RESEARCH ON THE TIME PERCEPTION IN ATHLETES

Maxim KOCHERYAN[1*], Igor SEMENET[2], Elena DAVYDOVA[1], Stanislava FAGINA[1]

[1] Ural State University of Economics, Ekaterinburg, Russia
[2] Slavonic University, Kishinev, Republic of Moldova
*Corresponding author: sports-department@rambler.ru

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Abstract. *Modern concepts of athlete training activities include sets of adaptation measures that allow accurate perception of time. The effectiveness of an athlete's actions in sports, such as martial arts, gymnastics and rhythmic gymnastics, athletics, etc., depends on the exact perception of time intervals. Solving a wide range of motor tasks requires combined perception of spatial parameters and differentiation of micro-interval times. The purpose of the paper is to clarify the methodology for studying the characteristics of the time perception by athletes. As a basic research method, we used the definition of the endogenous sense of time of an athlete at various intervals and compared the obtained result with the astronomical time. A significant underestimation of the athlete's astronomical time was deemed as the predominance of the excitation state. On the contrary, the coincidence of endogenous and astronomical time was assessed as the possibility of consciously regulating actions, which makes it possible to achieve a high level of group coordination, for example, for joint team actions. It is recommended to use training sessions for bringing together feelings of endogenous and astronomical time with imitation of various training conditions and competitive activities of athletes. Athletes need to develop their ability to arbitrarily regulate the time of action. In order to form the "sense of time", the coach needs to be able to choose the right means and methods to solve the tasks, taking into account the peculiarities of the athlete's personality and the specificity of the sport.*

Keywords: *time perception, endogenous sense of the time, adaptation measures.*

Introduction

The "sense of time" is considered as an important psychomotor quality for athletes, a specialised perception, a component of a motor picture that provides a reflection of the duration and sequence of phenomena, of the motor control effectiveness under the conscious control of the pace and rhythm of action. Winfree (2001, p. 84) and Enright (1965, p. 426) argue that the accuracy of estimating and measuring the time interval indicates a conscious regulation of actions, i.e., the correctness of the comparison of objective results with what an athlete experiences during the execution of an action. The time perception is largely subjective and depends on many factors, such as the properties of the nervous system and the peculiarities of the inter-hemispheric sensory asymmetry of the actual mental state.

Many scientific studies on the phenomenon of the time sense represent living actionable concepts that are constantly growing and developing (Grushkoa, Isaevb, Kaminskyc, Leonovd, & Polikanovae, 2019; Duffield, 2003, p. 991; Gerasimov & Yashin, 2014, p. 17). However, the features in the development of a time sense in athletes, depending on the sport, gender and qualifications, are not yet well understood. The time sense is a figurative reflection of such characteristics of phenomena in the surrounding reality, such as duration, flow rate and consistency. The individual perception of the length of time periods essentially depends on the intensity of the activity and the emotional states generated during its implementation. The time perception reflects the duration, speed, sequence, pace and rhythm of movements, so the study of these features and patterns must be considered when shaping the personality of an athlete in sports training.

Of particular importance is the problem of time perception in complex coordination sports associated with the implementation of complex movements in the minimum amount of time. The control of rotational movements in the unsupported position is ensured by the coordinated work of the functional systems of the body, the inter-hemispheric organization of mental processes, which underlies the psychological preparedness of the athlete.

Material and Methods

To diagnose the individual characteristics of the time perception, the "Individual Minute" test was used to assess the "sense of time". The basis of this test is the assessment of the "sense of time" in combination with the type of vegetative response, the ability to synchronise internal with external time, endogenous with exogenous rhythms. It included the following test tasks: "Pure time", "Numerically and verbally neutral minute", "Sound interference", "Visual disturbance", "Motor disturbance", which reveal the subjective time perception by athletes when exposed to various stimuli: visual, auditory and motor ones (stressors). The subjects were asked to perform a

15-second intuitive subjective reading based on the internal (endogenous) sense of time. The recalculation was carried out for the 60-second interval (the individual minute) and the difference in the subjective assessment was determined in comparison with the astronomical time. Overestimation or underestimation of the time interval is a diagnostic sign of a change in the mental state of an athlete. The obtained data were processed using the methods of mathematical statistics: calculation of average values for the sample. The studies were conducted at the Ural State University of Economics within the university sports complex during 2018-2019. Forty-two athletes from various sports and with different qualifications were investigated.

Results and Discussion

The subjective time perception in athletes was 36.71 ± 1.85 seconds. 6% of subjects overestimated the time interval, and for 5%, the individual time was close to 60 seconds. The negative value of the individual minute reflects underestimation of the time interval, an increase in the excitation processes of athletes, their desire to accelerate the action.

