CLUSTERING OF SOME MOVEMENT STRUCTURES IN AEROBICS

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Meta Zagorc

Faculty of Sport, University of Ljubljana, Ljubljana, Slovenia

Abstract

Aerobics has not yet been studied in terms of classifying and systemising the elements and structures of movements. This study is an attempt to classify 154 movement structures (units), performed standing up and without any accessories, into groups. The basis of classifcation is the employment of cardiovascular system, appropriate motor abilities and workload of muscles and joints.

To define unit characteristics, we selected 33 variables,which were then graded from 1 to 5 by five experts. The reliability of the evaluation was appropriately tested, the marks were excluded using the factor analysis by the PAF method and by applying the Guttman-Kaiser criterion. By using a hierarchical method of clustering (Ward, 1963), the movement structures were then divided into six fairly homogenous groups. The differences between the groups were established through discriminant analysis. Research indicates that the movement structures vary with regard to the involvement of functional capacities of the cardio-vascular system and certain motor abilities, and above all with regard to topological workload of muscles and joints (in lower and upper extremities and trunk).

Keywords: *aerobics, motor abilities, evaluation, clustering, discriminant analysis, training*

Zusammenfassung

GRUPPIERUNG VON EINIGEN BEWEGUNGSSTRUKTUREN BEIM AEROBIC

Das Aerobic wurde noch nicht so erforscht, daß man versuchte, eine Klassifikation oder Systematisierung von Elementen und Strukturen der Bewegungen zu machen. Diese Forschung ist ein Versuch, die 154 Bewegungsstrukturen (Einheiten), die stehend und ohne Zubehör ausgeführt werden, in Gruppen einzuteilen. Die Basis der Klassifikation war der Einsatz des Kreislaufs, der entsprechenden motorischen Fähigkeiten und der Muskel- und Gelenkbelastung.

Um die Charakteristiken der Einheiten definieren zu können, haben wir 33 Variablen ausgewählt, die von den fünf Experten von 1 bis 5 benotet wurden. Die Zuverlässigkeit der Bewertung wurde adäquat getestet, die Noten wurden mittels der Faktorenanalyse und der PAF Methode ausgewählt, wobei auch das Guttman-Keiser-Kriterium verwendet wurde. Mittels der hierarchischen Gruppierungsmethode (Ward, 1963) wurden die Bewegungsstrukturen in sechs ziemlich homogene Gruppen eingeteilt. Die Unterschiede zwischen den Gruppen wurden durch die Diskriminanzanalyse festgestellt. Die Forschung zeigt, daß die Bewegungsstrukturen wesentlich variieren, meistens in Bezug auf den Einsatz von funktionellen Fähigkeiten des Kreislaufs als auch in Bezug auf die bestimmten motorischen Fähigkeiten, und vor allem in Bezug auf die topologische Muskel- und Gelenkbelastung (bei den Extremitäten und bei dem Rumpf).

Schlüsselwörter: *Aerobic, motorische Fähigkeiten, Bewertung, Gruppierung, Diskriminanzanalyse, Training*

1. Introduction

Aerobics belongs to sports being born during the last 15 years and presents, in the sports arena, a unique phenomenon. Ensuing from forms such as aerobic dancing workout, keep-fit, etc., aerobics started on its way in the late 70s in America and pointed to many new orientations of people (at first mostly women) in the concept of sports values.

Aerobics has obtained the status of a modern sport in two diverse phenomenal forms: as recreation sport with a longer workout of aerobic character and as a competitive sport with aerobic ability tests, as well as short competitive content of mostly anaerobic character.

By aerobic training we strive for an increase of abilities, which is, in modern sports, defined as the idea of AEROBIC FITNESS (Sharkey, 1991), meaning aerobic strength or aerobic capacity and is the indicator of the ability of uptake, transport and usage of oxygen.

