ORIGINAL ARTICLE

Emotional intelligence and aggression in kyokushin and shotokan karate athletes

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C Statistical Analysis
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Cezary Kuśnierz [1ABDE], **Aleksandra Rogowska** [2ACD], **Karol Görner** [3AD]

[1] Faculty of Physical Education and Physiotherapy, Opole University of Technology, Opole, Poland
[2] Institute of Psychology, University of Opole, Opole, Poland
[3] Department of Sports Education and Humanistics, Faculty of Sports of the University of Prešov, Prešov, Slovakia

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Abstract

Background & Study Aim: Although athletes' aggression (aggressiveness) and emotional intelligence (EI) were examined in previous studies, the associations between these variables were never investigated among karate athletes differing in their practice styles. This study aims is to verify two hypothesis: H1, that high EI is associated with low aggression (aggressiveness); H2, the level of aggression (aggressiveness) differentiates karate athletes of different styles aggressiveness and these differences also apply to physically active and inactive people (also in relation to karate athletes).

Material & Methods: The cross-sectional study was performed in Poland using self-reported questionnaires to measure aggressiveness (the Buss-Perry Aggression Questionnaire; BPAQ) and emotional intelligence (the Trait Emotional Intelligence Questionnaire – short form; TEIQue-SF). The research sample included 246 men aged 16-60 (M = 24.72, SD = 8.51) in four groups: KK karate kyokushin (n = 42), KS karate shotokan (n = 39), PA physically active people (n = 93), and PI (n = 72). A one-way ANOVA, Pearson's correlation, and General Linear Model of regression were used to verify hypotheses.

Results: Significant differences were found between KK, KS, PA, and PI samples in emotional intelligence and almost all aggression scales, including total aggression score, physical aggression, anger, and hostility (excluding verbal aggression). The KK group showed the lowest aggression levels and the highest EI compared to other groups. Aggression scales (excluding verbal aggression) correlated negatively with EI. Low aggression is a significant predictor of EI, but the moderating effect of the sample on the relationship between aggression as a predictor and EI as explained variable was not found in this study.

Conclusions: This study confirmed the beneficial effect of physical activity and karate training on improving emotional intelligence and reducing aggression. Karate training, especially in kyokushin style, is recommended for people with 'aggression problems' and to increase EI and well-being.

Keywords: aggressiveness • combat sports • martial arts • physical activity

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Author's address: Cezary Kuśnierz, Opole University of Technology, 76 Prószkowska St., Opole, Poland;
e-mail: c.kusnierz@po.edu.pl

INTRODUCTION

Martial arts combine physical combat elements with strategy, philosophy, tradition, or other characteristics, thus distinguishing them from pure physical reaction [1]. Many martial arts developed their sporting sides and evolved into combat sports, which is the case with Olympic combat sports such as freestyle wrestling, Greco-Roman wrestling, boxing, fencing, judo, taekwondo, and karate. Other martial arts, such as *tai chi*, developed mainly as mind-body movement practices, disregarding combat's pure realm. Today, these terms are often used in academic literature as martial arts and combat sports (MA&CS). In addition to hand-to-hand combat and self-defence skills, MA&CS strengthen health potential and physical fitness (especially cardiorespiratory fitness, speed, agility, strength, flexibility, coordination, and balance) and improve life satisfaction and quality of life [2-9].

The combination of physical training and ethical principles contributes to the holistic nature of martial arts and combat sports as transformative practices extending beyond physical combat. However, practicing sports and martial arts also raises much controversy about the effects of training. Due to the great interest in combat sports and martial arts, they are increasingly becoming the research topic in the context of social impact and aggression in adolescents [6]. Despite the many supporters of these exercises, there are also opposing stances. Research conducted in Norway shows that practicing strength and combat sports increases antisocial behaviour [10]. Pearn [11] suggests that boxing under sixteen should be prohibited for medical, philosophical, and ethical reasons. Indeed, some combat sports (e.g., boxing) may be more aggressive than others (e.g., judo) due to the principles and philosophical orientation associated with their goals [12, 13].

Despite the 'aggressive' stigma associated with combat sports and martial arts, research has shown that in the long term or at a higher level of advancement, they can reduce the aggression of athletes [14]. However, research has highlighted that aggression in sports can be confused with sporting combativeness [15]. It is an attitude that can be associated with competitive sports anger or 'fighting spirit' that has been shown to facilitate performance [16]. Martinkova and Parry [17] argue that martial arts should be treated as a safe, educational activity in which participants learn safe fighting strategies by introducing the Codes of Conduct principles and defining the means and goals of martial arts.

Aggression involves intentional behaviours that cause harm or injury to others, either physically or psychologically [18]. It is a behaviour characteristic for people and animals, which often has destructive consequences for both the aggressor and the victim. Aggression can take many forms, including physical violence, verbal hostility, and psychological manipulation [19, 20]. According to Buss and Perry [21], individual differences in tendencies to aggression can be assessed on four dimensions: physical aggression, verbal aggression, anger, and hostility. Based on different underlying motivations and triggers for aggressive behaviour, Vitiello and Stoff [22] identified two types of aggression: controlled-instrumental and reactive-impulsive. Controlled-instrumental aggression refers to premeditated, goal-oriented, and consciously planned aggression. It is often strategic and used to achieve specific objectives or desired outcomes. Individuals who engage in controlled-instrumental aggression typically have a clear intention behind their aggressive behaviour, and they may use aggression as a calculated tool to attain personal gains, dominance, or solve problems. It can occur in various contexts, including competitive sports, business negotiations, or social interactions. Reactive-impulsive aggression, on the other hand, is characterized by impulsive and emotionally driven outbursts of aggression. It occurs in response to perceived threats, frustration, or provocation. Unlike controlled-instrumental aggression, reactive-impulsive aggression is not premeditated but emerges in the heat of the moment, often triggered by intense emotions such as anger, fear, or frustration. Individuals exhibiting reactive-impulsive aggression may lose control over their actions and act impulsively in response to perceived offenses or threats. Aggressive behaviour is more reactive and not necessarily guided by specific goals or motivations beyond an immediate emotional release. However, it's important to note that the distinction between these two types of aggression is not always clear-cut, as a combination of situational factors, individual differences, and the interplay of various emotions and motivations can influence aggressive behaviour.

