

Study of Anticipation in Handball through Interactive Tests

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Abstract Following a theoretical analysis of current trends in handball game and taking into consideration that the flow speed of game situations and the choice of technical and tactical methods, decisions and actions are subject to strict time, we tried to select appropriate videos for mental and motor activity in handball. They were classified into separate groups in order to create tests for assessing anticipation. Interactive software was created for selecting interactive tests, and the tactical issues, evaluation of the accuracy and response time for the surveyed handball players were set as well. The statistical processing realizes the implementation of the objective of determining (diagnose) the state (level) of anticipation, the age of handball players in their specific game environment under competitive conditions. The software development provides the researcher with a standard format of recording information of the experiment. At further development of the project, the algorithm analyzing the results achieved so far can be interpreted according to the new guidelines for the development of the idea of evaluation of game situations for surveyed athletes.

Keywords Video Clip, Interactive Test, Handball

1. Formulation of the Problem

In handball, as a team game, the final success is a matter of team efforts, i.e. of all handball players. Without disregarding this truthful statement, the researchers would like to emphasize that at its bottom, from a sports technical point of view, the factor of most significant importance is the winning of the "one-to-one" contest, which puts the duel between the offender and defender in the first place and the one between the offender and the goal keeper – in the second place (not in order of importance).

In sharp conflict situations, which actually are the essence of the handball game, anticipation (A) has crucial importance.

According to P.K. Anokhin (1962, 1979), anticipation is a specific form of "PRE-EMPTIVE REFLECTION" during which the image of the result of the action of its actual conception is formed in human mind.

When used in the context of sport psychology, the term "anticipation" is understood as the ability to predict partner's or opponent's moves.

In researchers' point of view, anticipation in handball is a preemptive creative mental and motor activity!

Intuition, is defined by us as a sense, ability to unconsciously penetration into the essence of phenomena, insight.

Intuition and anticipation are interrelated and they interact with each other!

On the other hand, in extreme situations of competition, the operational thinking (its intellectual parameters), which helps to shorten the time for decision-making and its optimization, also holds an essential place. At this point the authors have to underline that *game situations in handball run at high speed and the choice of technical and tactical maneuvers, decisions and actions are subject of strict time.*

The role of anticipation in the "duel" between offender and goalkeeper and vice versa, powerfully stands out in this specific aspect. Right at this point, the ability of the shooting handball player (of the goalkeeper respectively) to mentally and intuitively foresee (and forestall) the actions (or counteractions respectively) of the opposing subject, stands out as of the very first importance!

A given action can be performed before the appearance of the expected signal through the „movement” of thought. This is specifically clear in “discerning” (i.e. “deciphering”) of game situations or in outplaying with the offender / defender / goalkeeper, when the handball player guesses of what is forthcoming!

Anticipation creates skill – the actions (and counteractions respectively) of the shooting player and the goalkeeper to be confidently performed within a split second, called ex-prompto (ready on the spot), which can be considerably improved through many years of training ever since childhood (7-8 years of age).

In researchers' point of view, the potential moment for solving this problem lies in unraveling the "mysteries" of anticipation in handball and outlining the route to its formation right from the earliest childhood.

2. Research Methodology

Aim

To establish (diagnose) the state (level) of anticipation in terms of handball players' age in a specific for them game environment under competitive conditions.

Tasks

1. Selection of suitable video clips on motor activities in handball and composition of anticipation assessment tests.
2. Arrangement (systematization) of the selected video clips by series of their distribution into groups and their video editing.
3. Development of a software for interactive selection of video clips, setting a tactical question, assessment of examined person's response correctness and time.
4. Processing and analysis of obtained research results.
5. Development (elaboration) of a normative table.

The creation of a new research method on anticipation in handball was preceded by three pilot studies which provided an opportunity to specify the manner of work, the instructions, to make a number of improvements in the specially developed software.

On the grounds of all the records of handball matches at the Olympic Games 2012 and the World Championships 2009 for women and 2013 for men, 70 situations were selected for the test which were compiled into 5 subtests involving 14 tasks (situations) each of them. Using this 70-items variant of the test (i.e. of 70 situations), 149 handball players (of which 111 men and 38 women) from 8 clubs in 7 cities/towns – Sofia, Svishtov, Varna, Dobrich, Burgas, Haskovo and Bankya were examined.

The solution of the first and second tasks required a selection of the videoclips, video editing and their preparation for putting into the computer memory. The video editing computer program Adobe Premiere Pro, which was purchased through the project, was used for the accomplishment of the above.

