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Personality traits in male judo and Brazilian jiu-jitsu athletes with the use of different questionnaires

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C Statistical Analysis
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Dictionary

Aggressiveness – a human characteristic manifesting itself in inclinations to hurt others, to destructive behaviour. Aggressive = virulent, truculent, attacking [77].

Athlete – noun 1. Someone who has the abilities necessary for participating in physical exercise, especially in competitive games and races 2. a competitor in track or field events [78].

Brazilian jiu jitsu (BJJ) – is a type of fight in which a uniform or gi is used; its main purpose is to project or take your opponent down. Once on the ground, you must seek to control your adversary with different techniques (immobilizations, chokes, joints locks). In the absence of submission at the end of the fight, the winner is declared by the number of points won [75].

Combat sports – noun a sport in which one person fights another, e.g. ju-jitsu, wrestling, boxing, taekwondo and the combat sports [78].

Neo-gladiator – a person who trains mix martial arts (MMA) and similar forms of hand-to-hand fighting that do not meet the definition of sport according to the Olympic Charter [32].

Abstract:

Background and Study Aim: Psychologists are focusing their research on the personality of combat sports athletes. Particular attention is focused on traits that describe unacceptable, antisocial behavior, including a tendency toward aggression. Beyond aggression, there are many other personality traits, and the use of multiple questionnaires reveals a more comprehensive psychological profile. The aim of study was knowledge about the differences in personality profiles of athletes practicing two different combat sports with very similar task structures, using two questionnaires.

Material and Methods: Thirty-six judo athletes and 36 Brazilian ju-jitsu (BJJ) athletes were examined using the Eysenck EPQ-R (EPQ-R), which assesses levels of neuroticism, extroversion, psychoticism, and a control scale commonly known as the lie scale. The Zuckerman-Kuhlman ZKKO (ZKKO) questionnaire, which assesses levels of impulsivity, neuroticism, and aggressiveness, was also used. Athletes from both groups did not differ significantly in age, experience, athletic achievement, and demonstrated similar technical skill levels. The Mann-Whitney U test was used to compare intergroup differences in the seven aforementioned traits. Relationships between traits for each group separately and for both groups combined were expressed using Spearman correlation coefficients (R). Statistical analysis was performed using the STATISTICA software package vs. 13.3.

Results: The BJJ group demonstrated significantly higher levels of neuroticism, psychoticism, aggressiveness, and control scale scores. In each group, significant positive correlations were observed between neuroticism measured by the EPQ-R and the ZKKO, but a stronger correlation was observed in the BJJ group, r = 0.837, than in the judo group, r = 0.453. In turn, a stronger correlation between extraversion and impulsivity was observed in the judo group, r = 0.877, than in the BJJ group, r = 0.493. Only in the judo group was a significant correlation observed between aggressiveness and psychoticism, r = 0.753. In both groups, very large inter-individual differences were found for each trait.

Conclusions: It has been observed that the use of two questionnaires containing different scales increases the diagnostic value of the personality profile description, as each test, apart from neuroticism, contains different subscales and allows for the expansion of the personality profile. It was found that BJJ competitors demonstrated significantly higher scores for those personality traits which are considered undesirable in the assessment of mental health and social norms. The intergroup differences revealed may result from higher ethical standards in the Olympic sport of judo, which is also sanctioned by the principles of Far Eastern martial

arts. In individual cases, when very high levels of aggressiveness, impulsivity, and neuroticism are observed, there is a risk of antisocial behavior and psychophysical health problems. It seems advisable to introduce appropriate pedagogical and psychotherapeutic content into combat sports training to reduce the negative impact of personality traits on mental and physical health.

Keywords: combat sports, grappling sports, mental health, physical health

Performance – noun the level at which a player or athlete is carrying out their activity, either in relation to others or in relation to personal goals or standards [78].

Personality – according to trait theories human personality consists of various traits, which account for an individual's relatively coherent behavior [79].

