Thesis of Doctoral (PhD) Dissertation

METHOD-SPECIFIC EXAMINATION OF PSYCHOLOGICAL COMPETENCES OF HANDBALL PLAYERS

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Debrecen, 2022

Content

1. Aims of the research

The aim of the research is to explore the key psychological competencies that determine the athletic performance of handball players and to measure competencies by developing an interactivity-based, sport-specific test system that can be used to objectively examine the (mental) performance of athletes on the field. In the dissertation, we aimed to create a comprehensive picture of the performance of handball players, so during the development of the Psychological Test System of Debrecen (DPTR) Handball Test Package, I also integrated a number of scientific literature along with domestic and international research results related to handball and sports performance. However, the novelty of the DPTR Handball Test Package lies in the fact that it tests players' abilities not in general and by using paper-and-pencil-based tests, but through sport-specific ability tests.

The main objectives of the research

1. Expanding the psychological research areas of handball as a sport, defining the key competencies of handball players that are important for their sports performance.
2. To measure key competencies, developing an objective testing tool that examines the abilities of athletes not in general but specifically in sport.
3. Identification of individual differences affecting competency levels, including personal variables at gender, age, and competitor levels.
4. Within the framework of the competency study, getting to know the performance profile of handball players as fully as possible.
5. Creating the practical applicability of test results.
6. Formulating targeted development proposals in line with the test results.
7. Development of a test protocol related to the DPTR Handball Test Package.

Research questions

The test results related to the interactive test tasks that form the central part of the dissertation can be interpreted within the framework of an exploratory study, where the research questions differ somewhat from the usual hypotheses. We are looking for the answer to the question of what skill levels may lie behind an athlete's profile and how their development is affected by differences in gender, age and competitor levels, as well as the position of the team in the social network. The following expectations were formulated in connection with the study:

- Excellent players have high levels of cognitive skills and are able to:
    - share attention
    - process large amounts of stimuli,
    - paying attention to detail,
    - have fast response speed,
    - make quick and efficient decisions,
    - to see and recognize situations perfectly.
- In relation to risk-taking, we assumed that:
    - men, characterized by an impulsive style, and younger players are more likely to have risk-taking behaviors than women, characterized by a reactive style, and older players.
    - Furthermore, we also hypothesized that risk-taking could be considered an innate factor.
- Regarding the performance motivation of athletes, we assume the following:
    - Men have a higher level of performance motivation than women.
    - Younger players have a higher level of motivation than their older counterparts.
- "Older" players with more routine are able to anticipate situations, see through them, and select the best reaction (s), as opposed to younger players with less routine.
- The experience of the players is a kind of hallmark in having an excellent skill level.
- Players with higher skill levels are more popular and well-liked within the team than their weaker performing teammates.

2. Antecedents of the research

In elite sports, the concept of athlete performance permeates the everyday life of athletes and sports teams, all stages of their preparation, and their goal is to continuously increase it. Reviewing the definitions of sports performance, we can see that many researchers point to several factors to describe it as fully as possible. Bangsbo (2015) summarized the determinants of athletic performance alongside a holistic model, highlighting the role of influencing the technical, tactical, physiological, psychological, and social characteristics of athletes. However, in Géczi and Baji's (2016) Long-Term Sports Development Program, they emphasize that the development of athletes' abilities in their genetic potential can only be achieved through planned and careful development.

Handball is an extremely complex, open-movement team sport based on interactivity and cooperation, in which players must possess technical and tactical knowledge relevant to their sport, as well as a good physique and a high level of special mental factors (Wagner and et al., 2014). Cognitive abilities (attention, anticipation, decision-making, executive functions) appear to be important psychological determinants of athletic performance (Dubecz, 2009). By cognitive factors we mean the innate and developable sensory abilities that influence the evaluation of a situation, the chosen response to that given situation and its outcome. Cognitive abilities are usually measured by the speed of information processing and the amount and quality of information processed per unit time. These three cognitive characteristics make a sharp distinction between athletes and place them in a completely different athletic dimension with the right physical and technical knowledge (Tenenbaum, Basevitz & Gutierrez, 2014).

After exploring the mental factors behind the excellent performance of handball players, the influential power of cognitive abilities, including the construct of decision-making, the area of paying attention and concentration, alongside with the ability to recognize and assess situations as well as the aspects of risk-taking and related effectiveness, clearly emerged. In addition to cognitive abilities, we aimed to explore areas of performance motivation and specifically examined the effects of interactions between team members and the effects of ability levels on their performance. In the following, I will briefly describe these areas.

Decisiveness

Decision-making is a cognitive operation in which we choose the option that fits the situation and is currently considered the best, considering the alternatives that appear in the given situation (Tenenbaum and Gershgoren, 2014). We perceive much of the environmental information needed to make decisions through our visual system. The visual system allows the reception of environmental stimuli, the perception of visual patterns appearing in the visual field, and then the transfer of information to long-term memory, which serves as a basis for making subsequent decisions. In addition to the pressure of environmental stimuli, decision-making is influenced by a number of factors, including the athlete's expertise, past experiences, but also the athlete's current mental state (Tenenbaum, 2003).