The basic components of aerobics are elements of natural movement such as walking and running, and their combinations which often transform into a number of dancing steps. The foundations comprise movement segments, primarily used by jazz dancers, gymnastic extension exercises, exercises for strength and balance, which are often connected into coordinationally demanding and also rhythmically complex units. The movement segments are executed in an upright (standing up) position, as well as horizontal (lying down) one, and also sitting, crouching, kneeling, in short, on different levels of movement. The effects can be further developed and transformed by changing the music and its tempo.

Thus in the field of aerobics there is a virtually infinite number of movement elements and their combinations into movement structures. Therefore we tried, by this research and by use of suitable statistical methods and techniques, to select groups of those movement structures which, by some of their characteristics, represent relatively homogenous units. We tried to analyse chiefly those movement elements and structures that are primarily used for developing aerobic abilities.

The majority of past researches relate to functional (2 *, 3 *, 4 *, 6 *, 10 *, 13 *, 15 * , 16 *, 19 *, 21 *) and motor abilities (11 *, 23*), morphological characteristics that are. developed by training (exercises), as well as to the character changes space, motivation (24*) and social space (2 5 *) .

We have not yet discovered researches which relate to the clustering of elements (as such) and movement structures in aerobics. As a matter of fact, such research is quite rare in other sports as well.

Lanc (1984) used the taxonomic procedure in elements clustering in the judo technique. On the basis of subjective evaluations of five experts, who evaluated, by binary mode, the attributive marks defined by 90 biomechanic parameters on a sample of 40 throws, she obtained, by the HERAKLIT method, the clustering of elements into groups which are not in accordance with the existing elements clustering in this sport.

Other research (1987) was performed on 250 gymnastic elements on asymmetric bars. On this device, the elements differ in space and time parameters, as well as in muscle workload (exertion). On the basis of evaluating similarities and by methods of metric multidimensional scaling, the author also varied, regarding certain criteria, the clustering of gymnastic elements.

In aerobics we only have "practical" experiments of the clustering of movement elements and structures. Due to different approaches, work methods and goals, these experiments have not reached a unique formulation of the problem of clustering movement structures that would be the basis for a suitable planning of transformation processes, a basis for an efficient compositions of competitive choreographies, but most of all the basis for further scientific study and implementation into practical work.

The aims of this research were:

- selecting groups of variables with which we can hypothetically evaluate the characteristics of some chosen aerobic movement structures, from the point of view of activating certain abilities of the cardiovascular system and some motor abilities, as well as from the point of view point of workloading the joints and muscles.
- clustering movement structures into the most homogenous groups possible.
- determining the characteristics of the obtained movement structure groups and determining the similarities as well as differences.

2. Research methods

The units in this research are various movement structures in aerobics. In the final phase the sample comprised 154 movement structures on the basis of the following criteria:

- movement structures are performed in upright position and without implements
- as natural movements as possible are included
- the possibility that more complex and coordinationally more complicated movement structures can be created with additional movements of the head, hands, trunk and legs
- the possibility of making movement structures more or less difficult and demanding by changing the rhythm
- the possibility of increasing the level of difficulty by moving inside a certain space.

On the basis of these criteria, the sample comprised 56 examples of various jumps, 11 examples of running, 17 examples of movement structures executed in place and 70 movement structures of various steps. Various arm movements (swings, swinging, rotation, twisting), trunk motions, movements with lifted leg (kicks, tapping, lifting) were added to the basic natural movements.

Regarding the goals, we wanted to analyse simultaneously the chosen sample from various angles, therefore we selected 33 variables according to:

- inclusion, or rather, activation of some functional abilities of the cardiovascular system (PULSE, AEROBO-, ANAEROBO, TRAJAN),
- motor abilities (REPROK, REPTRU, REPNOG - repetitive strength of arms, trunk and legs, STATROK, STATTR STATNO - static strength of arms, trunk legs, GIBROK,GIBTRU, GIBNOG - flexibility of arms, trunk, legs, RAVNOT - balance, KOORDI - coordination, RITEM - coordination and rhythm, UČENJE - learning ability
- joints and muscles workload (SKLGLE - ankle, SKLKOL - knee, SKLKKO - hip, SKLHRB - spine, SKLRAM - shoulders, SKLKOM - elbow, MISGLE - ankle muscles MISKOL, knee muscles, MISTRE - stomach muscles, MISHRB -spine muscles, MISRAM- shoulder muscles, MISROK- arm muscles)
- some specifics that movement structures have in aerobics (NENAVA - exceptionality, ORIENT - space orientation, KONCEN - special concentration).

