

Article

The Level of Physical Activity, E-Game-Specific Reaction Time, and Self-Evaluated Health and Injuries' Occurrence in Non-Professional Esports Players

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Abstract: This study aims to compare physical activity levels, esports-specific reaction times, self-evaluated health, and injuries between non-professional esports players (EPs) and non-players (NPs). Participants were healthy, with an average age of 22.7 ± 2.49 years and BMI of 25.5 ± 4.95 kg/m². Physical activity was quantified using the Baecke Questionnaire, while reaction times were measured with computer games. The analysis reveals that EPs exhibit significantly lower levels of physical activity compared to NPs ($p < 0.05$), underscoring the sedentary nature of esports. Despite this, EPs demonstrate superior reaction times ($p < 0.001$), suggesting cognitive enhancements associated with esports participation. EPs report increased incidences of gameplay-related discomfort ($p = 0.025$), highlighting health drawbacks of prolonged gaming. However, no significant differences were observed in overall self-evaluated health statuses and specific pain complaints between the groups, indicating a complex relationship between esports involvement and perceived health outcomes. These findings suggest that esports can offer cognitive benefits through improved reaction times but are also associated with reduced physical activity and increased reporting of discomfort. This dichotomy underscores the need for strategies that capitalize on the cognitive advantages of esports while mitigating its physical health risks, encouraging a more balanced engagement with the activity.

Keywords: competitive gaming; cyber sports; reaction time; physical health; exercise; human–computer interactions



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1. Introduction

In recent years, esports, or competitive video gaming, has rapidly ascended to a global phenomenon, captivating a wide and diverse participant base [1]. This remarkable evolution has shifted esports from being a casual, recreational activity to a legitimate, highly competitive sport [2]. As the esports industry grows, so does the focus on understanding player performance factors, including cognitive abilities like attention, perception, and visuospatial skills, as well as physical skills [3]. This increase in popularity has significantly transformed entertainment and sparked global scholarly interest in the cognitive aspects of competitive gaming.

The emergence of esports as a global entertainment and competitive phenomenon has raised health concerns due to the sedentary lifestyle it promotes among players. Extended gaming sessions have been linked to musculoskeletal issues, cardiovascular risks, obesity, and behavioral problems [4–7]. Research, including studies by Bailey et al., Rudolf et al., and Wattanapisit et al. [8–10], highlights the public health implications and the connection between gaming and an increased risk of non-communicable diseases. It emphasizes the need for a balanced view of esports, recognizing its challenges while exploring its potential benefits for cognitive and physical health.

It is also worth noting that, in the studies, notable contradictions emerge, particularly regarding the cognitive impacts of esports. For example, Argyriou et al. [11] discovered that response inhibition in gamers might be impaired, contrasting with Bediou et al. [12] who noticed enhanced cognitive skills from gaming. Moreover, the psychological and behavioral dimensions of esports players are gaining scholarly attention, particularly in understanding how personality traits and gaming behavior intersect [13]. This line of inquiry is crucial, as it broadens the scope of esports research to encompass not only physical and cognitive factors but also the psychological well-being of players.

1.1. Physical Activity and Reaction Time in Esports

Recent research highlights cognitive enhancements and faster reaction times in esports players. A test of reaction time indicates the intense cognitive engagement and rapid decision-making required in competitive gaming, aspects central to esports players' cognitive demands [14–16]. These findings suggest that competitive gaming, despite its sedentary nature, may foster significant cognitive adaptations, potentially offsetting some of the negative impacts of reduced physical activity. This raises intriguing questions about the nature of these cognitive adaptations, especially in terms of how they might compensate for the reduced physical activity levels commonly associated with gaming [17]. Boot et al., Toth et al., and Wang et al. [18–20] have explored this phenomenon, suggesting that the specific demands of esports could lead to shortened reaction times, even amidst lower levels of physical activity. Furthermore, professional esports players exhibit significant cognitive improvements, challenging traditional expectations and opening new avenues for understanding the cognitive impact of esports [12,21].

However, the relationship between esports and physical health, particularly in terms of physical activity levels, remains an area of conflicting findings and ongoing debate. For instance, Rudolf et al. [9] found that a significant portion of esports players reported good to excellent health status, with nearly two-thirds of respondents following recommended physical activity levels. Moreover, Giakoni-Ramírez et al. [22] report that most esports players meet or exceed recommended physical activity levels. Nevertheless, these findings are contrasted by Trotter et al. [23], who observed that esports players generally met international physical activity guidelines less frequently than the general population. These contrasting results underscore the complexity of the relationship between esports, physical activity, and overall health, pointing to the need for more focused and nuanced research in this area.

