also suggest the role of regular sports in reducing the potential for aggression (Lemieux et al, 2002; Steyn and Roux, 2009). Steyn and Roux's (2009) study compared 15–18-year-old hockey players, taekwondo, and non-athletes in terms of mental well-being and aggression. The results of the research showed that the values of verbal aggression and hostility of taekwondo athletes were significantly lower compared to the other groups. Skokoufeh and Erhan's (2016) study compared athlete and non-athlete groups ($N = 242$) in terms of trait aggression and found that the mean values of trait aggression in the non-athlete group were significantly higher compared to the athlete group. Maresh et al. (1991) compared representatives of athletics (track and field) and non-athletes and found that athletes have lower levels of aggression and anger. Dobosz and Beaty (1999) also found lower levels of aggression in representatives of athletic than in non-athlete individuals. Filho et al. (2005) found a significant difference in the level of aggression between athlete and non-athlete individuals. Masoudnia (2007) showed lower aggression values in martial arts practitioners compared to non-athletes. Morvay-Sey et al.'s (2019) research showed a significant difference ($p < 0.01$) in the questionnaire analysis of trait aggression levels between 14–18-year-old school students practicing budo (Japanese) martial arts (judo, karate, aikido, iaido, jiu-jitsu, kendo) and those not engaging in it, in a total score of trait aggression level (students: 76.20 ± 14.75 ; budo athletes: 68.05 ± 11.89) and anger - (students: 17.94 ± 4.40 ; budo athletes: 15.26 ± 4.05), physical aggression - (students: 22.21 ± 6.78 ; budo athletes: 19.49 ± 4.92), verbal aggression - (students: 15.35 ± 3.01 ; budo athletes: 14.21 ± 2.24); and hostility values (students: 20.81 ± 4.89 ; budo athletes: 19.08 ± 4.78). Tékus et al. (2018) examined trait aggression using a questionnaire method among athletes studying in different school types and non-athletes regularly and found a significant difference between the two groups in terms of trait aggression, anger, physical aggression, and hostility, where the non-athlete group showed higher values in the group of athletes.

Objective

We aimed to examine individuals aged 14–18 who regularly exercised sport (athletes) and non-athletes using a questionnaire method for differences in trait aggression. Another goal was to examine the level of trait aggression in each sport group, after the tactical categorization of sports activities. The categories were created according to Harsányi's (2001) tactical division of sports: divided into non-contact or draw sports, sports games, combat sports, and cyclic sports. We aimed to examine objectively whether there is indeed a difference between the pursuers of each sport in terms of trait aggression.

Hypotheses

1. We assumed that the 14–18-year-old group of athletes (regardless of sport) has significantly lower trait aggression levels, so lower trait aggression total scores and lower subscale values (anger, verbal and physical aggression, hostility) than their non-athlete counterparts.
2. We hypothesized that by grouping the sports according to tactical division, we will find a significant difference between the level of trait aggression between the sports groups with greater contact (contact) and non-

contact sports groups. We hypothesized that the group of paired combat sports (wrestling, judo, karate) would achieve significantly higher values in terms of total trait-aggression score and physical aggression score.
3. We hypothesized that by examining each sport independently, we would find a statistically detectable difference in trait aggression among their pursuers.

Material and methods

Our study's subjects were selected by convenience sampling. The subjects were school students between the ages of 14 and 18 (N=1600). Participation in the study was voluntary, and individuals were treated anonymously. The selection criterion was to be a student of a Hungarian public educational institution that exceeded the number of persons completing the questionnaire. The distribution of athletes (n=800) and non-athlete (n=800) was halved. The non-athlete group does not participate in any sports activities, only the obligatory PE classes at the school. The athletes had a sports age of at least 3 years and participated in a minimum of 3x1,5 hours of training per week. The division of the athlete group into further sports groups was done as follows, taking into account the degree of contact and the tactical nature of the sport (Harsányi, 2001; p.13] non-contact or draw sports (aerobics n=100), sports games (handball n=100, basketball n=100, football n=100), combat sports (wrestling n=100, judo n=100, karate n=100) and cyclic sport (swimming n=100).

