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Model characterizing sports game referees

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Abstract. The question concerning such a person who is forced to work in the conditions of increased stress and about work safety still is a psycho-physiological part of a broader problem. Referees of sports games can also be added to this group as this occupation has become their profession. Today, there is a situation that in order to enroll the most suitable individuals in this job position it is necessary to select the candidates for sports game referees according to strictly worked-out criteria. The aim of the study was to investigate the abilities characterizing high quality sports game referees. 18 international level referees of sports games in Latvia were selected as subjects of the research. To state the subjects' physical ability, functional state, psychological peculiarities the following were applied: a computerized testing device "Omega" was used to assess the functional state of the body; situation alertness, psycho-emotional stability, self-regulation ability and motivation were stated with the help of tests used in sport psychology; simple reactions and the quickness of alternative reaction were measured using the computer system Vienna Test System. 16 parameters of each subject were obtained, and they were processed using Factor analysis – closed variant of the main components with the following turning of the referent axis according to the Varimax criterion. With the Factor analysis nine main factors were obtained characterizing sports game referees. Their contribution in the common dispersion is 93.7%. Seven factors of higher value were interpreted, and they were as follows: choice reaction time, its contribution in the dispersion 30.31%; functional state of the body and readiness (17.92%); correctness of the answers in choice reaction time test (the quality of the decisions made) 15.40%; the simple reaction time (9.02%); IQ coefficient (7.20%); psychological preparedness (5.01%) and the ability to concentrate (4.80%). The quickness of the alternative reaction and the quality of the decision made in this situation were the most important abilities characterizing high quality referees. The second most significant parameter is the functional and physical abilities of referees. Psychological ability and preparedness are important for referees. It is supposed that developing the above mentioned components a more successful preparation of sport game referees will be possible.

Introduction

Referees are the specially structured subgroup of individuals. They are the constituent part of team competitions and as such attract attention of sport public, as well as the broadest social environment. Refereeing in sports has multiple dimensions, with the most significant ones being of legal, social, moral, psychological, and economic dimension. Professional sport requires the professional refereeing,

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characterized with the adequate psychological preparations, high-quality and high-level expertise of referees, as well as the correct and composed attitude towards all participants [24]. Under such conditions, referees require excellent visual skills to catch details of action on the field during matches. They also require the cognitive skills to predict actions, know which actions to watch, and to make rapid and appropriate decisions. These skills should be investigated in referees as well, to assess whether they play a similar role in this related and complex task [3].

Referees should have excellent vision ability in order to notice all action nuances on the court during a game. Referees should also have cognition skills to anticipate the actions of the persons involved in the game to know which actions to observe, and to make fast and adequate decision [8].

There is a section where an ideal referee is described in the USA Basketball Rules. An ideal referee is characterized as a man who, during a game, notices everything, but he himself is seldom noticed [23]. He is quick-witted and has initiative, powerful voice and simple behavior without pomposity. Such referee is tactical, considerate, kind and not too strict. But he controls players effectively, with understanding and always takes care of players' physical and mental feeling of comfort, fully cooperating with other officials of the game. An ideal referee is also able to be physically in the right moment in the best place of the court and he knows absolutely all rules of the game and how to interpret them in each situation. A wide insight in the special literature shows that sports game specialists' opinion concerning the main and decisive factors of referee work quality differs [11]. To lead the games successfully referees' physical preparedness should be similar to the one of players. Therefore the referees of the international category have to take the norms of physical preparedness once a year [14, 15]. These tests are directed towards the control of referees' functional condition. Referees do not take the norms of bio-motor ability and to our mind such norms have not been developed yet. However, we think that if not all then some referee's bio-motor abilities should be at the similar level with players. The question is – which abilities?

When leading a game, referees should use not only the rules of the definite kind of sport, but also the common sense for coaches to understand that both teams have a chance to win fairly [18]. It is not an easy work, but it should be perceived as work. Refereeing of team contact sports is an excellent context to study complicated decision making and functions which refer to different fields where people have to make fast decisions. Research about complicated decision making in limited time shows that referees rely on heuristics (the system of logical elements and methodological rules, which usually are not studied and proved, to find out the truth; as well as a teaching method that promotes activity and inventiveness) [6, 17].

