

**Doctoral (PhD) Dissertation**



*Videogames as a catalyst for intercultural and foreign language  
advantage in secondary school ESL students*

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## STATEMENT

This dissertation, written under the direction of the candidate's dissertation committee and approved by the members of the committee, has been presented to and accepted by the Faculty of Humanities in partial fulfilment of the requirements for the degree of Doctor of Philosophy. The content and research methodologies presented in this work represent the work of the candidate alone.

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**Videogames as a catalyst for intercultural and multilingual literacy advantage in secondary school ESL students**

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Written by Robert Arnold-Stein

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## ABSTRACT

There are different strategies for vocabulary acquisition among language learners, and this is a difficult, but particularly beneficial part of language learning because it is essential for understanding the message and the construction of the language (Surmanov & Azimova, 2020; Rosyada-AS & Apoko, 2023). For the sake of steady language development, it is especially important to acquire the most frequently occurring words; for example, the first most recurrent 1,000 words appear in approximately 75% of informal texts and colloquial speech, while the other 2,000 most frequent words together make up around 90% of a non-academic writing or speech (Laufer & Nation, 1999). Possessing the high-frequency word families in one's receptive vocabulary is crucial, because these are likely to become part of productive vocabulary faster and deeper by incidental vocabulary learning (Shin, Chon & Kim, 2011). Among other strategies, the child–adult interactions, especially playing, provide children with the most advantageous input to acquire primary words, because play provides an opportunity for both implicit and explicit learning simultaneously (Wessel, Haider & Rose, 2012). Both implicit and explicit systems form their own mental representation in each person's brain by using inherent patterns that can serve an overall and higher goal which causes more adaptable neuroplasticity (Dienes & Perner, 2002). Such systems are driven by neurotransmitters, particularly dopamine, which is attributed to every individual in completing a task, experiencing little wins as well as learning something useful (Wong et al., 2012). Video gamers reported flow (Klasen et al., 2012), improved visual attention (Mater, Westhuizen & Mostert, 2020) and incidental vocabulary acquisition experiences (Benson & Chik, 2011; Cabrera, 2016; Al-Jifri, 2017), also video gaming activity can be linked to quick problem solving, improvement of attention and lateral thinking as an aftereffect (Liu et al., 2019). However, according to research the non-interactive activities, like watching television programs in L2 provide less opportunity to gain experience of L2 high-frequency words (Sylvén & Sundqvist, 2012). Furthermore, parents with higher socioeconomic status (SES) also grant exceptional and pricey gadgets to play on and special education to their children, such as prominent level of extracurricular classes or fee-paying schools. The higher SES may mean better educated parents with a wider vocabulary in their L1 and the existence of the knowledge of L2 and even L3 as additional influencing factor in learning L2, and such parents commonly establish higher demands on their children's linguistic development (Butler & Le, 2018).

Joining the subculture of video gamers means that members employ a special game-related vocabulary, which mostly consists of proper nouns for virtual places and characters. Even

though such low-frequency words are impractical from the view of real-life usage because they can be utilized only among those who are affiliated to the video gamer community through online practice the gamers build pragmatic bridges between peoples, nations, and cultures (Balogh 2014, Arnold-Stein & Hortobágyi, 2021).

Following the latest research data this complex research attempts to find an answer to whether video gaming is able to provide an environment for L2 language acquisition in fostering the learning of high-frequency words. The research was conducted in 5 secondary schools in the south of Hungary that provide vocational studies for their ESL students in grades 9-13. In the pre-questionnaire of the quantitative part of the study 58% of the video gamer answerers indicated that they primarily learn English words from video games which generated the further investigation. 890 (42% female, 58% male) Hungarian EFL high school students were divided into video gamer and non-gamer groups and completed a receptive vocabulary levels test in English. The high-frequency word families were the basis of research, because they are necessary for the formation of linguistic messages to be conveyed in real life and generally learned in school classroom settings of which both groups are a part. To quantify the possible differences, the VLT measurement device was chosen (Schmitt, Schmitt & Clapham 2001), because it is a reliable, validated and distributable on computers. As the first aim of the analysis, the participants of the video-gamer group showed moderately higher difference on VLT compared to their non-gamer peers. Having further divided the gamer group into games that were primarily played for cooperative or for a single player, it was found that the cooperative video game players have greater discrepancy on the VLT than the single players compared to the control group (non-gamers).

Moreover, other grouping calculations were completed, e.g. 'watching films in English' and 'gender' for verification purposes, which partially produced statistically relevant result, although, men slightly outperformed women. The research also developed answers of possible factors facilitating performance on the VLT in connection to students' SES, used devices, spent time on video gaming and English language grades, respectively. The latter was used as an indicator of the contribution of high-frequency words to grades. The correlation analysis revealed that the participants with higher SES and better English grades were also better on VLT. Likewise, the playing device by which the participants reached the better results on the VLT was the desktop computer, and players who spent no more than 3-5 hours a day playing were among the best answerers of VLT.

A further empirical study used Stroop test to assess L2 inhibitory control and L2 proficiency (Suarez et al., 2014), as well as verbal fluency test to investigate L2 proficiency level (Friesen et al., 2015) as it seemed interesting to use both tests created for confirming the advantages of bilingualism. This independent assessment was conducted at one of the 5 schools among 9-13 graders EFL secondary school learners' (N: 157, gamers: 92, non-gamers: 65). The video gamers were marginally faster in Stroop tests and provided significantly more L2 words in verbal fluency test (VFT).