1.2. Bridging the Research Gap and Aims

So far, most studies have focused on the physical activity levels, common pain complaints, and cognitive well-being status of professional esports players [24–28]. Moreover, research in the general population has demonstrated a clear correlation between physical activity and improved reaction time, suggesting that even modest physical activity can enhance cognitive functions like attention and decision-making time [29,30]. This leads to a critical question in the context of esports: does the sedentary nature of competitive gaming limit these cognitive advantages? Understanding the implications of sedentary behavior, physical health, and cognitive well-being in esports is crucial for individual well-being and the broader esports culture [12,31,32]. Recent research underscores the need for comprehensive health assessments in the esports community, considering the interplay between these factors. Some interventions in esports settings have shown promise in promoting physical activity without compromising cognitive performance [32,33].

This study aims to address a gap in our understanding of the levels of physical activity, e-game-specific reaction time, and self-evaluated health and injuries' occurrence among young adult non-professional esports players (EPs), by comparing them with non-players (NPs). Additionally, this research examines the potential relations between EPs' physical activity, e-game-specific reaction time, and self-evaluated health perceptions, with the

expectation of identifying significant relationships that underscore the unique impacts of esports on physical and reaction time dynamics.

Considering the results of previous research [9,19,20], it is hypothesized that (1) EPs will demonstrate lower physical activity levels and superior performance in e-game-specific reaction time tests compared to NPs; (2) EPs' self-evaluated health and injuries' occurrence assessments may range from similar to more negative than those of NPs, reflecting the complex health dynamics within the esports community.

2. Materials and Methods

2.1. Study Design

This study was structured as a cross-sectional analysis, focusing on young adult non-professional EPs and NPs. The research design involved a comparative approach to evaluate differences in physical activity levels and e-game-specific reaction times between these two cohorts. Additionally, it aimed to collect self-reported data on health status and incidence of injuries.

2.2. Characteristics of the Participants

This study involved 36 EPs (9 women and 27 men) and 25 NPs (10 women and 15 men), aged 19 to 30. No one withdrew from this study due to injury or other reasons during its duration. As a result, 61 persons participated in this study (Figure 1). Inclusion criteria for both groups included a minimum age of 18, proficient verbal communication skills, and full mobility. For the EP group, active participation in esports was required, whereas, for the NP group, it was essential to confirm that they were not game players. Exclusion criteria for both groups included any health conditions that could affect reaction time or physical activity levels as neurological problems or current injuries or pain of the spine or upper limbs (based on participants' declaration). All participants were volunteers and provided written informed consent. This study was conducted between March and May 2023. The project was approved by the Bioethical Committee at Poznan University of Medical Science (Decision No. 220/23) and adhered to the Helsinki Declaration [34].

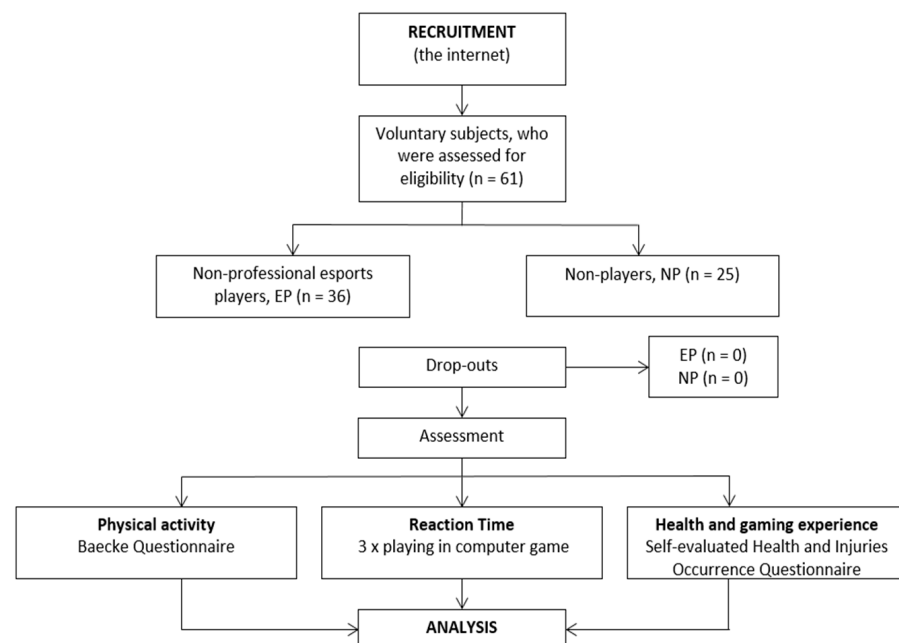


Figure 1. Flowchart of study participants.

2.3. Outcomes

2.3.1. Basic Characteristics

Data on age, body weight, height, and Body Mass Index (BMI) were collected. BMI was calculated as weight (kg)/[height (m)]².

2.3.2. Physical Activity

The physical activity levels of young adult non-professional esports players were evaluated with the use of the Baecke Questionnaire [35]. This comprehensive tool measures physical activity across three distinct categories, work-related activity (WI), sports activity (SI), and leisure activity (LI), culminating in a total index of physical activity (TI). The questionnaire is designed to capture the intensity, frequency, and duration of physical activities across various contexts, such as occupational tasks, organized sports, and leisure pursuits. The WI component assesses physical exertion at work, SI evaluates regular sports or structured exercise participation, and LI focuses on casual, unstructured physical activities during leisure time. The TI score amalgamates these aspects to provide an overarching view of an individual's total physical activity, reflecting their lifestyle and routine physical engagement.