Aggressive behaviour is constituted in combat sports since the athletes practice skills required to fight effectively using kicks and punches [23, 24,

Aggression (in psychology) – is deliberate behaviour by the perpetrator intended to either hurt the opponent, harm or distress him/her in any other way, cause pain (regardless of whether this aim is achieved), or destroy things [97, 98].

Aggression (in praxeology) – is to initiate destructive fight or move in a verbal dispute from material arguments to those causing distress to the opponent [99].

Aggressiveness – a human characteristic manifesting itself in inclinations to hurt others, to destructive behaviour. *Aggressive* = virulent, truculent, attacking [99].

Emotional intelligence – one's ability to perceive, express, understand, and regulate emotions in the self and others [100].

Martial arts – *plural noun* any of various systems of combat and self-defence, e.g. judo or karate, developed especially in Japan and Korea and now usually practised as a sport [101].

Combat sport – *noun* a sport in which one person fights another, e.g. wrestling, boxing and the martial arts [101].

Dan – *noun* **1.** One of the numbered black-belt levels of proficiency in martial arts such judo and taekwondo. Also called **dan grade 2.** Somebody who has achieved a dan [101].

Kyu – *noun* a level of proficiency in some martial arts [101].

Kata – *noun* a sequence of movements in some martial arts such as karate, used either for training or to demonstrate technique [101].

Kumite – is a semi contact karate competitive concurrence, where two athletes perform various kicking, punching and blocking techniques towards each other with maximum control in order to gain points and win the match. Destruction is fictive [102].

Training session – *noun* a period of time during which an athlete trains, either alone, with a trainer or with their team [101].

10, 14, 17, 25]. In sports, controlled-instrumental aggression is associated with assertiveness, while reactive-impulsive aggression is linked to intense emotions, raising arousal levels. In all sports, particularly in relatively dangerous combat sports, it is important to maintain an optimal level of arousal to enable athletes to respond to sudden opportunities to attack and avoid or block dangerous attacks from opponents [26]. Combat sport is characterized by the persistent fear of failure, direct physical contact, and attack on contestants, which is related to a high risk of experiencing pain and injuries. However, a meta-analysis showed that levels of externalizing behaviour do not differentiate martial artists from non-athletes and team sport athletes [27].

In contrast, several studies showed a beneficial effect of traditional martial arts training on reducing aggressiveness [28, 25, 29-31]. Some differences in aggression levels were found between particular disciplines of combat sports and martial arts, compared to other sports disciplines and non-athletes [23, 32-37]. Moreover, Piepora et al. [38] showed that aggression levels might differ between particular styles of karate (depending on distinct rules of kumite), including shotokan (semi-contact), kyokushin (knockdown), Oyama (full contact), and shidokan (mixed fighting). A karate athlete should improve emotional control [39] as a critical variable to perform well.

Emotional intelligence (EI) refers to recognizing, understanding, managing, and effectively expressing emotions in oneself and others [40, 41]. It involves being aware of one's own emotions, accurately perceiving the emotions of others, and using this emotional awareness to navigate social interactions, manage conflicts, and make sound decisions. It involves perceiving, understanding, and effectively regulating emotions in oneself and interpersonal relationships [42]. The crucial dimensions of EI comprise self-awareness (recognizing and understanding one's own emotions, strengths, weaknesses, and triggers), self-regulation (managing and controlling one's emotional responses and impulses, avoiding impulsive reactions, and remaining calm under pressure), and social awareness (being attuned to the emotions and needs of others, showing empathy, and understanding different perspectives). EI has been recognized as an essential aspect of personal and social competence, contributing to individual well-being, mental health, and successful interpersonal relationships [43, 44]. Kopp et al. [45] showed that EI considered a personality trait, can better predict sports performance than EI, understood as an ability.

In a systematic review, Laborde et al. [46] showed a positive association between EI and physical activity (PA) levels and the amount of exercise performed. In sports, EI is crucial in controlling and managing stress, anxiety, and other negative emotions under training and competition [47-50, 46, 5-54, 45, 55-57]. Studies found that martial artists and combat sports athletes demonstrate significantly higher EI than athletes of other sports disciplines, as well as physically active people and non-athletes [58-61].

The association between aggression and emotional intelligence has been extensively studied in psychology. Numerous research studies have shown that individuals with higher levels of emotional intelligence tend to display lower levels of aggression [62-68]. Moreover, a high EI is presented in people with low aggression, independent of age, culture, EI measure, or type of aggression [64]. Potoczny et al. [69] suggest that karate, in particular, focuses on self-regulation and self-development, which may reduce aggression and impulsivity and improve self-control and emotional regulation. However, up to date, aggression and emotional intelligence were not explored among karateka, particularly in comparison to shotokan and kyokushin.