The lexical content of video games is primarily distributed online as written-spoken language (Márku & Bartha, 2015) and in the offline circulation there are thought-provoking grammatical insertion solutions. Further supplemental qualitative research (N: 21, female: 3; male: 18) was initiated to investigate the video gamers out-of-game extra game-related English loan words practice in their everyday speech, thus enriching their Hungarian language use and cultural spectrum. The words and phrases from sentences were collected from gamer blog sites by the local secondary school gamers. This collection presents 73 special local neologisms from these conceptually verbal texts by young video gamers living in the Hungarian countryside.

The main conclusion of the studies as stated by the results of the VLT tests, video gamers successfully recognized significantly more high-frequency words than their non-gaming peers. In addition, the action video gamers could achieve higher performance than the non-gamer participants. Other influencing factors or categorization did not produce significant results, although higher SES, more expensive gadgets and around 3 hours daily playing meant better VLT performance. After all, the better knowledge of the high-frequency words contributed significantly to English language grades. According to both Stroop and verbal fluency tests, the gamers were competent enough to outperform their non-gamer rivals. The glossary of low-frequency words provides a quick insight of how video gaming influences the English literacy among the researched Hungarian EFL students. Hence the effect of the video gaming activity was recognizable and measurable in favour of video gaming.

The instrumental motivation and the intrinsic joy are the strongest inducements and driving forces behind any prosperous activity. Video gaming play is one of the occasions in which all kinds of motivating factors can be found; hence it is so popular among language learners. This reality has driven me to initiate comprehensive research in which the catalytic effect of playing video games in secondary school students was revealed.

‘JOY IS THE DRIVING FORCE BEHIND EVERY SUCCESSFUL ACTION.’

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## DEDICATION

*To my mother, Magdolna Stein.*

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## LIST OF ABBREVIATIONS

- AI – artificial intelligence
- AoA – age of acquisition
- AVG – Action video games
- BNT – Boston naming test
- CAN – central autonomic network
- CT – Computerized Tomography
- CAT – computer adaptive testing
- CATSS – Computer Adaptive Test
- CEFR – Common European Framework of Reference
- CLL – community language learning
- CMC – computer-mediated communication
- COCA – Corpus of Contemporary American English
- COD – Call of Duty (video game)
- DP – Declarative/Procedural processing model
- DGBLL – digital game-based language learning
- EF – executive functions
- ESL – English as a second language
- EFL – English is taught as a foreign language
- ELF – English as a lingua franca
- EMT – enhanced milieu in teaching
- EROS – Event-related optical signal
- FIFA – Fédération Internationale de football association (International Association Football Federation)
- F1 – Formula 1
- FL – foreign language
- fMRI – functional magnetic resonance imaging
- FPS – first person shooter
- G4L – Games for learning
- GSL – General service list
- GTA – Grand Theft Auto
- IA – interactive activation model

ICM – Inhibition Control Model  
IT – information technology in general  
K-S/S-W – Kolmogorov-Smirnov and Shapiro Wilk test (statistics)  
L1 – first language  
L2 – second or learned language  
LL – language learning  
LoL – League of Legends (video game)  
LMS – language management system  
MEG – Magnetoencephalography  
MB – medical doctor  
MMORPG – massively multiplayer online role play game  
MOBA – multiplayer online battle arena  
NBA – National Basketball Association (USA)  
NVLT – new vocabulary levels test  
PNAMW – proper nouns and marginal words  
PLT – Productive Levels test  
RPG – Role Playing Games  
RT – reaction time  
rIFG – right inferior frontal gyrus  
SDQ – strengths and difficulties questionnaires  
SES – socioeconomic status  
ST – Stroop test  
TLU – Target Language Utilization  
TMT – trail making test  
TPS – third person shooter  
UX – user experience  
VFT – verbal fluency test  
VLT – vocabulary levels test  
VST – Vocabulary Size Test  
WoW – World of warcraft (video game)  
WTC – willingness to communicate

# CHAPTER ONE

## INTRODUCTION

### 1.1. Introduction to the problem

In the past decades much research has focused on the general effects of video gaming, like the players' permanent interaction with the game by decoding visual, aural, and textual messages and making decisions based on them (Gee, 2009). In addition to the multimodal features, the video gamer – video game contact in English has also been intensively researched (Benson & Chik, 2011; Vidlund, 2013; Thompson & von Gillern, 2020; Nash & Brady, 2022). Järvinen (2002) and Antzaka et al. (2017) researched the perception of video games in order to examine the nature of visual elements that are displayed in fast pace along with their descriptions, to which the player must react immediately in order to score points. The authors find that collecting different treasure items can be beneficial when the player steps forward to the next level to eventually become a winner. Likewise, the significance of gathering the required number of articles is twofold: on the one hand, to master the ability to control the player's avatar<sup>1</sup> (Worth, 2015) within the game level successfully (performance level), and on the other hand, to recognise and amass the essential objects appearing on the screen (cognitive level) (Gee 2003). Acquiring the necessary 'articles', such as in-game items, equipment and knowledge, can only be gathered by practice (Vygotsky, 1978b; Piirainen-Marsh & Tainio, 2009; Sandseter & Kennair, 2011), which leads to the proper mastery of the in-game language (gamerlect) and the evolution of the argot of the gamer society as well (Thorne, Black & Sykes, 2009). The usage of the word 'article' is intentional, because the gamer must acquire linguistic treasures – words and phrases – just like scores. Collecting such glossal elements while playing can cover all the linguistic parts at once, because the arising information includes grammatical, phonological, and lexical information to a different extent (Sylvén & Sundquist, 2012), from which the gamer can draw orthographic conclusions.

