

Psychomotor aspects of talent identification: A new approach in the case of fencing

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Abstract

The problem of talent identification in fencing can be analyzed using the existing theoretical models of sport selection and talent development. The research was based on extensive studies of fencers at the introductory and specialistic training stages. The conclusions were supported with experts' observations of the combat technique of advanced fencers at the championship level. The impact of formerly emphasized somatic and psycho-physiological factors on the level of sport mastery in fencing was sidelined in favor of psycho-motor factors. The later, especially choice reaction time and spatial anticipation, are considered to be the major predictors of talent in fencing. The application of the novice-expert paradigm allowed assessment of developments of these traits as well as correlations between the information processing speed and the motor phase of sensorimotor responses. A significant reduction of decision-making time in complex motor tasks was observed in expert fencers. Following opinions of the leading fencing coaches, reaction time should be treated as a significant factor of effectiveness of learning complex motor habits and their successful implementation in sport combat.

Key words: talent in fencing • reaction time • movement time • anticipation reactions

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BACKGROUND

One of the most popular models of sport selection and talent development worldwide is the so-called model of sport championship, consisting of a set of guidelines for long-term sport training. The model was originally based on expert and extrapolation methods [1]. One of its varieties is the "champion model" constructed on the basis of correlations between athletes' morphostructural and physiological parameters and their sports results [2]. A dominant tendency in western countries used to be construction of talent identification models in sport similar to paradigms in science, art, business, etc. These concepts were then used in various organizational and institutional forms, e.g. national programs of talent identification in the United Kingdom [3], Canada [4], the United States [5], and Australia

[6]. The common feature of the above models is complex analysis and recognition of all parameters that can effect sports results. They all focus on somatic, physiological and energetic properties of the athlete's body as well as psycho-motor aspects, functions of the central nervous system, psychological characteristics [7] and the impact of genetic traits.

Revision of traditional approaches

In terms of the so-called "champion model" the coaching practice shows that scientific selection without expert studies can miss crucial information in the process of identification of true talents. A number of trainees who have failed to go through the selection process have later achieved high sports results, including world championships. In such cases the selection process was a form

of discrimination rather than recognition of talented individuals. It seems that statistical methods aimed at averaging parameters are conducive to construction of purely abstract models. It is also the case with talent selection and identification methods based on probability calculus and other mathematical methods, known as optimization of the sports training process.

A serious fault of the above systems is their negligence of motor habits learning and predispositions towards development of new motor experiences, which should serve as the basis of technical and tactical preparation combined with athletes' psychological profiles and their effectiveness in sport competition. These factors are particularly significant in sports with open motor habits, including combat sports. Also, the selection process should be emphasized as continuation of talent development in the course of one's sport ontogenesis from the introductory to the championship stage.

There are also reservations about some national programs of sport talent development aimed at recognition of morphostructural and psycho-physiological predispositions, which sideline instruction of motor skills, including sports technique.

Complex studies of fencers carried out by numerous authors [8,9] revealed that athletes' somatic properties had a limited influence on the achieved sports results. They can serve as a basis for classification of athletes into individual fencing weapon categories. Tall and slender athletes (leptosomatic types) become more often epee and foil fencers; whereas shorter and muscular individuals become saber fencers. Physiological parameters measured with VO₂ max are not significant factors discriminating between the champions and average-level fencers. Some significance can be attributed to predispositions in the area of anaerobic metabolism, especially the phosphagen system in legs, measured with the Wingate test. However, the main area of prediction of high sports results and fencing talent consists of a complex of psycho-motor conditions such as speed, accuracy and durability of acquisition of motor habits and their variability in sport ontogenesis [10,11].