2.3.3. Reaction Time

The reaction time assessment was conducted using a computer game hosted on MouseAccuracy.com, accessed on 1 March 2023. The MouseAccuracy.com test is an online tool designed to assess a user's accuracy, speed, and reaction time with a mouse. Participants are typically required to click on various targets that appear on the screen, which can vary in size and speed, within a specific time frame. The test measures several key performance metrics, including

- Accuracy: How precisely the user can click on the targets.
- Speed: How quickly the user can move the mouse to click on new targets as they appear.
- Reaction Time: The time it takes for the user to respond to a new target appearing on the screen.

Results from the test provide insights into the user's proficiency in controlling objects and reaction time, indicative of their hand-eye coordination. This assessment is popular among individuals looking to improve their general skills and among esports athletes and gamers who require precise and rapid control to succeed in competitive gaming environments. Sayhi and Odabas [36] have noted the utility of similar games to mouse accuracy in training and assessing motor skills and cognitive processing speeds within gaming and professional contexts.

Regarding standardization, the MouseAccuracy.com test, while widely used, does not fall under traditional standardized tests in clinical settings. However, it is recognized for its consistency and reliability in gaming skill assessments [36]. This test, set at a challenging level for 30 s, aimed to measure indicators of participants' motor skills and cognitive processing speeds. It evaluated several parameters, including the number of clicks, hits, and misses; hit effectiveness; click accuracy; and total score in points. Detailed information about the reaction time test interface and statistics can be found in Figure 2.

To enhance the reliability of the findings, this study calculated the average results from three separate trials for each participant. This approach helps to mitigate anomalies or inconsistencies in individual performances, thereby offering a more accurate assessment of their reaction capabilities.

