

MULTIVARIATE ANALYSES ON THE VARIANCE OF PSYCHOLOGICAL CHARACTERISTICS IN KARATE COMPETITORS AND KARATE NATIONAL TEAM PLAYERS

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Abstract: *This survey was conducted on a deliberate sample of 32 respondents, 16 karate competitors and 16 karate representatives, members of the national team, male, senior (according to WKF) from the Republic of North Macedonia. The main objective of the research was to analyze the multidimensional manifestations or latent spaces of psychological characteristics in both groups of respondents. In the study, a total of 13 variables of psychological characteristics were used: one variable for assessing general intellectual abilities, three variables for assessing specific intellectual abilities, six variables for assessing emotional characteristics, and three variables for assessing motivational dispositions. The basic descriptive statistics for the two groups of respondents were applied separately to determine the basic statistical parameters. Since most of the kinesiological information obtained from this type of research is multivariate, it means that a number of factors, whether motor, psychological, or sociological, are influenced by one anthropological feature. Therefore, a multivariate analysis of variance MANOVA was used for this purpose, which basically analyzes only one variable but vector variables whose elements are variables in the research area. The results obtained in the study show statistically significant differences in 11 out of 13 variables examined.*

Key words: *psychological characteristics, karate competitors and representatives, MANOVA, descriptive statistic*

INTRODUCTION

The value of research of this type in the field of karate sport is essential for several reasons such as different levels of mental resilience, self-confidence, motivation, self-control, etc. It is important to note that these are general observations and there are individual differences in both national team and regular competitors (Macovei et al., 2014). Furthermore, the specific psychological demands of karate, such as controlled aggression and close physical contact, can affect the psychological profiles of athletes in this sport (Ayyildiz, T., Gökyürek, B., 2017). Understanding these differences helps coaches and professionals to adapt training methods to suit individual psychological profiles. Mental attributes such as perception, stress management, and aggression control play a key role in competitive karate. Identifying psychological differences allows for targeted mental conditioning, leading to improved performance. An essential starting point for conducting in-depth analyses of the personality of athletes at every level of their athletic career are new empirical arguments. To effectively reflect the social and health purpose of sport, this information must be supplemented by research on other predispositions and adaptive effects (Piepiora P, Witkowski K, Piepiora Z, 2018). Building on the previous research, the same authors (2022) conducted another study in which they concluded that older karatekas probably manifest greater openness to experience, which is a result of their high sporting level and experience. On the other hand, good emotional adaptation of karatekas is strictly related to conscientiousness. Monitoring psychological growth and eliminating deficiencies over time ensures the development of karatekas not only physically, but also mentally, which is crucial for long-term success in sports. More research is needed to specifically compare national team players and other karate competitors to fully understand the psychological factors that separate elite karate players from competitors.

METHODS OF WORK

The research was conducted on a purposive sample of a total of 32 respondents divided into two subsamples, of which 16 karate competitors and 16 karate representatives, members of the national team, male, seniors (according to WKF) from the Republic of Macedonia. The respondents were subjected to tests to determine psychological characteristics that were conducted in the clubs where the competitors conduct their daily training.

A total of 13 variables of psychological characteristics were applied in the research (according to the doctoral dissertation of Aleksovska, V., L. 2002), divided into 4 areas, of which:

- one variable for assessing general intellectual ability - IQ Test
- three variables for assessing specific intellectual abilities - F1, F2, S1
- six variables for assessing emotional traits - anxiety (TAI), aggressiveness (T-15), extraversion/introversion, neuroticism, psychoticism, social desirability (EPQ)
- three variables for assessing motivational dispositions - P2, F+, F2

The data obtained from this research according to the characteristics and size of the selected sample were processed with adequate statistical programs. For the needs of this research, the following were calculated: Mean - arithmetic mean, SD - standard deviation, Min., Max. - the minimum and maximum result, Skew - symmetry of the distribution of results, Kurt - homogeneity of results in a certain variable, K-S - Kolmogorov - Smirnov method that determines the normal distribution of results and MANOVA - multivariate analysis of variance.

