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Psychomotor skills – a general or specific approach?
Psihomotricitatea - abordare generală sau specifică?

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Abstract

Background. The progressive transformation of the psychomotor components necessary in an activity depends greatly on each individual's capacity to understand this process and act on prefiguring exclusive skills for a particular area of practice.

Aims. This study is based on comparing groups of subjects with various professional activities, depending on the psychomotor components development.

Methods. The methodology of the study is based on the use of measuring instruments, with an objective character, applied to emphasize the differences between individuals by using psychological tests (the motivation test - PM Inventory, the psychosocial test - Social self-esteem inventory) and bio-motor tests (Vienna Test Sport System, the hand-eye coordination test - SMK, the space-time anticipation test - ZBA, the Opto-Jump test and the Equilibrium Platform test).

Results. The results of the study generally indicated a medium adaptation level for the measured psychomotor components and a high adaptation level of those specific psychomotor components in relation to the task and dominant field of activity.

Conclusions. We must emphasize that these measured components have an average level regardless of the activity, but the score increases (or is lowered) for the specific components, depending on the activated aptitude of the individual.

Keywords: psychomotor, indicators, specific, behaviour, activity.

Rezumat

Premize. Transformarea progresivă a componentelor psihomotorii care sunt necesare într-o activitate, depinde în mare măsură de capacitatea fiecăruia de a înţelege acest proces şi de a acţiona/a se acţiona în sensul prefigurării unor deprinderi exclusive pentru un anumit domeniu de practică.

Obiective. Compararea unor grupuri de subiecţi care prestează activităţi sportive diferite, în funcţie de dezvoltarea psihomotrice.

Metode. Metodologia studiului se bazează pe folosirea unor instrumente de măsurare cu caracter obiectiv, aplicate în vederea evidenţierii diferenţelor dintre indivizi cu ajutorul testelor psihologice, (testul de motivaţie – Inventarul PM, testul psihosocial – Inventar de stimă de sine socială) şi a testelor biomotrice (Vienna Test Sport System – proba de coordonare mână – ochi SMK,1 şi proba de anticipare în timp şi spaţiu ZBA; Testul Opto-Jump şi Platforma de echilibru).

Rezultate. Rezultatele studiului au indicat un nivel de adaptare mediu, la modul general, pentru componentele psihomotorii măsurate şi un nivel ridicat al acelor componente psihomotorii specifice, în raport cu sarcina şi cu domeniul de activitate dominant.

Concluzii. Componentele măsurate au un nivel mediu, indiferent de activitate, însă componentele specifice, scorul acestora creşte (deşi poate uneori să şi scadă), în funcţie de rezerva aptitudinală activată a individului.

Cuvinte cheie: psihomotricitate, indicatori, specific, comportament, activitate.

Introduction

In everyday life we often hear people talking about their occupations. Most often these occupations are chosen on the basis of decisions about their own qualities in various fields. These opinions, in one field or another, have formed based on some accumulated experiences, through success or failure in different tasks. The acquisition level of psychomotor components is reflected in the development of individuals through their behaviour. Manifesting an efficient behaviour in relation to certain situations is the key to the individual's adaptation to the social environment and demonstrates the possibility to innovate attitudes and capacities. Our environmental activities are carried out through the "environment – action" relationship, by creating an interior model of the outside world (Albus, 1991).

From general to specific, the psychomotor components' metamorphosis implies shaping the outside world (general abilities), by adapting it to the interior model (individual specific abilities). The individual is born with a genetically acquired psychomotor background. The individual's ontogenetic evolution depends on several social, cultural

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and environmental factors. Individual differences can be observed from this perspective or from the individual's capacity to evolve.

The individual's evolution by reaching the human limits is a goal in high-performance sports. In order to overcome the barriers which appear during the sports training process, some specialists (Smith et. al., 1995; Young & Knight, 2014) discuss psychological skills as contributing factors to maximizing the potential of the individual's physical abilities, especially for sports with a high risk. The involvement of mental skills in high-risk sports indicates that athletes who practice extreme sports have the capacity to maintain a very high skill level in any event; moreover, in case of danger, they have the resources to overcome any psychological situation. The authors studied a large number of sports, including glider flight. Differences between a pilot and a non-pilot were identified in the brain by an increase in the ventral premotor cortical matter and the peripheral field of vision. These discoveries reveal cognitive and motor processes associated with the studied areas (Ahamed et al., 2014).