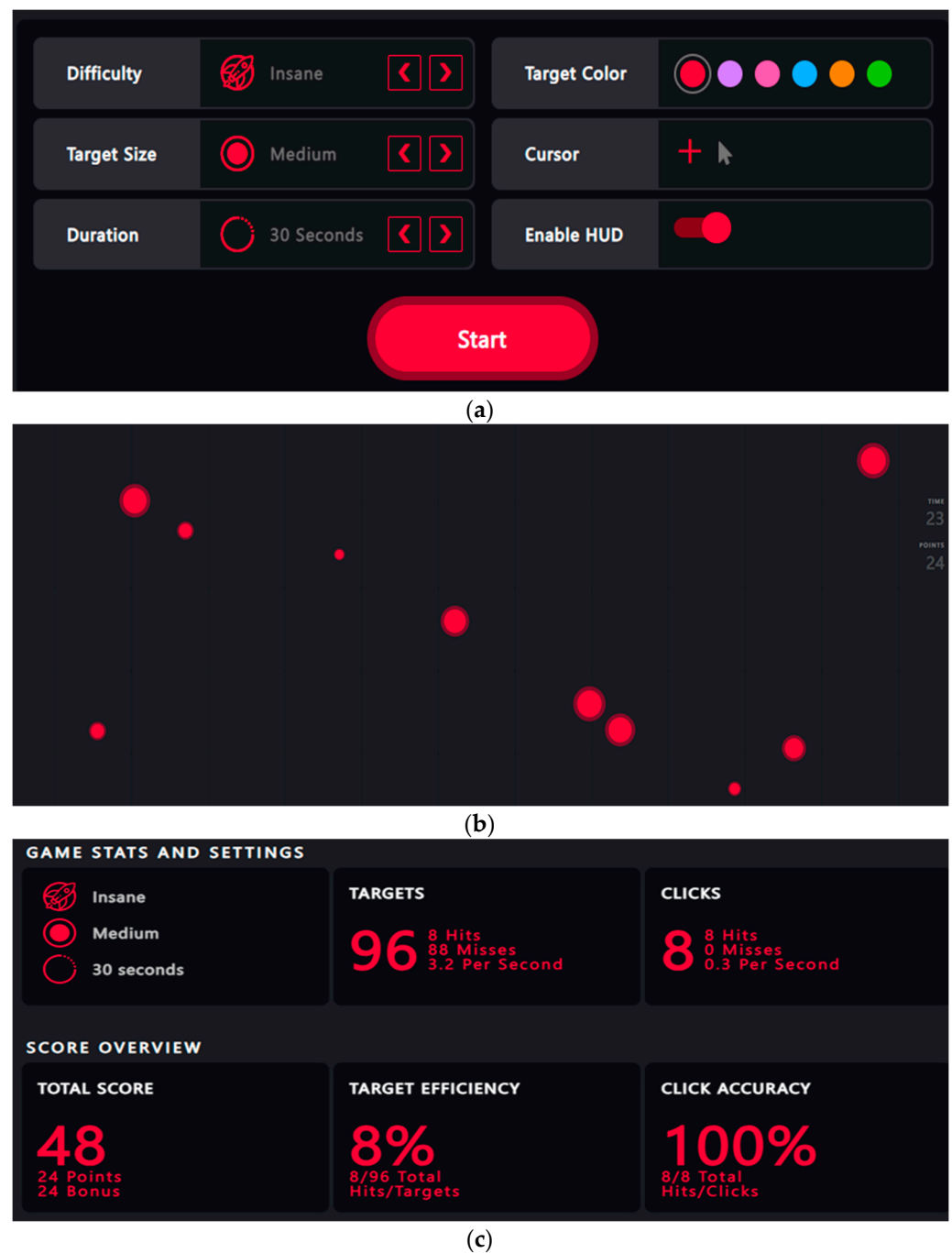


Figure 2. Example game parameters: (a) sample settings for games—customized test conditions, including difficulty, target color, size, cursor type, and duration; (b) sample of game—gameplay with red targets on dark background, enhancing visibility and simulating dynamic scenarios; (c) sample of game stats, settings, score overview—summary of results, including targets, hits, misses, accuracy, and total score. MouseAccuracy.com, accessed on 6 April 2024.

2.3.4. Information Connected to Health and Gaming Experience

This study employed a diagnostic survey method, disseminated online, to ensure broad demographic reach and participant confidentiality. The survey covered aspects such as participant demographics (age, gender, occupation), training experience (frequency, intensity of gaming sessions (per week)), and common injuries and health issues, aiming to yield a subjective evaluation of health. This focused on identifying any prevalent health patterns or concerns associated with the participants' lifestyle or exercise routines.

Upon completion, the responses were anonymously collected and securely stored. Data from the surveys were then systematically exported to an Excel file to facilitate the data organization and preliminary analysis. This step was crucial for ensuring data integrity and preparing the dataset for a more advanced statistical analysis.

2.3.5. Statistical Methods

All data were stored in Excel for the further analysis. Statistical analyses involved using Student's *t*-test for independent data to assess differences between groups for quantitative variables, including reaction time tests, physical activity indexes, BMI, and age. It was assumed that *t*-tests are quite robust against violations of normal distribution [37,38]. However, skewness and kurtosis were checked to assess potential limitations of using parametric tests. In both cases, the obtained values were within appropriate ranges: $<-1.5;1.5>$ and $<-2;2>$, respectively. Pearson's *r*-coefficients were calculated to determine correlations between indicators of physical activity levels and reaction time tests. Since the condition of normality was violated for about half of the variables, a bootstrap analysis was adopted (percentile method with 5000 samples). Differentiations in the frequency of answers connected to indicators of overall health and gaming experience were analyzed with the use of Pearson's χ^2 independent test. All calculations were performed using Statistica 10.0 (TIBCO Software Inc., Palo Alto, CA, USA) and Statistical Package for the Social Sciences—SPSS 20.0 (IBM, Armonk, NY, USA).

3. Results

Statistical analyses were performed on participant characteristics, revealing no significant differences in age or BMI between the groups (Table 1).

Table 1. Average Values, Standard Deviations, and Differences Between Groups for BMI and Age.

Variable	M (SD) EP	M (SD) NP	t df = 59	p	Cohen's d
Age [years]	22.92 (2.7)	22.32 (2.23)	0.91	0.366	0.24
BMI [kg/m ²]	26.40 (5.07)	24.24 (4.71)	169	0.097	0.44

Note: EP—esport player; NP—non-player; BMI—body mass index; SD—standard deviation; M—mean; Cohen's d effect size: 0.2—small, 0.5—moderate, 0.8—large.

EPs demonstrated lower scores in leisure physical activity ($p = 0.037$) and the total physical activity index ($p = 0.05$). However, they exhibited significantly higher performance in time reaction tests, with more clicks ($p = 0.001$), higher hit rates ($p = 0.001$), and greater overall results ($p = 0.001$) (Table 2).

Table 2. Average Values, Standard Deviations, and Differences Between Groups for Physical Activity Indexes and Time reaction Tests.

Variable	M (SD) EP	M (SD) NP	t df = 59	p	Cohen's d
WI [pts]	2.90 (0.55)	2.91 (0.72)	−0.07	0.948	0.02
SI [pts]	2.51 (0.59)	2.82 (0.67)	−1.89	0.064	0.49
LI [pts]	3.25 (0.59)	3.57 (0.56)	−2.13	0.037	0.56
TI [pts]	8.66 (1.05)	9.3 (1.44)	−2.00	0.05	0.51
Clicks [n]	71.33 (19.40)	33.92 (9.89)	8.87	0.000	2.55
Hits [n]	65.36 (17.60)	32.12 (8.89)	8.69	0.000	2.51
Missed hits [n]	5.97 (4.23)	1.76 (1.90)	4.66	0.000	1.37
Hit effectiveness [%]	68.22 (18.52)	33.48 (9.25)	8.64	0.000	2.5
Click accuracy [%]	91.83 (4.62)	95.12 (4.53)	−2.75	0.008	0.72
Overall result [n]	373.36 (99.99)	181.96 (46.47)	8.91	0.000	2.61

Note: EP—esport player; NP—non-player; SD—standard deviation; M—mean; SI—sports activity; WI—physical activity at work; LI—leisure physical activity; TI—total index of physical activity; Cohen's d effect size: 0.2—small, 0.5—moderate, 0.8—large.