RESULTS AND DISCUSSION

Table 1 Basic descriptive statistical parameters of the psychological characteristics among the respondents - competitors

	M	Std. Dev.	Min.	Max.	Skew.	Kurt.	K-S	Sig.
PM	51.56	1.75	50.00	56.00	1.20*	1.26	0.76	0.62
F1	28.81	2.23	25.00	33.00	0.06	-0.48	0.63	0.82
F2	17.00	1.93	15.00	22.00	1.39*	1.84	1.00	0.27
S1	20.94	2.11	18.00	26.00	1.01*	0.80	0.95	0.32
TAI	35.75	3.40	30.00	41.00	-0.39	-0.81	0.57	0.90
P	2.75	0.86	1.00	4.00	-0.18	-0.32	0.96	0.32
N	11.31	2.24	7.00	16.00	0.08	0.38	0.62	0.84
E	11.00	2.13	7.00	15.00	0.05	-0.18	0.53	0.94
L	11.56	2.50	7.00	15.00	-0.30	-1.03	0.62	0.84
P2	20.56	2.31	17.00	25.00	0.35	-0.74	0.75	0.62
F+	3.94	1.29	2.00	6.00	0.34	-0.58	0.92	0.36
F-	7.13	1.20	5.00	9.00	0.25	-0.63	0.92	0.37
T-15	32.81	4.52	26.00	40.00	0.11	-1.25	0.54	0.93

Legend: Mean - arithmetic mean, Std.Dev. - standard deviation Min. - minimum score, Max. - maximum score, Skew. - symmetry of distribution, Kurt. - skewness of distribution of scores, K-S - Kolmogorov - Smirnov

Table 2 Basic descriptive statistical parameters of the psychological characteristics among the respondents - national team members

	M	Std. Dev.	Min.	Max.	Skew.	Kurt.	K-S	Sig.
PM	55.13	2.45	51.00	59.00	-0.04	-1.07	0.52	0.95
F1	31.94	1.65	30.00	34.00	0.21	-1.69	0.86	0.45
F2	20.56	1.93	17.00	24.00	0.27	-0.59	0.96	0.32
S1	26.63	1.82	24.00	29.00	0.11	-1.44	0.79	0.57
TAI	30.31	2.44	27.00	35.00	0.53	0.08	0.56	0.92
P	2.31	0.87*	1.00	4.00	-0.02	-0.55	0.89	0.41
N	9.25	2.54	4.00	14.00	-0.46	0.42	0.84	0.48
E	13.06	1.91	10.00	16.00	-0.23	-1.13	0.63	0.83
L	11.13	2.25	6.00	14.00	-0.74	0.15	0.86	0.46
P2	23.13	1.36	21.00	25.00	-0.07	-1.19	0.71	0.69
F+	3.00	1.10*	1.00	5.00	0.00	-0.80	0.78	0.58
F-	8.63	1.15	7.00	11.00	0.56	-0.40	1.08	0.20
T-15	27.63	4.27	21.00	38.00	0.94	1.15	0.73	0.66

Analyzing the data from the basic descriptive statistical parameters of the psychological variables among the competitors and the junior and senior national team members presented in Table 1 and 2, it is concluded that the standard deviation of all the examined variables is with normal values, i.e. they are less than 1/3 of the arithmetic means. The lower and upper limits of the range in which the results move (Min. - Max.) are expected in relation to the treated variables in both the competitors and the national team members.

A statistically significant deviation of the asymmetry of the values of the results of Skew, in the competitors, is noticeable only in two variables: progressive matrices (PM=1.20) and speed of observation of perceptual structures (F2=1.39), while in the test (S1=1.01) that measures the ability to visualize spatial relations, a value was obtained slightly above the upper limit. In the remaining variables, the results shown are within the limits of the recommended values. If we look individually for each statistical parameter in the representative respondents, it can be concluded that the values of the standard deviation (Std.Dev), in the variables psychoticism (P=0.87) and the variable (F+=1.10) that examines the degree of positive emotional engagement and emotional self-control in situations of sports achievement, show very little deviation. Also, in them, a statistically significant deviation of the asymmetry of the values of the results of Skew., has not been observed in any of the variables whose values mainly move around zero, which tells us that the data are normally distributed. By analyzing the values of the degree of curvature of the Gaussian curve, it is concluded that the majority of the applied variables are distributed along the width of the horizontal axis in both groups of respondents. The normal distribution of the results obtained with the Kolmogorov - Smirnov method shows that there is no deviation in any of the psychological variables in both groups of respondents.

