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THE ROLE OF STATOKINETIC AND HYPOXIC EXERCISES IN IMPROVING THE ACCURACY OF MOVEMENTS PERFORMED IN SPORTS GAMES

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ABOUT ARTICLE

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Abstract: This article provides essential information for specialist coaches and researcher-scientists regarding the development and implementation of strategies aimed at enhancing sports performance. In practice, more attention is often given to managing intense training loads during annual preparation stages, particularly during competitive cycles, rather than optimizing the volume and intensity of training sessions. The focus here is on improving athletes' ability to withstand and overcome high-intensity loads by developing stable working capacity, functional reserves, and energy resources. The article highlights that many studies in the scientific literature examine how the disruption of static

and dynamic balance—especially in rapidly changing or extreme conditions often observed in various sports—negatively affects movement precision and performance outcomes. It also presents theoretical insights and practical recommendations for improving the stability of these abilities through the use of specific non-traditional exercises.

Introduction

In globally popular sports such as football, basketball, and handball, penalty shots awarded due to rule violations are executed under standardized conditions. However, even leading players sometimes deliver these shots inaccurately or off-target. Such mistakes, despite the routine nature of the action, can in certain cases cost a team victory or a championship title. Coaches and specialists typically attribute these errors to negative psycho-emotional reactions, insufficient emphasis on developing the technique and tactics specific to this action, or signs of fatigue. However, literature also points to another overlooked dimension of the problem—namely, a decline in postural stability, which leads to reduced coordination and accuracy of movements. Despite its potential impact, this aspect and methods to improve related abilities have not been systematically investigated in research.

Materials and methods

According to V.N. Platonov, in sports practice—especially in team sports—the effectiveness of a movement largely depends on its execution at high speed, with precision, purposefulness, and energy efficiency. Such abilities are linked to the athlete's capacity to assimilate new movements based on previously developed motor skills, to differentiate the structural elements of movement (such as muscle tension limits, temporal intervals, and the coordinated activity of body parts), and to perform complex movement combinations swiftly and skillfully. However, for these movements to be executed effectively, it is essential that the athlete possesses a well-developed ability to maintain both static and dynamic balance.

It is emphasized that the ability to purposefully perform and control complex, especially variable, movements depends on the integrated activity of nervous centers located in the cerebral hemispheres, including various analyzers such as visual, auditory, tactile (proprioceptive), and vestibular systems.

Based on his research, V.I. Lyakh highlights that in situational sports characterized by constant variability, the successful execution of different motor actions—particularly complex tactical combinations—requires not only the perception of muscle activity (contraction, extension, tension, relaxation, etc.) but also temporal-spatial coordination, balance control, the ability to transition from one movement to another, and the capacity for statokinetic stability. These elements are essential not only for teaching but also for developing motor skills.

A.S. Nazarenko, F.R. Zotova, F.A. Mavliyev, and A.S. Chinkin conducted research on qualified football players and concluded that regular execution of exercises with sudden changes of direction under extreme conditions leads to adaptation of the vestibular analyzer receptors. As a result, the stability of balance improves. Nevertheless, it is also acknowledged that continuous training of balance stability can positively influence the effectiveness of movement execution.

According to A.S. Nazarenko and N.Sh. Khasnutdinov [2016, pp. 157–160], and A.S. Nazarenko [2011, pp. 726–732], in football (and other team sports), the highly dynamic and intense movements performed under unpredictable conditions can, first, trigger signs of fatigue, and second, directly affect the vestibular analyzer receptors. This can lead not only to balance disruption but also to a decline in the coordination and control of decisive game-related actions, reducing the accuracy of both simple and complex motor reactions.

They argue that unspecialized static or stabilographic tests are insufficient to objectively and qualitatively assess balance stability in both athletes and non-athletes. In such tests, the role of the vestibular analyzer may be passive. However, when rotational motion loads that strongly stimulate the vestibular analyzer are applied during these tests, a noticeable reduction in balance stability is observed.

Result and discussion

In sports practice—particularly during various stages of athletic preparation—it is common to begin the investigation of a specific issue by conducting interviews, discussions, and surveys with coaches and athletes. Based on the outcomes of pedagogical observations, further targeted and ongoing research is typically carried out. Following this tradition, we also began our study by conducting surveys among relevant respondents.