From the above mentioned we can understand that sports game refereeing does not only involve knowing rules very well and the practical application of this knowledge. There is a range of different qualities both physical and also psychological, and if a referee, when officiating a game, does not develop them, he cannot reach high professionalism nor officiate competitions of the highest level. So, a referee should be a many sided physically and mentally developed personality [7]. It is known that there are not many referees in the world whose authority is respected and recognized by players and also the large number of spectators. Where can we get such people from? Here we see two ways: firstly, to educate and prepare young referees who have the necessary abilities and, secondly, to select the people suited for refereeing already in childhood. In both cases definite criteria are necessary to find the desirable individuals, train them specially and develop definite abilities. The **aim** of this research is to find out these criteria.

Theoretical background

In most team sports referees should take into account a range of different information sources (for instance, markers on the court, positions of players and the ball, the information given by other referees etc.). They have to make fast decisions which can be analyzed and criticized when watching decelerated repetitions of the game records from different views [5, 16]. In such conditions, referees should have

outstanding abilities in order to notice all action nuances on the court during the game. Referees should also have a skill to anticipate the actions by the people involved in the game to know which actions to observe and to make fast and adequate decisions [8]. Summarizing his long-years experience, Mifelis Rubenis, the football referee of the International category from Latvia, agrees that to lead a game at a high quality level a referee should do it in a way that his whistle is heard as seldom as possible. But his presence and actions have to be seen on the whole court by both players and spectators [21].

However, in many researches from the view of the social role theory, it is found out that individuals have the habit to use hopes based on stereotypes, related to sex, when decisions are to be made in womanly and manly fields and can face social sanctions if they violate their roles [22].

Making of inaccurate decisions by a referee can change the course of the game and cause significant financial consequences for the clubs, thus affecting also players' career [17]. Sports game referees have to make decisions in the conditions when pressure from players, coaches, spectators and mass media is present. Referees also make decisions in short time and from different visual positions. Thus, refereeing is a complicated action of decision making where the necessity to interfere (when violation is observed) is not self-evident in most cases for other people being present. Acting in such conditions, it is not surprising that referees rely on evaluating heuristics, and that this reliance on heuristics can affect referees' decision making.

Is there anything else what is common for successful referees? As S. Ellinger, the USA university and college referee, head of Southwest basketball referee school, points out, that they all communicate well [23]. Communication skills essentially make game control easier and help to avoid potentially expected difficult situations. Communication is defined as a complex process where its participants convey and receive messages [19]. Is communication effective or isn't, it depends of communicators' language, approach, nonverbal signals. Correctly chosen means provide successful communication.

The research carried out by specialists [2, 9] testify that the aerobic abilities of basketball referee organism are as developed as the ones of professional players. Statistically significant difference is not observed on the level of functional capacities between young (26–32 years old) and older (33–46 years old) players. It is natural that elderly referees are better in refereeing quality indicators, as well as they have bigger experience in leading high level games. Taking a look at the question – why basketball referees having weaker mechanical abilities have on average better marks in refereeing quality, the authors admit that the results obtained in research show the complexity of a basketball game what is directly related to the complexity of basketball rules. All research subjects were physically well trained and they had shown theoretical knowledge of basketball rules adequate to the highest criteria [2, 10].

Referees act in the conditions of significant physical and mental tension. It puts higher requirements regarding referees' functional abilities. Researching football referees, the Russian scientist A. Shibayev [26] has concluded that the necessary professional qualities include the functional abilities of the vision analyzer, choice reactions and the length of their components, stability of intellectual and professional activity, as well as the dynamics of these parameters during physical load. D.R. Mascarenhas in his research has identified the qualities which characterize professional proficiency of volleyball coaches: objectivity, adherence to principles, responsibility, immunity to troublesome irritators, competence, as well as a definite mechanism regulating a referee's activity in game conditions (procession of information, attention, operative memory, field of vision, sensory reactions etc.). Acknowledging the necessity for a wider range of instruments, there are attempts to evaluate effective refereeing by classifying indicators of good performance, for instance, working out in knowledge based a referee development system and the international referee assessment forms based on indexation analysis by the board of a definite sport [16]. Physical and mental preparedness is obligatory for referees. Exercises strengthening the cardio-vascular system have to be included in a daily training process before the season. Walking and jogging facilitates the strengthening of the function of the heart at the level what is necessary for being able to move across the court in the next following months [12, 13].