The general English lexis consists of words that are not equally frequent, some word families occur more than others in any type of conversation (Schmitt, 2010) and as such, the video gaming is an effective and an authentic promoter and a potential resource for high-frequency words (Hartanto, 2018) and low-frequency (i.e. video game specific) words (Thomas & Clyde, 2013) as well. Despite the fact there are many papers tackling the role of the video game as an instantly accessible virtual area to acquire English, as Al-Jifri (2017), Eisenclas, Schalley &

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<sup>1</sup> A figure representing a particular person in video games or on internet forums.

Moyes (2015), Thompson & von Gillern (2020), Peterson (2013) and Cabrera (2016) wrote, only few academic papers discuss the distribution of word frequencies of video games, e.g., Nindyaputry (2017), Rodgers and Heidt (2020), Hartanto (2018) or about the possible contribution of video games to high-frequency English word acquisition, e.g. Sylvén & Sundquist (2012).

Even though many different media (photographs, audio recordings, film, and video) have been used in education, most teachers still have an unreasonable resistance to using video games as an educational and even extracurricular tool (Pickard, 1996; Marone, 2018; Hanghøj, Lieberoth & Misfeldt, 2018; Nash & Brady, 2022). Those tutors who claim that video games are only for gaming or fun, potentially suggest that acquiring new knowledge cannot be fun or playful. In schools, students have limited time to acquire useful information, for example, in language classes, students feel bored and anxious during recitative tasks. If these tasks could be combined with games, students might forget their concentration difficulties and benefit from the positive effects of the game (Prensky, 2003; Sandseter & Kennair, 2011). Consequently, playful learning can have a beneficial effect on the students' daily mood, while a certain level of knowledge is to be acquired. For instance, at secondary schools in Hungary, there is a clear level of L2 that students must achieve, which generally conclude with a B1 matriculation exam, as the formal target level of the National Curriculum (Szilágyi, 2020). The preferred receptive vocabulary level for such exam is around 3,000-word families by CEFR, which is needed for a satisfactory comprehension of a text at B1 level (Laufer, 1998; Milton & Alexiou, 2009). Consequently, the knowledge of high-frequency words is crucial because it supports learners not just to understand the meaning of the text and the structure of the language, but also to achieve a high and permanent quality of language awareness. Therefore, high-frequency words have been favoured at the initial stages of L2 vocabulary learning (Kucera & Francis, 1982; Schmitt 2010).

Globalization has innumerable effects on its users (Ricento, 2012), such as the widespread increase of online trends such as the creation and participation of short videos, podcasts, and video games, which users are willingly employing English as the lingua franca (ELF) (Seidlhofer, 2005, 2013; Butler, Sayer & Huang, 2018). Consequently, the consumers are all continuously and extensively influenced by English words and idioms without even noticing them every day in all levels of society (Veszelszki, 2017). This entails not merely a linguistic impact by English as a 'foreign' – or rather transnational – language, but it also has an apparent intercultural related footprint even in the Hungarian minds (Nikolov, 2009).

The quality social occasions have particularly intense demand in childhood, when the playing activity could be the means to understand the surrounding world (Rubin et al., 1983). The video games are also getting more lifelike in screen resolution and language utilization to provide a reality-like experience (Hodent, 2017; Matern, van der Westhuizen & Mostert, 2020), which make the video games a suitable substitute of the presence of social interactions. Advancement of the language skills enables a child to communicate with others which encourages the development of cognitive skills and fosters the socio-emotional self-regulations (Vigotsky 1978). Video gamers' cognitive functions also profit from gaming which have been widely confirmed (Banquied et al., 2014; Kühn, Gallinat & Mascherek, 2019), with the positive effect on memory, flexible thinking, and self-control. Many studies have presented video gamers outperform non-gamers in terms of attention, spatial perception, mental flexibility and working memory efficiency (Atzaka et al., 2017; Green & Bavelier, 2007; Martinez, Gimenes & Lambert, 2023; Welker, 2022; Liu et al., 2019). Child cognitive development has many influencing factors, e.g., playing games, reading, and playing music instrument as the most popular ones, because they require competence, performance, skill and cause joy and rearrange knowledge (Christakis, Zimmerman & Garrison, 2007). Also, the consequence of the family income (SES) on child development is well documented, study proves that the volatile SES has the greatest effect on the children living in the borderline of poverty (Sosu & Schmidt, 2022). Video games with internet access may offer various and low-cost alternative to be unattended but not playing alone. As a small tool for cognitive development, smartphones provide children with imaginative, mysterious, problem-solving, or so-called educational games (Järvinen, 2002). Besides, as it has already been discussed, playing any kind of video games may develop into the acquisition of (high- and low-frequency) English vocabulary. This complex vocabulary promotes concealed instructions and gimmicks to the player which assist the progress of winning of an actual part of a game, still, some gamers select to use information exchange platforms, e.g., YouTube videos and podcasts, chatrooms etc., to find out which way to progress (Damsa & Fromann, 2018). Hence, such gamers often find themselves in an online multinational environment where the discourse occurs in English (Ashraf, Motlagh & Salami, 2014; Al-Jifri, 2017).