Examples of the tasks from the test are presented at the pictures in Appendix 1.

3. Development of a Software for Interactive Selection of Video Clips, Setting a Tactical Question, Evaluation of Examined Person's Response Correctness and Time

The solution of the third task required a development of a device for demonstration of video clips, a possibility for an easy interactive access to them and evaluation of time and correctness of the practical actions of the examined person. A standard computer was chosen to serve as such a device for its operational flexibility by inputting a specialized program and measurement of the response time, assessment of answer's correctness and output of a final result for the examined person in line with the adopted standards of statistical data processing. Apart from that, the projection of the video clip had to be able to stop at a specific moment, which is typical for choosing further actions of the team. The measurement of the response time followed from that moment on. The researchers preferred the option of a computer program built from Pascal giving an easy interactive access to the selected clips, control of the visual presentation of the game situation from the video clip, measurement of the time for giving an answer, assessment of its correctness and recording (archiving in a standard computer format) of the results in the computer memory.

The video clips were divided into five distinct groups based according to their intended use in the practical handball activities. The individual results obtained in the process are insufficient for an overall assessment of the collective abilities of the team. Therefore, the researchers moved on to further processing through a variation analysis of team's results. They were directed towards the measurement of the successful answers percentage for the separate five menus. Moreover, the average response time was also found. A graphical model of the team, visually showing the comparison of the results obtained from individual players, was created by means of the coefficient adopted by us.

4. Processing and Analysis of Obtained Research Results

While conducting the research and processing the results, the researchers proceeded from the theoretical assumption that anticipation, i.e. the very pre-emptive action (foreseeing) itself, can be divided into two interrelated parts: motor activity and game environment (space and time).

Handball players are required to:

1. To foresee the „fields“ of the ball (game environment).
2. To comprehend the purposefulness of their own movements in the event of probable changes in the positioning of the opponent (motor activity).
3. To correctly assess the course of the game and to program their conduct/action (game environment).
4. To foresee the ultimate purpose or the subpurposes, the alternatives and the stages of the action (motor activity).
5. To predict, i.e. to grasp the consequences of their own actions and those of the opponents in advance (complex).

Results of the Conducted Research

At this stage, in view of the number of the individuals covered in this study the researchers are going to make an analysis of the obtained common results of handball players (both men and women).

The following summary is derived from the analysis of table 1, which illustrates the mean values of the average response time in seconds for both genders:

1. The time for anticipation of an action of male and female offenders is equal to (4.8 sec.), while regarding the actions of defenders the difference is quite insignificant (5.7 sec. against 5.5 sec.) in favour of female players.
2. Anticipation of actions in the contest between a goalkeeper and a player (in 7 m. throwing) – the time is shorter for female handball players (6.45 sec. against 6.9 sec. for male handball players), which could be explained by better technical and tactical counteraction of male goalkeepers. And vice versa, in a dynamic (one to one) situation, male handball players give a correct answer within a little bit shorter time (5.98 sec. against

6.1 sec.).

Fig. 2 reflects the average values of the coefficient obtained after dividing the % of correct answers by the average response time, i.e. the higher numerical values mean higher results.

The conclusions of the researchers are as follows:

1. The most significant differences in favour of men are obtained for the coefficient of defenders’ anticipatory actions (Defender) – 17.12 against 15.86, of offenders (Offender), respectively 18 and 16.3, as well as in the anticipation of the interactions of the goalkeeper with the defense (13.19 against 9.35).
2. The coefficient of female handball players is higher in anticipatory actions in dynamic contests between the goalkeeper and a player ((one to one) – 13.88 against 12.84).
3. Significantly lower is the difference in the coefficients for anticipatory actions of the handball players in the contest goalkeeper-player (one to one) in static situations (9.85 against 8.91 for women).

Table 1. Mean values of the average response time for both genders (sec.)