Leisure physical activity (LI) shows a positive correlation with the number of clicks ($r = 0.432, p = 0.034, R^2 = 0.184$), hit rates ($r = 0.449, p = 0.024, R^2 = 0.193$), and hit effectiveness ($r = 0.449, p = 0.024, R^2 = 0.192$), suggesting that higher engagement in leisure activities relates to better performance in time reaction tests (Figure 3). The details can be found in Supplementary Materials (see attached Supplementary File).

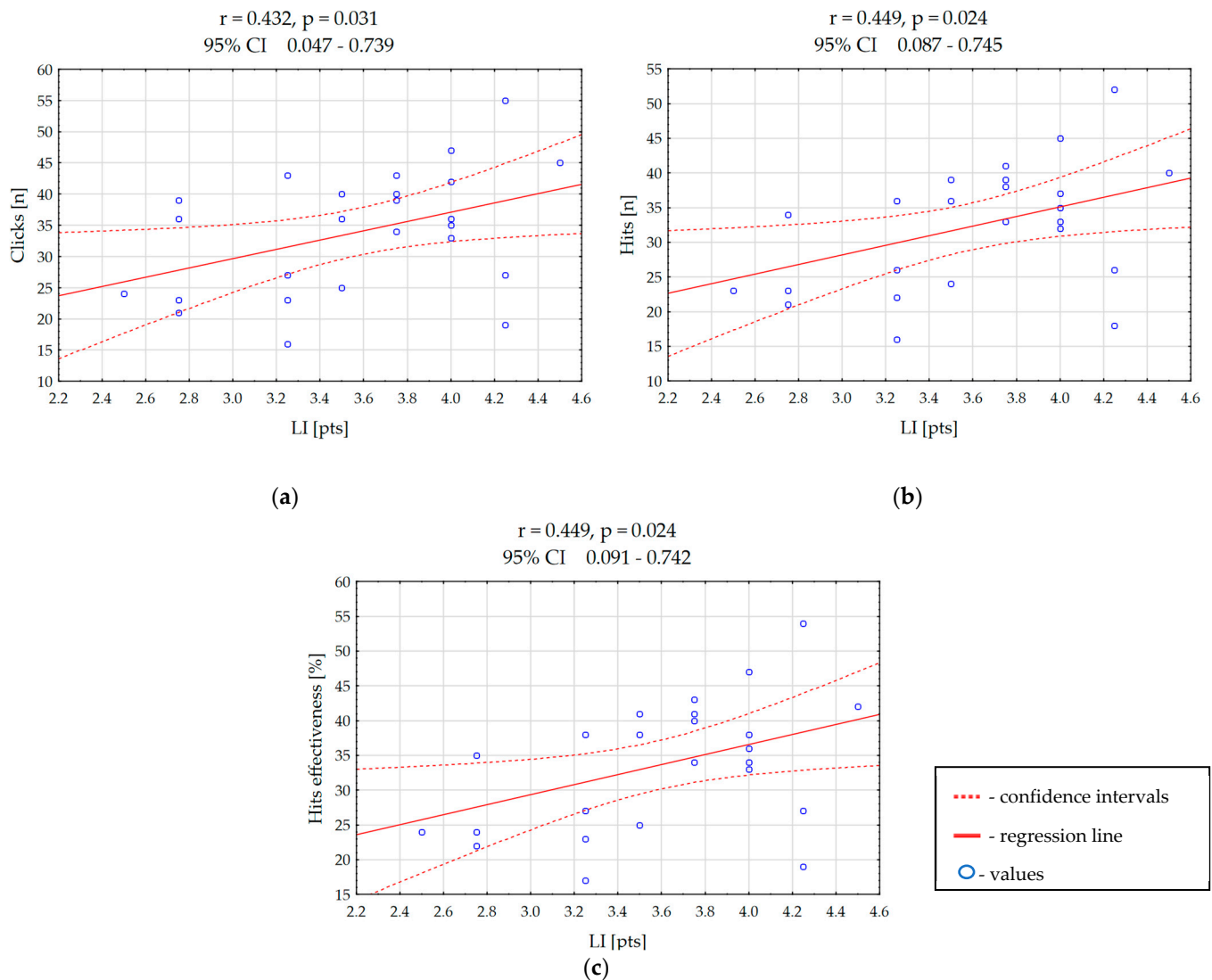


Figure 3. Correlations between leisure time activity index (LI) and (a) number of clicks, (b) number of hits, and (c) hits' effectiveness. Correlation coefficients and 95% confidence intervals are calculated using bootstrap method with 5000 samples.