Flying a glider implies developing psychomotor skills such as an airline pilot's. Identification and development of an airline pilot's skills are essential when technical problems arise and aircraft maneuvering is switched from automatic to manual. Technical components and narrow skills are not enough for safe aircraft functioning; a synergistic relationship between desire (motivation), ability (emotional stability, cognitive synthesis, psychomotor skills) and means (adaptation possibility to the flight's specific requirements and risks) is also required (1). This approach shows that selection in high risk activities involves several perspectives, one of these being the motivational component of the individual's personality. In this context, it is considered that although high-level psychomotor skills have their degree of importance, they depend on the individual's degree of involvement in activity. For the development of psychomotor skills in a shorter time, Bolstadt et al. (2010) have developed a system of six modules, to improve the awareness of risk situations. Generally, the training modules have improved the participants' performance in these specific skills, without producing the desired effect regarding the degree of awareness of risk situations.

Another step of our research was the study of the literature on athletes practicing judo. We chose this sport because it involves adaptation to one-on-one combat situations, including as an induced state of danger. A high level of adaptability is a prerequisite for a higher degree of activity, and developing formative adaptation responses depends on the quality of psychic and motor skills (Lech & Sterkowicz, 2004). Supiński et al. (2014) indicate in their study that high athletic performance in judo would be conditioned by an optimal level of psychomotor skills.

The third direction of this investigation has been oriented towards field tennis, which is currently one of the most publicized sports in the world. Confrontation in this situation is face to face, and the opponents are separated by a net. The net also has the role of an obstacle and the main objective of a tennis player is to hit as many balls as possible over the net, so that the opponent will miss the ball or just make a mistake, provoked or unprovoked. Crespo et al. (2006) discuss the importance of training physical and mental abilities in a steady rhythm. A tennis match is not as dangerous as a glider flight or fight on the tatami, but involves a high level of adrenaline when the score is very close. Sheldon & Eccles (2005) have conducted research investigating tennis players in relation to physical and psychological skills. The research has shown that perceived confidence and achievement motivation have a significant role in the athletes' results. Carlsted (2007) used a neurocognitive test battery in tennis players for measuring neurochemical activity in each lobe of the brain. This battery of tests is based on the athlete's understanding of certain tasks; the measured psychological factors are attentional behaviour in terms of concentration, maintenance and diversification; hand-eye coordination, and spatial ability; executive function – planning; social cognition - social recognition.

Objectives

The study's objective is to compare some groups of subjects who perform different professional activities, whose psychomotor component development is influenced, with specialization tendencies of the psychomotor components.

Hypothesis

The specific manifestation level of necessary psychomotor components for an activity depends largely on the individual's own capacity of understanding this process and of taking action (in the case of a formative process) in the sense of prefiguring exclusive skills for a certain practice field.

Material and methods

Protocol research:

a) *Period and place of the research*

The approval of the University's Ethics Commission for conducting research on human subjects was obtained. The requirement of the subjects' informed consent was met through the POSDRU project and the collaboration contract between the Rectorship and Brasov Aero Club. Each participant filled in a form of factual data, among which the testing participation agreement.

In this study, we used the psychomotor testing equipment of the Transylvania Research Institute in Braşov. The study was conducted over a period of four months, November 2014 – February 2015.

b) *Subjects and groups*

The participants in this study were gliders from Braşov Aero Club, n=6, and athletes from the judo (n=6) and tennis (n=6) sections of Dinamo Sports Club, all aged between 14 and 24 years.

c) *Tests applied*

For this study, the following tests were used:

Social Self-Esteem Inventory – a questionnaire developed to measure self-esteem in social situations. This questionnaire has the advantage of measuring only one dimension of self-esteem.

Intrinsic/extrinsic motivation questionnaire: The inventory describes motivational preferences, work

motivating factors. It contains two primary scales: intrinsic motivation and extrinsic motivation. Secondary intrinsic scales are pleasure and challenge, and extrinsic ones are reward and recognition.

Balance platform: The equipment allows the study of the position of a horizontal projection of the athlete's mass centre. It acquires data on the time course of the pressure centre, provides real-time visual informational reactions to the athlete and performs standard calculations of data on the development of the centre of pressure position. Only one acquisition was taken into consideration – the route length (total route) calculated in millimetres, for the rebalancing task (with eyes opened).

Opto-jump: This device measures and evaluates sport performance for various parameters such as expansion and responsiveness. The optical detection system measures the contact time with an accuracy of 1/1000 seconds during the execution of a jumping series. We considered the following acquisitions: time on the ground (ms), time in the air (ms), flight height (cm) and strength (w/kg).

