Promoting Cognitive Brain Health and Sustained Attention in Adults and Older Adults Through e-Games

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Abstract

The ability to learn new skills as an adult, cognitive stimulation in the ageing process, and a cognitively active lifestyle are of interest to experts in education, public health, and social studies. The game Scrabble, with its enjoyable nature, has gained recognition as an educational resource that facilitates the acquisition and preservation of vocabulary, thereby augmenting both practical and cognitive abilities. In this study, a descriptive quantitative research design was implemented to assess attentional capacity using the Bourdon Attention Test, specifically utilizing the BoPr (Prague Square Modification of the CSAT), within the cohort of Scrabble League e-players and the broader general population. With a focus on promoting cognitive brain health, this study presents a comparison of sustained attention levels between these groups. A sample of N = 60 participants (divided into Scrabble e-players who participate in a league [N = 30], and a comparison group of the general population [N = 30]) underwent a study comparing their levels of attention achieved in the Bourdon test. A significant difference (p = 0.050) was found in their attention span, favoring the league e-players. The results suggest that Scrabble e-games can potentially improve the cognitive well-being and attention of adults and older individuals. However, further investigation is necessary to understand their capabilities fully. Utilizing Scrabble in the realms of adult education, gerontology, and medical practice could be beneficial for enhancing cognitive brain health.

Keywords: Adults and older adults, attention span, cognitive health, scrabble, sustained attention

Introduction

The term 'cognitive brain health' describes the well-being of the brain when performing cognitive activities such as thinking, learning and using memory skills (La Rue, 2010). According to Gomez-Osman et al. (2018), modes of various cognitive exercises, or in combination with physical activities, may benefit learning and mental health during the ageing process. There are a variety of

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online games (for both professional e-players and for the general population) designed to improve cognitive brain health for adults and older adults that are useful and safe for the improvement of objective cognitive performance (D'Amico et al., 2024). Growing interest during the last ten years among researchers and psychologists, neurobiologists, social care workers, and information technology professionals in the potential of e-games to promote cognitive brain health in adults and older adults is significant. Scase (2018) and Ordonez (2017) found that cognitive games, particularly those that focus on different aspects of cognitive health, can be successfully used by older adults to improve cognitive function and promote active ageing. Several studies have highlighted the benefits of using serious games to improve cognitive function in older adults (Abd-alrazaq et al., 2023; Koivisto & Malik, 2021; Terada & Lee, 2021). This is supported by Duplàa (2017), who highlights the potential of mobile digital games to improve the physical, cognitive, and social health of older adults. Gutiérrez-Pérez (2023) provides a systematic review of these findings and suggests that digital action games can provide cognitive benefits to older adults by improving specific cognitive skills. Education, facilitation and support may be needed to encourage older adults to realize the socio-emotional benefits of digital gaming (Kaufman et al., 2016). Taken together, these studies suggest that electronic games may be a valuable tool for promoting cognitive health in adults and older adults.

The social word game of board-and-tile Scrabble, and its online version Scrabble Go, are in widespread use worldwide. Mastering the system and rules of this game at the highest level is extremely demanding on all cognitive functions (Lawrence et al., 2020; Perea et al., 2016). Klimova et al. (2016) produced a review study on the effects of playing board-and-tile games, including Scrabble, and their long-term cognitive benefits for older adults. The research included a compilation of 57 research studies whose results demonstrated the positive effects of board-and-tile game playing on cognitive functions such as attention, memory, language skills, and executive functions. The authors concluded that playing board games, including Scrabble, should be encouraged as an activity for older adults to maintain cognitive health and prevent cognitive decline. Verghese et al. (2013) found that older adults who engaged in playing board games, including Scrabble, had a lower risk of developing dementia than those who did not. In general, playing computer games, including Scrabble, can improve cognitive functions such as attention and memory (Protzner et al., 2016; Van Hees et al., 2016). A different study by Lee et al. (2016) examined how playing word games affects sustained visual attention in older adults; after four

weeks, it was found that a group of word game players made significant improvements in sustained visual attention.