To provide effective refereeing in professional games only competence and elements based on minimal standard may turn out insufficient. Empirical research is necessary with the results substantiating scientific support programs to provide training a program for effective professional development [20]. From the view of sports management referee development usually is referred to some form of physical condition test and written examination on the rules of the game. It is clear that these two indicators are very important in referee performance. However, although general physical preparedness assessments, for example, many level fitness test can provide a possibility to be allowed to referee a game, as well as theoretical test can show referees' knowledge about the rules, little is done to evaluate other, possibly more important aspects of referee activity that determine successful application of this knowledge.

There are researches which prove mutual unity of the body physical and intellectual activity. It is proved in research that human's mental and physical condition strongly mutually affect each other what is very important in sport [25]. Intellectual level is a significant factor in order to achieve good results in sport. A number of researches link intellectual capacity to success in sport. Particularly, the link between intellect and education level is emphasized, that is, athletes having higher IQ not only succeed more in sport, but also they have higher level education [24].

Intellect is the ability to understand the gained knowledge and apply it to solve problems. An individual having high intellect is able to intuitively make decisions and find optimal solutions, as well as untraditionally solve difficult issues even having limited knowledge. In other word, intellect is the coefficient of the mind activity caused by searching of information correctly in the flow of knowledge. For instance, the ability to learn, think logically, systemize information, analyze and classify it in order to state its suitability, to see connections or differences in the obtained information and associate it with similar previous information. Inquisitiveness and depth of the mind, its flexibility and mobility, the skill to think logically and to prove are considered to be essential qualities of human intellect. These are the qualities which should be developed [25].

Sport games are becoming more and more dynamic, attractive, faster and also risky. Therefore, not only other game philosophy, but also other physical preparedness is required from players. Now, the development of strength, speed and aerobic endurance are in the focus of attention. Also referees should adapt to these changes and more than ever they should be aware of their condition. Referees, contrary to players, cannot be substituted or relax during a game [9]. Their duty is not only to keep up with the pace of the game, but also to endure the "temperature" of the match [2]. Referees should move so that they always manage to be "in" every situation, as a correct choice of position often provides making of a right decision. Believing that the gaps of physical performance can be only lessened, but it is not possible to avoid them fully, state and international referee governing institutions should try to select talented referees who show good level performance in aerobic and anaerobic tests adequate to their age [4]. Testing of physical possibilities will help to solve a range of questions – also to state athlete (referee) conditions and bio-motor ability development [20].

The expressions of an athlete's mental condition are the following: being or not being confident about oneself; the level of anxiety; feelings of comfort or discomfort; ability to maximally concentrate and maintain attention during the game process; condition characterized by an athlete's readiness and determination [25]. According to the analysis of the practical research results by the psychologists, the minimal program of psychological skill development includes the skill to regulate anxiety (emotional control), the facilitation of self-confidence, the development of imagination [25]. Referees should work to increase the attention concentration abilities and aim setting skills.

In fast physical contact sports, games players, coaches and spectators continuously, energetically express their emotions in order to turn competition referees' decisions to their advantage. During a game a referee usually makes hundreds of decisions. Facing this continuous pressure, he has to make immediate, very fast decisions otherwise difficulties can arise in further leading of a game.

The main task of referees in a game is to identify and evaluate players' deviations from the rules of a game ("faults") – the faults of the game element execution and tactical activity by separate players and the team. Referees have very short time to make decisions, besides decisions have to be made very often during a game. For example, after the World Cup 1986 competitions the analysis showed that football referees make one decision on average in every 40 seconds [1]. The necessity to decide sequentially and quickly requires from referees stable attention and high concentration.

Attention is a special condition of consciousness that deviates and concentrates human cognition processes to the objects and phenomena to be studied for fuller and more precise reflection of reality. Although attention is not continuous cognition process and does not exist as separate psychic phenomenon, it plays essential role in cognitive processes, as attention is linked with all sensory and intellectual processes especially it is attributed to perception and feelings [5] explains this many-sided characterization of attention with some human anatomically-physiological peculiarities of the nervous system:

- at psycho-physiological level – such indicators as the brain electrical activity, the heart functioning and breathing changes, the eye micro-movements etc.;
- at muscle motor level – the body and extremity macro-movements, movements to the attention object by the organs of sense (for example, the movements of the apple of the eye);
- at behavior level – poses, facial expression, gestures, the head movements etc. [25].