Vienna test - hand-eye sensorimotor coordination, measured using the SMK 1 test, which lasts ten minutes. The test consists of manipulating a segment on a circular trajectory, the movement taking place into a three-dimensional space. The purpose is to provide information about sensorimotor development on a hand-eye level and the following data are provided: angular deviation, measured in degrees (right hand coordination on rotation level), horizontal deviation measured in pixels (left hand coordination, horizontally), vertical deviation, measured in pixels (right hand coordination, vertically). Space and time anticipation was measured using the Time/Movement Anticipation test. In our study, we used the ZBA S3 test with 8 items. Time anticipation is measured by the athlete's ability to predict where the ball will reappear on the target line. In the second phase of the test, the subject also has to indicate where the ball is placed. This last execution measures the athlete's ability of anticipating motion in space and time. For the Space and Time Anticipation test, the following variables were taken into account: median time deviation and median direction deviation. For all variables, the raw score was taken into consideration. The testing protocol was achieved by: a) psychosocial testing (15 minutes); b) biometric testing (Vienna Test - 10 minutes, Equilibrium Platform - 3 minutes and Opto-Jump - 2 minutes).

d) *Statistical processing*

All data were analysed using SPSS 18. Each variable's distribution was analysed in order to identify abnormalities or extreme data. These data were analysed using the unifactorial Anova test, with one independent variable, group type, consisting of 6 athletes for each group. F critical (F (0.05, 2, 15)) from table F, for p =0.05: F critical = 3.6823.

Results

Table I shows significant data for the conducted research. The rest of data are not included in the table because of the high information volume. No differences were identified for

Table I

Descriptive data according to each group - for the analysed indicators.

Indicators		N	Average	Standard deviation	Standard error	95% Av. confidence interval	
						Lower limit	Upper limit
Intrinsic Recognition	gliding	6	27.00	2.530	1.033	24.35	29.65
	judo	6	31.00	2.000	.816	28.90	33.10
	tennis	6	27.17	2.787	1.138	24.24	30.09
	Total	18	28.39	2.993	.705	26.90	29.88
Balance LT4	gliding	6	1292.00	283.564	115.764	994.42	1589.58
	judo	6	753.00	253.787	103.608	486.67	1019.33
	tennis	6	1396.33	139.688	57.027	1249.74	1542.93
	Total	18	1147.11	363.982	85.791	966.11	1328.12
Air Time	gliding	6	.38583	.072334	.029530	.30992	.46174
	judo	6	.46900	.052998	.021636	.41338	.52462
	tennis	6	.28617	.054591	.022287	.22888	.34346
	Total	18	.38033	.095690	.022554	.33275	.42792
Flight Height	gliding	6	18.9500	6.79198	2.77281	11.8223	26.0777
	judo	6	30.8650	5.09841	2.08142	25.5146	36.2154
	tennis	6	21.1850	6.87960	2.80859	13.9653	28.4047
	Total	18	23.6667	7.96536	1.87745	19.7056	27.6277
Strength	gliding	6	25.3167	7.83944	3.20044	17.0897	33.5436
	judo	6	36.1400	5.21702	2.12984	30.6651	41.6149
	tennis	6	27.2567	7.57070	3.09072	19.3117	35.2016
	Total	18	29.5711	8.15147	1.92132	25.5175	33.6247
Average Angle	gliding	6	24.650	4.9168	2.0073	19.490	29.810
	judo	6	31.997	5.8449	2.3862	25.863	38.131
	tennis	6	30.450	2.3839	.9732	27.948	32.952
	Total	18	29.032	5.4239	1.2784	26.335	31.729
Average Vertical	gliding	6	34.950	11.1177	4.5388	23.283	46.617
	judo	6	47.833	12.3801	5.0542	34.841	60.825
	tennis	6	54.033	9.1782	3.7470	44.401	63.665
	Total	18	45.606	13.1568	3.1011	39.063	52.148
Average Horiz. after 5 minutes	gliding	6	40.633	15.3530	6.2678	24.521	56.745
	judo	6	50.683	17.4848	7.1381	32.334	69.032
	tennis	6	65.567	7.3896	3.0168	57.812	73.322
	Total	18	52.294	16.9230	3.9888	43.879	60.710
Average Vert.1 after 5 minutes	gliding	6	31.383	10.3507	4.2257	20.521	42.246
	judo	6	43.883	10.4840	4.2801	32.881	54.886
	tennis	6	50.183	8.6675	3.5385	41.087	59.279
	Total	18	41.817	12.2706	2.8922	35.715	47.919

the social self-esteem questionnaire, intrinsic motivation, pleasure, p = .510; intrinsic motivation, challenge, p = .254, extrinsic motivation, reward, p = .666. There were also no differences for Opto-Jump, ground–time acquisition, p = 117. There were no differences for the Vienna Test, SKM 1 test, angle average after 5 minutes, p = .075, and the ZBA 3 test, median time deviation, p = 409 and median direction deviation, p = .280. Group differences were distributed, for all significant indices, in Table 2, where data statistically processed by the unifactorial Anova procedure are found. For the comparison of the groups, we also used Post-Hoc analysis, for which we chose the Games-Howell test, one of the most powerful procedures, when the groups of subjects are small (Field, 2009).