Undoubtedly, video game players encounter a substantial number of words and phrases, although it remains unclear, whether the gamers can acquire high-frequency words from video game play or not. The aim of this research was to shed light on the potential for L2 English high-frequency vocabulary acquisition through video games. The research tries not to fail to

consider that L2 language learning and L2 high-frequency word acquisition do not always overlap, and learning L2 through video games itself simply becomes ineffective if so-called video gamer people view the video gaming world as opportunity to express themselves in L1 exclusively or play only visually satisfying games.

### **1.2. Purpose of the study**

The dissertation endeavours to identify relevant theories supporting the special acquisition and use of English by video gamers with special regard to high-frequency word families. In order to discover all the influencing factors, the theories and practice of bilingualism are reviewed thoroughly to prove that video gamers are second language users rather than foreign language learners (Cook, 2007), because of the level of their high-frequency word knowledge. The main purpose of the quantitative Study 1 is to determine the English receptive vocabulary difference of the video gamers compared to non-gamers up to 3,000-word families in the cases of the participated secondary school EFL learners as well as to identify players of which video game types achieve higher scores on the VLT, to observe the most effective game type concerning the high-frequency words. The Study 1 also aims to assess other possible influencing and controlling factors, like ‘watching films in English’, gender, parental SES, time spent on gaming and school grades of English, as independent variables. The quantitative Study 2 is administered to check if there is any effect of the bilingual language use among the video gamer and non-gamer secondary school EFL learner participants by Stroop and verbal fluency tests. The qualitative Study 3 aims to provide samples of game related, low-frequency English word utilization methods in the local gamer subculture which explain whether they differ in meaning and usage from the international and national examples.

### **1.3. Research questions**

Main research question:

To what extent video gaming contributes to the receptive vocabulary proficiency, inhibitory control, and lexical retrieval of EFL learners?

Study 1.

What is the relationship between video gaming and the receptive vocabulary proficiency of high-frequency words of the participating high school students?

For reaching comprehensive answers, the research question is further divided into sub-questions inquiring about measurable concepts.

- a) Is there a significant difference between the VLT scores of the participating video gamers and non-gamers?
- b) Is there a significant difference between the VLT scores of the female and male participants?
- c) Is there a significant difference between the VLT results of the 'watching videos in English' group and the control group?
- d) Does the 'time spent on video game play' correlate with the participants' VLT results?
- e) Is there a difference between participants VLT results with different SES background?
- f) Do the participants' English grades at school correlate with the participants' results in the VLT?
- g) To what extent the device video gamers use contribute to their VLT results compared to the control group?
- h) Players of what video game type have the highest VLT scores compared to the control group?

#### Study 2.

Is there a difference between the inhibition and lexical retrieval of gamers and non-gamers?

Stroop test:

- a) Is there a significant difference between the intralingual interferences of the video gamer and the non-gamer groups?
- b) Is there a significant difference between the interlingual interferences of the video gamer and the non-gamer groups?

Verbal Fluency test:

- a) Is there a significant difference between the performance of the video gamer group of students compared to their non-gamer peers in the VFT letter 's' (L1 & L2) cases?
- b) Is there a significant difference between the performance of the video gamer group of students compared to their non-gamer peers in the VFT category (L1 & L2) cases?

#### Study 3.

Main research question:

Does the game-related low-frequency English vocabulary used by the interviewed video gamer participants in out-of-game situations differ from other domestic and international examples?

With the video gamer students, a wordlist was assembled to highlight,

- a) the embedding methods of the video gaming words into sentences,
- b) examples of video game words used by interviewed video gamers that have different meanings compared to examples taken from the literature,
- c) the pronunciation of the gaming words by the interviewed secondary school gamers.

### 1.4. Hypotheses

According to my general hypothesis, the proportion of video gamers among the researched secondary school children may be high, and if these video gamers are using video gaming for edutaining (educating through entertainment) purposes, i.e., to acquire a wide range of English vocabulary as Al-Jifri (2017), Eisenchlas, Schalley & Moyes (2015), Thompson & von Gillern (2020), Sylvén & Sundquist (2012), Peterson (2013) and Cabrera (2016) suggest, they can also learn high-frequency words (Sylvén and Sundquist, 2012). Therefore, the participating Hungarian video gamer EFL secondary school students may have a measurable receptive vocabulary advantage related to high-frequency words due to the powerful amount of high-frequency word content of video games (Nindyaputri, 2017; Hartanto, 2018; Rodgers and Heidt, 2020). Furthermore, if the video gaming activity have a positive impact on the player's cognition, i.e., executive functioning and inhibition of habitual responses, this can be assessed by Stroop test (Toth, Kowal & Campbell, 2019) as well as lexical retrieval and inhibition assessed by verbal fluency test (Luo, Luk & Bialystok, (2010). Video games provide a virtual area for excessive L2 language use; thus, the video gamer user of such multilingual games should be considered a bilingual person (Pirainen-Marsh, 2010). Finally, the subcultural usage of video game related words creates a unique social environment in which the video game players employ the phenomenon of code switching and code mixing, which further confirms that they ought to be considered bilingual (Pirainen-Marsh, 2010).

### **1.5. Significance of the study**

This dissertation aims to fill in a research gap in the study of acquiring L2 high-frequency words in relation to video gaming in Hungary. Furthermore, the examined high school students voluntarily collected the locally used video game 'slang' words (gamer argot). This dissertation includes high-frequency vocabulary tests (comparing several assorted independent variables) and low-frequency word utilization approaches which have never been used in the Hungarian society about video gaming. Because of the aim of the comprehensive and holistic perspective of the issue, other variables were also introduced, including the effect on SLA, the number of recirculated words, parental SES etc. All the mentioned points of view provide a comprehensive and thorough view of the video gamer L2 online and offline utilization.

