

**Short thesis for the degree of doctor of philosophy
(PhD)**

**What makes a good esports player? –
Scientific foundations of an e-sports-specific
testing system to support talent
identification and performance diagnostics**

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The aim of the thesis, the scope of the topic

The aim of the dissertation is to identify psychological factors influencing the performance of esports players using qualitative and quantitative methodologies, and to lay the foundations for the development of tools suitable for measuring these factors. The research contributes to the expansion of the psychological literature on esports by exploring psychological characteristics relevant to performance and defining competency groups based on these characteristics.

The practical significance of the study lies in the fact that the factors and competency groups identified guide the selection and performance evaluation of esports athletes and the development of psychodiagnostic processes. During the test development phase, six computer-based measurement tools were created, several of which we initiated validation for, thereby expanding the scientifically based psychological toolkit that can be used to examine esports players.

Esports – as competitive video gaming – has become a significant and rapidly growing phenomenon worldwide alongside traditional sports, attracting increasing interest not only from younger generations but also from older ones. Although the acceptance of esports as a sport activity remains controversial, this paper interprets it as a sport based on the definitions provided by Tiedemann (2004) and Wagner (2006). International data shows rapid growth in this area: viewership of the League of Legends World Championship already exceeded that of the Super Bowl in 2019 (CNBC, 2019) and reached a peak of 6.86 million in 2024 (Statista, 2025). Although e-sports is still a young phenomenon in Hungary, more and more specialised clubs, teams, and competition systems are being established, including within universities.

As with traditional sports, performance optimization and mental preparation play a key role in esports, an area in which

there is a growing demand for the involvement of sports psychologists. Although opinions differ on the professional role these factors play in esports, mental preparation is more important than physical training due to the specific nature of esports.

Several research areas appear in the literature that focus on examining the psychological characteristics of esports players and the related performance indicators. Campbell and colleagues (2018) pointed out that esports provide an exceptionally suitable field for the empirical exploration of neurocognitive abilities, particularly expertise and proficiency. Several measurement methods have been used with e-sports players in this area, including the flanker task and SART (Kozachuk et al., 2016), action reprogramming and attentional network task paradigms (Zakalski & Hart, 2024), also eye-tracking-based studies (Hampshire & Tyndall, 2024). At the same time, certain cognitive tests—such as the Stroop procedure—did not show sufficient discriminatory power to identify differences in the ranking of esports players, even in the case of players characterised by outstanding performance levels (Toth et al., 2019).

Research examining factors influencing performance in esports using explicitly qualitative methodologies has typically focused on a limited range of mental, cognitive, and social skills. The impact of digital communication, including the management of online interactions and conflict resolution, emerged as a key area (Banks & Carr, 2019; Bonilla et al., 2022; Freeman & Wohn, 2019). Other key factors in terms of performance include game knowledge, tactical and strategic skills, and the ability to anticipate based on available information (Fanfarelli, 2018; Kim et al., 2016; Sharpe et al., 2022).

However, in addition to these cognitive and decision-making factors, digital cooperation, team cohesion, and the

importance of the in-game leader role are emphasised as additional critical performance components in team-based esports (Bonilla et al., 2022; Kim et al., 2016; Falkenthal & Byrne, 2021). In addition, motor skills (eye-hand coordination, reaction time), attention processes, stress management, and the role of resilience are also recurring themes (Hilvoorde & Pot, 2017; Holm et al., 2021; Himmelstein et al., 2017).

However, interpreting these findings requires methodological caution, given that many empirical studies are based on a single esports title and a limited sample size, which significantly limits the generalizability of the results (Fanfarelli, 2018; Smith et al., 2019).

Overall, the results so far suggest that esports performance is multideterministic and shaped by the combined effects of several psychologically relevant factors. This complexity was evident not only in the results of qualitative research and various cognitive measurement procedures, but also in studies on the effectiveness of training programs designed to develop communication, cognitive, and mental skills (Kovács et al., 2020; Maier, 2024; Toth et al., 2021; Zakalski & Hart, 2024).

Outline of the methods used

In the initial phase of the dissertation, I used qualitative research methods—focus group interviews and semi-structured individual interviews—to explore the psychological factors influencing esports performance. The participants in the study were active esports athletes on the one hand, and people with expertise in the field of esports (coaches, researchers, community organisers) on the other. Based on the results of the exploratory study, existing standardised psychological measurement tools were systematically reviewed, and new measurement procedures were developed to measure the

identified constructs. Several of the developed tools were subjected to pilot and validation tests.

The semi-structured interview outline used for focus group discussions and individual interviews was developed based on the studies of Himmelstein and colleagues (2017) and Csukonyi and colleagues (2015). The focus group sessions lasted approximately 60 minutes each, while the individual interviews lasted approximately 90 minutes per participant.