The variables value was evaluated by an independent expert group of five experts who had expert knowledge in the field of aerobics. These experts have, in previous research procedures, been acquainted with some measurable data of the pilot study.

The method, by which the evaluation of the presence of the mentioned characteristics (variables) in each unit (movement structure) has been performed, is based on the subjective evaluation of experts. They graded the individual variables by a range of marks from 1 -5, taking into account the fact that the movement structure is being executed by averagely trained persons (not beginners), aged 20-25, appropriately warmed-up before the exercises, and the fact that each movement structure lasted (if possible) at least 3 minutes. The data was processed at the Institute for Kinesiology at the Faculty of Sport in Ljubljana, on a DEC VAX 8550 computer at the Computer Centre of the University of Ljubljana with the use of the SPSS-X statistical package.

3. Results and discussion

The characteristics of each movement structure were, in the final phase, determined on the basis of average values of five experts. We decided on the use of average marks on the basis of evaluation reliability which we verified in various ways:

- by factorisation of the matrix of correlation between the marks of individual judges (PC), by which we found that in all the variables only one characteristic can be isolated as the main component (Table 1). The variant values of the first main component of judges' marks, also the considerable balance of the degree of contribution of each judge in overestimation of each chosen variable, undoubtedly show that the measurement object of each variable is clear and precisely defined;
- by the inner consistency method, where reliability is comprehended from the alfa reliability coeficients (Crombach, 1951), whose values are in the range from .82 to .96.

Table 1 - Own values of the first major component (LVR) and percentage of varified common variance of evaluation (PCT) of each variable by 5 judges

1 major comp	LVR	PCT	1 major comp.	LVR	PCT
PULZ001	3.94795	79.0	SKLKOL1	3.87969	77.6
AERO8O1	2.93989	58.8	SKLKKO1	3.96351	79.3
ANAERO1	3.75470	75.1	SKLHRB1	3.05024	61.0
TRAJAN1	3.83792	76.8	SKLRAM1	3.88081	77.6
REPROK1	4.18232	83.6	SKIKOM1	3.42160	68.4
REPTRO1	3.61696	72.3	MISGLE1	3.88987	77.8
REPNOG1	3.9950E	79.9	MISKOL1	3.91630	18.3
5TATRO1	4.16363	83.3	MISKKO1	3.98911	79.8
STATTR1	3.20247	64.0	MI5TRE1	3.61325	72.3
5TATNO1	4.16972	83.4	MISHRBI	3.16514	63.3
GIBROK1	4.01402	80.3	MI5RAM1	4.02422	80.5
GIBTH	4.12096	82.4	MI5ROK1	3.98531	79.1
GIBNOG1	4.35155	87.0	UCENJE1	4.01739	80.3
RAVNOT1	3.99559	79.9	NENAVA1	3.80610	76.1
KOORDI1	3.74411	74.9	KONCEN1	4.04146	80.E
RITEMO1	3.I8333	75.7	ORIENT1	3.93608	78.7
SKLGLE1	4.02193	80.4			

By the analysis of center and discursive values we found that in the majority of variables these values do not statistically significantly deviate from normal distribution and that in the frame of the given range, they discriminate the chosen movement structures quite well.