Often, in order to prepare for the game, it would be useful for referees to think about the basics – the things which seem to be self-evident. They are simple and general, for instance, to remember the main tasks and to increase more and more one's concentration level. Pre-game state is important as it gives a possibility to a referee to discuss situations from the previous experience with his partner. Thus, a referee enriches himself, intensifies his knowledge and ability to cope with different game situations [23]. As S.Andorka, has concluded that referees are the most worried by social isolation after "bad" performance, negative reports by referee controllers, mass media comments and spectators [2]. So, for a good referee besides the above mentioned needed abilities and qualities it is necessary to maintain also high self-confidence. So, to become a high quality sports game referee an individual should have and develop a number of abilities and qualities.

Aim of the study was to investigate the abilities characterizing high quality referees of sport games and factorial model of referee preparedness.

Subjects and methology

18 international level referees of sport games in Latvia were selected as subjects of the research. To state the subjects' physical abilities, functional state, psychological peculiarities the following were applied: a computerized testing device "*Omega*" was used to assess functional state of the body. Situation alertness, psycho-emotional stability, self-regulation ability and motivation were stated with the help of tests used in sport psychology. Simple reactions time and the quickness of alternative reaction were measured using the computer system *Vienna Test System*. In general, all abilities and features emphasized by specialists to characterize top level professional sports game referees were tested. In some tests we got more additional information. 1. The choice reaction time was tested: 1) by vision choosing an object without additional irritation; 2) by vision choosing an object with additional irritation; 3) reacting to one symbol; 4) reacting to two symbols; 5) without motor activity (the latent period); 6) the choice reaction full time in combination with motor activity. 2. In the functional preparedness test it was stated: 1) the adaptation ability to physical load; 2) general condition 3) the organism energetic reserves; 4) psycho-emotional condition; 5) general functional condition. 3. Evaluating the answer correctness of the choice reaction test, it was stated: 1) the number of total faults; 2) the number of faults in visualization. 4. Having measured the simple reaction time, it was

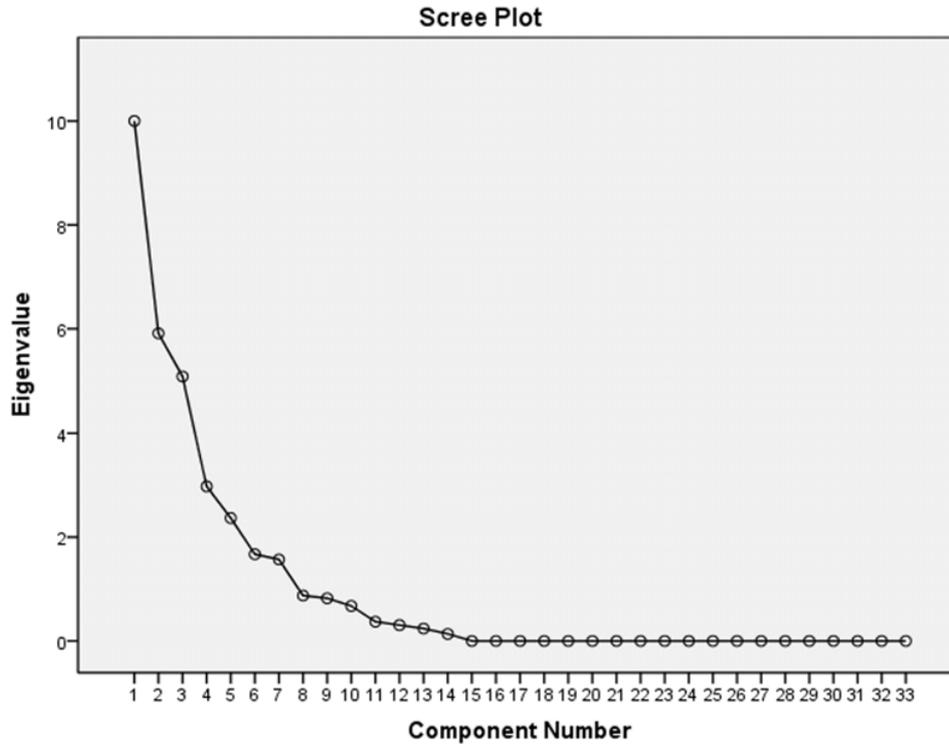


Figure 1. The number and significance of the obtained factors.

stated: 1) total reaction time in the test; 2) motor time; 3) the latent period dispersion. 5. Evaluating the psychological preparedness, it was stated: 1) psychically-emotional stability; 2) self-regulation ability; 3) motivation. 16 parameters of each subject were obtained, and they were processed using Factor analysis – closed variant of the main components with the following turning of the referent axis according to the Varimax criterion.

