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FACTOR STRUCTURE OF BASIC MOTOR ABILITIES IN 17-YEAR-OLD KARATE ATHLETES

Preliminary communaciation

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Abstract

The study has been conducted with a sample of 67 respondents doing karate sport. The study has applied both initial and final tests for their motor abilities and a three-month training process was carried out between the initial and final tests. In this regard, nine basic motor tests were used for 17-year-old male respondents. For more exact scientific conclusions, the obtained manifest variable results in the initial and final measurements include a factor analysis with application of the principal component method, that is the Hotelling principal component method. The principal components have been transformed into parallel and orthogonal oblimin factor projections. The obtained results indicated isolation of a similar number of latent dimensions (factors), with certain abilities of the physical (motor) space in the initial and final measurements. Three basic motor factors were isolated in each of the two measurements.

Keywords: *karate training program, factor analysis, motor tests*

INTRODUCTION

Karate sport is an old eastern martial art taught on the Okinawa Island, and later spread out all over Japan. Yoshitaka Gichin had been the most credited teacher in this sport, and later his work was continued by his students who expanded the ancient martial art skills around the world. Thus the karate sport today finds its place in the world as one of the internationally recognized sports. As a result, there is increased mass interest among young population for learning this martial art all over the world.

Today, competition is certainly the main karate characteristic. High level physical fitness of young karate athletes is necessary for achieving top results in international competitions. Accordingly, there is a necessity for advanced training programs to be conducted by the karate coaches. It was the basic motive for the study to be carried out in order to understand the impact of the previous training process on the young 17-old-karate athletes' motor abilities.

Based on this, the principal objective of the study has been defined for determining the efficacy of the three-month karate training process in trained respondents' motor abilities transformation.

METHODS

The sample of 67 respondents doing karate sport was examined with application of initial and final tests for their motor abilities determination. Between the initial and final testing a three-month training process was conducted. The sample consisted of male respondents aged 17. The study included application of the following nine basic motor tests:

- Long stick shooting (PGDS),
- Long jump from a spot (ESDM),
- Aft standing with one foot on the bench for balance with eyes open (BNOO),
- Stronger hand forearm flexion (DPDL),
- Deep forward bend on the bench (FDPK),
- Hinge hanging (SVZG),
- Non-rhythmic strike (RNEUD),
- Bending eight (KOSUM),
- Hand tapping (TTAPR),

The applied tests were aimed for checking up and assessment of the precision, explosive strength, balance, dynamometric strength, flexibility, general strength, respondents' rhythmic structure and coordination in the initial and final tests.

For providing more exact scientific notions, a principle method factor analysis was applied with the obtained manifest variable results in the initial and final measurements, that is the Hotelling principle component method.

The principle component method application includes calculation of the characteristic roots (Lambda). The characteristic roots have been interpreted as a variance of the latent motor indicators, and for the principle components determination the Guttman-Kaiser Criterion was applied. According to it, any principle component of the characteristic root size, that is the variance, with equal or larger value than 1.00 is considered to be significant. Furthermore, the cumulative (h^2) have been calculated and the common variance assessed for each applied motor indicator.

For determination of the simplest structure of the isolated latent dimensions, their further transformation has been made in oblique (oblimin) position. For that purpose the direct oblimin Jennrich-Sampson method has been used. Parallel vector projections have been calculated of the isolated oblimin factors for applied manifest motor indicators on the vectors of isolated latent dimensions, that is the factor form matrix (POF). In addition, the orthogonal projections have been calculated in correlations with the manifested motor indicators of the isolated latent dimensions, that is the factor structure matrices (OOF). Also, inter correlations have been calculated of the isolated factors of these matrices.

RESULTS AND DISCUSSION

The values of the characteristic roots and the valid variance percent, as well as the cumulative valid variance within the applied principle component method in the initial and final measurements, are presented in the Table 1. Both measurements have isolated three principle components, whose characteristic roots are of a different value size. The first characteristic root in the final measurement (2.890), is evidently larger as compared with the adequate root in the initial measurement (2,055).

Also, the percent of the cumulative valid variance of the three principal components is larger in the final measurement. The initial measurement shows the result of 51,8%, and the final measurement 64,96%. According to these percentage, the methodological value can be defined of the results influenced by the program activities with respondents involved in this study.

The preliminary structure of the latent dimensions (the Hotelling principle components) in both measurements, presented in the Table 2., provides the values between the correlations of the applied manifest variables and each of the three obtained principle components. The first principle component has more and higher statistically significant correlations in the final than in the initial measurement. The number and size of the statistically significant correlations in the second and third principle components are similar in both measurements. Also, the cumulative (h^2), has similar values indicating similar validity degrees of all applied variables in both measurements.

The parallel projections of the oblimin factors in the initial and final measurements (Table 3.) characterize with high saturations, so that validity of the motor tests defining these factors is satisfactory for further interpretation of the results provided in the study.

In this respect, all tests take part in definition of some of the three motor abilities, and the factor structure in the final measurement can be interpreted considerably clearer. The first factor in that measurement has been defined through the tests: Long jump from a spot (ESDM), Hinge hanging (SVZG), Non-rhythmic strike (RNEUD) and Hand tapping (TTAPR). Clearer definition of this factor is the logic saturation with the ESDM and SVZG tests, which belong to the motor muscle strength segment.

The second factor has been defined in tests: Deep forward bend on the bench (FDPK) and Bending eight (KOSUM), and the third factor in tests: Long stick shooting (PGDS), Aft standing with one foot on the bench for balance with eyes open (BNOO) and Stronger hand forearm flexion (DPDL). The saturations of the two tests have high values.