This study aims is to verify two hypothesis: H1, that high EI is associated with low aggression (aggressiveness); H2, the level of aggression (aggressiveness) differentiates karate athletes of different styles aggressiveness and these differences also apply to physically active and inactive people (also in relation to karate athletes).

MATERIAL AND METHODS

Study design and procedure

The cross-sectional study was performed from October 1, 2022 to May 18, 2023 in Poland. Two separate ways were performed for karate athletes and non-karateka groups. Two different karate styles were deliberately chosen where the fight takes place in full contact (kyokushin) and without contact (shotokan). A paper and pencil questionnaire was conducted among karateka during the Winter grouping of the national team

A Likert scale – is a **psychometric** scale commonly involved in research that employs **questionnaires**. It is the most widely used approach to scaling responses in survey research, such that the term (or more accurately the **Likert-type scale**) is often used interchangeably with ***rating scale***, even though the two are not synonymous [103].

A variance inflation factor (VIF) – is a measure of the amount of multicollinearity in regression analysis. **Multicollinearity** exists when there is a correlation between multiple independent variables in a multiple regression model. This can adversely affect the **regression** results. Thus, the variance inflation factor can estimate how much the variance of a regression coefficient is inflated due to multicollinearity [104].

Beta (β) – a standardized regression coefficient that determines the relationship between the predictor (explanatory variable) and the dependent (explained) variable. Its interpretation is similar to the interpretation of the correlation coefficient and, like it, its value ranges from – 1 to 1. In practice, the value of the Beta coefficient, in the case of multiple regression, allows for comparison of the importance of the predictors in the model [105].

WKF Shotokan in Spała 2023, the grouping of black belts Shinkyoukushin in Stara Wieś, and in the Gliwice Kyokushin Karate Club October – December 2022. The inclusion criteria were: age of at least 16 years, male gender, and participation in karate training for at least one year. Trainers invited their students to participate in the study during training sessions, and those who met inclusion criteria and submitted written consent voluntarily participated in the research. Among karatekas, 119 responded to the invitation, but one refused; seven were younger than 16, and 30 were women, so they were excluded from further statistical analyses. Finally, 81 male karatekas participated in the study.

The online study was conducted using a Google Forms survey in a non-karatekas sample. The invitation to participate in the study was disseminated using the e-mailing list at the technical university. The academic teachers of physical education classes at the Opole University of Technology (Poland) invited their students to participate in the study. Initially, 190 university students responded to the invitation, but 15 people refused, and ten did not meet the inclusion criteria (male gender), so the final sample included 165 non-karateka participants as a control group. Informed consent was obtained from all subjects involved in the study.

This study was conducted following the Declaration of Helsinki and approved by the University Research Ethics Committee of Opole University of Technology (issued July 09, 2022; no 2/2022).

Measures

The Buss-Perry Aggression Questionnaire (BPAQ) is a widely used self-report questionnaire designed to measure various aspects of aggressive behaviour and traits [21]. The BPAQ consists of 29 items that assess four different dimensions of aggression: physical aggression (PA; measures the tendency to engage in physically aggressive behaviour, such as hitting, pushing, or physically harming others; e.g., 'I have threatened people I know'), verbal aggression (VA; assess the inclination to use verbal aggression, such as insulting, yelling, or verbally attacking others; e.g., 'My friends say that I'm somewhat argumentative'), anger (AN; evaluates the level of anger and irritability in an individual's personality; e.g., 'Some of my friends think I am a hothead'), and hostility (HO; gauges the degree of hostile thoughts, feelings, and attitudes towards others; e.g., 'Other people always seem to get the breaks'). Each item in the BPAQ presents a statement related to aggressive behaviour or feelings, and respondents are asked to rate their agreement or disagreement with each statement on a Likert scale (from 1 *extremely uncharacteristic of me* to 5 *extremely characteristic of me*). The total scores range from 29 to 145, and higher scores indicate higher aggression levels. The BPAQ in Polish validation and adaptation [70, 71] showed satisfactory psychometric properties. The Cronbach's α ranges from 0.72 to 0.89 for particular BPAQ scales in previous study [71]. The present study's reliability (Cronbach's α) was 0.75 for PA, 0.63 for VA, 0.79 for AN, 0.73 for HO, and 0.88 for the total BPAQ score.

The Trait Emotional Intelligence Questionnaire (TEIQue) is a self-report assessment tool designed to measure trait emotional intelligence (EI). Unlike ability-based EI tests, which assess an individual's cognitive abilities related to emotions, the TEIQue focuses on the individual's emotional dispositions and self-perceived emotional competencies. It provides insights into an individual's emotional self-awareness, social skills, and overall emotional functioning, contributing to a comprehensive understanding of emotional intelligence in real-life contexts [44]. The TEIQue was developed by Petrides and Furnham [72], an expert in the field of emotional intelligence, and it has been widely used in research and applied settings to understand how individuals perceive and manage their emotions in daily life. The TEIQue consists of 153 items that cover different facets of emotional intelligence, including the following 15 facets in five dimensions: well-being (traits of optimism, happiness, and self-esteem); self-control (stress management, emotion regulation, and low impulsiveness); emotionality (trait empathy, emotion perception and expression, and relationships); sociability (emotion management, assertiveness, and social awareness); auxiliary facets (self-motivation and adaptability). Respondents rate each item on a 7-point Likert scale, indicating the degree to which they agree or disagree with each statement based on their typical emotional experiences and behaviours (1 *strongly disagree*, 7 *strongly agree*). In the present study, the questionnaire was used (TEIQue-SF), consisting of 30 items (two items for each of the 15 facets). The total TEIQue-SF

scores range from 30 to 210, and higher scores indicate a higher EI level. In the Polish adaptation and validation studies [73], Cronbach's α was 0.89 for TEIQue-SF, while 0.90 in the present study.