Surveys were administered in an express, offline format to a group of coach-instructors actively working in football, handball, and basketball. This approach was chosen to minimize the possibility of consulting others while responding, thereby ensuring more objective answers. To further encourage honest and accurate responses, respondents were assured of anonymity and confidentiality, and were informed that their input would help improve the quality and effectiveness of training sessions.

The results revealed the following: in response to the first question, "Is penalty kick training regularly practiced during sessions?", among 23 football coach-respondents, 5 (21.7%) answered "yes," 14 (60.9%) answered "no," and 4 (17.4%) responded "not necessary" (see Table 3.1). This question was included based on observations that in specialized football schools, clubs, and even elite training centers, the execution of 11-meter penalty kicks is either rarely practiced or not regularly incorporated—particularly following intense anaerobic loads.

This lack of focus may explain why even top-tier professional football players occasionally fail to successfully convert penalty kicks during matches. In teams or groups that do include penalty kick practice, the emphasis on mastering its technique and tactics still often appears inadequate. This is supported by the responses to the second question, where only 3 respondents (13.6%) answered "yes," 15 (65.3%) answered "no," and 5 (21.7%) said "not necessary."

It is well known that in today's fast-paced football matches, penalty kicks are typically executed in a heightened neurophysiological and vegetative state. At the moment of execution, the player's body may not have fully recovered; breathing rate and heart rate are elevated. In

certain situations, even highly experienced players may fail to strike the ball accurately due to this physiological strain. This observation is reflected in the responses to the third question, where 4 respondents (17.4%) answered “yes,” 15 (65.2%) answered “no,” and 4 (17.4%) responded “not necessary.”

Table 1

Survey Results of Football Coach-Teachers Respondents – n=23

№	Questions	“Yes” (count/%)	“No” (count/%)	“Not necessary” (count/%)
1	*Is the penalty kick practiced during training sessions?*	5 / 21.7%	14 / 60.9%	4 / 17.4%
2	*Are the methods of executing a penalty kick specifically developed?*	3 / 13.0%	15 / 65.3%	5 / 21.7%
3	*Is the penalty practiced under intense technical-tactical drills and combinations?*	4 / 17.4%	15 / 65.2%	4 / 17.4%
4	*Is the penalty practiced under hypoxic conditions during intense anaerobic loads?*	0 / 0%	16 / 69.6%	7 / 30.4%
5	*Is the penalty practiced when signs of fatigue increase?*	2 / 8.6%	18 / 78.4%	3 / 13.0%
6	*Is the penalty practiced after sharp sprint-stop and turning/spinning movements?*	3 / 13.0%	17 / 74.0%	3 / 13.0%
7	*Is the technique and tactics of penalty execution specially taught?*	6 / 26.1%	13 / 56.5%	4 / 17.4%
8	*Is penalty kick execution developed in a competitive format?*	2 / 8.6%	17 / 74.0%	4 / 17.4%

Although question 4 is conceptually similar to question 3, respondents may have considered that during training involving intense anaerobic loads, increased oxygen debt and accelerated breathing make it impractical to practice penalty kicks. This is reflected in the responses: no participants selected “yes,” while 16 respondents (69.6%) answered “no,” and the remaining 7 (30.4%) considered it “not necessary.”

Conclusion

Based on the comparative analysis of the results obtained from the express survey, pedagogical observations, and ongoing research conducted within the framework of the selected topic, research aim, and objectives, the following conclusions can be drawn:

The results of the survey carried out among football, handball, and basketball coach-educators (respondents) revealed that only 19.3% to 28.6% of them acknowledged the necessity of practicing penalty shot accuracy during training sessions in these sports. Furthermore, it was found that little to no serious attention is paid to developing either the technical or tactical aspects of executing penalty shots, with only 0% to 13% of respondents confirming such efforts. Similarly, research conducted among qualified handball and basketball student-athletes revealed a parallel trend, highlighting the same pattern of neglect in systematically developing penalty execution skills during training.

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