Attention and concentration

Attention helps to select relevant information from the outside world that is consistent with our own inner feelings (Gray, 2014). Athletes' attention can be distracted by a number of factors; several theoretical approaches have tried to explain the underlying causes of them. According to the explicit observation approach, athletes do not direct their attention to the right goals, they start to think more about themselves and their abilities that they consider important for the result in order to achieve excellent performance (Baumeister, 1984). According to distraction theory, the performance of each athlete's ability is determined by the capacity of information processing (Moran, 2012). Another explanatory theory of the relationship between attention and performance seeks answers in the effectiveness of processing and finds that negative thoughts and worries do not always lead to poor performance. According to this theory the situation-induced pressure distracts the athlete's attention from important information to the task, however this reduction in resources leads to an increase in effort, which, although lasting for only a few hours, helps the activity to be performed successfully (Gray, 2014).

Taking risks

During handball matches, players often encounter unpredictable, new situations, unfamiliar opponents that in many cases they can hardly or barely prepare for. In these situations, athletes decide how much risk they will take. What is common in the definitions of risk is that risk creates an uncertain decision situation with negative consequences. It is important to distinguish between risk and uncertainty. In the case of uncertainty, the

knowledge is incomplete and it is not possible to quantify the consequences of each alternative. In risky situations, on the other hand, knowledge is incomplete, but we can calculate the consequences of action alternatives (Grünhut, 2015). During risk-taking, the behavior involves two or more outcomes, and they may also carry a risk or undesirable outcome (Beyth-Marom and Furby 1992).

Situation recognition and identifying the essentials

Situational recognition involves the perception of elements present in the environment in a given time and space, an understanding of their meaning, and a prediction of their future state (Endsley, 1988). According to Endsley, situational awareness is the current state of a particular knowledge and must be distinguished from the processes that led to that knowledge. This kind of cognitive process can be perception, comprehension, or planning, which are also the three main stages of situational awareness. This process serves to facilitate successful decision-making in complex situations. Without the essentials, we would be devoting an equal amount of energy to processing all the information in the environment, resulting in a slow and cumbersome decision-making that is unthinkable in the world of modern handball (D'Isanto, Di Tore, Raiola, 2018).

Performance motivation

Performance motivation can be defined as the desire to achieve some kind of performance, which includes competing with others, overcoming obstacles, and mobilizing resources (Murray, 1938). According to Atkinson (1993), performance-related behavior is influenced by emotional conflict between hope for success and fear of failure. Performance-motivated behavior can be characterized by both avoidant and approaching tendencies. In the case of an avoidant tendency, the individual seeks to reduce the probability of failure of the task, whereas in the presence of an approaching tendency, maximizing success is at the heart of the performance situation (Pang, 2010). In this sense, we can talk about success-oriented, as well as failure-avoiding people. Success-oriented people are likely to set themselves medium- but challenging goals that provide direct information about their performance and a sense of control and effectiveness. Success is attributed to their own abilities, and their self-esteem is also higher (Barkai, Lukács & Mayer, 2011). In contrast, failure avoidants typically set themselves very low or very high, unrealistic goals that do not

match their abilities and cite external factors as the reason of their success; their self-esteem is also considered lower (Fodor and Mihalik, 2017).

Social relationships within a team

Exploring social relationships can provide data on the position of the players within the network, as well as the hierarchy of the team. Getting to know social networks thus helps to determine how much a particular team member is liked by teammates by expressing social preferences (Moreno, 1954). The network of relationships expresses representations of relationships between team members that include the individual's perception of the team, the relationships of teammates, and the social structure of the team (Graupensperger and Evans, 2019). Analysis of social relationships sheds light on the strength of relationships between them, which is significantly influenced by time spent with each other and the depth of relationships (Campbell and Marsden, 1984).

3. Description of the applied methods and the research sample

The studies were conducted under the ethical license entitled *"Present of the Champions of the Future: Comparative Targeted Studies of the Regeneration and Competing Athletes of Individual and Team Sports"*, registration number: 2016/033, date of authorization: 10/06/2016.

The thesis was supported by: GINOP-2.3.2-15-2016-0062.

Table 1: Presentation of competencies in the DPTR Handball Test Package and the related tests

Handball Test Package	
Competencies	**Competency tests**
1. Decisiveness	*"Maze Test"* The test subject must navigate a maze from the starting point to the exit using the cursor keys. The time available is arbitrary, the maze is of medium difficulty. The test is also suitable for examining impulsivity-reflexivity.
2. Attention and concentration	*"Simple Attention Test"* The athlete should compare the figures with sport-specific elements one after other over a period of time.