The demographic survey included questions about age (number of years old, continuous variable), education (primary, secondary, high school, Master degree or higher), relationship status (in a relationship, single), and economic status (unsatisfactory, average, good, very good, and excellent). We also ask about physical activity ('Do you regularly exercise?'; with yes/no response options). In the karateka sample, the questions concerned the number of training internship years, the average number of training sessions per week, the average number of hours during a typical training session, karate ranks: kyu (1-8) or dan (1-6), the karate discipline (kumite and kata), and the highest competition level (regional, national, European, and world).

Participants

The sample of 246 men participated in the study, aged 16-60 (M = 24.72 ±8.51), including 72 self-report physically inactive people (PI; 29.27%), 93 physically active participants (PA; 37.81), and 81 karateka athletes in two styles and groups, respectively: karatekas shotokan (KS; n = 39, 15.85%), and karatekas kyokushin (KK; n = 42, 17.07%). In the sample, 18 (7.32%) participants had primary education, 5 (2.03%) secondary, 153 (62.20%) high school, and 70 (28.46%) Master's degree or higher. Regarding relationship status, 116 (47.15%) people were in a relationship, and 130 (52.85%) were single. Unsatisfactory economic status was declared by 15 (6.10%) respondents, average economic status was presented in 58 (23.58%) participants, good in 112 (45.53%) people, very good in 54 (21.95%), and excellent in 7 individuals (2.85%).

In the karateka sample, the average number of training internships was 12 years (M = 11.80 ±8.63, ranging from 1-43). Karatekas trained four days on average per week (M = 3.72 ±1.56), 20 athletes trained two days a week (24.69%), 25 people three days a week (30.86%), 12 participants exercised four days per week (14.82%), and five days or more declared 24 men (29.63%). During a typical training session, an average of 6 hours was trained (M = 6.22 ±3.58). Among karatekas, two people did not indicate any kyu or dan ranks, 8 kyu ranks had four people (4.94%), 7 kyu had two athletes (2.47%), 6 and 5 kyu were presented in one person, respectively (1.24%), 4 kyu had ten people (12.35%), 3 kyu had 11 participants (12.58%), 2 kyu had nine individuals (11.11%), and 18 karatekas had 1 kyu (22.22%). Regarding dan ranks, 16 karateka athletes had 1 dan (19.75%), four people had 2 dan (4.94%), while 4, 5, and 6 dan were represented in one person, respectively (1.24%). Kumite discipline indicated 50 karateka athletes (61.73%), while kata was declared by 34 athletes (13.82%). In the karateka group, 39 people participated in the regional level of competition (48.15%), the national level represented 36 participants (44.44%), European level 19 people (23.46%), and 15 karatekas took part in the world championships (18.52%).

Statistical analysis

Psychometric properties of all continuous variables (aggression and EI in BPQ and TEQue-SF scales, respectively) were examined in regards to the range of scores (symbols of indicators used in the table in brackets): mean (M), standard deviation (SD or ±). Since the sample size is large (n = 246), M, SD, and median, skewness and kurtosis range ± 1, any violation from normal distribution was not detected, and parametric statistical tests were performed to verify hypotheses. Initially, assumptions for linear regression were checked: Variance Inflation Factor (VIF) – see glossary; homoscedasticity (Breusch-Pagan test); multivariate normality (Shapiro-Wilk test). In doubtful situations we used the Durbin-Watson test (autocorrelation).

We applied Tukey post-hoc test. Cohen's d coefficient and eta squared (η^2) was used to measures of experimental effect size. The strength of the effect **d**: 0.2 weak, 0.5 average, 0.8 strong; and $\boldsymbol{\eta^2}$: 0.01 weak, 0.06 average, 0.14 strong. Also was used Cronbach's α reliability coefficient.

A one-way ANOVA was performed to examine differences between four groups of participants (KS, KK, PA, and PI), in particular, aggression scales and EI. Pearson's correlation analysis was conducted to test relationships between all aggression scales and EI. Also, the General Linear Model (GLM) with ordinal least-squares (OLS) regression was performed to examine the moderating role of the study sample (KS, KK, PA, and PI) on the association between aggression (total score) and emotional intelligence. All statistical analyses are performed using software JAMOVI, ver. 2.2.5 for Windows.

RESULTS

Differences in emotional intelligence and aggression between karate athletes and people at various physical activity levels

Significant differences were found between these groups in all aggression scales and subscales (excluding verbal aggression) and emotional intelligence (Table 1).

Tukey post-hoc test showed that sample KS scored significantly higher than the KK group in the aggression total scale ($p<0.05$, Cohen's $d = 0.64$). The physical aggression subscale was higher in the KS sample compared to PI ($p<0.05$, Cohen's $d = -0.55$) and PA ($p<0.01$, Cohen's $d = -0.68$) but did not differ significantly from KK. No significant differences between groups were found in verbal aggression. Anger was significantly lower in the KK sample than in the IP group ($p<0.05$, Cohen's $d = 0.56$). Regarding the hostility subscale of aggression, the KK group scored significantly lower than the IP ($p<0.01$, Cohen's $d = 0.71$) and the KS ($p<0.05$, Cohen's $d = 0.69$) but did not differ from the PA sample. In contrast, KK athletes presented the highest emotional intelligence scores, in particular, significantly higher than the IP ($p<0.001$, Cohen's $d = -1.00$) and the KS ($p<0.01$, Cohen's $d = 0.71$) samples. Also, the PA group scores significantly higher than the PI ($p<0.001$, Cohen's $d = 0.70$).