1. Introduction

Personality is a set of various traits characterizing a relatively stable pattern of emotional reactions. These traits largely determine the quality of interpersonal relationships and psychological well-being. Adult personality studies utilize various questionnaires to assess levels of aggressiveness and its derivatives, such as hostility, anger, and neuroticism. The levels of these traits determine the quality of psychosocial health. Aggression has been defined as the tendency to intentionally engage in harmful actions toward others [1]. Aggression in athletes is defined as transgressing the rules governing the scope of offensive actions taken against opponents [2, 3]. Neuroticism is a predisposition to experience negative emotions such as anger, anxiety, irritability, emotional instability, and a lowered mood state [4]. Assessing the tendency to aggressiveness and antisocial reactions in individuals using questionnaires has diagnostic significance. High levels of aggressiveness should constitute a premise for psychological intervention, e.g., psychotherapy. Aggression and antisocial reactions in larger, organized social groups provide a basis for shaping appropriate legal regulations in the field of social policy and public health.

Sport is one of those areas of social life where research on personality traits as predictors of emotional and behavioral reactions is particularly important among both fans and athletes. Some sporting events trigger strong emotions in observers, which often escalate into antisocial reactions. This is particularly evident after football matches, where groups of fans are ready to engage in physical confrontation with each other or with their surroundings. For this reason, aggressive fan behavior has been the subject of sociological research for several decades [5-9].

The prevalence of pathology in sports environments is highlighted in a document from the International Olympic Committee, which calls for counteracting negative phenomena such as bullying and harassment [10]. Other researchers have noted the problem of violence in sports [11], emphasizing the importance of personality research and the desirability of psychotherapy [12]. Studies on the occurrence of negative emotional reactions and factors moderating these phenomena, such as gender, age, sporting achievements, type of discipline, and cultural traditions, have provided a wealth of valuable data. Cross-cultural comparisons have revealed a greater tendency towards physical aggression in athletes from Western countries than from the Far East, which may be due to different traditions [13]. Studies conducted among students have shown that in Western societies characterized by a higher level of culturally sanctioned individualism than collectivism, there is a greater tendency towards aggression [14, 15]. Biological factors play a role in shaping personality traits. The involvement of genetic factors has been documented [16, 17]. Furthermore, testosterone levels influence certain personality traits. In adolescent athletes, testosterone levels correlate negatively with neuroticism and trait anxiety, and positively with extraversion [18, 19].

High testosterone levels in boys during adolescence are associated with increased aggressiveness [20-22]. A decline in testosterone levels is observed with adolescence, as observed in soccer players in various age groups ranging from 14.5 to 23.5 years [23]. These results seem to confirm the increasing ability to control negative emotions with age. Many studies have been conducted to explain sport-related differences in personality profiles. Significant differences in personality profiles have been demonstrated in volleyball, basketball players, and judo athletes, as well as gender differences in these sports [24]. The level of neuroticism measured with the NEO-FFI questionnaire differentiates athletes most significantly based on their athletic achievements. Medalists demonstrate lower neuroticism scores than other athletes, while no differences were observed for the remaining characteristics of this test [25, 26]. Another important issue addressed in psychological research was whether competitive sports differentiate the personality of athletes from non-athletes. Comparisons of several groups of athletes practicing combat sports with those who did not practice revealed comparable levels of anger, verbal and physical aggression in those who did not practice and boxers, and lower values of these traits in jiu-jitsu and Capoeira [27]. Furthermore, competitive athletes have slightly lower levels of negative traits, verbal and indirect aggressiveness, negativism, and irritation than people practicing amateur sports [28]. This phenomenon corresponds to the results of comparisons of all 5 traits of the Big Five questionnaire in athletes and the non-training population [29].