By factor analysis of the correlation matrix of variables (by method of the main axis(PAF) and by the Guttman-Kaiser criterion, we selected 6 well-defined latent dimensions. The obtained variance of the common factor space is 83,1 %, where the I. factor covers as much as 37,5 % of the total variability of variables. From the latent dimensions structure, obtained by the oblimin rotation, it is clear that almost all variables have high

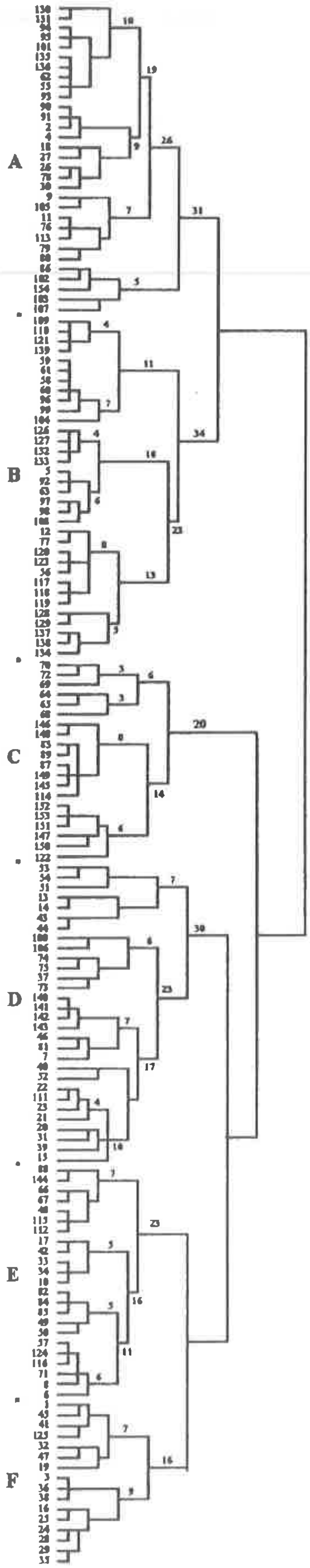

Table 2 : Structural weights (correlation of variables and leaning factors)

variable	FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
PULZ00	.24263	.13249	.23345	.86178	.05883	.15606
AEROBO	-.49949	.10344	.12458	.05070	.33610	.67894
ANAERO	.55425	.00802	.12413	.58069	.16316	.81307
TRAJAN	-.55730	.08316	.21593	.49273	.14124	.79125
REPROK	-.28513	.89815	.06214	.31267	.07782	.02512
REPTRO	.25132	.00122	.35695	.13643	.91533	.02247
REPNOG	.64090	.40022	.20E33	.81385	.25723	.17712
STATRO	.06956	.42326	.06264	.00626	.12269	.54896
STATTR	.65507	.05063	.16044	.35046	.13819	.44176
STATNO	.75520	.27218	.05292	.21138	.32892	.45349
GIBROK	--.19252	.81064	.07574	.35236	.06714	.01022
GIBTRU	.33870	.00308	.16116	.06255	.88015	.17026
GIBNOG	.74042	.30444	.10067	.36202	.41576	.32610
RAVNOT	.79365	.26041	.52115	.40163	.37311	.29186
KOORDI	.20682	.06525	.91523	.18472	.18633	.00200
RITEMO	.13164	.01540	.92107	.31420	.07285	.06609
SKLGLE	.31106	.33810	.31315	.95168	.04270	.O8282
SKLKOL	.56139	.37735	.29184	.89983	.26586	.22834
SKLKKO	.82746	.41347	.30446	.65034	.47948	.32113
SKLHRB	.70903	.23307	.43770	.61550	.46878	.37074
SKLRAM	-.12991	.88363	.04762	-.22395	.02372	.26593
SKLKOM	-.22284	.52594	.01193	.17627	.07885	.15478
MISGLE	.34264	.31869	.28767	.94232	.01547	.15628
MISKOL	.54355	.34329	.29551	.87775	.26439	.22615
MISKKO	.88812	.37912	.24518	.64534	.46162	.32876
MISTRE	.85315	.07688	.43481	.44511	.39322	.39673
MISHRB	.74481	.09813	.45066	.42482	.40500	.38578
MISRAM	-.12567	.94667	.03239	.23862	.07131	.27761
MISROK	-.16549	.89207	.04916	.22973	.09893	.21588
UCENJE	.15560	.02540	.96102	.32884	.19572	.05708
NENAVA	.27598	.01874	.94223	.31302	.28478	.12272
KONCEN	.30518	.02953	.94745	.29942	.18100	.09677
ORIENT	.15933	.05049	.85682	.22740	.21521	.01514

values of structure loads (over .80); somewhat lower values appear only in the workloading of the elbow and the static strength of the upper extremities (Table 2).