1. Results and discussion

33 factors were obtained as a result of the testing result analysis. The distribution of the factor values is shown in Figure 1. It can be clearly stated here that only the most valuable 9 extracted factors would have a bigger or smaller effect on the preparedness of the tested individuals.

For interpretation 7 main factors with their contribution to the total dispersion was 89.62% were chosen. The characterizing parameters of these factors are seen in Table 1.

We interpreted these factors as follows: 1. Choice reaction time 30.31%; 2. Body functional condition 17.92%; 3. Answer correctness of the choice reaction test (quality of the decisions made) 15.40%; 4. Simple reaction time 9.02%; 5. Physical and mental development 7.20%; 6. Psychological preparedness 5.01%; 7. Concentration ability 4.80%. However, there are also possibilities to evaluate also other abilities, for example, concentration. Thus, a factor model was obtained. In our opinion, it will be able to serve as the basis for new referee selection process, as well as for the working out of referee development program.

Making the Factor analysis 9 main factors were obtained characterizing referees of sports games. Their contribution in the common dispersion – 93.7%. 7 factors of higher value were interpreted,

Table 1. The main factors characterizing sports game referees.

Component	Extraction Sums of Squared Loadings		Rotation Sums of Squared Loadings		
	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	30 309	30 309	6540	19 818	19 818
2	17 916	48 225	5979	18 119	37 937
3	15 400	63 624	5601	16 972	54 909
4	9019	72 643	4262	12 914	67 824
5	7173	79 816	2886	8746	76 570
6	5061	84 877	2510	7607	84 177
7	4755	89 632	1800	5455	89 632

The factorial model of Sport games refferees

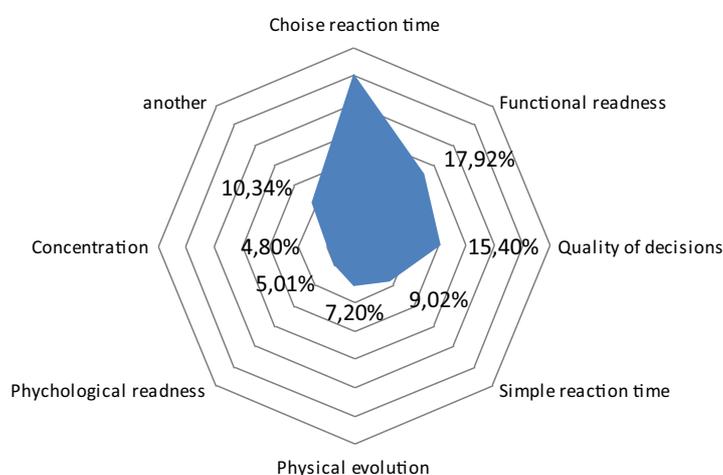


Figure 2. The factorial model of abilities and qualities of high qualification referees.

and they were as follows: choice reaction time, its contribution in the dispersion 30.31%; functional state of the body and preparedness (17.92%); correctness of the answers in the choice reaction time test (the quality of the decisions made) 15.40%; the simple reaction time (9.02%); IQ coefficient (7.20%); psychological preparedness (5.01%) and the ability to concentrate (4.80%). The quickness of the alternative reaction and the quality of the decision made in this situation were the most important abilities characterizing high quality referees. The second most significant parameter is the functional and physical abilities of referees. Psychological ability and preparedness are important for referees. It is supposed that developing the above mentioned components a more successful preparation of sports game referees will be possible.

Conclusions

1. The feature which characterizes sports game referees the most is their choice reaction time and the quality of the decisions made (45.71%).
2. A great significance should be paid to their physical and functional preparedness (17.92%);
3. In the referee characterization an essential place is taken by their psychological ability and preparedness (9.81%).

4. Taking into account the obtained results it is possible to develop the referee work quality improvement program.

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