Due to the link between cognitive brain health and attention span, and in order to improve our understanding of the promotion of cognitive brain health, sustained attention was chosen as a theoretical framework. According to Sarter (2001), 'sustained attention' is a fundamental component of attention that involves the subject's readiness to detect rarely and unpredictably occurring signals over prolonged periods. Sustained attention is a key attentional function that determines the efficacy of 'higher' aspects of attention (selective attention, divided attention) and cognitive performance in general. Vallesi et al. (2021) added that sustained attention maintains cognitive focus on a task, or stimulus within a task, over an extended time. The decline in attention over time is called fluctuation, which is observed between the twentieth and thirty-fifth minute after the start of a task. During the first 15 minutes, there is a decline in focus; this could be at least half of the final loss of attention (Teichner, 1974). This may not always be an impairment of perceptual abilities, as it could be due to non-perceptual factors such as detection strategies, the expectancy of the nature and occurrence of the stimulus, or the anticipated consequences of correct and incorrect responses (Sternberg, 2002). Two models explain lapses of sustained attention in tasks; the first one, the absent mind model, states that a person is inattentive to ongoing activity, loses oneself in tasks, and is often distracted from intended activities by irrelevant stimuli (e.g., there may be a lack of task monotony). The second model assumes attentional decline due to resource overload. Where tasks deplete cognitive capacity, they exhaust the person and do not allow attention to be restored, inevitably leading to task withdrawal (Warm et al., 2008). A 2017 study examined how playing word games affects sustained visual attention in older adults. Participants were randomly assigned to either a word game group, where they played Scrabble for 50 minutes per day, or a control group, where they watched educational videos for the same amount of time. After four weeks it was found that the word game group had made significant improvements in sustained visual attention, which was measured using a continuous tracking test (Lee et al., 2017). Insights into sustained attention were also provided by a study that examined the effects of playing word games, including Scrabble, on cognitive function in older adults with mild cognitive impairment. The study found that the word game players achieved significant improvements in sustained attention, as well as other cognitive functions such as memory and

executive functions, after eight weeks of playing the game for 30 minutes per day (Jeong et al., 2016).

The concept and definition of sustained attention are described to underpin the variables in our research study. According to Esterman & Rothlein (2019) and Avirame et al. (2022), sustained attention is a fundamental attentional mechanism characterized by the ability to sustain attention and vigilance over an extended period. This concept encompasses various functions, including information selection, amplification of selected information, and inhibition of irrelevant information, thereby facilitating an appropriate response to infrequent and unpredictable stimuli. Furthermore, Tan & Thamarapani (2019) elaborate that sustained attention plays a crucial role in influencing other aspects of attention (such as selective and divided attention), cognitive abilities (e.g., memory, executive functions), and everyday functions like academic performance, work productivity, and safe driving. To investigate the differences between the research samples, the most appropriate definition of attention is that of Anne Treisman (1996) and her two-stage model of selective attention, in which the distinction between effective and ineffective visual search is an important factor. The theory assumes that distinct sensory features, which can include colour, orientation, size, or direction of motion, are encoded in special modules (Sternberg, 2002). In a game of Scrabble, these forms of encoding have long been used in training cognitive functions. Research has shown that sustainable attention in Scrabble players can be enhanced by game analytics and an adaptive system (Harrison, 2013). This is further supported by the finding that players' attention is influenced by the features of the game they are playing (Avoyan, 2020). Additionally, the level of strategic sophistication and social motives can impact players' attention and decision-making in games (Polonio, 2015). These findings suggest that sustainable attention in Scrabble players can be fostered using adaptive systems and by considering individual differences in attention and decision-making.

Thus, the study examines the impact of promoting cognitive well-being and sustained attention among e-players of the Scrabble League and the general population, intending to enhance existing understanding and influence the design of future interventions for various subgroups of adults. The main focus is to compare the attention levels of Scrabble players who participate in a league with the attention levels of the general population. Based on the findings, this study was guided by two hypotheses. H1: The level of attention is significantly higher in Scrabble League e-players than in

the general population. H2: Attention span increases with the length of time an e-gamer has participated in playing Scrabble at the league level.