The focus group study was conducted with 15 participants divided into four groups (3-3-4-5), while individual interviews were recorded with 30 participants. Composition of focus group participants: 13 men, average age 23.7 years (standard deviation 5, min. 18, max. 37), including 10 professional esports players, 2 coaches, 2 researchers, and 1 team owner/manager. There were 27 male individual interviewees with an average age of 25 (standard deviation 4.3, min. 18, max. 34). This group consisted of 20 professional e-sports players, 4 researchers, 3 coaches, 2 event organisers, and 1 commentator. The total sample consisted of 45 individuals (40 men, average age 24.6 years, standard deviation 4.5, min. 18, max. 37), all of whom were Hungarian citizens and participated in the study representing 15 different esports titles.

The content analysis was performed by three coders using a predefined coding system based on psychological characteristics, using ATLAS.ti software. The focus group content was subjected to exploratory content analysis before formal coding, during which 28 third-year psychology students identified and summarised the relevant psychological concepts according to frequency. The resulting individual lists were synthesised through conceptual consolidation and terminological harmonisation, and then incorporated into the final code scheme. Only those segments on which the coders reached consensus were used in the final content analysis, thus

ensuring the conservative and reliable nature of the coding process.

The quantitative study consisted of three stages: validation of one test requiring personal attendance and two tests that could be completed online. In the in-person study, we compared the STT test with the short version of the Vienna Test System's DT test to make sure the tests worked the same way and the results could be compared. In the online section, we compared the RIT and SzKKT tests with the "Choice Reaction Time Task" and "Nasa Pointing Task" on the Inquisit platform. The sample for validation requiring personal presence consisted of 100 people, mostly psychology students (73 women), with an average age of 22.7 (SD = 2.44; range: 19–29 years). A total of 127 people participated in the online validation of the RIT; however, after excluding 34 invalid completions, the data from 93 individuals were analysed (58 women; M = 26.85 years, SD = 11.44; range: 18–67 years). The online validation of the SzKKT involved 125 participants, of whom 32 were excluded, leaving 93 valid responses (65 women; M = 25.5 years, SD = 10.4; range: 18–67 years). In all cases, participants provided their consent in advance via a Google Forms questionnaire, which included their sociodemographic, sports, and video game usage data, and then completed the selected tests. Completing the personal test took approximately 20 minutes, while online validations took 10-10 minutes.

The thesis statements of the research results

Thesis 1: Scientific foundation of factors influencing performance in esports.

I base my first main thesis and its sub-theses on the results presented in subsection 3.3.4 of the main research (Papp et al., 2025), detailed in Chapter 3.

Sub-thesis 1: During the research, 17 factors were identified that can have a varying degree of influence on the success of an esports career and performance in a given activity. The generalizability of the identified factors to all esports genres varies. The 17 factors are: resilience, stress tolerance, cooperation, sustained attention, goal orientation, situational awareness (anticipation) and insight, performance motivation, communication skills, critical thinking, reaction time, adaptability, tolerance for monotony, decision-making ability, eye-hand coordination, creative problem-solving ability, simultaneous attention capacity, and memory.

Based on the results of the content analysis, all three coders consistently identified references for all 17 predefined codes in the overall content, which confirms the statement made in the sub-thesis (Papp et al., 2025).

Sub-thesis 2: Among the factors influencing the success of an esports career and performance in this activity, resilience, stress tolerance, sustained attention, and tolerance for monotony can be generalised.

Based on the results of the content analysis, the codes that were mentioned most frequently – resilience ($F^1=532$), stress tolerance ($F=479$), and sustained attention ($F=362$) – and were mentioned by all participants without exception in the discussions – ability to tolerate monotony ($F=120$) – serve as reliable indicators that these factors are generally relevant to the career and performance of esports players, regardless of the esports title and genre (Papp et al., 2025).

Sub-thesis 3: Among the factors influencing the success of an esports career and performance in a given activity, characteristics such as cooperation, communication, simultaneous attention capacity, and

¹ Frequency

reaction time can be utilised to varying degrees depending on the characteristics of the esports genre in question.

We accept the sub-thesis based on the results of the content analysis, as the data showed that certain codes occurred less frequently – situational awareness (anticipation) and insight ($F=252$), goal orientation ($F=260$), critical thinking ($F=176$), adaptability ($F=142$), decision-making ability ($F=116$), eye-hand coordination ($F=94$), simultaneous attention capacity ($F=61$), and memory ($F=30$) – while others were specifically emphasized by the participants, indicating that they do not apply to all esports genres – cooperation ($F=426$), communication skills ($F=179$), reaction time ($F=156$) –. Some factors proved to be more relevant to team games – such as cooperation, communication skills, and the social aspect of adaptation – while others proved to be more relevant to individual competitions and different game genres – typical examples include reaction time and the aspect of movement speed in eye-hand coordination (Papp et al., 2025).