In the sample, the proportions of the two sexes were nearly the same, 52.5% were boys and 47.5% were girls. The mean age of the sample was 15.94±1.42. In our study, we used the standardized and validated Aggression Questionnaire (AQ / BPAQ) developed by Buss and Perry (1992) which measures personality trait aggression using a 5-point Likert scale with 29 items. In addition to the total score that determines trait aggression, the scores of the respondents can be calculated for four subscales, such as verbal aggression, physical aggression, anger, and hostility. In addition to the subject issues, we also included demographic data such as gender, age, place of living, type of school, sports age for athletes, frequency of training, and competition habits. The original test was translated into Hungarian by Gerevich et al. (2007) and validated in the framework of various researches (Gerevich et al, 2007; Gerevich and Bácskai, 2012). The internal consistency values of the original English test were between $\alpha=0.72$ (verbal aggression) and $\alpha = 0.89$ (total aggression score), while for the tests repeated nine weeks later, $\alpha = 0.72$ (anger) and $\alpha = 0.80$ (physical aggression) (Buss and Perry, 1992). In our sample we found Cronbach alpha values follows: hostility $\alpha=0.77$; verbal aggression $\alpha= 0.80$; anger $\alpha= 0.75$; physical aggression $\alpha=0.74$ and total aggression score $\alpha=0.78$. We examined our sample with the Statistics Package for Social Sciences (SPSS) 24.0. program, the results were considered significant if $p\leq 0.05$. The Kolmogorov-Smirnov test was used to examine the normality of the data. Because of a non-normal distribution, Mann-Whitney U-test and Kruskal-Wallis test were used depending on the number of samples. The research received prior approval from the Regional and Institutional Research Ethics Committee (5813/2015.)

Results

Comparison of athletes and non-athletes in terms of total trait-aggression score and subscales

Using the Kruskal Wallis test and the Mann-Whitney U test, we found a significant difference between the athlete and non-athlete groups in the mean of the subscale scores *anger* (athlete: 17.94±4.38, non-athlete: 15.54 ± 3.91; $p<0.001$; $Z=-4.84$); *hostility* (athlete: 18.90±4.78, non-athlete: 20.79 ± 4.36; $p=0.001$; $Z=-3.28$); *physical aggression* (athlete: 18.63±5.48, non-athlete: 24.93 ± 6.08, $p<0.001$; $Z=-8.68$) and *trait-aggression* total scores for averages (athlete: 67.35 ± 13.82, non-athlete: 77.55 ± 14.68; $p<0.001$; $Z=-5.91$). In terms of verbal aggression score, we didn't find significant difference between the two groups examined (athlete group 14.28±2.83; non-athlete group 13.88±3.61; $p=0.377$; $Z=-.833$).

In our sample, athletes have significantly lower overall trait-aggression scores, as well as lower values for the three subscales (hostility, physical aggression, and anger) than their non-athlete counterparts (**Figure 1**).

Figure 1: Differences between athletes and non-athletes in trait aggression total score and subscales (verbal, physical aggression, anger and hostility) (* $p\leq 0.05$ mean±standard deviation) (Source: own edition)

Comparison of the results of sports groups based on the tactical division and non-athlete group

After the tactical division of sports, the athlete sample (n=800) was divided into four subgroups, which are: *non-contact or draw sports* (aerobics n=100), *sports games* (handball n=100, basketball n=100, football n=100), *combat sports* (wrestling n=100, judo n=100, karate n=100) and *cyclic sports* (swimming n=100). The non-athlete group (n=800) was treated unchanged as a control group.

Trait aggression total score (BPAQ)

With the Kruskal-Wallis test and Mann-Whitney U test, we found a significant difference ($p \leq 0.05$) in the trait aggression total score (BPAQ) between the non-athlete group and each sport group based on tactical division. The non-athlete group had a significantly higher value than each of the sports groups. The average total aggression score of non-athletes was 77.55 ± 14.68 , that of draw/non-contact sports was 62.15 ± 10.84 , that of cyclic sports was 64.50 ± 13.39 , that of sports games was 68.16 ± 10.84 , and that of combat sports was 69.22 ± 12.31 . We found a significant difference between non-athletes and non-contact/draw sports $p < 0.001$; $Z = -4.86$; non-athletes and cyclic sport $p < 0.001$; $Z = -3.55$; non-athletes and sports games $p < 0.001$; $Z = -3.73$ and non-athletes and combat sport $p < 0.001$; $Z = -3.76$. Compared the tactical sports groups with each other we found significant differences only between the draw/non-contact sports and combat sports, where the value of the combat sports was higher ($p = 0.028$; $Z = -2.19$) (Table 1).