Method

Research Design

A descriptive quantitative research design was implemented to assess attentional capacity using the Bourdon Attention Test, specifically utilizing the BoPr (Prague Square Modification of the CSAT), within the cohort of Scrabble League e-players and the broader general population (Treisman, 1996; Sternberg, 2002). The research design is based on the two-phase model of selective attention wherein in the second phase, information is received by individuals, whether or not they are actively focusing on it. This model is particularly suitable for analyzing variations among research samples. A key aspect of this theory is the differentiation between successful and unsuccessful visual searches. Central to this theory is the concept that distinct sensory cues, such as colour, orientation, size, or motion direction, are stored in specialized modules. In Scrabble games, these forms of coding have long been used to train cognitive functions.

In this study, participants had to meet the following four inclusion/exclusion criteria: (1) adults aged 18+ and older adults 65+ (2) fluency in Slovak language, (3) voluntary participation to attend this study; and (4) to be a Scrabble player. Players and non-players were comparable in terms of age, gender, education, and place of residence, and all were fluent in Slovak. Also, this study aims the level of attention of Scrabble League players and compare it with the level of attention of the general population, to clarify the relationship between attention and the length of playing Scrabble at the league level.

The Ethics Commission of the University of Ss. Cyril and Methodius in Trnava in Slovakia, Department of Psychology (FF-EK 1-2023) approved 25th April 2023 this study, within the University project 'Enhancing the Smart Active Ageing', funded by EEA through Norway Grants. All authors of the study from Slovakia and Norway are members of the aforementioned project. All respondents received an explanation of the aims of the study and agreed to participate by signing informed consent via an e-survey. Respondents in the online survey agreed that the return of the questionnaire implied consent to participate in the study.

Study Group

The baseline sample consisted of all league players registered on the 'herna.net' platform and all registered e-players in the Slovak Scrabble Association. Scrabble is a social language game, spread all over the world and adapted into different world versions. The goal of the game is to combine letters into written words according to precisely defined rules and achieve the highest possible total score. Slovak Scrabble is played at the league level on the online platform herna.net or at face-to-face tournaments organized by the Slovak Scrabble Association, which has up to 100 registered members. Each Scrabble league player has his personal ELO account, which changes after each game. After a win, points are added according to a special formula, after a loss they are subtracted. Only players who had a personal ELO ranking of 1650 points or more on the day of testing were chosen to cooperate, and they needed to confirm their consent to be involved in the study. Out of a total of 1283 registered players, 75 players met the inclusion criterion, a representation of 5.85%. The average number of games played over the entire time of their league registration was 10,698 games per player, which at an average of 16.77 games played per player is 638 games per year, an average of 1.75 games per day. Given the type of selection of respondents into the research population, this is a chance sample. Since we included players in our research sample intentionally, it was a non-random selection.

Data Collection Tools

The Bourdon Attention Test, based on the BoPr (Prague Square Modification of the CSAT), was used in this study to evaluate attentional capacity. This tool was adapted into an online format to assess the extent of attentional capacity. The test is one of the standard methods of measuring human concentration, perceptual accuracy, and psychomotor tempo. The method is based on recognizing the differences in the shapes of individual stimuli within an item (Svoboda et al., 2013). The reliability of the Bourdon test generally reaches high Cronbach's alpha values. A high alpha value was obtained in both groups: 0.964 for the Scrabble league players group and 0.993 for the general population group.

This study analyzed several categories of variables: gender (male-female) as the nominal variable, and Scrabble league players and the general population as the second category. Furthermore, as an ordinal variable, participants were divided into three age subcategories (26-35, 36-50, and 51-70 years). Another category was the length of experience playing Scrabble, ranging from 2 to 30 years

as an ordinal variable. The final variable measured was attention; it means the computerized test which is used as commonly used to measure human concentration, perceptual accuracy, and psychomotor tempo with the raw scores ranging from 283 to 971 are considered ordinal variables.