Particularly strong evidence for the beneficial effects of martial arts on personality was provided by studies of self-control, aggressiveness, and the tendency to bully peers in adolescent athletes. All negative traits decreased, while positive traits increased with training experience due to improved emotional self-control [30]. Another moderator of aggressiveness is emotional intelligence. In a group of karate athletes, a negative linear relationship was found between emotional intelligence and aggressiveness in both the kyokushin and shotokan styles [31]. Compared to these results, persons practicing mixed martial arts (MMA – in fact, neo-gladiation [32]), where there are virtually no restrictions on the use of destructive techniques during a fight, present an unfavorable personality profile. Sometimes, the fight continues despite a clear physical advantage, requiring referee intervention to prevent injury. The level of aggressiveness, physicality, hostility, and anger is significantly higher in MMA compared to Oyama karate, which sanctions full-contact fighting [32, 33]. A comparison of personality changes after a 5-month period of MMA and Brazilian Jiu-Jitsu training led to similar conclusions. After this training period, the aggressiveness of MMA neo gladiators increased, while in the BJJ group it decreased, although both groups showed some improvement in emotional self-control [34]. We share the experts' view that do not consider MMA a combat sport – it is not beneficial for health, neither mentally nor physically [35, 32].

The available literature lacks a comparison of the personalities of athletes from combat sports with very similar structures and techniques, which belong to the grappling sports group. Judo and BJJ employ similar throwing and grappling techniques that lead to unleashing the opponent. BJJ is characterized by a greater proportion of offensive and defensive actions conducted on the ground, while judo is fought more often in the standing position. The aim of the study was to understand the differences in the personality profiles of athletes practicing two different combat sports with very similar task structures, using two questionnaires.

2. Materials and Methods

Participants

Thirty-six judo athletes and 36 Brazilian ju-jitsu (BJJ) athletes were examined using the Eysenck EPQ-R (EPQ-R) [36], which assesses levels of neuroticism (**Neu**), extroversion (**Ex**), psychoticism (**Ps**), and a control scale (**CoS**) commonly known as the lie scale. The Zuckerman-Kuhlman ZKKO (ZKKO) questionnaire [37], which assesses levels of impulsivity (**Im**), neuroticism (**Ne**), and aggressiveness (**Ag**), was also used. Athletes from both groups did not differ significantly in age, experience, athletic achievement, and demonstrated similar technical skill levels.

Statistical analysis

The Shapiro-Wilk test and Levene's test were used to check the normality of distributions (Shapiro-Wilk test) and the homogeneity of variances of the features. Due to the lack of normal distributions and homogeneity of variances, the nonparametric Mann-Whitney-U test (indicator U) was used to compare differences between groups for each of the seven features. The relationships between features were expressed using Spearman correlation coefficients (r) for each group. Statistical analysis was performed using STATISTICA vs. 13.1 software. Effect size was calculated using the formula = $|Z|/\sqrt{N}$ where (N = 36 for each group).

The estimation of the results is based on the following indicators: frequency (N, n); mean (M) and other indicators: significance level, probability (p); coefficient of variation (CV); confidence interval (CI); z-score (Z).

Measures of effect size; eta squared (η^2) is calculated from the sum of squares (SS) between groups divided by the total SS (SSbetween/SStotal = η^2) $\boldsymbol{\eta^2}$ (the strength of the effect: 0.2 weak, 0.5 average, 0.8 strong)..

3. Results

Higher mean values of the Ne, Ps, and CoS indices (but lower individual variability) were found for BJJ athletes compared to judo athletes, and these differences are statistically significant. These data refer to the EPQ-R Eysenck questionnaire results (Table 1). The ZKKO results also demonstrated higher levels of neuroticism and aggressiveness among BJJ athletes compared to judo athletes – similarly, lower individual variability is observed among BJJ athletes (Table 2).

Table 1. Descriptive statistics of the personality traits based on EPQ-R Eysenck questionnaire.