Figure 2: Comparison of sport groups by tactical division and non-athlete group in terms of total trait aggression score (* $p \leq 0.05$ mean $\pm$ standard deviation) (Source: own edition)

		Total Aggression Scores (BPAQ)		Physical Aggression scores		Anger scores		Verbal Aggression scores		Hostility scores	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Sport activity	Non-athletes	77.55	14.68	24.93	6.08	17.94	4.38	13.88	3.61	20.79	4.36
	Aerobic	72.70	15.84	21.45	5.61	18.25	4.09	14.20	3.58	18.80	4.76
	Wrestling	70.55	14.09	22.45	5.15	15.30	3.23	14.35	3.01	18.45	4.64
	Judo	69.85	10.91	19.75	4.38	14.60	3.72	14.55	1.90	20.95	5.76
	Karate	67.25	12.13	18.15	4.42	15.95	3.27	14.00	2.13	19.15	4.68
	Basketball	66.55	18.06	19.75	6.33	15.15	4.82	14.45	3.52	17.20	5.50
	Handball	65.25	13.08	15.65	3.69	15.35	4.85	14.20	3.38	20.05	4.25
	Swimming	64.50	13.39	17.20	5.34	14.40	3.30	14.20	2.91	18.70	4.32
	Football	62.15	10.84	14.65	4.20	15.35	2.83	14.25	2.15	17.90	3.88
Sport groups divided into tactical groups	Non-athletes	77.55	14.68	24.93	6.08	17.94	4.38	13.88	3.61	20.79	4.36
	Combat sports	69.22	12.32	20.12	4.92	15.28	3.40	14.30	2.37	19.52	5.08
	Sports games	68.17	15.86	18.95	5.78	16.25	4.74	14.28	3.44	18.68	4.92
	Cyclic sport	64.50	13.39	17.20	5.34	14.40	3.30	14.20	2.91	18.70	4.32
	Non-contact or draw sports	62.15	10.84	14.65	4.20	15.35	2.83	14.25	2.15	17.90	3.88

Table 1: Results of the total aggression score and subscale values regarding the sport tactical groups and non-athletes (mean $\pm$ standard deviation) (Source: own edition)

Anger subscale

Regarding the means of the scores for the anger subscale, we found significant differences between the non-athlete group (17.94 ± 4.38) and combat sports group (15.28 ± 3.40) ($p < 0.001$; $Z = -3.99$) and non-athlete group and the cyclic sports group (14.40 ± 3.30) ($p = 0.001$; $Z = -3.41$). The non-athlete group, therefore, shows a significantly higher value for this subscale. Comparing the tactical sports groups, we didn't find significant differences between the groups regarding the subscale anger.

Physical aggression subscale

Comparing the physical aggression scores, it can be clearly seen that non-athletes show significantly higher values than all other sports groups divided into tactical divisions. The value of the non-athlete group was 24.93 ± 6.07 , the value of non-contact/ draw sports was 14.65 ± 4.19 , the value of cyclic sports was 17.20 ± 5.33 , the value of sports games was 18.95 ± 5.78 , and the value of combat sports group was 20.11 ± 4.91 . We found a significant difference between the non-athlete group and all of the tactical sport groups following: non-athletes and draw / non-contact sport ($p < 0.001$; $Z = -6.06$); non-athlete group and cyclic sport ($p < 0.001$; $Z = -4.81$); non-athlete group and sport games ($p < 0.001$; $Z = -5.98$); non-athlete group and combat sports ($p < 0.001$; $Z = -5.42$). We also found significant difference between the tactical sport groups: combat sports and the representatives of the non-contact /draw sports ($p < 0.001$; $Z = -4.09$); combat sports and cyclic sport ($p = 0.028$; $Z = -2.12$); and draw/non-contact sports and sport games ($p = 0.004$; $Z = -2.91$).

Hostility subscale

Regarding the hostility subscale, we found only significant differences with the Kruskal Wallis test and Mann-Whitney U test between non-athletes (20.79 ± 4.36) and draw / non-contact sport (17.90 ± 3.87) ($p = 0.13$; $Z = -2.47$) and non-athletes and sports games (17.90 ± 3.87) ($p = 0.012$; $Z = -2.50$).

Verbal subscale

No significant differences were found in the verbal aggression subscale ($p > 0.05$).