Data Collection

Directions for completing the questionnaires were concise and clear. A statistical program to process and analyze the collected data was used, and to measure the strength of the relationships between the variables the Pearson coefficient was employed. The completed questionnaires were collected in November and December 2023 through personal contact, using the pen-and-paper technique. Purposive sampling was exercised and established the criteria that the respondents had to meet, the first one being that they were an adult aged over 18 and a regular player of, or not a regular player of, Scrabble. Additional information for the research - demographic data i.e., age and gender, and measurements for focus and attention obtained using the Bourdon test – was also collected.

Data Analysis

To achieve the objectives of our research, comparative-correlational research was used. The Pearson coefficient was chosen due to our interest in the relationship between the variables. The Pearson coefficient of correlation gives a varying degree of dependence, which was interpreted based on this scheme: value up to 0.3, moderate dependence; value between 0.3 and 0.6, medium dependence; and value above 0.6, strong dependence. A t-test was used to detect differences. A computerized version of the data collected was evaluated using IBM SPSS (Statistical Package for the Social Sciences) software version 26. In the game of Scrabble, these forms of coding have long been used to train cognitive functions.

Data was collected and uploaded successively into Excel and then transferred into SPSS statistics 26. The uploaded questionnaires were evaluated using manuals and guides. The normal distribution of the file was verified based on the numbers obtained. Based on the results of the normality test, it was decided to work on the file with parametric tests.

Findings

Test of normality and homogeneity

According to the Shapiro-Wilk normality test (p = 0.553, p = 0.147, p > 0.05), both groups have a normal distribution in the tested variable, therefore we used parametric tests to test the hypothesis H1 (Table 1). We investigated whether there is a statistically significant difference in the level of attention as measured by the Bourdon test, depending on whether the respondent is a league-level Scrabble player or not. To analyze the hypothesis, we used a parametric t-test for two independent samples after taking into account the tests for the normality of the data distribution and the nature of the variables.

Table 1

Description of the test of normality regarding hypothesis H1

Group	Shapiro-Wilk		
	Statistic	df	Sig.
League players	0.971	30	0.553
General population	0.948	30	0.147

Source: Own elaboration according to SPSS

In order to gain knowledge about the normality or non-normality of the distribution of the data necessary for the verification of the H2 hypothesis (Table 2), we used the Shapiro-Wilk normality test based on the sample size (N < 50).

Table 2

Description of the test of normality regarding hypothesis H2

	Shapiro-Wilk		
	Statistic	df	Sig.
Level of attention	0.971	30	0.553
Length of time playing Scrabble at the league level	0.961	30	0.330

Source: Own elaboration according to SPSS

According to the normality test, both variables have a normal distribution (p = 0.553, p = 0.330, p > 0.05). For hypothesis H2, we investigated whether there is a statistically significant relationship between the level of attention measured by the Bourdon test and the length of time playing Scrabble at the league level. For the analysis of the hypothesis, we used the parametric Pearson correlation coefficient after considering the tests of the normality of the data distribution and the nature of the variables.

Descriptive Statistic of the Age Respondents' Profile

There were 64 respondents in the study; four respondents were excluded due to incomplete questionnaires or failure to complete the Bourdon test. The evaluated research population consisted of N = 60 respondents in two groups. The first group consisted of 30 Scrabble League players, of which 18 were males (60%) and 12 females (40%), ranging in age from 34 to 69 years (mean age M = 52.41, standard deviation SD = 9.31). The second group of 30 general population respondents had 16 males (53.33%) and 14 females (46.67%), ranging in age from 26 to 70 years (M = 49.27, SD 10.04). Descriptive statistics for the results obtained by the Bourdon test (30 items, 85 stimuli each) are presented in Table 3. The mean gross attention rate score, measured by the number of correctly labelled stimuli, was 796.9 points for the respondents who play Scrabble at the league level and 724.13 points for the general population. The group of league players reached a maximum total score of 923 correctly labelled stimuli, compared with the general population group at 971. There was no difference in the mean scores between the groups in items 2, 4 and 21. A

larger difference between the groups was obtained in the items in the second half of the test (items 17, 18, 23, 24, 27, 28). The largest difference was obtained in item 29. We can conclude that the league players had a lower attentional decline in the Bourdon test.