- The first factor is formed by the variables relating to the level of inclusion of static strength and balance in movement structures and also to the workloading of joints and muscles which mostly enable the execution of such movement structures (pelvic girdle and trunk).
- The second factor is formed by totally topologically determined variables relating to shoulders and upper extremities.
- The third is a well defined factor of the informational component of movement, determined by all three chosen co-ordination variables as well as variables by which special characteristics of movement structures - special features, concentration degree and needed space orientation - are evaluated.
- The fourth factor is formed by variables of joint and muscle workloading of lower extremities, and respectively connected repetitive strength of legs and the pulse variable which is obviously most connected to the lower extremities activity.
- The fifth factor is topologically determined as it is in greater part formed by variables relating to trunk movement (repetitive strength and trunk flexibility).
- Only the sixth factor is defined by the variables of aerobic endurance (inclusion of aerobic component and duration) and by the negative value of the anaerobic component.

As the aim of the exercise is not to determine or analyze the latent structure of space of movement structures

Table 3 : Discriminat structural weights

variables	FUNC 1	FUNC 2	FUNC 3	FUNC 4	FUNC 5
REPNOG	0.68895*	0.00607	0.01321	0.17049	0.25689
SKLKOL	0.59131*	0.03766	0.09668	0.15907	0.09542
Sklkk0	0.57130*	0.37882	-0.02135	0.01379	0.05629
MISKOL	0.54414*	0.00845	0.07014	0.16466	-0.03713
MISKKO	0.54042*	0.34330	-0.07179	0.07995	0.05599
MISGLE	0.53984*	-0.24650	0.22759	0.25623	0.00121
SKLGLE	0.53315*	-0.28956	0.28695	0.21991	0.03192
PULZ00	0.41470*	-0.24007	0.10530	0.32935	0.01631
SKLHRB	0.39204*	0.27150	0.09015	0.09109	-0.15240
GIHNOG	0.l7976*	0.23201	-0.12102	0.02334	0.10148
MISTRE	0.30811	0.38958*	0.07702	0.22492	-0.21085
STATNO	0.26578	0.36310*	-0.33712	0.07659	0.04693
GIBTRV	0.12737	0.35887*	-0.17136	-0.04430	-0.09571
RAVNOT	0.29040	0.33369*	0.13306	0.04277	0.10804
MISHRB	0.24692	0.32632*	0.13537	0.30274	-0.19110
REPTRO	0.11639	0.29313*	0.01371	-0.02468	-0.03247
UCENJE	0.14814	0.22402	0.64056*	-0.00072	-0.21101
RITEMO	0.12111	0.16700	0.63188*	0.04275	-0.09666
ORIENT	0.09956	0.23182	0.61744*	-0.14256	0.02520
KONCEN	0.14416	0.28471	0.54538*	0.03831	-0.04983
NENAVA	0.14790	0.31250	0.54238*	0.04120	-0.16142
KOORDI	0.07932	0.24682	0.47197*	0.05624	-0.25226
AEROHO	-0.08548	-0.24677	0.28230*	-0.00161	0.06496
SKLRAM	-0.22422	0.12507	-0.01169	0.62406*	0.14095
MISRAM	-0.23778	0.13191	0.09128	0.6139=*	0.09990
GIHROK	-0.25486	0.06548	0.01301	0.54370*	0.04336
REPROK	-0.23209	0.05124	0.01130	0.39138*	0.08079
MISROK	-0.19837	0.12485	0.08089	0.37034*	0.02656
TRAJAN	-0.21760	-0.10349	-0.02150	-0.34115*	0.01139
STATRO	-0.06525	0.09202	0.06283	0.33478*	-0.17180
ANAERO	0.25694	0.09328	-O.0E256	0.28667*	0.07012
STATTR	0.16930	0.06151	0.04534	0.17486*	-0.02291
SKLKOM	-0.1199E	0.03557	0.01270	0.08511	0.14694*

characteristics, there is no need for a more precise interpretation of the oblimin factors, which namely, from the kinesiological point of view, represent the logical and interpretable latent structures.