№	Series – S1	Average – t	
		men	women
1.	Anticipation of actions of handball players (contest: goalkeeper-player) in static situation (7 m. throws) – „one to one” - B static	6.9	6.45
2.	Anticipation of actions of handball players (contest: goalkeeper-player) in a dynamic situation (in motion)– „one to one” - B dynamic	5.98	6.1
3.	Anticipatory actions of defenders (according to offenders’ actions) Defender	5.7	5.5
4.	Anticipatory actions of offenders (according to defenders’ actions) Offender	4.8	4.8
5.	Anticipation of actions of the goalkeeper and of the defense (interactions) when shooting into the offender’s goal - Goalkeeper	5.7	6.6

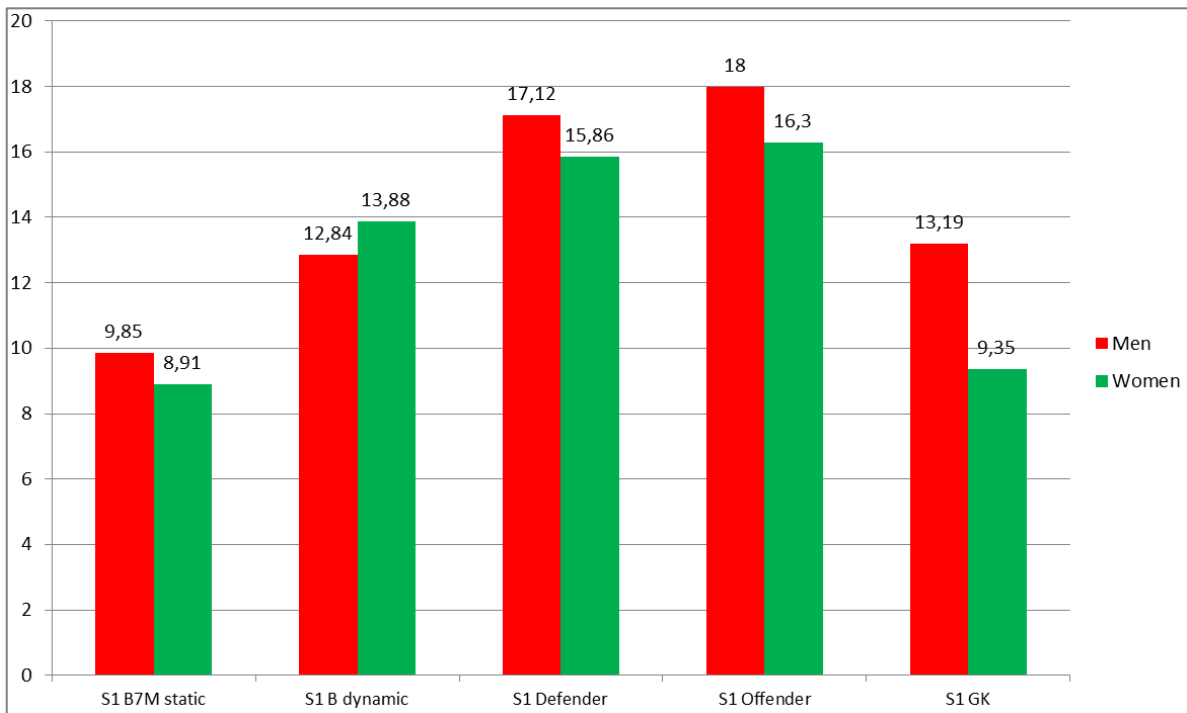


Figure 2. Mean values of the coefficient obtained after dividing the % of correct answers by the average response time for both genders

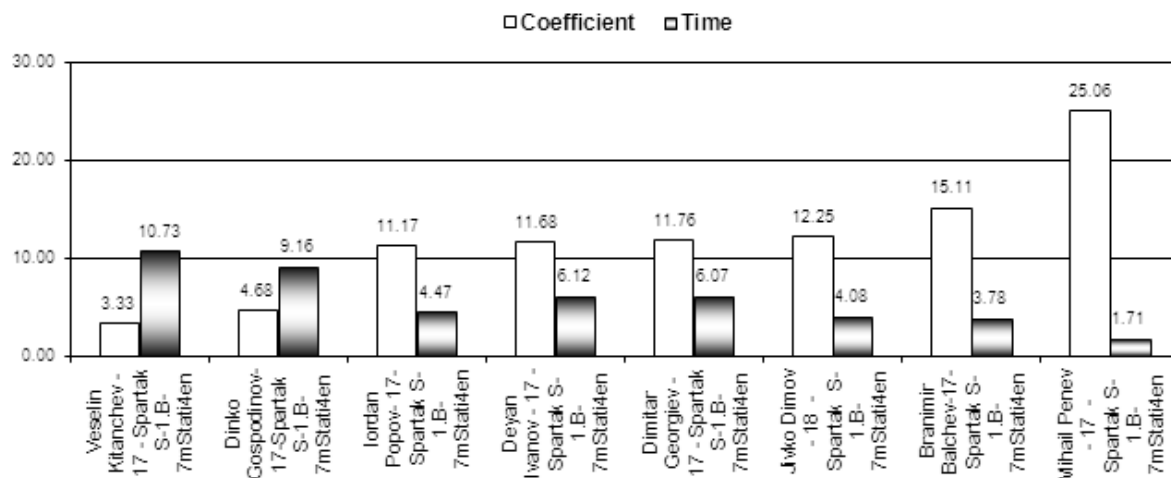


Figure 3. Individual average values of the coefficient and the response time for the questions of group "B-7 M Stati4en"