Table 3

Descriptive statistics of attention rate (raw scores of correctly labelled stimuli)

	League players	General population
N	30	30
Average	796.9	724.13
Median	803	731
Std. deviation	72.46	182.64
Skewness	-0.164	-0.592
Spiciness	-0.881	-0.330
Span	274	688
Minimum	649	283
Maximum	923	971

Source: Own elaboration according to SPSS

Figure 1

Overview of the raw scores in the group of Scrabble League players and the general population
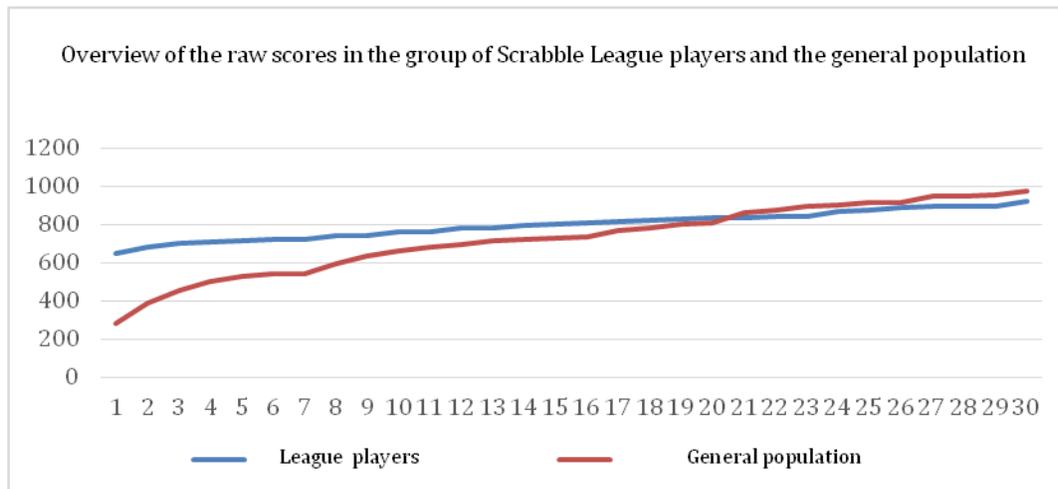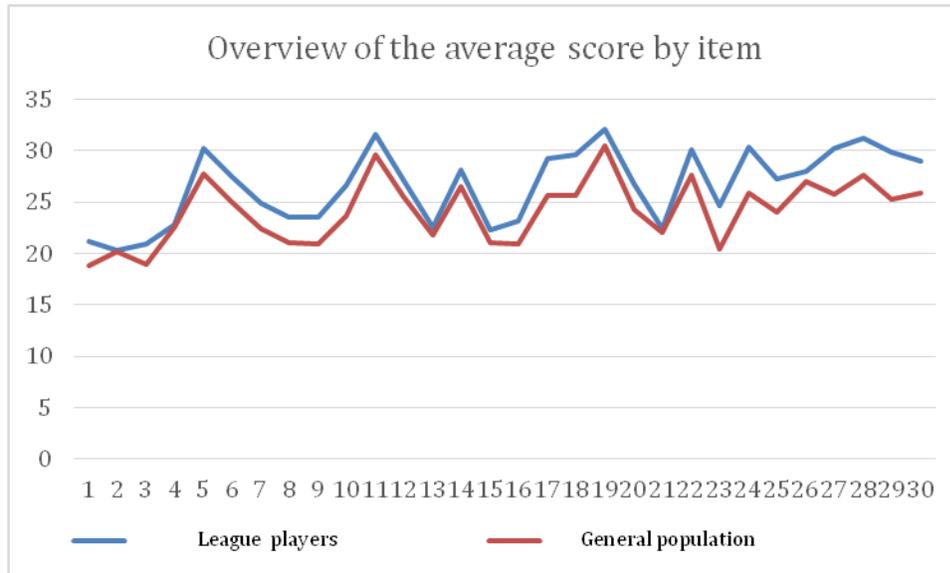
Figure 2