From descriptive data, the presence of differences between the three groups can be noted. The confidence interval is different. The average is not significantly equal between the three groups, which indicates the presence of differences between them (Table II).

Table II
Unifactorial ANOVA results

Psychomotor abilities	(F)	df	(p≤ .005)*	ŋ²
Intrinsic Recognition	5.073	2	.021	.4
Balance (LT 4)	13.058	2	.001*	.63
Opto-Jump – Air Time	13.686	2	.000*	.64
Opto-Jump – Flight Height	6.044	2	.012	.44
Opto-Jump – Strength	4.106	2	.038	.35
Vienna Test Average Angle	4.218	2	.035	.36
Vienna Test – Average Vert	4.724	2	.026	.36
Vienna Test Average Horiz .1	4.782	2	.025	.38
Vienna Test – Average Vert.1	5.641	2	.015	.42

Note: df (degrees of freedom); p (significance degree); ŋ (effect size).

The results of Post-Hoc analysis for motivation indicated differences between group 1 (gliders) and group 2 (judo practitioners), p = .034; no differences were found between tennis players and judo practitioners and gliders. The results of Post-Hoc analysis for balance showed differences between group 2 and group 1, p = .015 and group 3, p = .002; there were no differences between tennis players and gliders. The results of Post-Hoc analysis for Opto-Jump indicated differences in the time spent in the air between judo practitioners and tennis players, p = .000, in flight height between judo practitioners and gliders, p = .018, no differences in strength between the three groups. The results of Post-Hoc analysis for the Vienna Test evidenced differences in average vertical deviation between tennis players and gliders, p = .023 and differences in horizontal and vertical average after 5 minutes between gliders and tennis players, p = .02, p = .017, respectively. No differences in average angle deviation between the groups were found.

Discussions

Identifying extrinsic motivation recognition as difference between groups allows us to discuss the motivational aspect of personality, the athlete's involvement in tasks, regardless of the field. Our results revealed that those who fly in an airplane have a significantly higher desire of recognition than those who practice judo. There were no differences on motivational level between tennis players and judo practitioners, which shows that motivation on this level is intrinsic. This approach confirms the study of Harwood et al. (2004), conducted on elite athletes; the authors maintain that mobilized psychological competences are as important as the actual skills. Another important approach was identifying differences in rebalancing, judo practitioners proving to be superior from this point of view to tennis players and gliders. This difference could be explained by the development of this quality over time in judo practitioners, balance being one of the fundamental qualities for obtaining performance in this sport (Witkowski et al., 2014).

The results of hand-eye coordination tests revealed differences between gliders and tennis players. Judo practitioners, due to the specifics of this sport, possess very high coordination skills, especially since these are acquired in time without any devices (the handle in the glider) or objects (the racquet in tennis). Differences between athletes were found for both hands. Compared to judo practitioners, who use both their hands when they fight, tennis players mostly use their dominant hand and while flying, gliders also use their dominant hand the most. It was interesting to observe the difference in the right hand for vertical tasks during the first five minutes and after five minutes. These results are similar to those of Thullier et al. (2008), who made a device to evaluate psychomotor performance during a visual indication task. The study's results showed a lower performance level in the case of vertical compared to horizontal objects – a demonstrated fact in this study for tennis players and gliders, but not for judo practitioners. Visual feedback being connected between the hand rotation direction and the effect produced by localizing the target, it would seem it is far easier to discriminate for judo practitioners and gliders and more difficult for tennis players.

In the same direction of study, Obminski et al. (2011) tested whether hand-eye coordination has a predictive role in performance in junior boxing. The results indicated a better coordination in experienced athletes, without explaining the experimentally evidenced performance. Our results, in accordance with the literature, reinforce the need for high performance athletes to learn how to control their movements in stressful situations, in order to achieve success, emphasizing the fact that there is a basic level for these psychomotor skills (Button et al., 2011).

Conclusions

1. This study's results show a medium adaptation level, generally speaking, for the measured psychomotor components and a high level of specific psychomotor components, in relation to the task and the subjects' dominant field of activity.

2. All measured components have a medium level regardless of the activity practiced by the athlete, but the score of the specific indicators of each sport increases (and can sometimes decrease) depending on the individual's activated aptitude.

Conflicts of interests
There were no conflicts of interests.

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