	"Moving circles" test. Follow moving circles, first one of many highlights, then 2-3 laps at a time between increasingly difficult (faster moving, reversing) circles.
3. Risk taking and efficiency	*"Risk Test"* The test subject controls a handball player on the screen as instructed to avoid moving / bouncing squares on the screen and collecting balls placed on the screen. You can score points by collecting balls and losing points due to colliding with squares. The goal is to collect as many points as possible. After trying the task, you will have two options to set the difficulty of the task (number of squares and / or speed of squares) - the harder the task, the more points you will earn for collecting a ball.
4. Situation recognition and identifying the essentials	*"Tower Demolition Test"* Remove the figures off the screen while only what is not covered by another shape can be removed.
5. Performance motivation	*"Performance Test"* The player travels on a bounded course with obstacles, first alone and then in the presence of a competitor. The goal is to score as many points as possible, in addition to the distracting stimulus of the audience and the oppressive dexterity of the competitor. Relying on the subjective discretion of the test subject's own performance, you can set how many points you can collect in the next task.
6. Exploring social connections	Social relationships within the team were explored along issues of sympathy, competence, and leadership.

3.1. The sample

In the study, the primary objective was to be able to involve as many handball players as possible in the testing and to ensure that the conditions for representative sampling were met. Accordingly, we made the research available to dozens of handball teams playing in the Eastern region of Hungary, and we sent out information about the investigation in the form of an invitation letter to the leaders of the club teams. All interested handball teams who responded to our letter of invitation were included in the study. However, testing has

been significantly hampered by the emergence of the coronavirus and the resulting community restrictions. Thus, the investigation failed for several teams.

The study eventually included 210 subjects, with a mean age of 20.75 (± 6.187) years. 46% of the participants were women, 54% were men, 36% were playing at the highest level of competition, 44% at level two and 20% at level three. 48% of the subjects compete in the age groups of youth championships, while 52% are among adults.

The research conditions were the same for all tests, which meant providing a quiet site using the same testing protocols. We had 7 laptops and 5 joysticks available for the study, so we were able to perform the tests with a maximum of 5 people at a time, which meant approximately 3 hours for a team (15-18 people). The average test completion time for a handball test pack is 60 minutes, however, the time may vary from individual to individual.

3.2. Process of data processing

Data analysis was performed using the SPSS statistical program. During the data processing, we divided the variables that form the basis of the analyses into three groups.

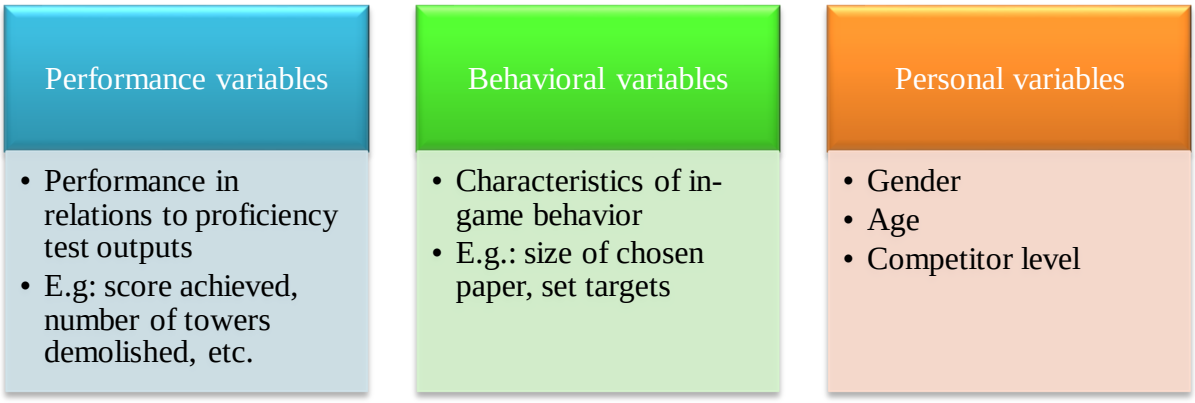

Figure 1: Presentation of variables grouped into three groups during data processing

The following correlations were examined between the variables of the three groups:

- The relationship of personal variables to variables describing in-game behavior.
- The relationship between personal variables and performance variables.
- How behavior affects performance (even depending on personal variables).
- How personal variables affect behavior and performance.
- How performance variables are affected by variables related to behavior and personal data.