Correlations between emotional intelligence and aggression

Emotional intelligence was related negatively to all aggression scales in both samples. However, the VA scale was not significantly associated with

Table 1. One-way ANOVA for karate shotokan (KS) and karate kyokushin (KK) athletes and physically active (PA) and physically inactive (IA) participants.

Variable	PI (n = 72)		PA (n = 93)		KS (n = 39)		KK (n = 42)		F(3, 242)	p	η^2
	M	SD	M	SD	M	SD	M	SD			
aggression (total score)	74.56	18.96	70.15	16.11	77.54	15.07	66.83	14.80	3.74	**0.012**	0.044
physical aggression	2.21	0.74	2.13	0.64	2.57	0.62	2.25	0.52	4.28	**0.006**	0.050
verbal aggression	2.89	0.84	2.85	0.72	2.91	0.72	2.75	0.63	0.39	0.763	0.005
anger	2.48	0.92	2.20	0.77	2.45	0.81	2.02	0.77	3.60	**0.014**	0.043
hostility	2.87	0.78	2.68	0.77	2.85	0.70	2.34	0.63	5.10	**0.002**	0.059
emotional intelligence	131.49	25.54	148.25	23.74	138.39	24.02	155.52	22.42	11.20	**<0.001**	0.122

Note: **F** result of the analysis of variance; **p** probability level, p–value; **η^2** eta squared

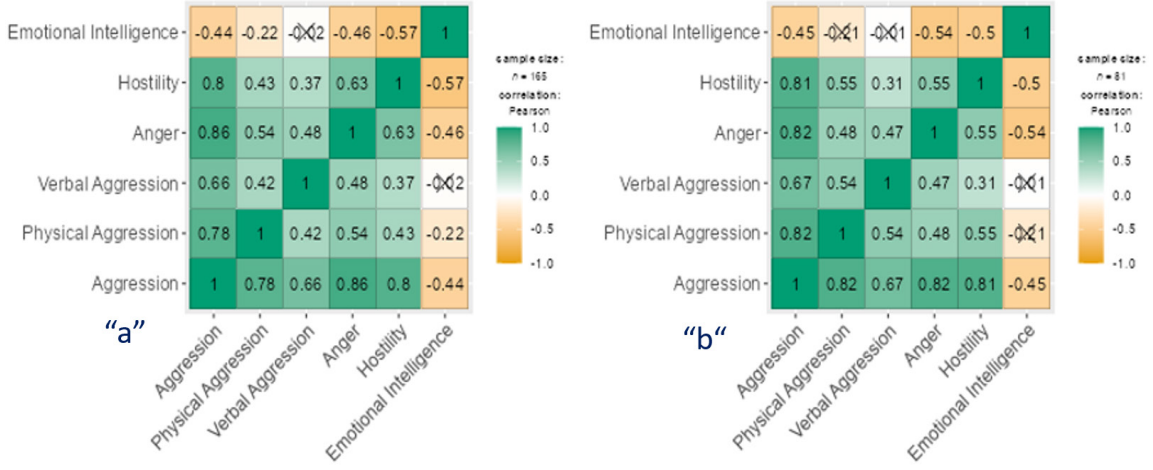

Figure 1. Pearson's correlations between aggression and emotional intelligence in the: "a" non-karatekas (n = 165) samples; "b" karatekas (n = 81).

EI in both karatekas and non-karatekas, while the PA subscale was also unrelated in karate athletes. Aggression scales and subscales were positively interrelated (moderate to strong associations).

Predictors of emotional intelligence

All statistics indicated that the data in the regression model met the criteria for collinearity (tolerance >0.25, and VIF <3), homoscedasticity = 12.02, p = 0.100), multivariate normality = 0.99, p = 0.268), and autocorrelation = 1.96, p = 0.668).

The General Linear Model (GLM) with OLS regression was performed for emotional intelligence as an explained variable, research sample (KK, KS, PA, and PI), and aggression (total BPQA score) as potential predictors. Significant negative predictors of emotional intelligence belong to KS (β = −0.43) and PI (β = −0.74) samples (compared to the KK group) and aggression score (β = −0.39) (Table 2).

The interaction effect between aggression and the sample on EI was insignificant (Figure 2).

Table 2. GLM regression for emotional intelligence (n = 246).

Effect	95% CI						
	b	SE b	LL	UL	β	t(238)	p
intercept	143.36	1.58	140.25	146.47	0.00	90.84	**<0.001**
aggression	−0.59	0.10	−0.78	−0.39	−0.39	−6.02	**<0.001**
KS÷KK	−10.98	5.25	−21.32	−0.64	−0.43	−2.09	0.037
PA÷KK	−4.90	4.31	−13.39	3.59	−0.19	−1.14	0.256
PI÷KK	−19.02	4.49	−27.87	−10.18	−0.74	−4.24	**<0.001**
aggression ✳ KS÷KK	0.17	0.33	−0.49	0.82	0.11	0.49	0.622
aggression ✳ PA÷KK	0.10	0.28	−0.44	0.64	0.07	0.36	0.721
aggression ✳ PI÷KK	0.03	0.27	−0.50	0.57	0.02	0.12	0.903