Table 2. Normative table for assessment of the results obtained in the examination of men

Mark	B-7M Stat	B-Dinami4en	Defender	Offender	GK
6	15.59	18.44	24.70	25.34	20.09
5	12.72	15.64	20.91	21.67	16.64
4	9.85	12.84	17.12	18.00	13.19
3	6.98	10.04	13.33	14.33	9.74
2	4.11	7.24	9.54	10.66	6.29

The specified differences in the coefficients of the two genders give us grounds to make the following summaries:

1. The handball players (men) give correct answers to photographic game situations more successfully (for a shorter time) for the exception of the dynamic contest situations (5.98 against 6.19 for women).
2. The average values of the coefficients of male handball players are considerably higher than those of female handball players in conflict game situations which in the opinion of the researchers is due to the greater experience gained in greater number of competitions, planned in the sports calendar of the BHF.
3. The comparatively lower coefficient for men and women, obtained in the contest goalkeeper-handball player (static and dynamic) is a result of the lesser and more elementary possibilities in the actions of the offender and defender in the 7 m throws.

The researchers' confidence that the "Study of Anticipation in Handball through Interactive Tests" will be of real benefit in the future work of coaches is confirmed by the "Analysis of the results obtained in the test and the performance of individual handball players in competitive environment", presented by the coach of „Cherno more" Varna – Yordan Dzhipov.

We will take the liberty of quoting one section of it:

"S1 B 7M Stati4en" (fig. 3) – in static contests (offender-goalkeeper), the results are also absolutely logical. The best result is achieved by the goalkeeper Mihail Penev (coeff. 25.06), followed by Branimir Balchev (coeff.15.11)

and Zhivko Dimov (coeff. 12.25) – the two backs, who are the handball players with the best results in the team and Dimitar Georgiev (right wing), who is distinguished for his very high performance in shooting. These are (in this order) also the performers of 7m throws of the team.

"S1 defender" – regarding the defense, the results of the test definitely coincide with the handball players' performance in the course of matches. The best results refer to Br. Balchev (coeff.32.00), who is the most complex player and is the foremost leader of the team. The second result is for the goalkeeper M. Penev (coeff. 30.44), who is shorter in height but has an exceptional overview on the game and makes up for his height with quick and right decisions, very good placement and interrelation with the defense. In general, the test provides exclusively valuable information, both about the weaknesses (on which the team is supposed to work) and on the advantages (on which the tactical development of the game can be built). Therefore, in the researchers' opinion, the information from this research work is valuable and its benefits spread to both aspects: 1 – where should the accent be placed in the coaching work; 2 – how should the qualities and abilities of the handball players be most efficiently used.

5. Elaboration of a Normative Table

Table 2 is composed of six columns containing:

The marks from 2 to 6 are in the first column.

The average value of the coefficient obtained after

dividing the % of correct answers by the average response time of the examined handball players in the separate centers is located against the row which contains mark 4 in the columns B-7M Stat, B-Dinami4en, Defender, Offender, GK.

Statistical distribution is determined to be normal, since the variation coefficient fluctuates within the range from 19% to 29%, the excess is within the boundaries from -1.78 and 0.37, asymmetry is within the boundaries from -0.27 and 0.45.

Against the row containing mark 5, in the neighboring columns, you can find the calculated value obtained as a result of summing up the average value X and the mean quadratic deviation S.

Against the row containing mark 6, in the neighboring columns, one can find the calculated values of the average coefficient value and the doubled value of the mean quadratic deviation.

The calculated value obtained as a result of subtraction of the mean quadratic deviation S from the average value of coefficient X can be found against the row containing mark 3.

The calculated value obtained as a result of subtraction of the doubled value of the mean quadratic deviation S from the average value of coefficient X can be found against the row containing mark 2.

Thus, five stages have been determined to distribute the values of the coefficient obtained on dividing the % of correct answer by the average response time.