The factor structure presented with orthogonal oblimin factors projections (Table 4.), coincides with the factor structure presented in Table 3. The coincidence is in respect of the kind and size of the correspondent factor saturations in both measurements. This situation confirms the stability level of the isolated factors according to the parallel projections.

Table 1. Principle Component Method (valid variances) for motor variables in the initial and final measurements for the Karate group

Initial measurement				*Final measurement*			
Components	Total	% of Variance	Cumulative %	Components	Total	% ofVariance	Cumulative %
1	2,055	22,830	22,830	1	2,890	32,115	32,115
2	1,492	16,581	39,410	2	1,557	17,297	49,412
3	1,115	12,390	51,800	3	1,399	15,546	64,957
4	,960	10,672	62,472	4	,851	9,456	74,413
5	,933	10,364	72,835	5	,739	8,216	82,629
6	,901	10,010	82,845	6	,557	6,184	88,814
7	,642	7,137	89,982	7	,440	4,894	93,708
8	,482	5,351	95,333	8	,354	3,931	97,639
9	,420	4,667	100,000	9	,213	2,361	100,000

Table 2. Homelling principle components (H) and cumulative (h^2) of the motor variables in the initial and final measurements in the Karate group

Initial measurement					*Final measurement*				
Variables	H1	H2	H3	h^2	Variables	H1	H2	H3	h^2
PKDS	-,054	,493	,579	,581	PKDS	,006	,460	,592	,562
ESDM	,768	,256	-,326	,761	ESDM	,735	,326	-,298	,735
BNOO	,627	,287	,257	,542	BNOO	,622	,194	,383	,571
DPDL	,445	-,060	,670	,650	DPDL	,465	-,192	,655	,683
FDPK	-,157	,848	,001	,744	FDPK	-,149	,843	,079	,739
SVZG	,717	,029	-,055	,518	SVZG	,665	,020	-,087	,451
RNEUD	,872	,050	-,022	,763	RNEUD	,855	,068	,010	,736
KOSUM	,483	-,613	,321	,713	KOSUM	,485	-,648	,137	,674
TTAPR	,553	,075	-,496	,558	TTAPR	,561	,170	-,593	,695

Table 3. Parallel projections of the Oblimin factors (POF) of the motor variables in the initial and final measurements for the Karate group

Initial measurement				Final measurement			
Variables	POF1	POF2	POF3	Variables	POF1	POF2	POF3
PKDS	-,142	,340	,679	PKDS	-,131	,442	,615
ESDM	,890	,136	-,073	ESDM	,866	,150	-,001
BNOO	,533	,057	,456	BNOO	,392	,037	,593
DPDL	,097	-,331	,704	DPDL	-,002	-,309	,755
FDPK	,113	,846	,219	FDPK	,123	,862	,121
SVZG	,665	-,134	,105	SVZG	,601	-,137	,141
RNEUD	,795	-,160	,174	RNEUD	,727	-,137	,302
KOSUM	,112	-,781	,222	KOSUM	,116	-,753	,218
TTAPR	,717	,059	-,330	TTAPR	,814	,042	-,356

Table 4. Orthogonal projections of the motor Oblimin factor variables (OOF) in the initial and final measurements for the Karate group

Initial measurement				Final measurement			
Variables	OOF1	OOF2	OOF3	Variables	OOF1	OOF2	OOF3
PKDS	-,117	,351	,656	PKDS	-,100	,437	,578
ESDM	,859	-,009	,031	ESDM	,844	,027	,125
BNOO	,578	-,039	,518	BNOO	,477	-,042	,651
DPDL	,235	-,359	,721	DPDL	,157	-,338	,767
FDPK	,000	,824	,217	FDPK	,018	,840	,106
SVZG	,700	-,245	,186	SVZG	,642	-,228	,238
RNEUD	,842	-,294	,272	RNEUD	,792	-,252	,417
KOSUM	,266	-,804	,249	KOSUM	,256	-,778	,265
TTAPR	,669	-,054	-,246	TTAPR	,754	-,060	-,234

Table 5. Motor factors inter-correlation (F) in the initial and final measurements for the Karate group

Initial measurement				Final measurement			
Factors	F1	F2	F3	Factors	F1	F2	F3
F1	1,000	-,165	,119	F1	1,000	-,142	,152
F2	-,165	1,000	-,018	F2	-,142	1,000	-,039
F3	,119	-,018	1,000	F3	,152	-,039	1,000

Data provided in Table 5. indicate in that direction. None of the correlation coefficients in the table is statistically significant, not only in the initial, but also in the final measurement. In this way, they are sufficiently independent and autonomous, so that their further possible higher level factorization would not provide a factor structure with existence of new and more numerous factors.

CONCLUSION

Application of the principle components method and their transformation into parallel and orthogonal projections indicate that a similar number of latent dimensions (factor) has been isolated, that are certain abilities of the physical (motor) space, in the group of respondents doing karate. The number of isolated factors is same in the initial as well as in the final measurements. Three factors have been isolated in each of the two measurements.

The meaning of this study can be seen as a possibility for providing significant information that can largely improve the training process, and therefore they can have a positive impact on the training quality improvement. Understanding the impact of the training contents on the motor abilities transformation will facilitate quality programming of educational processes in the karate clubs.

In the future period, it is necessary to project and carry out scientific studies for monitoring results of this study and their generalization in acquired knowledge in so far research practice.

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