### **1.6. Outline of the dissertation**

In chapter one, following an overview of the context, the research questions and the hypotheses, the body of the dissertation is introduced. In chapter two the literature review begins with neurolinguistic studies of bilingualism and its applicability on the video gamers, including the

possible bilingual advantage of the players that play effect of video gamers' cognition, including the cumulative effect of video game play on executive functions (EF) and comprehension of L2. It is followed by how the language is learned, stored, and recalled in the bilingual mental lexicon. This part also talks about the implicit / explicit working memory activation modes and the phenomenon of flow, which may facilitate language acquisition and utilization in video gaming. The review continues with the nature of playing any kind of game and its main facilitative and embedding effects are also detailed. This part concludes with the importance of the knowledge of the high-frequency word families and their niche in L2 language learning. In the sociolinguistic part of the literature review, along with the video gamers' practice of L2 and how the game related low-frequency L2 words and expressions are habitually embedded into the gamers' speech, which results in code switching or mixing. Motivational factors are itemized e.g., the instrumental motivation of using a second language has a practical value for video gamers. Concluding with the external circumstances, like socioeconomic status (SES) and used gadgets. The literature review also details the methodology of testing and assessing language competencies in relevant gaming articles. The research explains the step-by-step procedure to choose a proper testing device to measure the participants' receptive vocabulary level efficiently.

Chapter three talks about research question and hypotheses, including details and distribution of the participants, the used methods, the timeframe, and the piloting. Chapter four discusses the results of the calculations and displays tables, charts, and histograms. There are three quantitative studies with numerical calculations and a study with interviews the outcomes of which are also detailed. In Study 1 the difference of the participants' receptive vocabulary level is calculated in relation to independent factors, like gender, SES, 'watching videos in English', 'used devices for video gaming', 'time spent on video game play' and 'English grades'. This study also scrutinizes the video game used by the players with the highest test scores. In Study 2 the supportive tests (Stroop and verbal fluency) seek numerical results of inhibition and lexical retrieval regarding to video gaming. In Study 3 as a qualitative part, the dissertation attempts to reveal, with personal interviews, the semantic idiosyncrasies of the local video gamers offline language use.

Chapter five discusses the results in the view of the literature review including a word and expression glossary. Chapter six talks about the conclusions and the possible application of the research findings in future language education, including how to draw the students' attention in a language learning (LL) classroom environment by playing video games.

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.1. Concurrent language use and video gaming experience in the brain

##### 2.1.1. Video gaming activity and its impact on the brain

Video gaming is considered mostly as a current way of entertainment, as video gamers spend many hours weekly in front of their gaming devices. According to the market research in the EU regarding to the stats of 2018 (Nesterenko, 2019), more than 54% of the population in the European Union play video games regularly, at least 1 hour per week. 79% of people aged 11-24 play games frequently, i.e., the secondary school and the university students, besides 34% aged 45-64 play also some kind of video game. The top four best-selling video games are coming from the two best known genres, which belong to the category of the FPS (First Person Shooter) and the action-adventure, e.g., the *Call of Duty*, *Red Dead Redemption* and *Grand Theft Auto* just to mention a few. The first-person shooter (FPS), a massively multiplayer online role-play game (MMORPG), and action-adventure games are requiring the cooperation of the gamers, which triggers communicative events. Owing to their varieties and widespread use, many scientists have researched how these video game types influence on the cognitive and the language abilities of the brain (Bialystok, 2006; Peterson, 2013; Green & Seitz, 2015; Kühn et al., 2019; etc).

##### 2.1.2. Video gaming and its impact on executive function (EF) development

Besides the active determinants, there are several latent elements that can also influence the EF during reading or watching movies in L2, writing a letter to a foreign pen friend or reading newspapers, playing video games, respectively (Grabe, 1991; Pickard, 1996; Peters, Heynen & Puimège, 2016). More evidence supports that video gaming has a facilitatory effect on certain brain regions and may cause changes in many interconnected parts that work for the EF. This approach emphasizes the importance of researching how gaming activity influences an exact part of the brain. According to studies, controlled gaming can improve the performance of EF, communication skills, fine finger movement and motor skills (Baniqued et al., 2014; Green & Seitz, 2015); in addition, it may elevate the player's mood by the feeling of winning, protect from physical damage during exercises (Gee, 2007).

Comparative research of the human perception by Bellec & Boyle (2019) intended to understand how the brain operates, thus the authors used video games as a tool to model cognitive processes in parallel brain activities to measure the maximum performance of the

brain, because “video games have been designed to fully engage players” (Bellec & Boyle, 2019: 01). Instead of assessing elementary cognitive processes, the authors applied AI to test deeper neural networks by initiating fMRI to generate pictures to see the dynamics of a person’s brain, especially in decision making, which is a rather complex integrative cognitive process. It was found that during video gaming the brain works as in authentic real-life circumstances, consequently video gaming may create circumstances that can be used in teaching (Bellec & Boyle, 2019).