Athletes in sports with conditional physical contact more accurately estimate time intervals (53.8 ± 0.70 seconds) compared to the absence of physical contact (33.9 ± 1.83 seconds) (Figure 1). This may be due to the fact that sports with physical contact mainly include cyclic types, in which competitive activity has a time limit, which can contribute to the formation of the time sense. Our data are confirmed by a study in which it has been found that sports characterised to a greater extent by the time dependence of actions have the shortest duration of the individual minute. At the same time, there are data showing that athletes in those sports that require the most perfect coordination and accuracy of movements (boxing, martial arts, gymnastics, hockey) estimate and measure time intervals most accurately, namely in the sports where there is no constant physical contact. Time intervals are less accurately perceived by athletes in those sports where physical activity is associated with prolonged exercise (swimming, skiing, football). In this regard, it is planned to study the features of time perception when stimuli of various modalities are exposed to athletes, in accordance with the specifics of the activity.

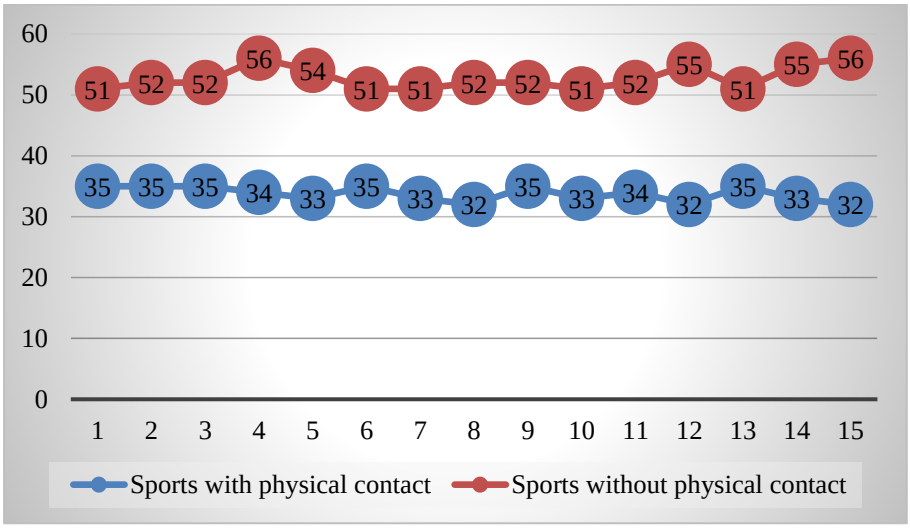

Figure 1. Subjects' estimation of the conditional minute by endogenous time depending on the presence of physical contact, in seconds

The accuracy of time interval estimation determines the nature of interaction with a teammate. In sports with joint-synergistic actions, a more accurate time perception (53.7 ± 1.53 seconds) was observed compared to athletes with joint-consecutive actions (42.3 ± 6 seconds) and joint-individual actions (33.02 ± 1.4 seconds) (Figure 2).

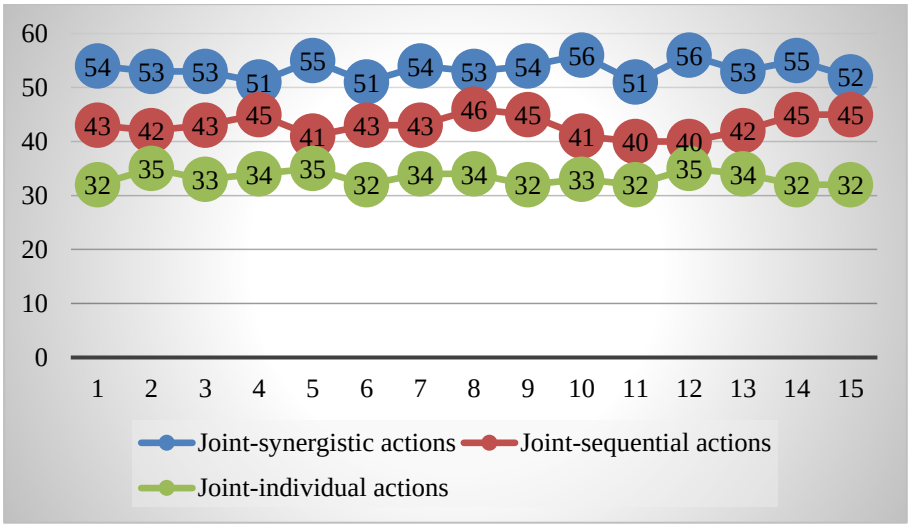

Figure 2. Subjects' estimation of the conditional minute by endogenous time depending on the type of joint actions, in seconds

The interaction of athletes with strict synchronisation of movements, which requires practicing clarity and control, contributes to more effective movement management, provided that the pace, rhythm and speed of psychomotor actions is consciously controlled. It should be noted that the time limit in competitive activity is also a condition for the formation of the time sense.