Variable of	Judo (n = 36)			BJJ (n = 36)			Differences between group			
EPQ-R	M & SD	CV (%)	95% CI	M & SD	CV(%)	95%CI	U	Z	p	η^2
Neuroticism (**Neu**)	7.4 ±3.3	44.6	6.3-8.5	8.8 ±2.2	25.0	8.0-9.5	461.5	2.11	**0.035**	0.063 (small)
Extraversion (**Ex**)	14.2 ±4.3	30.3	12.8-15.6	13.6 ±2.5	18.4	12.7-14.2	540.5	−1.22	0.226	0.021 (small)
Psychoticism (**Ps**)	8.0 ±3.9	48.8	6.7-9.3	9.4 ±2.4	25.5	8.5-10.2	446.5	2.28	**0.023**	0.073 (small)
Control scale (**CoS**)	6.5 ±1.8	27.7	5.9-7.2	9 ±1.5	16.7	8.5-9.5	221.5	4.80	**<0.00**	0.324 (medium)

Table 2. Descriptive statistics of the personality traits ZKKO Zuckerman-Kuhlman questionnaire.

Variable of ZKKO	Judo (n = 36)			BJJ (n = 36)			Differences between group			
	M & SD	CV%	95%CI	M & SD	CV%	95%CI	U	Z	p	η^2
Impulsivity (**Im**)	11.6 ±2.7	23.3	10.7-12.5	11.1 ±1.9	17.1	10.4-11.7	500.5	−1.68	0.093	0.040 (small)
Neuroticism (**Neu**)	5.9 ±2.0	33.9	5.2-6.5	7.6 ±1.8	23.7	7.0-8.3	320.5	3.72	**<0.000**	0.194 (small)
Aggressiveness (**Ag**)	6.8 ±2.5	36.8	6.0-7.7	9.6 ±1.6	16.7	9.0-10.1	254.5	4.46	**<0.000**	0.280 (small)

Despite using different research tools, significant positive correlations were found in both groups of athletes between neuroticism measured in the EPQ-R (Neu) and the ZKKO test. Similarly, in both groups, although with varying strength, the extraversion indicators of the EPQ-R Eysenck questionnaire correlated with the impulsivity indicator of the ZKKO test. Furthermore, in the group of judo athletes, the psychoticism indicators of the EPQ-R Eysenck questionnaire correlated very highly (r = 0.256) with the aggressiveness indicator of the ZKKO test (Tables 3 and 4).

Table 3. Matrix of Spearman correlations between the psychometric variables of both the questionnaires for judo group (n = 36).

Variable	EPQ-R			ZKKO		
EPQ-R	**Ex**	**Ps**	**CoS**	**Im**	**Ne**	**Ag**
Neu	−0.162	−0.013	0.131	−0.050	**0.453****	−0.237
Ex	-	−0.074	0.025	**0.877****	−0.125	0.118
Ps	-	-	−0.067	−0.232	0.022	**0.756****
CoS	-	-	-	0.008	0.139	0.007
ZKKO						
Im	-	-	-	-	−0.154	−0.050
Ne	-	-	-	-	-	−0.102

**p<0.01

Table 4. Matrix of Spearman correlations between the psychometric variables of both the questionnaires for BJJ group (n = 36).

Variable	EPQ-R			ZKKO		
EPQ-R	**Ex**	**Ps**	**CoS**	**Im**	**Ne**	**Ag**
Neu	−0.115	−0.069	0.180	−0.127	**0.837***	0.027
Ex	-	0.030	0.278	**0.493***	−0.009	−0.096
Ps	-	-	−0.016	−0.092	−0.041	0.198
CoS	-	-	-	0.267	0.168	−0.116
ZKKO						
Im	-	-	-	-	−0.095	−0.001
Ne	-	-	-	-	-	0.012