To examine the relationships between the above mentioned variables, the following statistical tests were used, depending on the scale represented by the variables:

- Correlation analysis (Pearson correlation, Spearman correlation)
- Chi-square test
- Mann-Whitney test
- Kruskal -Wallis test
- Cluster analysis

4. Listing of results

Decision making test

To analyze the test variables, we used cluster analysis, where we distinguished cluster groups by number of steps (many and few), cluster groups by speed (fast and slow), and cluster groups by time to first step (impulsive and reflective). The results of the players on the cluster variables are shown in the following summary figure, where it can be seen that most of them are impulsive, faster players with fewer steps:

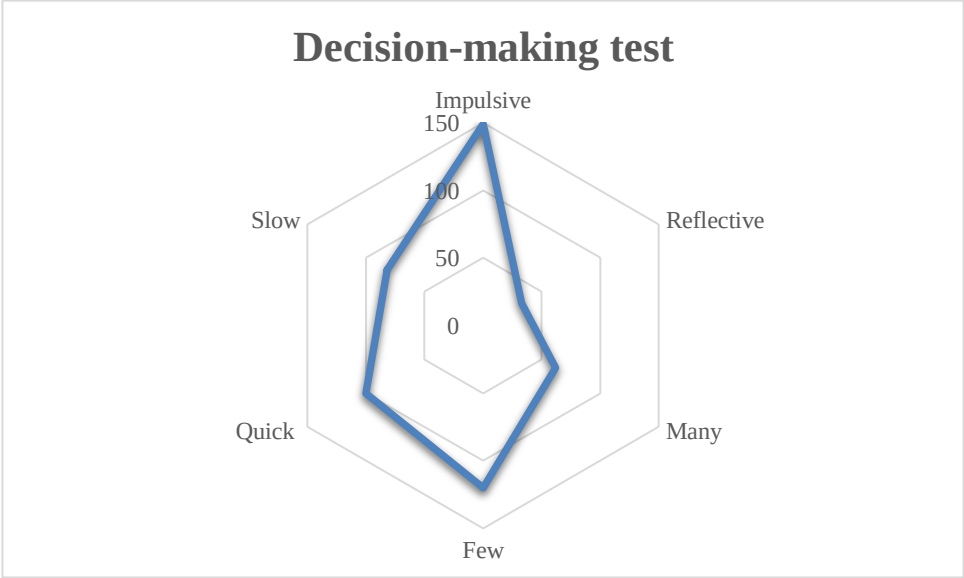

Figure 2: Presentation of the aggregate results of the decision-making test

The correlation between the number of steps and the cluster groups according to speed was examined by Chi-square test and it was found that the two cluster variables are independent of each other ($p<0.356$, Chi-square value=0.851), which means that speed did not necessarily lead to fewer steps. It can be seen more as a habit. The significant difference between first steps and speed ($p<0.000$, Chi-square value=34.048) suggests that test takers

who were in the impulsive group (65.1%) progressed rapidly throughout the test tasks, while reflective ones (90.9%) progressed slowly on the test tasks. In the cross-tabulation analysis of the cluster groups according to the first steps and the number of steps, repeated significance ($p<0.012$, Chi-square value=6.385) was found, which may bring us closer to the interpretation of the response rate and the associated decision efficiency. The results show that more than 80% of reflective players complete test tasks in a small number of steps, while more than 60% of impulsive players solve them in a small number of steps.

The test shows that excellent decision-making is associated with a lower number of steps (performance variable) as well as reflective attitude (behavior variable) and fast base speed (behavior variable). Including personnel variables, there is no clear gender distinction behind excellent decision-making, but men's fast baseline speeds can project better performance, and the performance of experienced but not the oldest competitors in the test also presupposes better decision-making. It is important to note, however, that competitor level and age did not affect the results of the behavioral variables in the test. Variables that affect the behavior shown on the test appear as innate characteristics that are less likely to be influenced with advancing age and along environmental conditions that affect us (e.g., competitor level).

Simple attention test

The test measured the performance of players along four main variables, which were the number of hits, the number of correct rejections, the number of false alarms and the number of omissions. In addition, the test completion rate was examined, which was further divided into 4 groups by cluster analysis, with the first group having the fastest and the fourth the slowest. The test scores of the subjects along the test variables are shown in the following summary figure:

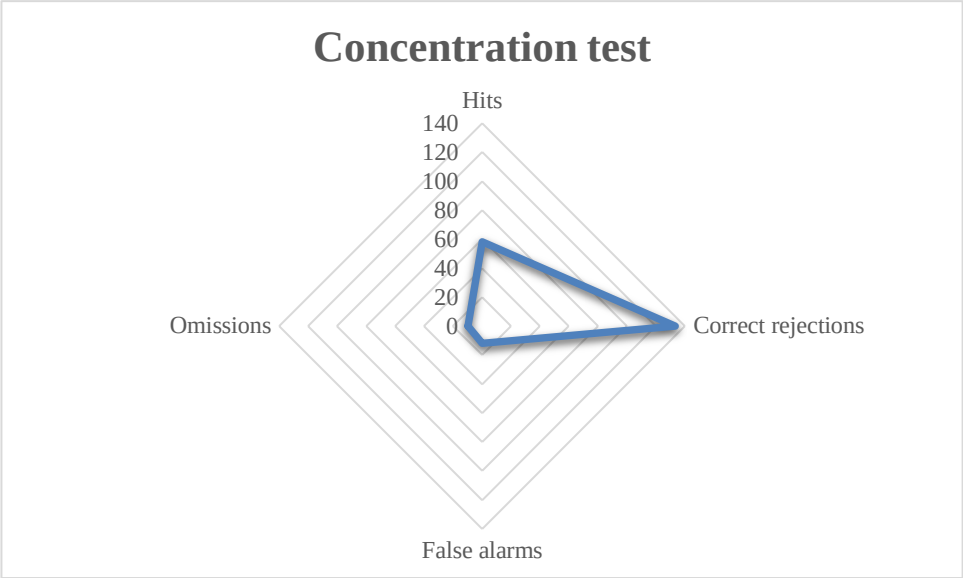

Figure 3: Presentation of the aggregate results of a concentration test

We first examined the velocity correlations using the Kruskal-Wallis test in the variables of false alarms and omissions. The rate groups had no significant effect ($p<0.216$, $H=4.454$) on omissions, but did on false alarms ($p<0.001$, $H=16.608$). It appears that a significant percentage of players correctly judged the images on the screen to be different and worked with a high number of hits, with the number of errors (number of images mistaken for the same, incorrectly different) ranging in a relatively low range. This can show the simplicity of the task, but it can also indicate the excellent attention skills of the players. The high number of correct rejections can be interpreted in itself as meaning that the errors and discrepancies are easily noticed by the players, which did not cause any difficulty during the task. If I also count on speed, we could see in the results presented above that players are able to spot differences faster than congenialities.

Female elite athletes also drew significantly more false alarms ($p<0.019$, $Z=-2.349$) and omissions ($p<0.015$, $Z=-2.426$) compared to their second-level athletes, which were detected by the Mann-Whitney test, as well as younger players. Compared with their older counterparts in the Kruskal-Wallis test, they performed significantly worse along both false alarms ($p<0.007$, $H=15.901$) and omissions ($p<0.017$, $H=13.842$) .

Moving circles test

The main variable of the test was the test scores obtained on all test tasks, in which we performed a cluster analysis. The ever-increasing test tasks made a sharp difference between players who were placed in two cluster groups: the better (32%) and the weaker (68%). Above a certain level of difficulty, the performance of many players deteriorates completely, presumably blocks or saturates the attention (capacity), and they are not able to complete the tasks that have been solved correctly so far. There are significant individual differences between players, with only a small percentage of subjects being able to properly direct and share their attention in the difficult layout. There seems to be a point (threshold) where players' performance sharply bisects. This threshold appears as the number of stimuli increases. Crossing the threshold will damage or overload the players' attention capacity, which will be followed by several error-prone reactions and actions. This can manifest itself in both technical and tactical errors in players, and in a reduction in the (quality) of interactions with players and coaches.

Regarding personal variables, the relationship between age and cluster groups was revealed by the Mann-Whitney test, where a significant ($p<0.014$, $Z=-2.470$) difference was found. Differences between competitor levels and cluster groups were revealed using a Chi-square test. There was no significant ($p<0.296$, Chi-square value=3.349) difference. There is a significant ($p<0.028$, Chi-square value=4.834) difference between the two cluster groups. 59.8% of men were in the lower performing group, compared to 75.3% of women.

Risk test

We examine the performance of handball players by offering them several options during the test tasks where they can make decisions, modify strategies, and optimize their own performance. So their performance is not simply a consequence, but a conscious choice on the part of the players. The card size chosen is one of the variables that provided information about the risk-taking propensity of the players, based on which we distinguished between small card size (70% of players, risk avoidant) and large card size (30%, risk taker). The following three cluster groups (collision cluster groups) were distinguished between the selected sheet size and the achieved test scores:

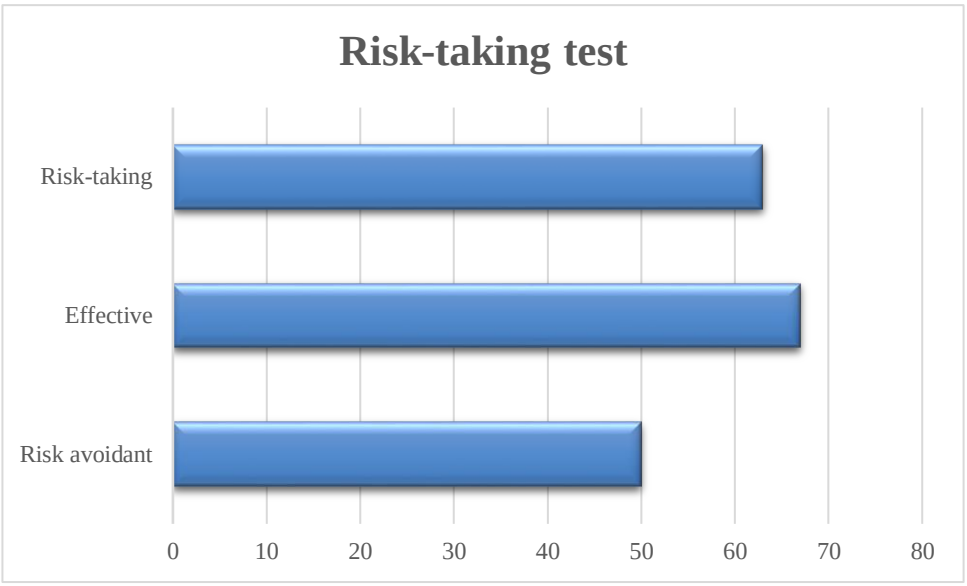

Figure 4: Presentation of aggregated risk test results

Overall, the larger hand consistently brought more points to the players, so the players who took the risk were mostly able to fulfill their preconceived notions. When examining the correlations with personal variables, it does not appear as the only influencing factor ($p<0.009$, Chi-square value=20.592) and it also has an effect only on cluster groups according to collisions. A significant proportion of the members of the second, well-optimized, highly adaptive cluster group were male, while the majority of women were in the first cluster group, who took the higher risk but did not benefit from them. However, age and competitor level had no significant ($p<0.073$, Chi-square value=8.562) effect on cluster groups. Based on the results provided in the most difficult test setup at the end of the test, we can conclude that the players were able to provide stable, balanced, consistent performance throughout the test and were characterized by the same behavioral attitude. Thus, the direction of the behavior is continuous development, towards better performance, optimization.

Tower demolition test

In the tower demolition test, the tests were performed along three main variables. The number of completed towers is a hallmark of a player's performance. The higher the number, the better the athlete performed on the test tasks, i.e. they had a good idea of the set of towers to be demolished.

The number of clicks represents the amount of stimuli processed (clicked) by the test taker, and is also a performance variable. The number of clicks is strongly related in a straight line ($p<0.000$, r=.948**) to the number of completed towers, i.e. we can deduce the number of towers demolished from it. The number of penalties is displayed as a quality indicator of the test taker's stimulus processing, which is a behavioral variable that affects performance. The number of penalties has a strong positive correlation with the number of clicks ($p<0.000$, r=0.951*), i.e. the values of the two variables increase or decrease together. The error rate was derived from the quotient of the above two variables (number of penalties and clicks), which nuances the relationship between the two main variables, i.e., provides us with information on the relationships between quantitative and qualitative indicators of stimulus processing. Examining the error rate with the Kruskal-Wallis test, we found that it was not related to how many towers the test filler demolished ($p<0.716$, H=1.356).

Based on the test results, we can see that for some players who play at a higher speed level than their counterparts, the error rate will be set, i.e. they will not make more mistakes than their slower-playing counterparts. Moreover, a lower speed can appear as a negative factor in the error rate. The question arises as to who can be the players who are able to solve the tasks correctly even at higher speeds. Maybe those with a higher base speed, or those who aren't overwhelmed by the many stimuli that appear during the task, are able to focus their attention and focus on the next task. However, we cannot state this unequivocally, but we can already be more certain that the player's performance with slowness and error may be due to inadequate attention focus, or to be easily influenced by stimuli. Overall, competitor levels (Kruskal-Wallis test: $p<0.002$, H=12.089) and age groups (Kruskal-Wallis test: $p<0.000$, H=35.952) seemed to be influential factors in examining the correlations with personal variables along the error rates, while there was a significant gender difference in the number of clicks (Mann-Whitney test: $p<0.000$, Z=-3.582).

Performance motivation test

The test examines players' performance motivation through three layouts. The three test layouts aim to explore areas of performance motivation that included:

- the player's aspiration level,
- the effect of goal setting on performance motivation,
- the level of performance motivation shown in the presence of the opponent.

Along the motivation shown in the baseline, the players were divided into three groups, just like in the goal setting test layout. Both test layouts distinguished cluster groups with low, medium, and high scores. In the third test layout, there was no longer a transition in the performance of the players, they were placed in one of the groups with low or high scores. Analyzing the performance of the players as the test tasks progressed, we found that those who scored lower in the past will still get a medium score, while those with a higher score will almost certainly get a high score (1 Test sections 1 and 2 ($p<0.000$, Chi-square value=123.106), Test sections 1 and 3 ($p<0.000$, Chi-square value=70.521), Test sections 2 and 3 ($p<0.000$, Chi-square value=79.479).