The video gaming provides a parallel visual and auditory activity, which also requires to memorize and recall rapidly changing visual events, participants, and words. “The term video games refer to thousands of quite disparate types of experiences” ... “A useful analogy is to the term food” ... “it is understood that the effects of a given type of food depend on the composition of the food such as the number of calories; the percentage of protein, fat, and carbohydrates; the vitamin and mineral content; and so on...” stated by the authors of a cognition related research, Green and Seitz (2015: 106). Furthermore, it is necessary to clarify the nature of the visual and audial tasks of the video games and the possible reaction of the player to them. Namely, the environment on the screen is changing constantly and rapidly along with frequent written and audial L2 comments and commands that must be acknowledged and responded to, not to mention the finger movement which must also be synchronised with the on-screen occurrences (Keogh, 2018). Answering such visual and audial challenges requires exceptional spatial and visual EF and L2 language skills, which the gamers possess because they are happy to practice these skills voluntarily by using video games that provide a joyful and captivating multitasking environment with the opportunity of winning (Green & Bavelier, 2003, 2007).

This pragmatic approach of the video game play comes from the nature of the playing activity, which is not just entertainment but has educational and training effects by mimicking the real-life tasks as the play works in human life (Brown & Vaughan 2010), therefore it is important to understand the influence of playing on the human brain itself. For instance, any recurring activity has a reinforcing and educative effect, which is also an attribute of the playing activity in terms of human social and intellectual development. Playing has evolved over the centuries in many animal species as a survival technique (Sandseter & Kennair, 2011), because it shapes the brain (Brown & Vaughan, 2010) and makes the participants more intelligent and flexible, as the most critical point of the evolution (Lillard et al., 2013). There are approaches which all agree that playing is just as essential to our lives as are sleep and nutrition, therefore playing is

incredibly useful to humans, since any kind of play “is simply practice for skills needed in the future” (Brown & Vaughan, 2010: 31).

There is a growing number of proofs confirming the way in which second language practice enhances the EF in the brain, but the question arises whether the effects of playing video games and using a foreign language concurrently add up and have an even greater impact on the EF (Pettersen, 2019; Acquah & Katz, 2020). In order to answer this question, the possible occurrences must be observed separately, because at most of the times three independent part of the executive functions are performing intertwined, for instance in video gaming, the visual comprehension of the environment (Green & Bavalier, 2003, 2007), working memory (Liu et al., 2019) and language comprehension (Gee, 2009). In Takeuchi et al. (2016) study, the authors measured the microstructural properties and examined cross-sectional correlations with the amount of video game playing in 114 boys and 126 girls. They also assessed correlations between the amount of video game play and longitudinal changes in multiple-demand system that developed after 3 years in 95 boys and 94 girls. Interestingly, it was found that the individual improvement in reading performance was compared to improvement in temporal and spatial visual attention. Their higher performance on tests of visuo-attentional skills (listing, multiple-object-tracking) was attributed to spatial attention development (Balogh, 2017). The research also suggests that action video games (AVGs) have positive effects on the temporal dimension of visual attention, and it is particularly exemplified by their ability to track more objects simultaneously than non-players. It was also found that the amount of video game play was associated with “the boost of multiple-demand system in the left middle, inferior and orbital frontal cortex; left pallidum; left putamen; left hippocampus; left caudate; right putamen; right insula; and thalamus in both cross-sectional and longitudinal analyses” (Takeuchi, 2016: 1785).

The genres which can train human brains are the cooperative AVGs (FPS, TPS, MMORPG, MOBA, etc.) which show lifelike events as sequences of confrontations that can be overcome by collaboration. The positive effect of analysed cognitive functions was detectable in video games “that feature quickly moving targets that come in and out of view, include large amounts of clutter, and that require the user to make rapid, accurate decisions -- have particularly positive cognitive impacts, even when compared to ‘brain games’ which are created specifically to improve cognitive function” (Green & Seitz, 2015: 107). AVGs are good to be used as practice the understanding of lifelike verbal or written material, because of their versatile storytelling and user involvement options, divergent playing structure and fascinating lifelike design which impact positively diverse cognitive demands and perceptual processes (Brackin, 2012). The

visual processes involved in playing AVGs provide complex dramatic scenes and issues to deal with, AVGs also add sophisticated geometric rendering, rapid object movement and audial commentary and commands (Antzaka et al., 2017). According to research even after a short training period, children significantly improved both their visual attention and reading speed, without loss of reading accuracy (Antzaka et al., 2017). AVGs are characterised by high-speed events and fast-moving targets, spatial and temporal variability, a challenge to the peripheral visual field, with the high cognitive pressure, as perceptual and motor skills. For example, AVG players are better in differentiation, prospected inference, and mental rotation functions (Green & Bavelier, 2007). The successful visual attention also influences many connected aspects to situational comprehension, i.e., visual search, multiple-object-tracking, quick skimming of a written text and problem identification after having repeatedly replayed a game level.

### **2.1.3. Effect of video gaming on attention**

As a result of playing, the non-native English-speaking video gamers use English as a second language on a daily basis, therefore they might be considered bilingual, which is an additional aspect that may influence their cognitive capacities, since the L2 language usage has a noticeable effect on the intellectual and rational abilities of an individual as it can be recognised on fMRI data (Witteman et al., 2018; Kovelman et al., 2008).

The gamer brain is capable to deal with an enormous memory load while gaming, because “research on the effects of video gaming on cognitive task performance suggests on the one hand that certain types of video gaming may enhance perceptual, attentional and cognitive skills.” (Liu et al., 2019: 2). The results showed increased working memory performance during video gaming but task performance decrease of the working memory after playing, due to the previous state of excitement. After resting, the performance of the working memory of the video gamers increased. Besides, the correlation between in-game performance and heart rate also increased, which was also expected, given that habitual video game use is recognised to influence attention. The study also revealed improvements in diverse types of attention, including constant and discriminatory attention while video gaming and the regions that play a role in attention are more effective in gamers in comparison with non-gamers, and that gamers also need fewer stimuli to remain focused on difficult assignments.