Note: **PI** physically inactive; **PA** physically active; **KS** karatekas shotokan; **KK** karatekas kyokushin; **CI** onfidence interval; **LL** lower level; **UL** upper level; **CI** confidence interval; **b** unstandardized regression coefficient; **SE** standard error; **β** standardized regression coefficient (see glossary); **t** Student's *t*-distribution; **p** probability level, p–value

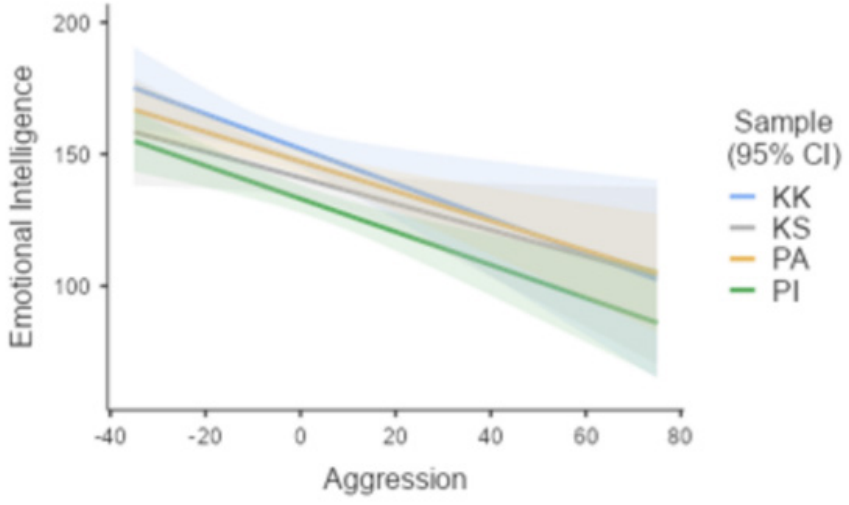

Figure 2. Association between aggression and emotional intelligence by samples of karatekas kyokushin (KK), karatekas shotokan (KS), physically active (PA), and physically inactive (PI) people. The moderating effect is statistically insignificant.

Therefore sample cannot play a moderator role in the relationships between aggression and emotional intelligence, $F(7, 238) = 28.70$, $p<0.001$, η^2_p (partial eta squared) = 0.46.

DISCUSSION

Aggression in karateka

According to hypothesis H1, significant differences between groups were found in the total aggression score and physical aggression, anger, and hostility subscales. Interestingly, the KK group presented the lowest levels of total aggression and its subscales of verbal aggression, anger, and hostility compared to the other three groups. Furthermore, KK scored significantly lower than KS in total aggression and hostility. Also, the KS group demonstrated significantly higher levels of physical aggression than non-karatekas (both PA and PI samples). Anger was significantly lower in the KK sample than in the IP group. And only verbal aggression did not differ significantly in the four samples. These results demonstrate a clear pattern that karatekas and physically active people have lower aggression than inactive people.

Differences between athletes of various sports disciplines, especially between athletes and non-athletes, were found previously [23, 32-37]. Martial arts practitioners showed a statistically significantly lower hostility level and overall aggression score (in the Buss and Perry Aggression Questionnaire, BPAQ) than combat sports athletes [36]. Ziaee et al. [32] examined reactive anger, instrumental anger, and anger control subscales in adolescents and non-athletes compared to karate and judo athletes and swimmers from sports clubs in Tehran. The results showed that karate athletes had significantly lower levels of anger than judo athletes and non-athletes. Ziaee et al. [32] concluded that karate training could be beneficial for controlling anger, while judo training may have no influence. In another study, Limpo et al. [37] compared the perceived benefits and aggression risks of sports among karate and football players. Karatekas perceived more benefits and fewer risks in karate than in football.

Furthermore, the perceived benefits of karate were relevant to experiencing fulfilment in training and general well-being among karate athletes but not in footballers. Among eight-year-old boys, those trained in karate did not differ significantly in aggression scales from the non-athlete control group but scored lower than judo practitioners [23]. Vertogen et al. [35] showed that Thai boxers show significantly more physical aggression than judoka, aikido athletes, and karateka. Moreover, karatekas have the lowest levels of aggression and better control of their aggressive behaviour than those practicing taekwondo, aikido, and box (who showed the highest levels of aggression).

In line with this study, Kuśnierz and Bartik [33] indicated that Shotokan karatekas showed the lowest aggression levels in all scales of the aggression questionnaire (in total score, as well as subscales: physical aggression, verbal aggression, anger, and hostility), compared to samples of Brazilian jiu-jitsu and boxing athletes and non-athlete group. In contrast, the sample of non-athletes scored higher in anger and hostility than combat sports athletes, indicating that practicing martial arts and combat sports positively affects negative emotional control. Research on selected sports and martial arts conducted by Kuśnierz et al. [34] showed a varied level of aggression among training players. It can be seen that the type of discipline has a significant impact on the results. The highest values of the examined manifestations of aggression were found in the group of boxers who fight in full contact and are exposed to injuries and loss of health. The specificity of such training and the rules of combat can significantly affect the development of aggressive behaviour. The lowest values of aggression were found in ju-jitsu practitioners. Among the several manifestations of aggression analysed in the research, the highest level occurred regarding verbal aggression. The result of general aggression, the highest value found in the control group, i.e., non-training people, should be considered the most important. Competitors of sports and martial arts, unlike their non-training peers, during training have the opportunity to relieve emotions, learn self-control, and develop self-discipline, which in turn can reduce aggression or control it.