**p<0.01

4. Discussion

Studies of aggressiveness and other negative personality traits in combat sports are undertaken to reveal differences between various sports and the influence of sporting class, gender, and injury risk. Among Polish athletes practicing various combat sports such as wrestling, judo, karate, boxing, taekwondo, and kickboxing, international-level athletes demonstrate significantly lower levels of anger but higher levels of competitive aggression [38]. This may be the reason why some coaches believe that a tendency toward aggression in combat sports promotes better performance. In martial arts and combat sports originating from the Far East, higher levels of aggressiveness have been noted in kyokushin karate athletes compared to other less-contact sports, such as aikido and traditional karate, where the risk of injury is lower [39]. Furthermore, kyokushin karate athletes tend to be more aggressive than other styles of this discipline, although the differences are not significant [40, 41]. In BJJ and judo, the risk and types of injuries are similar [42, 43]. In our study of BJJ and judo aggressiveness, judo and BJJ participants were selected to exclude the possible influence of various secondary factors, such as age, sporting class, and injury experience. The aggressiveness of BJJ athletes has not been compared to that of judo, but rather to other sports. A study using the Buss-Perry Aggression Questionnaire found no differences in physical or verbal aggression, anger, or hostility between BJJ athletes and baseball players [44]. Other personality traits assessed with the NEO-FFI questionnaire revealed significantly higher levels of neuroticism and suspiciousness (consciousness) in the BJJ group and lower levels of extraversion and agreeableness in comparison to judo athletes [32].

Judo, as a Far Eastern combat sport, requires practitioners to exercise greater self-control over their emotions and less aggressiveness than those required in Western cultural traditions. In judo, a single judo training session begins and ends with a ritual greeting and farewell. Similar behavior is required during official bouts, and ignoring this rule may result in disqualification. Furthermore, judo coaches require their athletes to exercise self-control over their emotions and curb impulsiveness. Aggressive behavior or a lack of self-control during a judo or BJJ fight can manifest itself when the dominant competitor fails to respond quickly enough to their opponent's signal of submission during a chokehold or an armlock (a general name for similar fighting techniques in wrestling-type combat sports). Another reason for the observed differences in BJJ and judo personality may be judo's status as an Olympic sport, which places a greater emphasis on fair play [45]. The authors of this study emphasize the role of Olympism in shaping the ethical principles of competing athletes. The reduced level of aggressiveness observed in adult judo athletes corresponds with what other authors have noted, who attribute a 'gently-way' attribute to this sport [46]. Only young boys aged 8 years before puberty showed an increase in aggressiveness and anger after a 2-year period, which was not observed in the untrained group or in juvenile karatekas [47]. However, it is not known whether these differences were due to the accelerated biological maturation process, including increased testosterone levels, induced by training. This review compares the contribution of specific forms of training in combat sports to the development of anger and aggression [48].

Personality studies are important in assessing the mental health of populations and individuals. In our study, a comparison of judo and BJJ personality profiles might at first glance suggest that judo training is beneficial and BJJ is not. However, in recent years, numerous reviews have confirmed the benefits of both judo and BJJ training.

Judo training improves cognitive functions such as alertness and mindfulness and reduces the symptoms of attention deficit hyperactive disorder (ADHD). Furthermore, this training increases self-efficacy and the ability to overcome life's adversities [49]. Other authors have noted improved mental health, motivation, and life expectancy after an eight-week period of judo training in war veterans with impaired vision [50]. Other studies have reported beneficial therapeutic effects of judo training in individuals with psychological disorders such as autism, attention deficit hyperactivity disorder (ADHD), and intellectual development disorder (IDD) [51]. One review cites the results of numerous studies on the use of judo training to improve physical and cognitive functions in older adults [52]. These characteristics naturally decline with age, especially in physically inactive individuals [53, 54]. Regular physical training that does not engage cognitive functions helps delay the decline in physical abilities but has a lesser impact on mental health. Combat sports and game-playing, on the other hand, are open-skill sports, which engage both body and mind equally. As a result, practitioners of open-skill sports achieve better results in various tests assessing cognitive functions, such as reaction time, the Trial Making Test, and the Flanker Task, than their counterparts in closed-skill sports [55].