A high percentage of the lower level of motivation shown in the baseline means that athletes are less motivated if there is no goal to be achieved or no competitor to beat. Goal setting increased players' motivation somewhat, but in terms of proportions, most players were placed in the middle category. However, in the presence of the opponent, a significant proportion of the players were highly motivated and made extra efforts to complete the task. Since we cannot say clearly where this level of motivation is compared to the high average, it would be a mistake to assume that the level of motivation of athletes appears as a weak point. However, I can state that the level of motivation of athletes with low levels of motivation in the group of subjects should be improved. We have seen that men have a higher level of motivation compared to their female counterparts and women increase performance when an opponent enters the field of vision. Furthermore, young competitors (test part 1 with Jonckheere-Terpstra test: ($p<0.018$, JT=2.375, test part 2: $p<0.002$, JT=3.160) had a lower level of motivation compared to their older counterparts and men with the highest level of motivation was also lower (test part 1: $p<0.053$, Chi-square value=9.280, test part 2: ($p<0.004$, Chi-square value=15.440) compared to those at the lower competitor level. among women, the exception where those at the highest competitive level performed significantly ($p<0.001$, Chi-square value=11,332) compared to the second competitive level. The relationships between the aptitude tests and the variables for exploring social relationships are shown in the table below:

Table 2: Presentation of the relationships between aptitude tests and social relationships within the team

	Sympathy	**Competence**	**Conductor**
Decisiveness			Few steps Women: speed
Situation recognition	Men: High error rate and penalty number are popular Women: low error rate and number of sentences	Men: High error rate and penalty number are popular Women: low error rate and number of sentences	
Attention	Women: Sensitive to noticing differences	Women: Sensitive to noticing differences	
Attention II.	Women: they like weaker ones	Women: they like weaker ones	
Risk			Brave, efficient competitors
Performance motivation	For men: low commitment is preferred	For men: low commitment is popular	

During the decision-making test, men's choice preference appears to be adaptive and suggests that peers have noticed well which team members are able to make appropriate decisions. Speed seems to be a more important preference for women. This means that speed appears as an adaptive advantage for the person in the leadership role. During the concentration test, women were more likely to choose those as their friends who were less capable to control and divide their attention during the test; they also thought those people were more apt to do the given tasks well. In the risk test, the more risk-taking, dynamic players are considered by their peers to be team leaders who might be suitable to represent the team, encourage or just reassure them. In the tower demolition test, men prefer those teammates who think they are capable of either taking a seven-meter penalty throw or responding appropriately to situations that have collected more penalties and completed the

tower demolition test tasks with a higher error rate. However, for female players, the high error rate, number of clicks and penalties among players reach the opposite. Women find those players to be competent to solve a task or situation who make fewer mistakes and are less active. In the performance motivation test, men with low commitment and fewer goals were thought to be more suitable in competency-based choices and more sympathetic to sympathetic statements; this could not be clearly stated among women.

The aggregate results of the subjects are summarized in the following table showing strengths, weaknesses, opportunities and threats:

Table 3: Presentation of strengths, weaknesses, opportunities and threats based on test results

Strengths	**Weaknesses**
At least 30% of the study group was included in the group of the best in all aptitude tests: fast, efficient, capable of excellent performance. Athletes were able to optimize their performance, to improve. In many cases, the players proved the results of the skill tests in the social relationships exploration method elections, i.e. they correctly identified the effective players, for example, for filling leadership positions.	Most of the study group was placed in the weaker group on several aptitude tests. Big difference between individual qualities. Female players react with reduced performance under high pressure. Low skill level of young players.

Dangers	**Opportunities**
Low motivation levels of young players can lead to burnout. The low level of motivation of young athletes makes it difficult for junior athletes to become adult athletes. Organizational culture affects the behavior and performance of those within it. The risk-averse behavior of players in aptitude tests has been observed several times, raising the question of the presence of an organizational culture that supports such behavior, which is not necessarily effective.	After learning about a performance profile, targeted developments, at the individual and team level, where the role of coaches and the supportive environment of the sports organization are paramount. Comparison of results of aptitude tests and protocols. Development of coaching competencies. Exploring and, if necessary, developing the organizational culture. Progress monitoring (with repeated measurements).

Based on the test results obtained during the exploratory study, we formulated the following developmental recommendations:

- Targeted application of sport psychological methods for the development of individual skills:
    - Setting SMART goals that are specific, measurable, action-oriented, realistic, and timely. These include the characteristics of effective goal setting, along with help to enhance the performance of athletes with their own well-structured, workable, yet challenging time-bound goals.
    - *Focusing techniques* can help athletes to perform more effectively in a given competition (glass bulb method, flashlight method, mental imagery)
- Continuous support for the psychological training of coaches, the incorporation of psychological aspects during training planning, and the purposeful development of the weaknesses that emerge during the measured test results. During coaching, it is important to know the individual differences as fully as possible, which affects the gender and age characteristics, but also the individual needs and motivations of the players.
- Finally, I would like to emphasize the importance of training adaptation, which means that with a well-targeted, consciously designed training plan, players will be able to play consciously in a match, to perform well-directed movements, as they are

used to during training. During training adaptation, it is possible to acquire additional abilities and skills and apply them as perfectly as possible, such as making effective decisions, but also optimally controlling stress levels.