Sub-thesis 4: Six competency groups were created based on 17 psychological characteristics identified as factors influencing esports performance. These groups are: Developmental Motivation, Attention Skills, Game Intelligence, Perseverance and Stress Management, Motor Skills, and Social Skills.

The competency groups defined in the sub-thesis are confirmed by the results of the code-occurrence analysis. Adaptability was most strongly associated with critical thinking, situational awareness, and cooperation, while goal-orientedness showed a strong correlation with performance motivation, resilience, and cooperation. Decision-making ability was mainly associated with reaction time and situational awareness. Cooperation was most strongly associated with communication skills, sustained attention with stress tolerance and resilience,

while situational awareness formed strong pairs with critical thinking. Creative problem solving was closely associated with critical thinking, while monotony tolerance and critical thinking were closely associated with resilience.

The most strongly associated code was resilience, which formed a prominent cluster with stress tolerance and performance motivation. Finally, the analysis confirmed the previously hypothesised relationship between reaction time and eye-hand coordination.

Overall, the codes showed consistent patterns of association, which allowed for the formation of distinct, logically interpretable clusters of competencies (Papp et al., 2025).

Thesis 2: Possibilities for measuring the identified factors and the initiation of test development. As part of the research, we also initiated test development to expand the range of available tests. This resulted in the creation of six computer-based tests. These tests are as follows: Mackworth clock test, Stress Tolerance Test (STT), Reaction Time Test (RIT), Flanker Test, Visual Search Test, Eye-Hand Coordination Test (SzKKT).

The second main thesis is supported by the fact that in Chapter 4.2 and its related subchapters, we described in detail the steps of the test development process and the structure of the six completed tests. These tests form the basis of a scientifically sound system that is specifically designed to measure the factors identified during the research. We treat the development as an open, continuously expandable system, which we plan to extend further in the future.

Thesis 3: Investigation of the concurrent and convergent validity of the completed tests.

I base the third main thesis and the associated sub-theses on the results presented in subsection 5.5 of the main research detailed in Chapter 5.

Sub-thesis 5: The STT showed an analogy with the computer-based test procedure used as a basis for comparison (Vienna Test System DT test). Based on the results, there is a positive, moderately weak but significant correlation between the number of correct answers given in the two tests ($r_s=0.26$, $p=0.009$).

We accepted the sub-thesis based on the level of significance and the strength of the relationship, as the moderate strength of the relationship is likely to be related to the different characteristics of the two tests (e.g., the method of response entry, the time frame allowed for reaction time), which the participants also indicated subjectively.

Sub-thesis 6: The RIT showed an analogy with the computer-based test procedure (Inquisit library Choice Reaction Task) used as a basis for comparison. Based on the results, a positive and strong correlation ($r_s=0.707$, $p<.001$) was found along the reaction time values, while a positive but moderate correlation ($r_s=0.545$, $p<.001$) was found for correct answers.

The statistical results prove that both reaction time and response accuracy show similarities between the two tests. This has resulted in the creation of a test procedure suitable for measuring reaction time.

Sub-thesis 7: The SzKKT showed an analogy with the computer-based test procedure used as a basis for comparison (Inquisit library Nasa Pointing Task). Based on the results, the respondents' reaction times showed a strong, positive, significant correlation ($r_s=0.883$, $p<.001$), while in the case of correct answers, we found a moderate, positive, significant correlation ($r_s=0.405$, $p<.001$).

According to statistical analysis, there was a significant similarity between the two tests in terms of reaction time and response accuracy, which confirms that the developed test procedure can be reliably used to measure eye-hand coordination.

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List of publications related to the dissertation

Hungarian book chapters (2)

1. Csukonyi, C., **Papp, D.**: A mentális állóképesség alakulása a hagyományos sportolók (vívás, kézilabda) és az e-sportolók körében.

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5. **Papp, D.**, Burján, R., Csukonyi, C.: Exploratory study of qualitative psychological factors influencing performance in esports.
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8. Bátfai, N., Csukonyi, C., **Papp, D.**, Hermann, C., Deákné, O. E., Györi, K.: A DEAC-Hackers esports szakosztály mesterséges intelligencia oktatási és kutatási elképzelése a Minecraftban.
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17. **Papp, D.**, Csukonyi, C.: Mi teszi a jó e-sportolót? - avagy egy e-sportspecifikus tesztrendszer kidolgozása az utánpótlás kiválasztás és tehetségdiagnosztika elősegítésére.
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