Table 3 presents the results of the values for the squared arithmetic mean (Mean Square), the F approximation and the level of statistical significance (Sig.) between the dependent variables of the treated groups. Significant significance is observed for all examined variables with the exception of two variables (L - social desirability and P - psychoticism) which we will also comment on in further analyses.

Table 3 Multivariate analysis of variance (MANOVA) of psychological characteristics among the participants, competitors and national team players

	Dependent Variable	Type III Sum of Squares	Mean Square	F	Sig.
G2	PM	101,53	101,53	22,44	,00
	F1	78,12	78,12	20,31	,00
	F2	101,53	101,53	27,21	,00
	S1	258,78	258,78	66,53	,00
	TAI	236,53	236,53	27,03	,00
	P	1,53	1,53	2,04	,16
	N	34,03	34,03	5,92	,02
	E	34,03	34,03	8,30	,00
	L	1,53	1,53	,27	,60
	P2	52,53	52,53	14,63	,00
	F+	7,03	7,03	4,91	,03
	F-	18,00	18,00	13,01	,00
	T15	215,28	215,28	11,13	,00

Legend: DV-зависна варијабла, Mean square-квадрирана аритметичка средина, F – value of the Wilks test for analyzing the significance of the difference between the centroid of groups, Sig. - significance coefficient

Analyzing the obtained results (table 4), which presents the values from the multivariate analysis of variance of the entire examined space for assessing the psychological characteristics between the competitors and representatives, it can be noted that there is a statistically significant difference in the arithmetic means between the competitors and representatives. The difference is determined based on the values of Wilks' lambda which is .12 in conjunction with the value of the F approximation of .39, degrees of freedom df=13, and the number of degrees of freedom associated with the errors of the model Error df=18 is significant at the level of Sig.=.00 (p<.05).

Table 4 Multivariate differences across the entire examined space of psychological characteristics

	Value	F	df	Error df	Sig.
Pillai's trace	.87	9,39 ^a	13.00	18.00	.00
Wilks' lambda	.12	9,39 ^a	13.00	18.00	.00
Hotelling's trace	6.78	9,39 ^a	13.00	18.00	.00
Roy's largest root	6.78	9,39 ^a	13.00	18.00	.00

Legend: F – the value of the Wilks test for analyzing the significance of the difference between the centroid of groups; Effect df, Error df – degrees of freedom, Sig. - significance coefficient

The obtained results presented in table 5, give us the values of the comparisons of the pairs of dependent variables between the examined groups, where the difference in the arithmetic means (Mean Difference), the standard errors of the arithmetic means (Std. Error), the significant level (Sig.) and the lower and upper limits of the confidence interval for the differences are presented. It has been determined that in 11 out of a total of 13 examined variables, there are statistically significant differences at the level of $p < .05$. The two variables that are exceptions are the variables L=.60 (social desirability) and P=.16 (psychotism). As confirmation of these results, a comparison can be made with the research conducted by Soltani, H., and Reddy, K S. (2013), in which, using ANOVA, they determined that there are significant differences between the levels of somatic anxiety, cognitive anxiety and self-confidence between elite and non-elite karatekas.

Table 5 Multivariate comparisons of psychological characteristics variables between the groups of respondents and representatives - Pairwise Comparisons