I think the present research is extremely complex, and this complexity manifests itself as both an advantage and a disadvantage. The difficulties were due to the fact that we involved a great deal of competencies, both theoretically and practically, which made the development work longer, the theoretical part more extensive, and the research results more complex. Furthermore, due to the novelty of the research, the application of the new test tool, the interpretation of the test results and the drawing of far-reaching, generalizing conclusions were limited and mostly limited to intra-group analyzes. At the same time, the results within the group have highlighted both the areas and strengths to be developed for handball players.

Such areas for development were the attentional abilities of the players in a stressful environment, their level of performance motivation in the baseline situation, the lack of "courage", which meant low willingness during the risk-taking test and thus low efficiency. Furthermore, in line with our preliminary studies, we also found that there is a big difference between the ability tests of handball players in the DPTR test results, i.e. we see many players with lower abilities and relatively few with exceptional abilities compared to the group, with a large variance in player performance. This result was further nuanced by the personal variables we examined, where we found that men performed better on the risk-taking, decision-making, and attention tests, while women were more likely to perform below their level of knowledge under more difficult conditions, thus falling into weaker groups. Furthermore, outside the fast speed in the vast majority of young players at the first competitor level, we were less able to highlight more strengths. This result was related to the less good results of the highest competitors. However, we cannot exempt elite athletes because of their young age.

As a strength, we highlighted the "narrow elite" of handball players who were consistently able to perform well across all skill tests, so we can say that handball players achieved a number of outstanding results along the test of decision-making, attention, situational awareness, risk-taking and performance motivation. Furthermore, we observed in the majority of players that they were able to optimize their own performance, to continuously improve, which is a source of confidence in relation to that the skills we examined can be developed. Finally, in the context of social relationships exploration

method results, we have repeatedly verified the personality of players who score well on the aptitude test and also have high skills according to the players.

In the future, however, I think it is very important to expand the number of test subjects, to create an athlete standard for the DPTR Handball Test Package. Future testing would certainly be complemented by further examination of players' performance on the handball court, including analysis of match protocols. This can help us to add to a player's risk-taking attitude, for example, information based on the objective fact of how many shots they tried to succeed in a match, but we can also add weights depending on the outcome of different league matches (winner, draw, lost). We can give them. For validation, the capabilities measured in the DPTR Handball Test Package can be tested in the future with already validated tools, so we can ensure that our tests actually measure what we want to. For validation, in line with the principles of our test system, we would prefer tools that work on a similar principle, such as VTS-related subtests or a tool to test and improve Eye Tracking attention.

In addition, the "toolkit" needs to be expanded and the tests adapted to English over time. The wide range of future opportunities indicates the necessary continuation of research and its sustainability.

As a final thought, however, I would like to emphasize the value of the research that our efforts to explore the key competencies of handball players in a sport-specific way and the practical integration of DPTR are novel not only domestically but also internationally.

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6. Further publications of the author

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Registry number: DEENK/234/2022.PL
Subject: PhD Publication List

Candidate: Brigitta Kiss
Doctoral School: Doctoral School of Human Sciences
MTMT ID: 10057685

List of publications related to the dissertation

Hungarian scientific articles in Hungarian journals (3)

1. Új, E. D., Csukonyi, C., Őrsi, B., **Kiss, B.**: A célkitűzés hatása az utánpótlás korú kosárlabdázók fejleszthetőségére a kontrollhely és motiváció forrásának tükrében.
   Stadium Hung. J. Sport Sci. 4 (1), 1-20, 2021. ISSN: 2676-9506.
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2. Tóth, M., **Kiss, B.**: Az áramlatélményre való hajlamosság, a teljesítménymotiváció és a kontrollhely kapcsolata kettős karrierű sportolók körében.
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3. **Kiss, B.**, Csukonyi, C., Münnich, Á.: Sport-pszichodiagnosztikai tesztek kézilabda specifikus alkalmazása.
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Foreign language scientific articles in international journals (2)

4. **Kiss, B.**, Balogh, L., Münnich, Á., Csukonyi, C.: A sport-psychological diagnostic examination of young EHF handball referees with a focus on mental skills.
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Foreign language abstracts (1)

6. Balogh, L., Makra, G., Donka, D., Pucsok, J. M., Bácsné Bába, É., **Kiss, B.**, Csiki, Z., Nagy, A., Papp, G.: Comparative analysis of the effects of regular exercise on immunoregulatory and cognitive abilities in young and elderly adults.
In: 24th Annual Congress of the European College of Sport Science : Book of abstracts. Ed.: V. Bunc, E. Tsolakidis, European College of Sport Science, Prague, 592, 2019. ISBN: 9783981841428

The Candidate's publication data submitted to the iDEa Tudóstér have been validated by DEENK on the basis of the Journal Citation Report (Impact Factor) database.

29 April, 2022

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