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Methods for Evaluation of Some Psychomotor Abilities

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A B S T R A C T

For estimation of psychomotor and sensor abilities different kinds of tests are used in the form of devices representing different technical devices which help examining sensomotor and psychomotor functions in certain conditions, as well as more complex motor abilities and skills that depend on CNS characteristics, vegetative nervous system and other functional systems and body states. These devices can be used for examining some parameters of psychomotor functions-such as speed of reaction through reactiometer or devices for examining sensor abilities-such as audiometer, ortoriter, color tests etc. In the scope of examining psychomotor skills and abilities, frequently used are different kinds of tests in the forms of devices serving for measuring ocultomotor coordination-such as Omega and Sinusoida, then Tumer`s device for measuring coordination and dissociation of hands` movements with visible control, O-Conor`s dexterimeter and Medeo`s dexterimeter-used for examining dexterity of fingers, Tremometer for examining hand stability and preciseness of movements, Minesota test for examining dexterity of hands and taping tests like "paper-pen" for examining speed and accuracy of simple movements. For examining more complex sensomotor abilities or different motor skills, special tests are used in the form of simulator, simulator and different technical devices, adjusted to specific sports situation. This category of tests includes different kinds of simulators and simulators used for examining certain aspects of sports activity.

Key words: *tests, functions, sensomotor, simulator*

Introduction

Contemporary research in the field of psychomotor abilities of a man are focused on discovering legalities determining motor behavior by which they contribute to improvement of sports results. Individual movements in the whole are the product of neuropsychological activity whose characteristics determine the structure of motor abilities. Each movement reflects increased number of elements, such as: irritation of receptors, transfer of impulse to the processing center and activation of nerves innerving the muscles whose contraction causes movement.

For estimation of psychomotor and sensor abilities different kinds of tests are used in the form of devices representing different technical devices which help examining sensomotor and psychomotor functions in certain conditions, as well as more complex motor abilities and skills that depend on CNS characteristics, vegetative nervous system and other functional systems and body states, according to Barrett (2003). These devices can be used for examining some parameters of psychomotor functions-such as speed of reaction through reactiometer or devices for examining sensor abilities-such as audiometer, ortoriter, color tests etc. In the scope of examining psychomotor skills and abilities, frequently used are different kinds of tests in the forms of devices serving for measuring ocultomotor coordination-such as Omega and Sinusoida, then Tumer`s device for measuring coordination and dissociation of hands` movements with visible control, O-Conor`s dexterimeter and Medeo`s dexterimeter-used for examining dexterity of fingers, Tremometer for examining hand stability and preciseness of movements, Minesota test for examining dexterity of hands and taping tests like "paper-pen" for examining speed and accuracy of simple movements.

For examining more complex sensomotor abilities or different motor skills, according to Fadde (2006) special tests are used in the form of simulator and different technical devices, adjusted to specific sports situation. This category of tests includes different kinds of simulators used for examining certain aspects of sports activity.

Methods

Methods used in the field of psychomotorics have to be adequate to the subject of examination and informative enough, as it is the case with all other sciences, meaning they have to provide objective examination of the monitored property and describe it in the best possible way.

Methods for psychomotor abilities` evaluation were developed primarily in psychology, biology and neurology, but they also had great implementation in the field of sport science (Biro, 1995). Examination of psychomotoric space has been quite mastered since the earliest researches at the beginning of the 20^{th} century, so the findings in that area have contributed to better knowing of motoric abilities` structure.

Evaluation of psychomotor abilities is commonly used by test-devices, of which we will mention the way of work and use of those most commonly used.

Reactionmeter CRD (Complex reactiometer) is the most complex in this group of measuring instruments for estimation of psychomotor abilities. The CRD series precedes cybernetic model of intelligence because the mental processes are reconsidered in terms of cybernetic processing of information (reception, processing, control and regulation of information). Mental functions examined by CRD, according to Fadde (2007) are: *reception* (observing phenomena and changes of lighting and sound signals, discrimination of location and height of signals,

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their identification and visual orientation) Fadde (2007) and *elaboration* (short-term and long-term memorizing, reasoning, convergent that is inductive thinking and instruction-led deducting and concluding, i.e. operative thinking.

CRD series has four blocks (tests of attention and three groups of tests of reaction-simple, elective and complex) with 34 tests in total. This series is psychometrically interesting for three reasons:

a) for theoretical bases,
b) for the first computerized version of battery tests of ability and
c) as predecessor of cybernetic model of intellectual functioning.

Theoretical bases of reactiometers CRD series are Pavlov`s nervous processes of excitation and inhibition which have the ability of irradiation (diffusion over cortex), concentration (i.e. localization in the spot of primary appearance) and alternation according to the law of mutual induction.