An e-book by Pliatsikas and Chondrogianni contrasted the language learning in video gaming activity to learning in natural environment by reviewing studies of the field. According to theory, gaming can provide immersion, similar to a natural environment, into engaging

activities including L2 speaking circumstances. The observed fMRI brain images shown significant changes after playing or resting for a certain period. The reviewed papers “demonstrate the role and the importance of experienced-based factors, and especially linguistic immersion, for the acquisition and processing of a second or a third language.” (Pliatsikas & Chondrogianni, 2015: 1009). Bialystok (2006) studied 97 monolingual and bilingual participants who had extensive practice in playing video games and had never participated in Simon tasks. The Simon task is computerised, simple cognitive psychological procedure that measures focused attention. The examined person must respond to (red or green) visual stimuli by pushing the correlated buttons (Proctor, 2011). The test measures focused attention performance on the form of various reaction time indicators similarly to the Stroop test. Bialystok found that bilingualism and video-game experience each influenced various aspects of performance, e.g., video game players were faster in all conditions, nevertheless “bilinguals were faster only in a condition that required the most controlled attention to resolve conflict from the position and the stimulus.” (Bialystok, 2006: 75). The author also found that jogging or other exercising activity may also help to increase cognitive conditions and focus.

Bialystok, Craik and Luk (2012) examined the thickness and the volume of grey matter in the cortical and subcortical brain regions, as well as characteristics of white matter in brain tracts. “The results showed higher white matter integrity in bilingual older adults, primarily in the corpus callosum connecting the two hemispheres but also extending to bilateral superior longitudinal fasciculi, right inferior frontal-occipital fasciculus and uncinata fasciculus.” (Bialystok, Craik & Luk, 2012: 245). The analyses produced many fascinating outcomes, such as the developmental trajectories of brain regions connected to working memory and EF, which were indeed affected by bilingualism, which means that bilingualism facilitates certain areas of the brain that manage EF processes. The findings of Matern et al. (2020) are also in line with the previously mentioned research in video gaming, which enhances cognitive skills, especially attentional abilities. The study examines the selective attention in a young adult sample to test the effects of video gaming and gender on visual selective attention by using a Stroop computerized test. The test shows a significant difference between participants who play video games and those who do not, regarding their reaction times in the Stroop test.

#### **2.1.4. Confirming authentic L2 language use in video games**

In several research the facilitative effect of video gaming was investigated regarding second language acquisition by using fMRI and other neuroimaging methods like CT scan, MEG, and EROS brain imaging methods to shed light on language acquisition during video gaming,

although only few include the authentic L2 language use. The issue in question is determining what type of game engages the participant the same way as it happens in a real conversation by using the same brain areas. Alternatively, the video games may be the best solutions to imitate the real circumstances, as the importance of immersing into a native like environment as it is proven in the comprehensible research of Pliatsikas & Chondrogianni (2015). In the research of Hong et al. (2017) the author discussed about 'HoDoo' game to learn English by using the benefits of online games to native Korean speakers. It was confirmed a measurable English proficiency improvement of participants after playing the game and the language development was associated with increased brain functional connectivity in brain areas involved in Broca's area (language production) and Wernicke's area (comprehension).

Bellec and Boyle (2019) found in their comparative research on human perception that during video gaming the brain works as in authentic real-life conditions, therefore video gaming may create circumstances that can be used in teaching. The authors used video games as a tool to model cognitive processes in parallel brain activities to measure maximal brain performance, as video games are designed to fully engage players. Instead of assessing elementary cognitive processes, the authors employed artificial intelligence to test deeper neural networks by fMRI images to see the dynamics of the human brain, especially in decision-making, which is a complex integrative cognitive process.

Cornillie et al. (2012) scrutinized the lexical diversity and how the association between pictures, actions and words works in games, when participants watch tutorials, walkthrough, and attendant discourse. The authors also found that, participants learned recognition methods can be re-utilised in real life events with the multimodal associations, a process which is facilitated by the in-game-communication namely by understanding words in context. Banquied et al. (2014) used computer-based tasks to prove that the video gamers can enhance their cognitive functions by any kind of video game, besides the authors utilized selected training games and they found meaningful relationship between participants' performance on training games and their cognitive abilities. There was also found working memory improvement at attention-demanding games. In conclusion, the authors confirm that the goal of computerised gaming is to maintain or improve everyday cognitive functioning, although the games should be carefully chosen to prepare an individual for different kind of challenges.

### **2.1.5. The authentic L2 use and video gamer user experience**

Creators of successful video games like *Fortnite* and *Assassin's Creed* invest both time and money perfecting the user's experience (UX) strategy. Dissertation of Androić (2019) presents a linguistic analysis of English dialects in fantasy films and video games. The empirical part analyses and comments on the English dialects and language variants used by the games. For instance, *Assassin's Creed*, a well-known historical game which may bring authentic experiences of history that are analogous to a real visit to a heritage site. The authenticity of historical settings also correlates to player's immersion, according to Mochocki (2021).