Although the BJJ group in our study presented a less favorable personality profile compared to the judo group, the literature reports a beneficial effect of BBJ training on personality. BJJ training has been shown to be a form of psychological therapy. Individual aggression indicators, such as anger, verbal aggression, hostility, and overall aggression, were higher in the control group in both sexes than in their long-term BJJ counterparts, and the most rapid decline in aggressiveness was observed in the first 5 years after training [56]. Similarly, other authors have reported improved well-being and reduced post-traumatic stress in individuals undertaking BJJ training [57-59]. Furthermore, a 12-week BJJ training program has been shown to have a beneficial effect on mental balance in boys aged 10-13. Despite the intergroup differences in neuroticism scores in our study, very high levels of this trait were also noted in several cases among judo athletes. This may suggest health problems in these individuals later in life. Hyperneuroticism, found in very young individuals, is one of the risk factors for physical health problems in the same individuals later in life [60]. In the aforementioned study, metabolic syndrome was observed in 11.2% of the study participants after 30 years of age, characterized by arterial hypertension (SBP>140, DBP>90). Elevated concentrations of biochemical indicators in blood collected in the morning after fasting (fasting condition): glucose (>5.6 nM), triglycerides (>150 mg/dL), and HDL cholesterol (40 mg/dL) meet the criteria for metabolic syndrome. In turn, metabolic syndrome, combined with a high neuroticism score, increases the risk of heart disease [61]. For this reason, appropriate public health policies are recommended to prevent negative personality traits in the population [62].

On the one hand, success in both judo and BJJ, as well as other combat sports, is determined not only by the level of general physical fitness [64-68], but also by psychological characteristics, sometimes indirectly and on the other hand, by the professional competences and those of specialists involved in physical fitness preparation [69, 70]. Modern methods used in sport training also promote faster recovery, influencing psychological aspects, including motivation, concentration, and reducing the level of anxiety and stress, especially during sports competition [71-73].

Our research ignored an important factor influencing personality: the socioeconomic status of the subjects. It has been shown that low status, or so-called social deprivation, is responsible for increased levels of aggressiveness [9]. Therefore, we believe that

since the appeal of broadly understood hand-to-hand combat is commercially exploited in a destructive way from a personality perspective, especially in children and adolescents, observations based on complementary research methodology can accelerate socially expected cognitive and aptitude effects [74].

5. Conclusions

It has been observed that the use of two questionnaires containing different scales increases the diagnostic value of the personality profile description, as each test, apart from neuroticism, contains different subscales and allows for the expansion of the personality profile. It was found that BJJ competitors demonstrated significantly higher scores for those personality traits which are considered undesirable in the assessment of mental health and social norms. The intergroup differences revealed may result from higher ethical standards in the Olympic sport of judo, which is also sanctioned by the principles of Far Eastern martial arts. In individual cases, when very high levels of aggressiveness, impulsivity, and neuroticism are observed, there is a risk of antisocial behavior and psychophysical health problems. It seems advisable to introduce appropriate pedagogical and psychotherapeutic content into combat sports training to reduce the negative impact of personality traits on mental and physical health.

Study strength

The use of two different questionnaires to detect different personality traits expands the scope of personality exploration, which consequently increases the diagnostic value of the study.

Study limitation

In our research did not take into account important factors influencing the personality traits studied: economic status and personal experiences. The personality traits studied are, to some extent, derived from these factors.

Data Availability Statement: The data supporting this study's findings are available from the corresponding author upon reasonable request.

Ethical approval: This study was approved by the Bioethics Committee at the Institute of Sport-National Research Institute (Nr. KEBN-20-54-HM). All procedures followed the ethical standards of the Declaration of Helsinki.

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Conflicts of Interest: The authors declare no conflicts of interest.

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