CRD series is one of the first computerized portable battery tests because all the reactions of examinees are automatically registered. The following indicators are automatically registered: *quantitative indicators* (total and average time of tasks` solving, total number of mistakes an total number of points), *qualitative indicators* (maximal speed of complex reaction, indexes of emotional stability-total ballast as a difference in speed of tasks` solving, unused experience as amount of difference between maximal and individual achievements, the beginning ballast as a difference between maximal speed and the speed of doing in the first half of tests series, the final ballast as a difference between maximal speed and speed of activity in the other half of tests series) and *indicators of functional disorders and frustration tolerance* (functional blockade as a measure of non-reacting time).

Standard reactiometer is shaped like a box behind which an examiner sits and controls the switch for electricity and selection of stimulus program (modality of color or height of sound). The front side (faced to the examinee) has a cord with keys for hands or pedals for legs. On one or both sides there is an electronic numerator for the reaction speed. Before testing, the examinee practices in a way that he has been presented a stimulus and then allowed to respond with the given reaction. During that, the device is set on manual tasking. When the examinee understands when he is expected to do, he passes to automatic tasking and registration of answers. During examination of simple reaction, the examinee is asked to respond uniformly (for example, by hand or leg), and in elective reaction the examinee has to assimilate his reply to the given stimulus in previously asked way (for example to respond on the low sound by his right hand, on the red light by the left leg).

Tremormeter is a device made to measure stability (tremor) of a hand. Task of the examinee is to pull a metal peak through openings of different diameters, without touching their edges. Touch of the edge closes a circuit which is automatically registered on the numerator. Success on the test depends on 380the number of touches with the opening edge, the number of non-contact provlacenja, precnik size of some openings and the length of duration of peak touch with the opening edge.

Device for taping testis used for examining manual speed. The device is consisted of a board on which is placed a metal panel, numerator (is not visible on the picture) and a metal peak (on the picture under stopwatch). Task of the examinees is to touch the panel as many times as possible within the given time. At every touch, a circuit is `stopped` and that is the signal for registration that the numerator remembers.

Sinusoidal test-device is made for examining hand ability and oculomotor coordination. Task of the examinee is to pull a metal disk from the beginning to the end of the sinusoidal rabbet as fastas possible and with the fewest touches as possible. Actually, the disk has two cilinders going into the channel. Touch of one, other or both cilinders closes the circuit that switches on the mjerac vremena and numerator). So, not only the number of touches is registered, but also the length of cilinders with the edge of the metal channel. Three parameters of efficacy are measured: total time for task accomplishment, total time of mistakes` duration and the total number of mistakes.

Dotting-test was also made for measuring psychomotor accuracy and velocity, but it is also the test of emotional stability. The examinee is using „an electronic pen“ and trying to guess as many openings as possible as they are passing by in one slit.

Results

By factor analysis of psychomotor abilities in a series of researches Schmidt and Wrisberg (2004), Schmidt and Lee (2005), Williams and Ward (2003), etc. the following agents of its efficacy were isolated:

- Precise control of arms, hands and legs control in objects manipulation.
- Coordinated work of arms and legs in small and big movements.
- Psychomotor orientation based upon fast reaction and accurate evaluations of the movement direction.
- Simple time of reaction refers to speed of the same replies of the examinees in miliseconds to the same visual or auditive stimulus.
- Simple velocity of massive movements of hands, disregarding precision.
- Manipulative dexterity referring to fine, controlled, precise and fast movements of hands, arms and fingers.
- Abilities of aiming and firing referring to visual-motor targeting.
- Stability of movements expressed by their preciseness during the time with optimal strength and speed.

As a result of need for creating a unique methodological access in examination of man in situations related to sport, quantitative methods began to be used in researches such as algorithms, mathematical modeling, theory of automatic management and other methods characteristic for technical sciences (Ericsson, 2001). However, that couldn`t completely give the answer to many questions related to reaction and behavior of man in sports activities, because there are many factors which refer to sports success.

Discussion

Lately, for some research areas in psychomotorics researchers have accepted a multidisciplinary approach which is more and more situational-contextual oriented, where different methods and techniques are used, starting from technical measuring, through mathematical describing and modeling, to monitoring physiological parameters, examining psychophysical states, abilities and features of personality in sports situations, according to Williams and Ward (2003). Naturally, these examinations and measuring are done under different experimental and external conditions where the sports activity of a man is

done. Accordingly, seen more broadly, it can be said that in psychomotor examinations are used all those methods used for describing dynamic of a man in sports situations, as well as special methods including man`s reaction and behavior in those.

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