Examining the differences in trait aggression between sports

Total trait aggression score

Examining the sports without grouping, we considered them relevant to the topic independently, so by examining them independently, we found significant differences in the mean of the total trait-aggression score with the Kruskal Wallis test and Mann-Whitney U-test between the non-athletes (77.55 ± 14.68) and aerobic (62.15 ± 14.09) ($p < 0.001$; $Z = -4.38$); non-athletes and judo (67.25 ± 12.13) ($p = 0.002$; $Z = -3.02$); non-athletes and karate (69.85 ± 10.91) ($p = 0.002$; $Z = -2.30$); non-athletes and basketball (65.25 ± 13.08) ($p < 0.001$; $Z = -3.65$); non-athletes and handball (66.55 ± 18.06) ($p = 0.002$; $Z = -2.30$) and non-athletes and swimming (64.50 ± 15.84) ($p < 0.001$; $Z = -3.55$).

In all cases, the values of the non-athlete group were significantly higher ($p \leq 0.05$). It can be seen that the non-athlete group with the highest total score values are followed by representatives of football players, such as wrestlers, karate, and judo athletes, followed by handball players, basketball players, swimmers, and finally aerobics athletes. Compared the sports individually we found with Kruskal Wallis test and Mann-Whitney U test significant difference between aerobic athletes and wrestlers ($p = 0.004$; $Z = -2.04$); aerobic athletes and karate athletes ($p = 0.042$; $Z = -2.03$), and finally aerobic athletes and football players ($p = 0.002$; $Z = -2.33$).

Physical Aggression subscale

With Kruskal Wallis test and Mann-Whitney U test we found a significant difference ($p < 0.001$) in the physical aggression score between the non-athlete group and aerobics ($p < 0.001$; $Z = -6.06$), judo ($p < 0.001$; $Z = -4.72$), karate ($p < 0.001$; $Z = -3.83$), basketball ($p < 0.001$; $Z = -5.98$), handball ($p = 0.002$; $Z = -3.05$), swimming ($p < 0.001$; $Z = -4.81$) and football ($p < 0.001$; $Z = -2.41$), where in all cases the values of the non-athlete (control) group were higher (24.93 ± 6.08). We found also in the score of physical aggression subscale examining each sport independently significant difference in case of aerobic-wrestling ($p < 0.001$; $Z = -4.18$); aerobic-judo ($p = 0.001$; $Z = -2.49$); aerobic-karate ($p = 0.001$; $Z = -3.28$); aerobic-handball ($p = 0.001$; $Z = -2.53$); aerobic-football ($p < 0.001$; $Z = -3.63$); wrestling-judo ($p < 0.001$; $Z = -4.18$); wrestling-basketball ($p = 0.001$; $Z = -2.34$); wrestling-swimming ($p = 0.004$; $Z = -2.84$); karate-basketball ($p = 0.001$; $Z = -2.57$); basketball-handball ($p = 0.004$; $Z = -1.98$); judo-football ($p = 0.003$; $Z = -2.12$); basketball-football ($p = 0.001$; $Z = -3.44$); swimming and football ($p = 0.002$; $Z = -2.34$).

Discussion

In our research, we undertook to examine and present the possible detectable differences in trait aggression in 14-18 year-olds who regularly exercise and do not exercise sport. We primarily sought to answer whether there was a difference in trait aggression between athlete and non-athlete groups (1), between sport groups divided into tactical groups (2), and between sports individually (3). We hypothesized that the 14-18-year-old athlete group has significantly lower trait aggression levels, so lower trait aggression scores based on responses to the Buss-Perry questionnaire and lower subscale values (anger, verbal and physical aggression, hostility) than the non-athlete group. We also wanted to support the positive effect of sports on trait aggression (H1). We found significant differences between athlete and non-athlete groups in terms of a total trait-aggression score as well as anger, hostility, and physical aggression. Considering verbal aggression no statistically significant differences were found between the two groups studied. In our sample, we showed that athletes have significantly lower total trait aggression scores, and lower trait aggression levels as demonstrated by the questionnaire method, than their non-athlete counterparts. Similar to our results, Rahmizideh et al. (2011) examining athlete and non-athlete groups found a difference in aggression where the athlete group showed lower aggression rates too. We hypothesized that by grouping the sports (according to tactical division), we would find

a significant difference between the trait-aggression levels of the sports groups with greater contact and non-contact sports groups (H2). Significant differences were found in our sample in the total trait-aggression score between the non-athlete group and each of the developed sports groups, where the non-athlete group had significantly higher values. Compared to the tactical sports groups regarding total aggression score significant differences were detected only between the draw/non-contact sports and combat sports, where the value of the combat sports was higher. Although the average values of trait aggression for those performing combat sports were the highest among the sports groups, the difference in scores is low with its + 7.07 point difference compared to the lowest value sports group (non-contact /draw sports).