Talent development in sports with open motor habits. The case of fencing

It is beyond all doubt that in most sports with open motor habits (combat sports, martial arts, team games and racket games) the physical effort is subordinate or complementary to the technical and tactical requirements of a given sport. Recognition of a sport talent is in such cases very difficult as the development of motor skills does not correspond to the teaching of motor habits, which are crucial components of motor skills. Motor learning

is of permanent character and, at an advanced level of training, attributes of championships become no longer associated with physical fitness but with perfection in execution of motor programs in changing sports combat conditions in accordance with the tactical demands of sport competition. Despite extensive research in the area the variability and development of technical skills in sport ontogenesis have never been thoroughly analyzed for objective reasons related to assessment difficulties even with application of modern technology (biomechanical analysis, video recording, telemetry, EMG). It seems that thorough studies of these issues are not possible without the empirical approach, with a particular emphasis put on expert opinions and research results [12].

RESEARCH METHODS

1. The first long-term research study was carried out on a sample of 127 fencers of the Polish National Team at the introductory and championship training levels and on junior fencers. With the aid of optimization statistical methods factors with the greatest impact on sports results in fencing were identified. They included visual-motor coordination, choice **reaction time** using EMG, precision and speed test consisting of pinning down a falling glove with a fencing weapon, temperament and stimulation processes.
2. The second study was conducted on a sample of 22 novice and 16 advanced fencers representing three fencing weapons: epee, saber and foil. Adopting a perceptual-cognitive approach the research procedures were selected to reflect three different types of reaction: simple, choice and spatial anticipation (Figure 1A–C). The study made a system of testing of psycho-motor reactions with the use of EMG for differentiation between the latency phase and sensorimotor response.
3. The analysis and conclusions were completed with recordings of technique parameters during world championship duels of both senior and junior fencers and with opinions of leading combat sports and martial arts coaches in Poland [14,15]. It was revealed that the desired technical profiles of medalists promoted fencers with higher than average technical indices in offensive, offensive-defensive and defensive actions [16].

CONCLUSIONS

It has been assumed that **talent in fencing** is the ability to effectively acquire motor patterns understood as motor programs. The second criterion of fencing talent is effective execution of motor programs in sport combat understood as a correlation between the fencers' technical-tactical profile and their sport results. The

Reaction time (RT) – The interval of time that elapses from the presentation of an unanticipated stimulus to the beginning of a person's response.

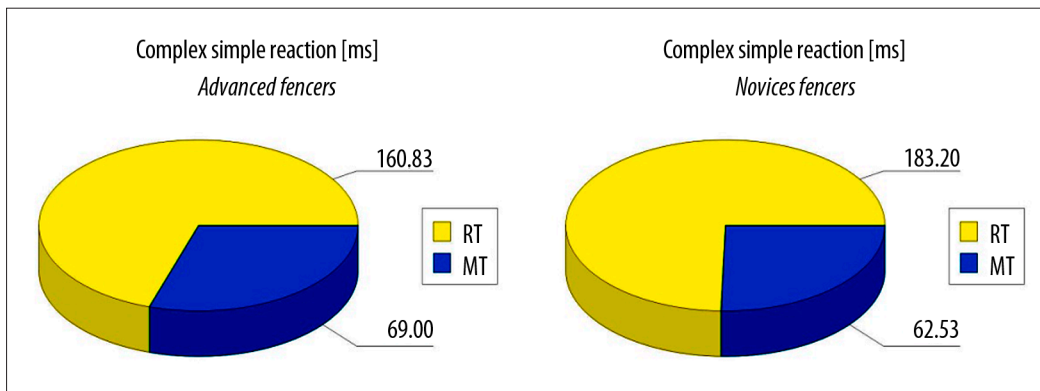


Figure 1A. Reaction time (RT) and movement time (MT) in simple reaction test [13].

Movement time (MT) – The interval between first muscle activity to the ending voluntary movement task.