Summary of the mean scores by the league players and the general population

Overview of the average score by item

Testing hypothesis

Testing hypothesis H1

The variable number of correctly labelled stimuli is distributed normally in both groups (skewness -0.164 and -0.592). We also used the Shapiro-Wilk test of normality to gain insight into the normal distribution of the data, since the groups had fewer than 50 respondents.

According to the Shapiro-Wilk normality test ($p = 0.553$, $p = 0.147$, $p > 0.05$) both groups have a normal distribution in the tested variable, so we used parametric tests to test hypothesis H1. We investigated whether there is a statistically significant difference in the attention rate related to whether the respondent is a Scrabble League player or not, as measured by the Bourdon test. To analyze the hypothesis, we used a parametric t-test for two independent samples after considering the results of the tests of normality of data distribution and the nature of the variables. We can conclude that there is a statistically significant difference ($p = 0.050$) in the attention rate when comparing Scrabble League players with the general population; the league players score statistically significantly higher on the Bourdon test.

Table 4

Comparing Scrabble League players with the general population

Levene's Test for Equality of Variances		t-test for Equality of Means			
F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference
17.817	0	2.028	37.909	0.050	72.767

Hypothesis H1 was confirmed.

Testing Hypothesis H2

From the results in Table 5, we can observe that the mean value of the duration of playing Scrabble at the league level was 16.77 years for the players.

Table 5

Length of playing Scrabble at the league level in years

N	30
Average	16.77
Median	17.5
Std. deviation	7.686
Skewness	0.034
Spiciness	-0.843
Span	28
Minimum	2
Maximum	30

Source: Own elaboration according to SPSS

To gain insight into the normality or non-normality of the distribution of the data needed to test hypothesis H2 based on the sample size ($N < 50$), we used the Shapiro-Wilk.

According to the normality test, both variables have a normal distribution (p = 0.553, p = 0.330, p > 0.05). For hypothesis H2, we investigated whether there is a statistically significant relationship between the level of attention as measured by the Bourdon test and the length of time an e-gamer has participated in playing Scrabble at the league level. For the analysis of the hypothesis we used the parametric Pearson correlation coefficient, after considering the tests of normality of the data distribution and the nature of the variables (Table 6).

Table 6

Pearson correlation coefficient

Attention span (Bourdon test) Gross score * Length of time playing Scrabble at the league level	
Pearson Correlation	-0.122
Sig. (2-tailed)	0.522
N	30

Source: Own elaboration according to SPSS

The value of the Pearson correlation coefficient is -0.122, which does not imply any relationship, and the value of p = 0.522 (p > 0.05) confirms statistical insignificance. Based on the results, we can conclude that there is no statistically significant relationship between the level of attention as measured by the number of correctly labelled stimuli and the length of time an e-gamer has participated in playing Scrabble at the league level.

Hypothesis H2 was rejected.

Discussion

Based on the results of testing league players of Scrabble and a group of the general population with untrained cognitive functions, the assumption of a decline in sustained attention after 15 minutes was confirmed in both groups; a game of Scrabble, by comparison, takes 2 x 20 minutes or 2 x 22 minutes. League Scrabble players have practiced sustaining attention within this limit, and many of them play other types of games which require similar cognitive skills. Hypothesis H1