6. Conclusions

The analysis of the data obtained in the research shows that anticipation is an intellectual process, as far as its indicators are moderately positively connected with general intelligence (i.e. the speed of information processing by the psyche/mind).

The researcher can make the conclusion that the test contains information which can be used by the coaches in their practical activities.

The psychometric characteristics of the test are subject of future research.

APPENDIX



Figure 1a. Contest between an offender and goalkeeper and vice versa (static) at 7m throw.

НАУЧНОИЗСЛЕДОВАТЕЛСКИ ПРОЕКТ Р-Л: ЖИВКА ЖЕЛЯЗКОВА
ПРОГРАМНО ОСИГУРЯВАНЕ: ОГНЯН ТИШИНОВ

ТЕСТОВЕ И ВИДЕООБРАБОТКА: ИЛИЯ ВЪРБАНОВ
ЕКСПЕРТНА ОЦЕНКА: ДИМИТЪР МИХАЙЛОВ

РЕЗУЛТАТ(% ОТГОВОРИ) = 7
NEW Training SaveAs..

static dynamic defender offender goalkeeper ANТИЦИПАЦИЯТА В ХАНДБАЛА

camera 180 -643

ИНСТРУКЦИЯ ЗА ЕКСПЛОАТАЦИЯ
Напишете в текстовото поле под хандбалния терен името и всички необходими данни свързани с изследването.
4.43
4.56
5.8
5.3.3
5.7.4
Поставете показалеца на мишката върху бутон "NEW". С натискане на левия и бутон всички бутони вляво и вдясно от големия текстово поле оцветяват в жълто.
Поставете показалеца на мишката върху първия бутон отляво от цифрите. С натискане на левия бутон се появява помощен панел вдясно. На него са показани един въпрос и три отговора. След внимателно прочитане на въпроса и възможните отговори избираме бутон "старт". На екрана вляво започва прожектиране на клипа свързан с въпроса. След спирането на клипа възможно най-бързо се избира предпочитаният отговор с мишката и се натиска левият бутон. При правилен отговор дясностоящият бутон се оцветява зелено. След това мишката се поставя върху бубона поставен хоризонтално вдясно и се натиска левият и бутон. На мястото на "11" се появява

старт

Къде ще насочи стрелбата си лявото крило (ЛК)?

между краката на вратаря

над главата

долу ляво на вратаря

Figure 1b. Contest between an offender and goalkeeper and vice versa (dynamic)

НАУЧНОИЗСЛЕДОВАТЕЛСКИ ПРОЕКТ Р-Л: ЖИВКА ЖЕЛЯЗКОВА
ПРОГРАМНО ОСИГУРЯВАНЕ: ОГНЯН ТИШИНОВ

ТЕСТОВЕ И ВИДЕООБРАБОТКА: ИЛИЯ ВЪРБАНОВ
ЕКСПЕРТНА ОЦЕНКА: ДИМИТЪР МИХАЙЛОВ

РЕЗУЛТАТ(% ОТГОВОРИ) = 0
NEW Training SaveAs..

static dynamic defender offender goalkeeper ANТИЦИПАЦИЯТА В ХАНДБАЛА

camera 119 -908

ИНСТРУКЦИЯ ЗА ЕКСПЛОАТАЦИЯ
Напишете в текстовото поле под хандбалния терен името и всички необходими данни свързани с изследването.
4.43
4.56
5.8
5.3.3
5.7.4
Поставете показалеца на мишката върху бутон "NEW". С натискане на левия и бутон всички бутони вляво и вдясно от големия текстово поле оцветяват в жълто.
Поставете показалеца на мишката върху първия бутон отляво от цифрите. С натискане на левия бутон се появява помощен панел вдясно. На него са показани един въпрос и три отговора. След внимателно прочитане на въпроса и възможните отговори избираме бутон "старт". На екрана вляво започва прожектиране на клипа свързан с въпроса. След спирането на клипа възможно най-бързо се избира предпочитаният отговор с мишката и се натиска левият бутон. При правилен отговор дясностоящият бутон се оцветява зелено. След това мишката се поставя върху бубона поставен хоризонтално вдясно и се натиска левият и бутон. На мястото на "11" се появява

старт

Кой защитник ще успее да „пресече“ подаването?

Десният краен

Десният полузащитник

Десният централен

Figure 1c. “Deciphering” of offenders’ actions or moves by defenders.



Figure 1d. "Forestalling" defenders' actions or moves by offenders



Figure 1e. "Discerning" of the actions of the defense and the goalkeeper by the offender

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