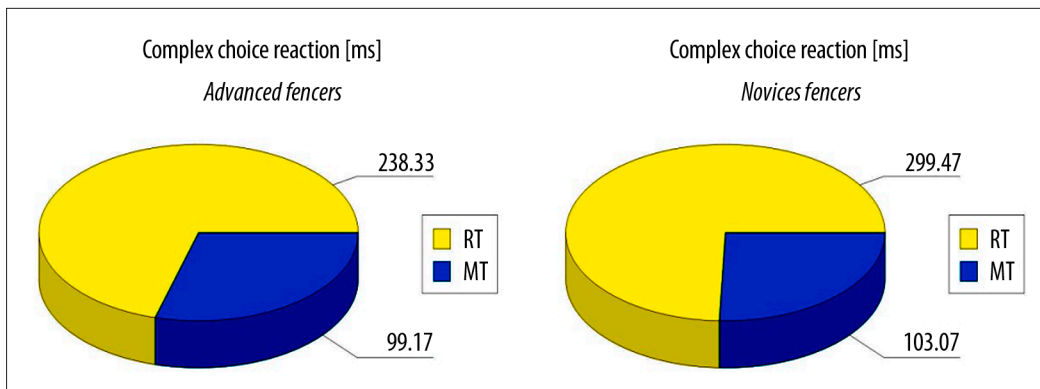


Figure 1B. Reaction time (RT) and movement time (MT) in choice reaction test [13].

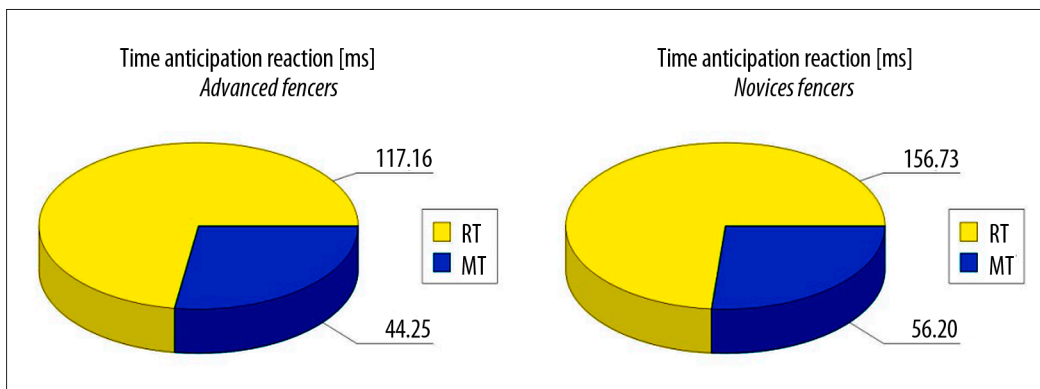


Figure 1C. Reaction time RT and movement time MT in spatial anticipation reaction test [13: p. 188].

Anticipation reactions – The anticipation of which stimulus (or the response to it) will occur; also called event anticipation.

Talent in fencing – Factors and traits decided about high level performance in sport fencing.

following conclusions concerning talent identification in sports with open motor habits can be drawn (on the basis of the analysis of novice and advanced fencers):

1. The study proved the significance of simple and choice reaction time in responses to visual stimuli, and the results showed the superiority (lower values of studied parameters) of advanced fencers over novice fencers. Also, the measurement of the speed of information processes (RT and MT) and analysis of simple reaction and choice reaction time results showed that elite fencers reduced their time of sensorimotor responses mostly in the middle phase, i.e. they perceive

and make decisions much faster than novice fencers. It is a permanent process of reduction of the latency phase in RT in the course of attainment of sport championship and it points to the influence of specialist training on the effectiveness of perceptual processes in advanced fencers.

2. The effectiveness of reactions to spatial anticipation signals was significantly higher in advanced fencers. It can be concluded that advanced fencers process the signals very early and react to the initial signals at a proper time. Too fast reactions were recorded as incorrect.

3. Statistical analysis and the coaching experience reveal a correlation between the quantity of actions (technical patterns) and the fencer's ranking place at top-level competitions. The champions, thanks to optimal stimulation, can effectively use the technical elements at their disposal, even in conditions of intensive mental stress. It is one of the main discriminating factors between advanced and novice fencers.

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