Next, we present the results of a study assessing endogenous time depending on the athlete's qualifications (Figure 3).

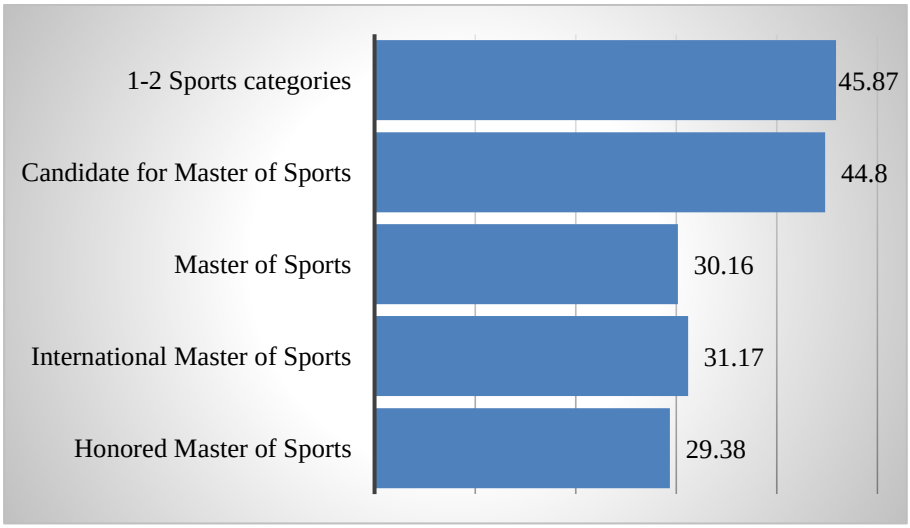

Figure 3. Subjects' estimation of the conditional minutes by endogenous time depending on the type of athlete's qualification, in seconds

During the study, significant differences were found in the deviation of individual minutes between athletes with different qualifications (temp. = 3.85 at $p < 0.05$). Honoured Masters of Sports, International Masters of Sports and Masters of Sports have less deviation (29.55 ± 3.55 seconds) than athletes with qualifications of Candidate for Master of Sports, 1st and 2nd Sports categories (43.81 ± 1.8 seconds). Less qualified athletes underestimate time intervals to a greater extent due to increased excitation of nervous processes. Thus, constant, perennial workouts order the daily rhythm of fluctuations in the duration of an individual minute and contribute to the development of specialised perceptions.

There are many studies of the time and space perception in men and women. So, it has been revealed that the individual minutes are significantly shorter for female athletes than male athletes. Women overestimate the

duration of time intervals more than men, meaning that time runs faster for them. In our study, there was no significant difference in the perception of time between girls and boys. The underestimation of time intervals by the two groups can be associated with both the conditions of sports activity and the pronounced masculinity of female athletes compared to women who are not involved in sports (Figure 4).

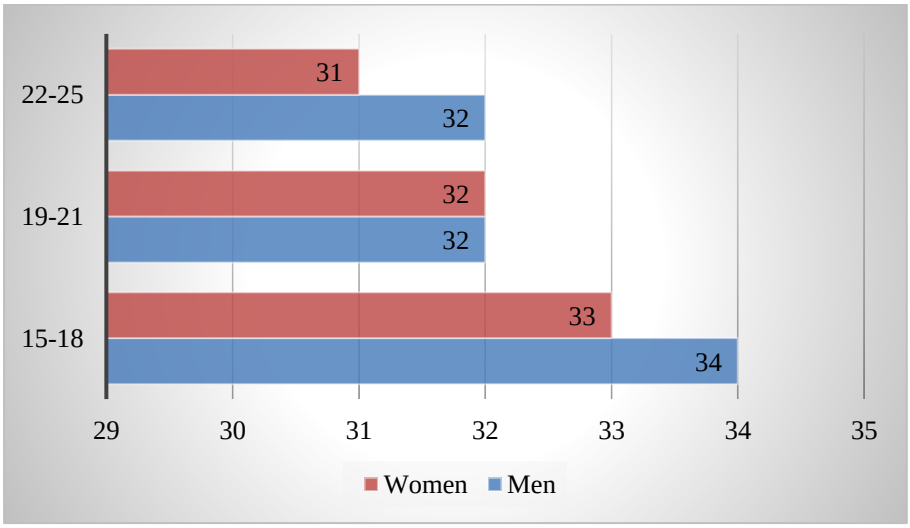

Figure 4. Subjects' estimation of the conditional minutes by endogenous time, depending on gender and age, in seconds

No significant differences in the time perception have been established among athletes in different age groups, which may be related to the study of athletes only in adolescence and youth.