The current study found that kyokushin karatekas scored lower in aggression than shotokan karatekas. In contrast, Piepora et al. [38] showed that kyokushin karateka scored significantly higher in all aggression scales than karateka of other groups representing shotokan, Oyama, and shidokan styles of karate. However,

the inconsistency between our and previous research may be related to differences in the overall level of competition. The biological basis can explain why kyoushin karatekas may present lower aggression levels than the shotokan style. Parmigiani et al. [74] found differences in testosterone and cortisol hormones among male karate athletes before (pre) and after (post) kumite (real fight) and kata (ritualized fight). Both hormones (testosterone and cortisol) increased only during kumite contests. Cortisol levels were lower in those who won than in those who lost the fight. Moreover, winners showed lower levels of harm avoidance and anxiety than losers, suggesting that kumite has a more beneficial effect on controlling negative emotions (stress, anxiety, and aggression) and improved performance in karate.

Overall, the present study is in line with other research, showing that martial arts training reduces aggression [28, 23, 14, 25, 29-31]. Recent research found that professional judo athletes are characterized by a low degree of aggression (in particular low indirect and physical aggression) compared to team sports members [31]. Furthermore, Lamarre and Nosanchuk [28] showed that aggressiveness declined across traditional judo training and ages. Athletes with longer training internships and those at the master level demonstrate lower aggression levels than those with shorter experience in martial arts and combat sport training [14, 75]. Therefore, participating regularly in combat sports training over many years, and complying with the rules, has the best effect on decreasing aggression. Szmajke and Doliński [76] indicate that youth practicing 'high-contact' sports show a greater tendency to aggressive behaviour in sports and everyday life than people without such experience. Jasiński et al. [77] also noted that anxiety and aggression levels were statistically significantly higher in trained adolescents than in those who had never practiced hand-to-hand combat. Other authors have observed that contact sports players are more aggressive than non-contact players [78-80]. Therefore, physical exercises can strengthen character traits useful in sports but not necessarily in social life.

It can be assumed that the socialization of fearful and aggressive behaviours based on rigid rules and principles of martial arts statistically significantly reduces their occurrence in athletes. These views have been confirmed in the publications of many authors [77, 2, 13, 81, 25]. Kubacka-Jasiecka and Wrześniewski [82] argue that although athletes practicing martial arts for recreational purposes or participating in combat sports competitions must, in themselves, arouse a certain degree of aggression, they are no different in this respect from people practicing other sports or activities. These authors found average levels of aggression among people practicing aikido, karate, judo, taekwondo, and krav maga. McEwan et al. [83] pointed out how individuals with high levels of aggressiveness may be attracted to combat sports. This motivation and predisposition to work in MA&CS could benefit the practice of MA&CS concerning greater aggressiveness. The training in traditional MA [28], as well as the philosophical aspects [84] and the elements of kata and meditation [24], have been associated with a decrease in aggressiveness. The review indicates a relationship between traditional martial arts and anger reduction. Although some evidence shows an unclear relationship between MA&CS practice and anger and aggression levels, training in traditional martial arts, which affects meditation, philosophy, or kata, seems to be an effective means to lower levels of anger and aggression. Regarding the age of subjects, there is a predisposition to reduce anger in the adult population. In addition, young subjects with violent or behavioural problems show a positive response to working with martial arts [30].

In ideological assumptions, people training in martial arts and sports strive for psychophysical improvement and self-realization [85]. Describing the benefits of this type of exercise, Herrigel [86] indicates the ability to prevent aggression, control one's emotions, and react calmly in a dangerous situation. The traditional values that have been associated with (MA&CS) include civility (importance of politeness, respect, and courteous behaviour towards others, both within and outside the martial arts community), humility (encourages practitioners to remain modest and avoid arrogance or egotism, acknowledging that there is always more to learn and improve upon), modesty (promotes a lack of pretence or showiness in one's skills and achievements), chivalry (pertains to the concept of honourable behaviour and the protection of others, particularly those who are weaker or defenceless), loyalty (encourages martial artists to show loyalty and commitment to their instructors, schools, and training partners), courage and bravery (emphasizes the

importance of facing challenges and adversity with bravery and courage, both in training and in life), and respect for oneself, for the opponent, for the master, and also for all sentient beings [17].

Emotional intelligence in karatekas

Consistent with H2, significant differences between groups were also found in emotional intelligence. The highest EI levels were found in the KK sample, then in the PA group, and afterward in the KS, while the lowest EI was presented among PI individuals. Moreover, significant differences were shown between KK and IP, KK and KS, and PA and samples. There are many ways in which EI impact sport activity by improving self-awareness, self-regulation, motivation and resilience, empathy, and stress management [47-50, 46, 51-54, 45, 55-57]. A high EI contributes to sports performance through adequate physiological stress responses and efficient psychological skills [46]. It was found that athletes tend to pay attention to emotions and value their feelings, using positive thinking to improve their negative moods [55]. EI is positively related to PA motivation while negatively to a motivation levels [54, 56]. Therefore, sports practice is conducive to improving EI and can be considered a mechanism of its development [50]. Indeed, a positive correlation is presented between EI and sports performance [50-53, 45].

The present study confirms the previous research [58-61]. In a recent study [60], judo athletes (especially those of high performance) showed higher levels of EI than physically active and non-active participants. Skurvydas et al. [61] indicate that although participation in any exercise related to physical activity is positively correlated to emotional intelligence, the highest emotional intelligence was found in men participating in martial arts. Szabo and Urbán [58] showed that boxers scored higher than judokas and non-athletes in understanding and controlling emotions. Also, boxers and judokas scored higher than non-athletes in appraising others' emotions. Furthermore, Emotional control was one of the dimensions of emotional intelligence distinguishing high-level athletes from other levels. Fernández et al. [87] demonstrated that athletes in high-level combat sports (including jiu-jitsu, judo, karate, kendo, taekwondo, and freestyle wrestling) scored higher in EI than those in low-level competitions.