was formulated regarding the level of attention, which stated that the attention levels of Scrabble League players are significantly higher than in the general population. This was confirmed; Scrabble League players scored statistically significantly higher on the level of attention as measured by the Bourdon test (correctly labelled stimuli) than the general population. This is consistent with the results of other research in this area that investigated the effects of playing word games on sustained visual attention in older adults. According to Ian et al. (2012) while Scrabble expertise was associated with specific effects like vertical fluency and semantic deemphasis in visual word recognition, elite Scrabble experts demonstrated high visuospatial and verbal working memory capacities, suggesting a binding of these abilities at exceptional levels (Toma et al. 2014). Moreover, engaging in play activities like Scrabble can have profound psychological benefits for adults, allowing them to tap into their creativity, release unconscious fantasies, and aid in the individuation process (Bih-O et al., 2020). Lee et al. (2017), for example, discovered that a group of word game players made significant improvements in sustained visual attention after four weeks. However, despite the significant difference between the Scrabble league players and the general population, the general population group achieved the highest scores for correctly labelled stimuli. This discrepancy may be due to the lower engagement in purposeful practice by players, as well as their preference for playing games of Scrabble, which does not necessarily improve performance (Moxley, 2017). Van Hees (2016) described that despite their superior performance in lexical decision tasks, the Scrabble league experts do not demonstrate the same level of skill transfer to non-linguistic tasks. The slope of the total score had a larger angle in the general population group, thus the league players achieved more balanced results and a better average score. Higher differences in mean score per item were achieved from item 17 onwards, with the highest difference in item 29, and we can conclude from this that attentional fluctuation was higher in the general population group. The determinant of attention could be the person's current health or emotional state or linked to personality characteristics. People with higher levels of neuroticism will signal lower attentional performance (Blatny, 2010). League Scrabble players share certain personality traits: they persevere to the end of a game, even in unfavorable circumstances; they stick to established strategies; they are not rude to their opponents if they dislike the strategy; and they respect and do not question the rules. Scrabble players understand the importance of finishing each game, regardless of the score. They view a lost game as a learning experience and are gracious in wishing their opponent success. By maintaining focus and

perseverance to the end, Scrabble players demonstrate valuable skills that can be applied beyond the game. These qualities can be applied to completing tasks, making decisions and solving problems in everyday life. Scrabble players understand that the rules of the game are universal, that improvement comes with daily practice, and that they must find the most advantageous solution in all circumstances. They also accept that each game ends with the last move, and that until then they must strive to win. A range of studies have demonstrated the potential of e-games, including Scrabble, in promoting cognitive brain health and sustained attention in adults and older adults. Siricharoen (2023) highlighted the effectiveness of creative brain training apps and games in enhancing memory, cognitive abilities, and mental health in the elderly. Baccolini (2020) reported significant improvements in verbal, memory, and visuospatial skills in adults aged 40-70 after using an online gaming platform. Terada (2021) further supported these findings, showing a positive association between e-games, including Scrabble, and cognitive functioning in older adults. These studies collectively suggest that Scrabble e-games can be a valuable tool in promoting cognitive brain health and sustained attention in adults and older adults.

Hypothesis H2, in which we stated that attentional levels increase with the length of time an e-gamer has been participating in league-level Scrabble, was rejected. There is no statistically significant relationship between the level of attention as measured by the number of correctly labelled stimuli and the length of time an e-gamer has participated in playing Scrabble at the league level. This finding is surprising given the results of research by Toma et al. (2014), in which Scrabble players and crossword experts performed better on cognitive ability tests as their years of practice increased. Ersin et al. (2022) found that e-game players who spend more time gaming have slower visual and aim reaction times, but no significant difference in auditory reaction time. This suggests that longer gaming time may not necessarily improve attention. Jeromin et al. (2016) also found that excessive Internet gamers exhibit an attentional bias towards computer-related stimuli, indicating a potential impact on attention. However, Moxley (2017) found no significant relationship between the level of attention and the length of time an e-gamer has participated in playing Scrabble at the league level and added that a bidirectional relationship between video game playing and attention problems, indicating that the impact of gaming on attention may be complex and multifaceted. This suggests that the relationship between gaming time and attention may vary depending on the type of game. It is important to note that attention as a separate function was not evaluated in this study. In addition, a study by Brooker et al. (2019) discovered that the use of

word puzzles (not specifically playing Scrabble) was associated with improved cognitive function in adults aged 50 and over. This suggests a possible connection between cognitive activities and attention abilities. Additionally, another study found that older adults were able to sustain their attention on a given task better than younger adults and did not exhibit a vigilance decrement, indicating that sustained attention abilities remain intact in older age (Robison et al., 2022). Previous research and our findings confirmed that Scrabble has an impact on cognitive function and its anticipated benefit is across all ages, as well as at different levels of cognitive function. Scrabble has been shown to improve cognitive skills such as attention span.