In general, it can be noted that athletes have an inaccurate assessment and measurement of the time interval. This may be due to the subjective ideas about the duration of the present time, which are formed under the influence of the complex interaction of conscious and unconscious factors of the surrounding and internal spatial-temporal continuum. The specific influence of sports activities, the nature of interaction with a teammate and qualification and, to a lesser extent, the age and gender of an athlete have the greatest influence on the perception of time intervals.

Due to the great importance of time perception in complex coordination sports, a group of 51 highly qualified athletes aged 18-26 was identified; of them, 2 are International Masters of Sports, 21 Master of Sports and 28 Candidates for Master of Sports. The duration of an individual minute, according to the athlete's inner sense, was 34.74 ± 2.64 (Table 1). Underestimation of the time interval (-26.42 ± 2.74 sec) indicates the predominance of arousal.

Table 1. *Results of the diagnosis of subjective time perception by highly qualified athletes according to the "Individual Minute" test (sec)*

Indicators	M ± m
Result minute	33.4 ± 1.11
Account to myself	33.11 ± 1.21
Words to myself	36.15 ± 0.98
Melodious music	51.85 ± 0.88
Major music	42.06 ± 0.77
Minor music	45.38 ± 0.98
Neutral words	44.91 ± 0.87
Positive words	47.84 ± 1.32
Negative words	43.92 ± 1.22
Auditory deprivation	45.72 ± 1.64
Landscapes are positive	46.14 ± 1.60

Landscapes are negative	39.71 ± 1.71
Sports text is positive	48.00 ± 2.44
Sports text is negative	47.77 ± 1.15
Visual deprivation	42.80 ± 2.04
Applause	34.87 ± 1.78
Tension	47.15 ± 3.28
Relaxation	44.08 ± 2.99

We can state that a person's subjective impression of the present time duration develops under the influence of a complex interaction of conscious and unconscious factors of the surrounding and internal spatial-temporal continuum.

Moreover, the verbal and non-verbal forms of time reference with the use of numerals do not affect the functional status of highly qualified athletes. The effects of factors of different sensory modalities on the receptors determine the variability of the temporal assessment. So, the time perception with listening to music and speech is more accurate compared to the "pure time". A more accurate estimate of time is noted when listening to melodic and minor music, deprivation and speech effects: neutral, negative, positive.

The deterioration of the time interval perception when listening to applause indicates the influence of the audience's emotional attitude on the state and behaviour of the athlete. A more accurate score is recorded when reading a neutral text than when viewing landscapes. There are no changes in the perception of time with the emotional colouring of the text or images in athletes. Visual deprivation contributes to increased excitation processes, as evidenced by the large underestimation of time compared to other visual stimuli. Muscle tension or relaxation does not affect the accuracy of the assessment.

Conclusion

Studies have shown that the perception of the duration of time periods depends on emotional states. The specific influence of sports activities, the nature of interaction with a teammate and qualification and, to a lesser extent, the age and gender of an athlete have the greatest influence on the perception of time intervals.

Of particular importance is the time perception in complex coordination sports associated with the implementation of complex movements in the minimum amount of time.

Thus, the features of the estimation of time intervals when exposed to stimuli of various modalities may indicate the level of mental stability and self-control of an athlete. Expressive speech, emotionally coloured music or sound isolation allow athletes involved in challenging sports to more accurately perceive time intervals, more effectively manage movements and states. Specially organized events can be used to improve the quality of the training process and competitive activities using various stress factors to improve the "time sense".

The accuracy of estimating and measuring the time interval indicates a conscious regulation of actions, i.e. about the correctness of the comparison of objective results with what the athlete experiences during the execution of an action. At the same time, the stability of the interval measurement can be a sign of the ability to control the speed of movement.

In this regard, the focus of training on the formation of the "time sense" is a prerequisite for adaptation and effective activity. Athletes need to develop their ability to arbitrarily regulate the time of action. In order to form the "time sense" in athletes, the coach must be able to choose the right means and methods to solve the tasks, taking into account the peculiarities of the athlete's personality and the specificity of the sport.

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