In combat sports and martial arts, self-awareness is essential for athletes to understand their emotions, physical state, and mental focus during training and competition. Awareness of emotions can help athletes manage anxiety, fear, or anger and maintain composure under pressure. Regulating one's emotions is vital in combat sports, where emotions like frustration or aggression can affect decision-making and performance. Athletes with high EI can control impulsive behaviours and maintain discipline, leading to better decision-making during matches. EI can influence an athlete's motivation and resilience, helping them stay focused and determined despite setbacks or challenges. Athletes with higher EI may bounce back quicker from defeats and use failures as learning opportunities. Empathy, a key component of EI, allows athletes to understand and relate to their opponents and training partners better. This fosters a sense of sportsmanship and respect in martial arts, promoting fair competition and positive interactions in combat sports. Combat sports and martial arts can be highly stressful and demanding. EI helps athletes handle pressure and perform optimally, as they can recognize and cope with the stressors that arise during training and competition.

Associations between aggression and emotional intelligence

As H3 assumed, negative associations between EI and total aggression, anger, and hostility, were found in the present study for all participants. Both verbal and physical aggression were unrelated to EI among karatekas. Also, the association between verbal aggression and EI was insignificant in non-karatekas. Peláez-Fernández et al. [63] showed that perceived EI (including attention, clarity, and repair dimensions) explains only 3% of the verbal aggression variance. Therefore, using this form of aggression may be related to many other EI factors. Socialization process, culture, and social norms may play crucial roles in verbal aggressive responses, but this presumption should be a goal of future studies.

Consistent with H4, the regression model in this study indicates that aggression is a significant negative predictor of emotional intelligence. Compared to the KK sample, EI can also be negatively predicted in KS and PI samples, but without interaction between aggression and the sample. Therefore, the moderating effect of the Sample

on the relationship between aggression and emotional intelligence (assumed in H5) was not confirmed in this study. Although the KK sample demonstrates the highest EI compared to PA, KS, and PI, the strength of the negative association between aggression and EI is similar in all samples. Therefore, the association between aggression and EI may be universal and independent of other factors related to individual differences or social context [62].

Overall, the results of this study are consistent with previous research that demonstrated a negative relationship between EI and aggression [62-68]. For example, Coccaro et al. [65] found negative associations between emotional intelligence (especially attention, clarity, and repair subscales of the Trait-Meta-Mood Scale) and aggression. People who identified as having anger problems scored lower on clarity and, in particular, repair scales than those who did not present problems with anger. Coccaro et al. [64] indicated that strategic EI was significantly lower in impulsively aggressive individuals compared to healthy and psychiatric control participants, and this relationship was explained by a dimension of hostile cognition (hostile attribution and hostile automatic thoughts). Therefore, strategic EI and reducing hostile cognition are crucial to reducing aggressive behaviour in impulsive individuals. Indeed, frequent use of cognitive reappraisal as emotion regulation strategy reduces aggression, while expressive suppression increases hostility and aggression [88].

A systematic review indicates that emotional intelligence and aggressive behaviour are negatively interrelated [62]. The EI, as an ability to understand and regulate one's emotions effectively, is crucial in reducing aggressive behaviours and is considered a protective factor for developing aggressive behaviour [89, 90, 68]. Individuals with high emotional intelligence are more likely to possess better interpersonal skills, empathy, and conflict resolution abilities, which further contribute to lower aggression levels [91, 92]. Research [66] also showed that emotional intelligence plays a buffering role in the relationship between personality traits (neuroticism and agreeableness) and anger (physical, verbal, and indirect aggression). Peláez-Fernández et al. [63] found an interaction effect between EI dimensions and some personality traits (i.e., extraversion and neuroticism) on aggression levels. Furthermore, Potoczny et al. [69] showed that the association between karate training and life satisfaction is fully mediated by self-control and emotional regulation (i.e., cognitive reappraisal), shaping volitional and personality characteristics and increasing subjective well-being. Overall, a negative correlation exists between aggression and emotional intelligence, highlighting the importance of developing emotional intelligence skills for promoting non-aggressive behaviour.

CONCLUSIONS

Regular and fully committed training in combat sports, especially martial arts, under the supervision of a trainer who pays attention to educational aspects and compliance with the rules can reduce aggression. The public considers martial arts, with a centuries-old tradition, a carrier of many desirable moral values and an educational system for children and youth, not only in Eastern societies. Based on the current research, it should be noted that it is worth introducing elements of martial arts to school physical education and as part of organized physical activity in free time. Ethical codes and philosophical teachings in martial arts serve not only to improve physical skills but also to foster personal development, character building, and moral growth by promoting an attitude of non-violence and care [93]. Therefore, martial arts training is recommended as a therapy, especially for children at risk of violence and antisocial behaviour, and for older people to increase their exercise capacity, improve self-efficacy, reduce falls, and benefit the immune and autonomic nervous systems [94, 25, 95, 96].

Incorporating EI and psychological skills training into combat sports and martial arts programs can improve mental and emotional resilience, better team dynamics, and enhanced performance outcomes. Moreover, developing EI in martial artists and combat sports practitioners can positively impact their life satisfaction, contributing to better interpersonal relationships and well-being. The present study indicated that although participating in any PA has beneficial effects, kyokushin karate seems especially effective in increasing EI and reducing aggression.

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