In the research, the clustering of units was done by the subprogram CLUSTER and by means of the Ward method (Ward, 1963). In calculating the distance between groups, the method takes into consideration the weighted square of the distance between the gravitation center of the groups (Ferligoj, 1989), then finds the nearest pair and regards it as a group.

By the described method a dendrogram is obtained for a sample of 154 movement structures whose positions had been defined in the Euclid space of 33 variables.

The uniting graphically presents the union tree - dendrogram. Individual movement structures represent the leaves, points of branch joints represent the composing of groups. The height of the joint, called the level of union, is proportional to the measure of diversity among groups. By examining the levels of union we have analytically defined the primary number of groups.

Figure 1 shows the complete course of movement structures union into groups. The basic pattern of movement structures is first divided into two groups in such a way that the upper group comprises two quite equivalent sub-groups, while the lower comprises four successively linked groups.

The discriminant analysis enabled the assessment of those group characteristics by which the groups differ (Table 3). In Table 4 we see the averages of discriminant functions (centroids) according to groups.

On the basis of clustering results and on the basis of assessing the differences between groups, the movement structures with the following characteristics are classified into individual groups:

Table 4: Centroids of groups

GROUP	FUNC 1	FUNC 2	FUNC 3	FUNC 4	FUHC 5
A	-2.01664	-0.10723	0.47059	-2.11404	-0.10526
B	-3.36086	-0.08372	0.62205	1.46031	-0.19755
C	3.43226	1.20449	2.16219	0.24422	0.59955
D	1.13720	2.79299	-1.85100	0.12302	-0.13301
B	3.1443E	-2.62495	-0.31757	0.18560	-0.94434
F	0.10643	-2.58342	-1.75921	0.19006	1.4E117

- In group A there are simple movement structures (stepping in place indoors), which do not demand any special motor abilities,which are executed in aerobic conditions and are most suitable for developing aerobic abilities.
- In group B there are those movement structures which, by manner of movement, strongly resemble those in group A, but differ mostly by the workload of the shoulder girdle and upper extremities. As they contain long-handle arm movements (swings, twists with outstretched arms), their energy requirement (demand) is much higher, and a greater repetitive strength of upper extremity is necessary. Due to the large workload of the shoulder joint they can be performed for only a short time and are often of the anaerobic character.
- In group C there are those movement structures that are, regarding their energetic and informational component, most demanding, that are of short duration and are carried out in anaerobic conditions. They demand great repetitive strength and flexibility of lower extremities, while the joint and muscle workload of this body part is very large. This group encompasses various skips (jumps) which include additional movements by the lifted leg and intensive arm work. Due to these singularities they also demand a great deal of co-ordination as well as some specific qualities (concentration, orientation).
- The D group represents those movement structures that are practiced mostly in place (steps, poises) and in such a manner that, in greater part, legs and trunk (crouches, forward bends) are statically workloaded. This group also encompasses those movement structures where one leg is being lifted in various directions, meaning that balance is needed for such movement. Movement structures are not especially complex, but often include certain trunk twists.
- Various jumps (skips) comprise group E. In most cases the arms only passively follow the movements. For the execution of these exercises great repetitive strength of legs is necessary, which means that a large workload of joints and muscles of lower extremities also occurs. During the workout, the pulse is significantly increased.
- Two kinds of movements are included into group F: various types of running and movement structures with standing on toes or dropping into semicrouching position. Movement structures are not complex, but are, regarding efficiency, quite similar to the movement structures in group E.

Further analyses show that as much as up to 97,4 % of the movement structures were classified correctly. Clustering into groups A, C and F is 100%, while two movement structures did not range correctly in group B, and one movement structure did not range correctly in groups D and E. This is, for such a research, a remarkable result.