In the averages of the scores for the anger subscale, we found significant differences between the non-athlete group and combat sports group and non-athlete group, and the cyclic sports group. The non-athlete group, therefore, shows a significantly higher value for this subscale. Comparing the tactical sports groups, we didn't find significant differences between the groups regarding the subscale anger. Representatives of combat sport or martial arts are likely to learn appropriate ways to manage anger as a part of their training. Comparing the physical aggression scores, it can be clearly seen that non-athletes show significantly higher values than all other sports groups divided into tactical divisions. We also found a significant difference between the tactical sports groups follows: combat sports and the representatives of the non-contact /draw sports; combat sports and cyclic sport, and draw/non-contact sports and sports games. In combat sports is a notable contact because the body to body fights naturally. To be successful in a fight the athletes have to be assertive, initiative and offensive. In sports games to get the ball or to work out an advantageous situation for the team, the players have to be decided, so in this point of view, it is not surprising that we get these results.

In the hostility subscale, we found only significant differences between non-athletes and draw / non-contact sport and non-athletes and sports games. No significant differences were found in the verbal aggression subscale measured the sport activities in tactical groups.

The combat sports group in our study included one classic combat sport as wrestling and two martial arts as judo and karate. The goal of these sports is to defeat the opponent in body-to-body combat, in a competition involving contact. Those who practice such a sport know and undertake to measure their knowledge in a fight, so they are also aware of the possible consequences (e.g. injury, pain). While in the group of non-contact draw sports, representatives of a non-contact aesthetic sport were aerobics, where the nature of the sport is completely different from the former. Safraoui found similar to our present results significant difference between contact and non-contact sports according to which the value of trait aggression in contact sports is higher compared to non-contact sports (Safraoui, 2020). In this research, Safraoui measured with the Buss-Perry Aggression Questionnaire 100 student-athletes divided into two groups, where 50 students made contact, and 50 students non-contact sport (football n=16, basketball n=6, women's soccer n=8, baseball n=14, softball n=6, volleyball n=6, tennis n=10, track and field n=22, cross country n=9, golf n=3). It was found that a significant difference exists between athletes who exercise contact sport and athletes who play non-contact sport. Athletes participating in a contact sport displayed significantly higher levels of aggression in the categories: verbal aggression and physical aggression. Football was the most aggressive sport and golf was the least. Tennis scored higher than any other non-contact sports, particularly in verbal aggression. Soccer scored lower than any other contact sport (Safraoui, 2020).

Trivedi and Pinto (2015) also found similar results when examining contact and non-contact sports groups. Stanger et al. (2017) compared collision sports groups (rugby, American football, men's lacrosse, and contact sports (football, handball, hockey, basketball, women's lacrosse) in terms of aggression, and found that those in collision sports showed significantly higher aggression, then contact athletes.

Comparing the individual sports without grouping, so by examining them independently, we found significant differences in the mean of the total trait-aggression score between non-athletes and aerobic; non-athletes and judo; non-athletes and karate; non-athletes and basketball; non-athletes and handball and non-athletes and swimming (H3). In all cases, the values of the non-athlete group were significantly higher. So it seems that exercising sport is able to decrease trait aggression. Compared the sports individually we found a significant difference between aerobic athletes and wrestlers; aerobic athletes and karate athletes and finally aerobic athletes and football players. Examining the sports on their own, the highest total aggression score was achieved by footballers and wrestlers, followed by karate, judo, handball, basketball, swimming, and aerobics. Aerobic is an aesthetic sport, where the quality of the performance is the main factor of efficiency. There is no contact between the competitors, so closed skills are required where the quality and the quantity of the practicing are determinative.

Graczyk et al. (2010) measured 80 competitors, who practiced combat sports like boxing, aikido, taekwondo, and karate (Shotokan), found that the master levels, and a long-year competitive period in combat sports, result in decreasing the levels of aggression. The levels of aggression and control of their aggressive behavior are very dependent on the practiced combat sport. Those, who practice karate, have the lowest levels of aggression and better control their aggressive behavior. The boxers manifested the highest levels of aggression. The average result of those, practicing karate, taekwondo, and aikido, are at that index they can state the positive effects of combat sport on socialization.