There is no significant difference in how individuals rate their health ($\text{Chi}^2 = 0.618, p = 0.734$), with both groups generally rating their health similarly.

When it comes to pain related to playing, a significant association is observed ($\text{Chi}^2 = 7.405, p = 0.025$), indicating that EPs are more likely to report pain compared to NPs.

The reported pain complaints do not exhibit a significant difference between the two groups ($\text{Chi}^2 = 6.243, p = 0.181$), suggesting no clear association between being an EP and specific pain issues.

In terms of injuries or contusions caused by playing games, no statistically significant difference was found ($\text{Chi}^2 = 2.972, p = 0.085$). The details can be found in Table 3.

Table 3. Pearson’s Chi² independence test for overall health among EPs and NPs.

Variables	N (%)	N (%)	Chi ² (Cramer's V)	p
	EP (n = 36)	NP (n = 25)		
How do you rate your health?				
Very good	12 (33)	10 (40)	0.618 (0.10)	0.734
Rather good	21 (58)	14 (56)		
Rather bad	3 (8)	1 (4)		
Bad	0 (0)	0 (0)		
Feeling pain while playing				
Yes	21 (58)	18 (72)	7.405 (0.35)	0.025
No	14 (39)	3 (12)		
Hard to say	1 (3)	4 (16)		
The most frequently reported pain complaints by players				
Back pain, pain in the lumbar region	9 (25)	3 (12)	6.243 (0.32)	0.181
Headache, neck pain, upper back pain	4 (11)	0 (0)		
Pain in the elbow	1 (3)	1 (4)		
No pain	22 (61)	21 (84)		
The incidence of injuries or contusions caused by playing games				
More than once	0	0 (0)	2.972 (0.22)	0.085
Only once	4 (11)	0 (0)		
Not once	32 (89)	25 (100)		

Note: EP—esports player; NP—non-player.

EPs and NPs show a similar preference in playing positions ($\text{Chi}^2 = 8.80$, $p = 0.069$), with no specific trend identified. However, a significant discrepancy emerges in the types of seating used ($\text{Chi}^2 = 14.37$, $p = 0.001$), as EPs tend to favor ergonomic gaming chairs.

A highly significant difference is found in the time spent in front of a monitor or any screen ($\text{Chi}^2 = 26.77$, $p = 0.000$), with EPs spending more extended periods compared to non-players. Similarly, a highly significant association is observed in the frequency of playing computer games ($\text{Chi}^2 = 36.69$, $p = 0.000$), with EPs more likely to play daily or often, while NPs play rarely or never.

The analysis of types and frequency of the most frequently used gaming equipment reveals significant differences between EPs and NPs. EPs exhibit a higher prevalence of using computers ($\text{Chi}^2 = 7.147$, $p = 0.007$), a lower likelihood of using telephones ($\text{Chi}^2 = 4.543$, $p = 0.033$), and a more diversified approach, particularly in combining computers with consoles or telephones ($\text{Chi}^2 = 13.467$, $p = 0.036$), as indicated by a significant Chi-square test. This underscored distinct patterns in gaming equipment preferences between the two groups (Table 4).

Table 4. Pearson’s Chi-square independence test for overall gaming experience—including frequency, intensity of gaming sessions, and choice of gaming equipment—and the preferred postures adopted during play among EPs and NPs.

Variables	N (%)	N (%)	Chi ² (phi or Cramer's V)	p
	EP (n = 36)	NP (n = 25)		
The positions in which the body is most often held while playing				
Semi-sitting position, with legs extended forward	3 (8)	5 (20)	8.7 (0.38)	0.069
Sitting, leaning against the back of a chair	25 (69)	12 (48)		
Seated, leaning forward	8 (22)	4 (16)		
Lying down	0 (0)	3 (12)		
Standing	0 (0)	1 (4)		

Table 4. Cont.

Variables	N (%)	N (%)	Chi ² (phi or Cramer's V)	p
	EP (n = 36)	NP (n = 25)		
Types of seating most often used while gaming				
Office chair	14 (39)	14 (56)	14.37 (0.49)	0.001
Ergonomic gaming chair	17 (47)	1 (4)		
Armchair/sofa/bed	5 (14)	10 (40)		
Time spent in front of a monitor or screen				
1–2 h	1 (3)	8 (32)	26.77 (0.66)	0.000
2–4 h	3 (8)	11 (44)		
4–6 h	15 (42)	3 (12)		
6–8 h	13 (36)	2 (8)		
More than 8 h	4 (11)	1 (4)		
Frequency of playing computer games				
Daily	22 (61)	0 (0)	36.69 (0.78)	0.000
Often	10 (28)	5 (20)		
Sometimes	4 (11)	7 (28)		
Rarely	0 (0)	11 (44)		
Never	0 (0)	2 (8)		
Types and frequency of most often used gaming equipment				
Computer				
Yes	33 (92)	16 (64)	7.15 (0.34)	0.007
No	3 (8)	9 (36)		
Console				
Yes	4 (11)	5 (20)	0.93 (0.12)	0.336
No	32 (89)	20 (80)		
Telephone				
Yes	0 (0)	3 (12)	4.54 (0.27)	0.033
No	36 (100)	22 (88)		

Note: EP—esport player; NP—non-player.

