

Effects of programmed training on motor abilities of persons with movement impairment in sitting volleyball

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Abstract

Results obtained through testing of 60 players were analyzed in order to determine the effects of programmed training on motor abilities of persons with movement impairment in a sports discipline – sitting volleyball. Programmed training was conducted through an intensive exercise of explosive strength, motion frequency, and agility for the duration of 60 days. Nine variables were applied for evaluation of motor abilities: side sliding, 20 meter sliding, throwing of a medicine ball while in lying position, hand tapping, foot tapping against wall, bend-stretch touch an “eight” with touch, sliding in a rectangle, and distance sliding. Qualitative changes were determined through application of factor analysis during and after the programmed treatment. Factor analysis confirmed that the expected changes in the tested motor abilities did take place as a result of the programmed training in such a way that 2 factors were singled out in during the initial measurement. Of those the first main component was composed of 4 variables. The greatest positive and orthogonal projections were recorded with the variables of distance sliding from still position, as well as throwing of a medicine ball while in lying position. Negative projections on this factor were recorded in variables 20 meter sliding and the “eight” with touch.

The records of initial measurement showed a domination of explosive force, whereby agility of the tested individual was projected negatively. In the final measurement, upon completion of the treatment, the greatest positive projections of an isolated main component were recorded with regard to the variables: foot tapping against a wall, bend-stretch touch, and hand tapping. The greatest negative projections were recorded with regard to: the “eight” with touch, sliding in a rectangle, and side sliding. The explosive force factor was reduced in a final measurement, while motor abilities were dominant.

Keywords: **motor abilities, programmed training**

Introduction

It has been determined by previous research that motor abilities may be influenced by certain exercise processes. It has been established that a specific program within a training process of sports games results in positive effects and transformation^{1,2,3,5,11}. As training frequency in sitting volleyball proves to be insufficient for reaching desired effects, it is necessary to examine methods, means, forms, operators and program whose application would have the same of better effects within shorter time. The questions that have to be answered are – how much does one need to exercise for those changes to take place, what is the level of adaptability of new motion structures and whether those changes may take place within shorter time?

Sažetak

U cilju utvrđivanja uticaja programiranog treninga kod osoba sa invaliditetom u sportskoj disciplini sjedeće odbojke na motoričke sposobnosti igrača, analizirani su rezultati dobijeni na uzorku od 60 igrača. Programirani trening se provodio intenzivnom vježbom eksplozivne snage, frekvencije pokreta i agilnosti u trajanju od 60 dana.

Za procjenu motoričkih sposobnosti, primjenjeno je 9 varijabli: klizanje u stranu, klizanje 20 metara, bacanje medicinke iz ležanja, taping rukom, taping nogom o zid, pretklon- zasuk-dodir, osmica sa dodirom, klizanje u pravokutniku i otklizavanje u dalj s mjesta. Kvalitativne promjene su determinirane primjenom faktorske analize, prije i poslije programskog tretmana. Faktorska analiza je potvrdila da je došlo do očekivanih kvalitativnih promjena ispitivanih motoričkih sposobnosti, pod utjecajem programiranog treninga, na način da se u inicijalnom mjerenju izolirala 2 faktora, od kojih je prva glavna komponenta sačinjavala 4 varijable. Najveće pozitivne paralelne i ortogonalne projekcije, imale su varijable otklizavanje u dalj s mjesta i bacanje medicinke iz ležanja. Negativne projekcije na ovaj faktor imale su varijable klizanje 20 metara i osmica sa dodirom. Uvidom u rezultate inicijalnog mjerenja konstatirana je dominacija eksplozivne snage, pri čemu se negativno projektovala agilnost ispitanika.

U finalnom mjerenju, nakon provedenog tretmana, najveće pozitivne projekcije na izoliranu glavnu komponentu, imale su varijable taping nogom o zid, pretklon- zasuk-dodir i taping rukom, a negativne projekcije: osmica sa dodirom, klizanje u pravokutniku i klizanje u stranu. U finalnom mjerenju, faktor eksplozivne snage je potisnut, a dominirale su motoričke sposobnosti.

Ključne riječi: **motoričke sposobnosti, programirani trening**

It is possible to apply programmed training, structured in accordance with a given situation, in a sports discipline of sitting volleyball through a training process with an aim to more quickly and more extensively develop motor abilities, based on a premise that application of such program shall not have negative effects on other segments of anthropologic status of a player.

In the field of sports for athletes with movement impairment, adjusting program to the players and their abilities is necessary for psychological reasons, to enable the players to find by themselves the game elements, motivation, to involve spontaneity, independence, sensibility, creativity, expressiveness, challenge, risk and alike. In this way the players will by themselves establish harmony in the perception, motor, cognitive, and conative area which will enable them to move to a higher level of motor abilities.

In order for the player to be interested and motivated to adopt and excel the contents of training, it should consist of a number of games that make training more interesting and special. Tangible and recognizable transformation represents a special motivation for the player as it caused his conscious engagement and acceptance of exercises. Due to the aforementioned, there is a need to evaluate effects of programmed contents in the training procedure and possibility of their application.

Sitting volleyball training programs have to meet emotional, social, and intellectual needs as a condition for maximum involvement and effort of players and their motivation for transformation through sports games. The aim of this research is to determine the effects of programmed training on motor abilities of persons with movement impairment in a sports discipline – sitting volleyball through factor analysis.

Methods

Analysis of latent space of applied variables on motor abilities of sitting volleyball players was used in this paper.