Interestingly, Kuśnierz and Bartik (2014) obtained almost identical results by comparing non-athletes and combat sports athletes (Brazilian jiu-jitsu, boxing, Shotokan karate) with the BPAQ test; in terms of the trait-aggression total score and the results of the physical aggression subscale. In their case, the average score for non-athletes was 80.60 points, while in our case it was 77.55; the karate pursuers are 71.10 in their case, while the value in our sample is 69.85. Examining the physical aggression values 25.90 for non-athletes, 21.70 for karate, and in our case 24.93 for non-athletes and for karate practitioners 19.75.

Mroczkowska et al. found - compared three groups of competitors practicing traditional karate, judo, and wrestling – that in the group of competitors practicing traditional karate, the overall level of aggressiveness was significantly ($p \leq 0.05$) lower (56.2 ± 8.70) as compared to the wrestlers (80.0 ± 7.40) and judokas (77.2 ± 8.40). For the most part, such differences stemmed from the contribution of two fundamental components of general aggressiveness, i.e. physical and verbal aggressiveness - as a manifestation of experiences involving negative emotions. The mean values of the measured parameters and general aggressiveness were found to be very similar for wrestling and judo. The lower level of general aggressiveness in competitors practicing traditional karate may result from the regulations laying down the rules of low/non-contact sparring (Kumite). Traditional karate recommends kata („form exercise”; choreographed pattern of martial arts movements) training and meditating which allow an enhancement of self-control and minimize the influence of negative emotions (Mroczkowska et al., 2008).

In our sample, we obtained the highest total score values from each sport for football and wrestling. The contact nature of the sports can explain our results. After wrestling came two combat (contact) sport as karate and judo and handball as a sports game with higher contact came after combat sports overall. Judo and karate are classic Japanese martial arts, with a very strong expectation of personality development. In the last 15-20 years a very spectacular changing is detectable at Hungary - similar to other European countries - in direction to practice this budo martial arts rather as combat sports, so the sport performance is increasing.

Vit et al. (2019) similarly to our study used the Buss-Perry questionnaire and found no statistically significant difference in total aggression and subscale scores compared baseball ($n=30$) and Brazilian jiu-jitsu ($n=30$) martial artists. Petrovska et al (2021) measured 149 athletes of different sports (rhythmic and sport gymnastics, sports acrobatics; sport games; cycling and speed skating, wrestling and boxing; elite athletes and non-elite athletes) and found that there are significant differences in the demonstration of aggression and hostile behavior in different sports. The lowest rates were found among gymnasts and acrobats, the highest significantly different from all groups, while indicators of aggression were found in boxers and wrestlers.

Conclusion

Our results provide evidence that regular sports can lead to favorable personality changes in the degree of aggression. In addition to many other known positive effects, to exercise regular sport can help reduce trait aggression and help to maintain socially desirable norms. Based on our results it is visible that persons who are not involved in sport activities show significantly higher trait aggression level than sportsman. It is worth pointing out that the time spent in the sport, the number of training sessions (training frequency), the training climate, the concept and rules of the practised sport, the personality and used methods of the trainer are also of fundamental importance. Our research is able to give an answer for parents' who have fear of the increase of aggression in their children as a result of training or fighting. The results of Carraro and Gobbi (2018) showed the role that play fighting help to cope with children aggressive behaviours. Those sporting activities that we observed are adequate for physical education lessons. Results may provide some suggestions in schools where peer aggression represents a serious concern. The authors recommend teachers to use these sporting activities – particularly combat sport - safely not only on physical education lessons, but in free time or during daycare. Further longitudinal research can examine the lasting personality changes caused by continuous, regular sports activity.

Highlights

Regular sport activity can lead to reduce trait aggression and help maintaining socially desirable norms. There is evidence for the difference in trait aggression level between athletes and non-athletes. A detectable difference is in the level of trait aggression between sport groups divided into tactical groups. Examined the different kind of sports, the highest total aggression score was achieved by footballers and wrestlers, followed by karate, judo, handball, basketball, swimming and aerobics.

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Conflicts of interests

The authors declare that they have no competing interests.

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