Dependent Variable	Mean Difference (I-J)				Sig. ^b	95% Confidence Interval for Difference ^b	
				Std. Error		Lower Bound	Upper Bound
PM	1,00	2,00	-3,56)*	.75	.00	-5.09	-2.02
	2,00	1,00	3,56*	.75	.00	2.02	5.09
F1	1,00	2,00	-3,12)*	.69	.00	-4.54	-1.70
	2,00	1,00	3,12*	.69	.00	1.70	4.54
F2	1,00	2,00	-3,56)*	.68	.00	-4.95	-2.16
	2,00	1,00	3,56*	.68	.00	2.16	4.95
S1	1,00	2,00	-5,68)*	.69	.00	-7.11	-4.26
	2,00	1,00	5,68*	.69	.00	4.26	7.11
TAI	1,00	2,00	5,43*	1.04	.00	3.30	7.57
	2,00	1,00	-5,43)*	1.04	.00	-7.57	-3.30
P	1,00	2,00	.43	.30	.16	-.18	1.06
	2,00	1,00	-.43	.30	.16	-1.06	.187
N	1,00	2,00	2,06*	.84	.02	.33	3.7
	2,00	1,00	-2,06)*	.84	.02	-3.79	-.33
E	1,00	2,00	-2,06)*	.71	.00	-3.52	-.60
	2,00	1,00	2,06*	.71	.00	.60	3.52
L	1,00	2,00	.43	.84	.60	-1.28	2.15
	2,00	1,00	-.43	.84	.60	-2.15	1.28
P2	1,00	2,00	-2,56)*	.67	.00	-3.93	-1.19
	2,00	1,00	2,56*	.67	.00	1.19	3.93
F+	1,00	2,00	,93*	.42	.03	.07	1.80
	2,00	1,00	-,93)*	.42	.03	-1.80	-.07
F-	1,00	2,00	-1,50)*	.41	.00	-2.34	-.65
	2,00	1,00	1,50*	.41	.00	.65	2.34
T15	1,00	2,00	5,18*	1.55	.00	2.01	8.36
	2,00	1,00	-5,18)*	1.55	.00	-8.36	-2.01

Legend: Mean - arithmetic mean, Std. Error - standard errors of the arithmetic means, Sig. significant level and Lower and upper bound - lower and upper bound of the confidence interval for the differences

CONCLUSION

Using the multivariate analysis of variance between groups, it can be seen that there is significant significance in all examined variables with the exception of two variables (L - social desire and P - psychoticism), i.e. with the multivariate comparisons of the variables of psychological characteristics between the groups of respondents and representatives, it was determined that in 11 out of a total of 13 examined variables, there are statistically significant differences at the level of $p < .05$. The two variables that are exceptions are the variables $L = .60$ (social desire) and $P = .16$ (psychoticism). If we take into account the previous experiences according to which psychoticism is more of a genetic predisposition and can be influenced very little, and social desire is more determined by attempts at emotional control, it can be concluded that the results obtained are logical and expected. Building on the above, Ikham et al., (2020), in their research, highlighted that members of the national karate team exhibit higher levels of mental toughness, enabling them to more effectively manage pressure, setbacks, and intense competition. This includes resilience, focus, and unwavering belief in their abilities.

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MULTIVARIJATNA ANALIZA VARIJANCIJE PSIHOLOŠKIH KARAKTERISTIKA KARATE TAKMIČARA I KARATE REPREZENTATIVACA

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Sažetak: Ovo istraživanje je sprovedeno na namernom uzorku od 32 ispitanika, 16 karatista takmičarai 16 karatista reprezentativaca, muškaraca, seniora (prema VKF) iz Republike Severne Makedonije. Osnovni cilj istraživanja bio je da se analiziraju višedimenzionalne manifestacije ili latentni prostori psiholoških karakteristika u obe grupe ispitanika. U istraživanju je korišćeno ukupno 13 varijabli psiholoških karakteristika: jedna varijabla za procenu opštih intelektualnih sposobnosti, tri varijable za procenu specifičnih intelektualnih sposobnosti, šest varijabli za procenu emocionalnih karakteristika i tri varijable za procenu motivacionih dispozicija. Za određivanje osnovnih statističkih parametara odvojeno je primenjena osnovna deskriptivna statistika za dve grupe ispitanika. Budući da je većina kinezioloških informacija dobijenih ovim tipom istraživanja multivarijantna, to znači da je na niz faktora, bilo

motoričkih, psiholoških ili socioloških, utiče jedna antropološka karakteristika. Zbog toga je za ovu svrhu korišćena multivarijantna analiza varijanse MANOVA, koja u osnovi analizira samo jednu varijablu već vektorske varijable čiji su elementi varijable u oblasti istraživanja. Rezultati dobijeni u studiji pokazuju statistički značajne razlike u 11 od 13 ispitivanih varijabli.

Ključne reči: *psihološke karakteristike, karate takmičari i reprezentativci, MANOVA, deskriptivna statistika*