The results obtained by the method of hierarchical clustering and discriminant analysis confirmed the hypothesis that, according to criteria of inclusion of some cardiovascular system characteristics, inclusion of various motor abilities and workloads of joints and muscles, $g < N$ movement structure groups will be formed (where g represents the number of homogenous and N the number of analyzed movement structures).

The attempt of aerobic movement structures clustering is the first of its kind, based on exact statistical methods. Analyzing the inner structure of individual movement structure groups has special significance, being the basic condition for varying, solving either scientific or expert problems in this sport.

The results of the research show that the spectrum of movement structures, regarding the criteria used in the research, can be significantly narrowed down and by further objective methods their effects on organism can be experimentally verified. Regarding the obtained latent dimensions in the variables space, it is also possible to narrow down the variable space for verifying the characteristics of movement structures.

For aerobics, those movement structures are favorable in which a large percentage of muscle mass is activated in short contractions, provided that few muscle fibers are contracted and that the relaxation is longer than the muscle work. Such type of movement structure is classified into group A.

Many movement structures that are performed with great intensity (amplitude, pace, changing rhythm which causes an increase of execution speed), are, generally seen, of anaerobic character, but in spite of this, need an aerobic basis. Such typical movement structures are in groups C and E. Aerobics programs for improving cardiovascular abilities not only demand aerobic training but also the majority of activities are based on the combination of aerobic and anaerobic methods of work.

The oxygen debt and consequently an increase of lactic acid occur by the inclusion of anaerobic processes at high intensity movements, demanded by repeated explosive muscle contractions (Can-Can and other jumps, high knee lifting, activities of upper extremities above shoulder level - movement structures of groups C, E and B). We have to be especially attentive with this kind of movement structures in planning workloads, because, an overloading may occur mostly with untrained persons. In most cases, the movement structures cause fatigue as the aerobic system cannot satisfy all energetic needs, it is also impossible to eliminate the products of the anaerobic source of energy during the training process itself (chiefly movement structures of groups C and E).

Although the knowledge about clustering, at the first sight, is only of theoretical importance, the knowledge about relations has a significant application value. In aerobics, the problem of determining the correct intensity of training is quite acute. Most exercise units last from 45 minutes to 1 hour, meaning that we are dealing with a continuous work regime. An increase in heart rate and especially a continuous exercising present a special problem concerning older persons and beginners. In exercises we can use a discontinuous method of training by systematically shortening the dance sequences, "inserting" "security" intervals and thus executing a kind of interval training. Regarding the results of our research, we could ensure the interval training by choice of movement structures alone, in such a way as to place among the structures of anaerobic character those which cause high pulse raise (group C, E, F, B), such structures that have lower intensity, and that are performed in aerobic conditions (movement structures in group A). Profound knowledge about movement structures and their effects is, of course, the condition for us to be able, during the exercise itself, to choose movement structures in such a way as to ensure workload changes.

Movement structure characteristics are much more complex than thought at first sight. An individual movement structure can be executed in completely aerobic conditions (when tempo is optimal, the amplitude small); by change of tempo, rhythm or increase of amplitudes these structures present quite different characteristics and demand different conditions. These finds are of great value for programming the transformation processes in various exercise groups both in recreation and in competitive aerobics.

4. Conclusion

We wanted to classify 154 aerobics movement structures comprising the sample, into a smaller number of relatively homogenous groups. For determining the characteristics of the selected movement structures 33 variables were used . Five experts evaluated each movement structure with grades from 1-5 for each variable. In the final data processing, on the basis of measurement reliability, average grades of all 5 experts were used. By use of the clustering method (Ward, 1963) and discriminant analysis, we selected 6 well defined groups of movement structures which differ from one another mainly by inclusion of functional abilities of the cardiovascular system, by certain motor abilities (repetitive, static strength, co- ordination), but mostly by the logical workload of joints and muscles (upper and lower extremities and trunk).

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