4. Discussion

This study enriches the esports research field by delineating the physical activity, reaction time, and general health of young adult non-professional EPs, in alignment with and expanding upon findings from prior research [14,15,19,39].

We also found that non-professional EPs exhibit superior reaction times compared to NPs, likely due to esports' intensive cognitive demands. This observation aligns with the notion that esports' unique mental requirements, such as quick decision-making and strategic thinking, may enhance cognitive processing speeds, even among amateurs who lack professional training regimes [40].

Contrary to findings from the literature suggesting that professional EPs generally maintain adequate physical activity levels [7,9,22], our study indicates that NPs engage less frequently in physical activities. This contrast underscores not only the lifestyle and training regime differences between professional and non-professional players but also highlights the potential health implications associated with these disparities, such as musculoskeletal issues and cardiovascular risks [4,5]. These observations reinforce the importance of implementing comprehensive health strategies that promote physical exercise and ergonomic practices, aiming to mitigate the health risks linked with the sedentary nature of prolonged gaming.

Esports are fundamentally different from traditional sports. In conventional sports, physical endurance and strength are critical [41]. Conversely, EPs demonstrate a unique blend of cognitive agility and 'sedentary endurance' [42].

Traditional sports emphasize physical attributes, enhancing stamina, muscle strength, and coordination through rigorous physical activity. In esports, the focus is on developing cognitive skills, quick reflexes, and strategic thinking while remaining stationary. Our findings highlight the primary development in esports as cognitive agility, involving quick decision-making and reaction time.

An open question remains regarding the potential benefits of incorporating physical exercise into esports training programs. While the cognitive demands of esports are well documented, the sedentary lifestyle poses health risks. Integrating physical exercise could mitigate these risks, potentially improving health outcomes and enhancing performance by promoting better physical and mental endurance.

The observed positive correlation between higher engagement in leisure activities and faster reaction times among NPs underscores an intriguing concept: regular physical activity significantly improves reaction time. This indicates that leisure activities, usually undertaken for enjoyment and relaxation, might also offer substantial cognitive benefits by enhancing response speed and accuracy [43].

Interestingly, no significant correlations were found between work-related (WI) and sports-related (SI) physical activities and reaction time performance in both NP and EP groups. This suggests that the cognitive and physical demands of leisure activities—likely involving more diverse, unpredictable, and enjoyable stimuli—provide unique cognitive stimulation absent in the more structured or repetitive activities related to work or sports [44].

Moreover, the significant findings linking leisure time activities to improved reaction times in NPs underline the cognitive advantages of engaging in varied and enjoyable physical activities. Such activities not only deliver pleasure but also challenge the brain, potentially enhancing neuroplasticity and cognitive reactions [45,46]. This underlines the importance of integrating a variety of enjoyable physical activities to boost cognitive function and overall performance [47].

On the other hand, EPs, despite lower physical activity levels, showed superior reaction speeds across all dimensions. This reveals an intriguing aspect: regular gaming might develop cognitive abilities that compensate for some benefits typically gained from physical activity, such as enhanced mental agility and faster reaction times. This aligns with cognitive adaptation theories in esports, suggesting that gaming's mental challenges can enhance various cognitive functions [18,20]. Nonetheless, the significance of balancing physical health with cognitive growth is paramount. The challenge is finding ways to weave physical activity into EPs' lifestyles to mitigate health risks while boosting cognitive benefits [33,48]. The health risks for EPs with lower physical activity levels can include a higher risk of cardiovascular diseases, obesity, reduced mental well-being, etc. [8]. Esports training and community programs, leveraging gamification, could be key to promoting a balanced, active lifestyle among players, highlighting the need for a comprehensive health approach in the esports realm. However, addressing these risks requires a comprehensive health strategy within the esports community.

In addition, our study suggests that both EPs and NPs rate their overall health similarly, which challenges the assumptions that esports negatively affect health perceptions. However, EPs report significantly more pain related to playing, aligning with findings from other studies highlighting the physical strains associated with gaming [23,49]. Despite this, the types of pain reported and the incidence of injuries did not differ significantly between groups. This suggests that the physical risks of esports may not be unique to these players. Nevertheless, our conclusions are based on participants' self-reports, which may not fully represent their actual health status. We acknowledge the need for further research involving health professionals using standardized health measurement tools to validate these findings and explore preventive strategies for gaming-related discomfort, paralleling concerns in traditional sports health studies.