Limitations of the study

The comparative research conducted had limitations in terms of both sample and methods. The small sample size is one of the first limitations. The group of both Scrabble players and the general population were tested online. Each respondent took the tests on his/her computer (not mobile device) and had sufficient information on the objective and the testing process. S/he was cautioned not to take the tests while under time pressure or while feeling fatigued. The tests were tailored to have a clear and easily distinguishable visual format for everyone. Respondents had a dedicated weekly interval in which to complete the tests. It was not stipulated that testing was to be done at the same time of day, but it was ensured that instructions were displayed during testing, each respondent was given precise time limits for each question, and each respondent was provided with practice without time constraints to ensure a good understanding of the tasks. The results were sent to the respondents automatically. The age and gender composition of the comparison sample of the general population was matched to a sample of Scrabble players; however other factors, such as education or occupation, were not considered.

According to research conducted by other authors, it would also be useful to include exclusion criteria from the general population sample so as not to inadvertently include a person who could bias the data obtained, such as a chess master or an active crossword solver. Since the sample of Scrabble League players is very small and scattered all over the country, getting all of them in one place at the same time was not possible. For this reason, an online approach was chosen. Replication studies are needed to verify the results found in this study, preferably with a large sample size. Despite this shortcoming, a comparison sample of the general population was tested identically and therefore it can be concluded that the results have sufficient predictive value. The

results may also have been influenced by the ability to use a PC and the speed of typing on a keyboard. It was also technically challenging to develop a customized version of the Bourdon test in online form.

Recommendation for practice implementation and future research

The findings suggest that playing Scrabble may have practical implications for rehabilitating and correcting the consequences of organic brain damage that cause a decline in cognitive functions. Scrabble could also be used in language therapy to restore vocabulary, as the physical handling of letters improves fine motor skills and stimulates recall of memory contents. Memory therapy could involve using letter-turning exercises to motivate patients to reveal hidden words. Therapists could assign patients tasks of varying difficulty, gradually shortening the time to complete them to stimulate attention. Scrabble also supports decision-making skills; when presented with multiple options for a word, the patient must select the most suitable one based on various factors, such as the word's point value.

Research on cognitive development has great potential as it confirms the differences between high-level Scrabble players and the general population, and in the long term, it is a way to improve cognitive functioning at all levels and all ages. Longitudinal research on different parameters of cognitive functions of expert Scrabble players is a possible proposal. However, it must be considered that Scrabble is only one factor in improving a person's cognitive profile; it is not the sole solution for improving memory or attention span. Using Scrabble in the adult educational creative process or medical and social practice as a non-pharmacological activity for cognitive brain health maintenance would be beneficial. It would be interesting to examine professional or league gamers on a wider scale. In addition to comparing their cognitive perspective with the general population, it would be useful to analyze different groups of gamers who use different types of games and to elaborate on the positives and negatives of gaming, according to several parameters.

Conclusion

The comparison of the attention levels of Scrabble League players with the general population showed the significant benefits of regular Scrabble playing on cognitive brain health. Scrabble

League players know that every game must be completed whatever the score, they take a lost game as a positive experience and they know how to wish their opponent success. They maintain focus and performance until the end, and the experience of success can foster a perception of their self-efficacy. These qualities may have an impact on completing tasks in everyday life, including decision-making and problem-solving. Scrabble players know that the rules of the game are the same for everyone, that they can improve through daily practice, and they must find the most advantageous solution in any given circumstance. They also accept that every game ends when the last move is made, and until then they must fight to win.

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