The sample

The sample is represented by 60 players with movement impairment, subjected to experimental training program in sitting volleyball.

Sample variables

The following variables were used to determine explosive strength of examinees: distance sliding from still position (MESODOM), 20 meter sliding (MESK20) and throwing of a medicine ball while in

lying position (MESBML). The following variables were used to determine motion frequency: hand tapping (MFPTAR), foot tapping against wall (MFPTNZ) and bend - stretch-touch (MFPPZD). The following variables were used to determine agility: side sliding (MAGKUS), sliding in a rectangle (MAGKUP) and an eight with touch (MAGOSD).

Results and discussion

An evaluation of variables' representativeness was conducted on the examinee sample in order to determine justifiability of application of factor analysis in this particular research. Kaiser-Meyer-Olkin coefficient of representativeness was calculated, amounting to 0.81. Its significance was tested through Bartlett Test through H_2 amounting to 257,20, with level of statistical significance $p = 0.000$. Factorization of variability in both initial and final measurement was done whereby two factors were isolated in both cases. Percentage of total variability amounted to 60% of common variance in the first main component at two measurement levels

Table 1 shows contribution of variables to individual factors, and it may be observed that the first factor defines four variables of which MESODM, MESK20 and MESBML has the greatest contribution, i.e. those defining explosive force of examinees so that this factor is titled **Explosive Strength Factor**.

The variables MFPTNZ, MFPTAR, MFPPZD, defining frequency of motion, have the greatest positive parallel and orthogonal projections onto the second factor onto which the variables of agility MAGKUS, MAGKUP and MFPPZD are negatively projected so that this factor is called **Motion Frequency Factor**.

Table 1. Parallel and orthogonal projection of variables on factors (the pattern matrix and structure)

VARIABLES	F 1	F 1	F 2	F 2
	PAP	ORP	PAP	ORP
MESODM	0,92	0,96		
MESK20	- 0,86	- 0,82		
MESBML	0,86	0,90		
MAGOSD	- 0,68	- 0,54		
MFPTNZ			0,80	0,91
MFPTAR			0,79	0,74
MAGKUS			- 0,74	- 0,53
MAGKUP			- 0,70	- 0,55
MFPPZD			0,56	0,46

Table 2 shows the contribution of individual variables, factors, and can be noted that the first factor defines the six variables of which 3 variables are positive, which define the frequency of movement, and 3 negative projections of the variables that define a player's agility. This points to the fact that measuring area of motor skills is defined by multidimensional characteristics, which are affected by motor skills.

There are negative correlations between the variables: MAGKUS, MAGKUP and MAGOSD, which are related to agility, which can be explained by the fact that the program improves the speed of movement and thus reduces the time required for the agility of players.

There are positive projections with variable MFPTNZ, MFPTAR and MFPPZD that define the frequency of movement, and this factor might be called the **frequency of movement and agility factor**.

The best parallel and orthogonal projection on the second factor have the variables: MESODM, MESBML and MESK20 that define the area of explosive strength and this factor is called the **factor of explosive strength**.

By factor analysis of qualitative changes we can see that under the influence of the program, as the first principal component with the largest percentage of variability, frequency of movement is being isolated, which indicates that the specific program developed in participants the ability which precedes motor skills, and it can be concluded that specific training process influenced the development of motor skills in subjects, as indicated by the communality of variables in measurement of subjects.

Table 2. Parallel and orthogonal projection of variables on factors (the pattern matrix and structure)

VARIABLES	F 1	F 1	F 2	F 2
	PAP	ORP	PAP	ORP
MAGKUS	- 0,82	- 0,67		
MFPTNZ	0,77	0,92		
MAGKUP	- 0,76	- 0,67		
MAGOSD	- 0,70	- 0,55		
MFPTAR	0,61	0,51		
MFPPZD	0,56	0,45		
MESODM			0,93	0,91
MESBML			0,86	0,87
MESK 20			- 0,76	- 0,69

Table 3 shows that the correlation coefficients of variables through their communalities are very high, pointing to the fact that all the variables in the measurement area have a significant stake in defining the area as part anthropological status of the subjects.

Table 3. Communality of variables

variables	communality
MESODM	0,86
MESK20	0,59
MESBML	0,74
MFPTAR	0,40
MFPTNZ	0,69
MFPPZD	0,37
MAGKUS	0,75
MAGKUP	0,61
MAGOSD	0,59

From the table 4 it is evident that the factors have a relatively good correlation indicating the existence of a connection between frequency of movement, agility and explosive strength in the training procedure.

Table 4. Correlation factors

Factors	1	2
1	1,00	0,45
2	0,45	1,00

Conclusion

In the area of motor abilities of subjects, the final measurement have isolated a factor of frequency of movement and agility, with the highest power of variability and explosive strength factor as the second principal component. Given that in the initial measurement the opposite occurred, where **factor of explosive strength** was isolated, as the first principal component and **frequency of movements and agility factor** as well as other major component, it can be concluded that the program has developed skills in subjects that precede motor skills, and can conclude that the training procedure in the final measurement affect the logical sequence of development of motor skills. Factor analysis confirmed that, under the influence of the program, there has been a qualitative change in the expected motor abilities. Choosing variables for measuring the subject has well covered the whole area of measurement and showed a significant change in variability on the variables: MESODM, MESK20, MFPTAR, MFPPZD and MAGKUS.

These variables describe the abilities that can be improved with applied training procedure, and noted changes can be explained as the changes that have occurred under the influence of programmed workouts.

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