Moreover, we noticed that EPs significantly prefer ergonomic gaming chairs and spend more time gaming daily compared to NPs, highlighting the importance of comfort

for prolonged gaming sessions. This aligns with findings from Trotter et al. [23] and Tang et al. [49], which suggest that esports players engage in sedentary behavior. Adopting ergonomic practices can mitigate some health risks, but our findings further reveal that the extended duration of gaming, often exceeding 6 h daily, necessitates more active interventions. Despite ergonomic setups, the long hours in static postures increase the risk of musculoskeletal problems, underscoring the urgent need for integrating physical activities into the daily routines of gamers. This proactive approach could significantly enhance the health outcomes of EPs, emphasizing the need for comprehensive ergonomic and physical health strategies in the esports community. Erickson et al. [29] support this view by detailing the cognitive and physical benefits derived from regular physical activity, suggesting that it can improve overall health outcomes and cognitive functions, which are crucial for esports players. Additionally, DiFrancisco-Donoghue et al. [28] highlight the importance of an integrated health management model to support the well-being of esports athletes by combining ergonomic adaptations with targeted physical exercises. This observation not only reiterates the need for health and ergonomic education but also highlights a critical area for intervention—enhancing ergonomic awareness combined with physical conditioning to support the long-term well-being of esports professionals.

Moreover, the distinct patterns in gaming equipment preferences between EPs and NPs have important implications for ergonomic and health strategies. Our findings reveal that EPs predominantly use computers and less frequently use mobile phones, suggesting a need for ergonomic setups that mitigate potential musculoskeletal strains associated with long hours of gameplay [4,7].

The variation in technology usage among EPs indicates a link to specific health outcomes, emphasizing the necessity for ergonomic interventions that cater to their unique gaming environments. Martin-Niedecken and Schättin [3] also highlight the importance of incorporating physical exercises in esports training to counteract the sedentary nature of the sport. Such strategies are crucial for promoting better health outcomes and ensuring the long-term well-being of esports professionals, as supported by Erickson et al. [29], who discuss the benefits of physical activity for cognitive and physical health in esports contexts.

These observations underscore the need for comprehensive health and ergonomic practices tailored to the specific needs of esports players, aiming to enhance their overall health and performance.

Lastly, the psychological well-being of EPs, including personality traits and behavioral patterns, presents an area for holistic health considerations in gaming practices, emphasizing the importance of addressing psychological well-being alongside physical and cognitive aspects to foster healthier gaming environments, as discussed by Braun et al. [13].

Limitations and Perspectives

Our study, while insightful, is limited by its relatively small sample size, particularly concerning non-professional EPs. This limitation might impact the generalizability of our findings to the broader population of esports enthusiasts. Future research should focus on larger, more diverse participant pools and potentially longitudinal studies to examine the long-term health and cognitive impacts of esports participation.

Additionally, our study primarily uses questionnaires to assess physical activity, which may be a limitation. Moreover, the methods for measuring click rates and self-reported health are also not standardized. Future research should incorporate objective methods like accelerometers and standardized measures. Experimental exercise programs could provide deeper insights into the impact of different physical activities on cognitive and physical health in esports players.

Investigating the effects of structured physical activity programs on cognitive and physical health outcomes in esports players would provide valuable insights into effective intervention strategies.

5. Conclusions

Our investigation into the physical activity levels, e-game-specific reaction times, and self-assessed health and injury occurrences among young adult EPs, as compared to NPs, has yielded significant insights.

Firstly, EPs displayed lower levels of physical activity yet outperformed in e-game-specific reaction time tests. This suggests that esports engagement could enhance cognitive skills like reaction time (specific for e-games), although it may come at the expense of physical health due to decreased physical activity.

Secondly, our study found that EPs rate their health similarly to NPs, challenging assumptions that esports negatively impact health perceptions. However, this is based on self-reported data, which may not fully reflect actual health conditions. Future research should include professional medical examination and objective measurements.

Thirdly, regarding injuries, EPs report injury frequencies and types comparable to or slightly worse than NPs. This suggests that esports have specific health risks, but these are not unique to EPs. The similar injury rates highlight the need for targeted preventive strategies and health interventions for both esports and other sedentary activities.

Moreover, our findings indicate that non-professional EPs, despite being less physically active, possess potentially sharper cognitive reflexes, including faster reaction times. Nevertheless, the sedentary behavior inherent in gaming carries substantial health risks, such as musculoskeletal disorders, injuries, obesity, and cardiovascular problems.

This highlights the necessity for a holistic approach that cultivates the cognitive advantages of esports while combating the negatives of physical inactivity. Collaboration among key stakeholders—players, esports entities, coaches, health experts, and policy makers—is imperative in encouraging physical activity as a complement to gaming. The introduction of health education and bespoke health interventions could alleviate these health concerns. Ultimately, a harmonious balance between mental stimulation and physical health is vital for the esports sector.

Looking ahead, subsequent research should focus on developing and testing strategies to integrate physical activity into the esports routine, aiming to safeguard the long-term health and well-being of all participants in the esports arena, from professional athletes to recreational gamers.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/electronics13122328/s1>, Table S1. Correlations Coefficients Between Physical Activity Indices, and Results of Time Reaction Tests for EP and NP.

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