The UX is essentially about the understanding of the gamer's brain, the extremities of the human abilities and limitations as well as the emotions the game can evoke. It is also important how players interact with others about the UX; therefore, it must be known how this can affect the brain in the best way to exploit its possibilities by enhancing the UX (Hodent, 2017). Her book provides an overview of how the brain learns and processes information, which was compiled from findings of cognitive science and psychology research. Topics which she covered include perception, memory, attention, motivation, emotion, and learning. It also includes numerous examples from released games of how scientific knowledge translates into game design, and how to use a UX framework in game development. It is also described how UX can guide developers to improve the usability and the level of engagement a game provides to its target audience by using cognitive psychology knowledge, implementing human-computer interaction principles, and applying the scientific method of user research.

## **2.2. Language learning systems**

### **2.2.1. The working memory models**

According to the working memory model there are two subcomponents of the working memory, the declarative (explicit) and the procedural (implicit) memory (Dienes & Perner, 1999). Acquisition is based on practice during which the behaviour is examined and adapted due to experimental repetition (Dienes & Perner, 2002). The processing capacity is a principal factor in the working or procedural memory, because when a process is activated / practiced the working memory gives the limit of the scope of the action / movement (Morales, Calvo & Bialystok, 2013). Language acquisition has divergent phases (Corder, 1975), like in Tadlock and Stone's 'predictive cycle', which includes four stages, attempt, fail, implicit analysis of the result and implicit change of the next attempt so that success is achieved (Tadlock & Stone, 2005). The stages must be repeated until the learner assembles or reactivates the neural network of the muscle memory accurately without conscious thought. This model resembles playing on

certain types of video games, where due to failure, the part must be restarted and practiced until it is successfully performed. The failure functions as feedback which demonstrates the moment when the action must be modified (Flache & Macy, 2002). Especially at learning high-frequency words because avoiding wrong fixation at the beginning is crucial (Honeyfield, 1977), because the practicing part usually loses its improving ability unless the motivation is upheld (Gluck, Mercado & Myers, 2008).

The working memory and the executive control direct the attention on the task and associate it to past, present, and future to formulate surviving strategies if necessary (Crick & Koch, 1998). The working memory manages no more than 4 bits of independent information; therefore, the instructions of rule-based tasks must be broken down into smaller components and combined into larger chunks once the skill is acquired (Gold & Ciorciari, 2020). The capacity of the working memory impacts explicit language learning without any influence of implicit learning because persons with greater working memory capacity perform better in processing second language lexical or grammar tasks (Miyake & Friedman, 1998).

### **2.2.2. The role of the implicit and explicit information processing systems**

The explicit and the implicit information processing systems in the brain are employed to acquire, memorize, and represent knowledge (Sun, 2001). Learning takes place when both systems cooperate thus the "...hierarchical development of cognitive functions where an increase of integral structures continues to increase the level of complex processing" (Gold & Ciorciari, 2020: 5). The declarative/procedural model is widely applied in language acquisition and second language learning (Ullman, 2001). According to this the implicit system is experience-based or a form of unconscious, incidental, and procedural knowledge, thus its content can only be transferred into task performance. The explicit system is rule-based or a form of intentional conscious and declarative process, thus its content can be accessed through conscious awareness (Dienes & Perner, 2002). Therefore, the most common scenario is that learning engages both systems simultaneously to apprehend the complete action or knowledge thoroughly to be practicable and later retrievable (Wessel, Haider & Rose, 2012).

Mastering a speech routine may facilitate the identification of the grammatical patterns and the immediate transfer of the implicit knowledge to the explicit representation because the implicit knowledge requires to reiterate the sentence pattern intrinsically to rebuild the sentence consciously (Ellis, 2002; Wessel, Haider & Rose, 2012). The declarative/procedural (DP) processing model states that the language learning storage and use are based on these discrete memory parts in the brain (Ullman, 2001). Furthermore, according to Schmidt's noticing

hypothesis the learners perceive features of the target language, like words which must be incorporated into interlanguage as procedural knowledge to be ready to recognize all meaningful inputs (Schmidt, 2012). Moreover, the interoperability between the implicit and the explicit knowledge implies memorizing the grammatical features by practicing the articulation of a grammar patterns which strengthens the motor unit in speech production (Smith, Zimmermann & Abbas, 1981).

### **2.2.3. Implicit / explicit systems in learning**

The explicit and implicit systems are significant at highly skill demanded human performances as well as for the easiness and flexibility that characterizes e.g., the flow experience (Csikszentmihályi, Abuhamdeh & Nakamura, 2005). Information processing or learning can occur when the complexity of the task is below the capacity limit of the explicit system. The implicit system does not seem to have a capacity limit because its performance is limited just to the quantity of the information of the motor tasks e.g., the finger movements on the video game controller which can be developed by practice (Ellis, 2002, Rose, Haider & Buchel, 2010). The implicit learning process controls the acquisition of cognitive motor and social skills which are based on the facilitative operation of the dorsolateral prefrontal cortex. Having decided the precise movement, the primary motor cortex sends the output to the specific muscles thus the muscle memory can be acquired through the neuromuscular system by repetition (Dietrich, 2003). The control of the basal ganglia and the supplementary motor cortex are supported by perceptual input from the parietal cortex without cognizant usage of the working memory thus the performance of the implicit expertise avoids awareness (Dietrich, 2004). Motor skills are efficient when they are not explicitly factual but rather automatic without the inhibition of the explicit system that facilitates the entrance into flow.

### **2.2.4. Implicit / explicit systems in learning L1 and L2 words**

The most essential theoretical components of languages are phonology, syntax, semantics, and pragmatics (Levine and Munsch 2010), which develop when a child acquires the ability to communicate with language (Tomasello & Farrar, 1986). According to Schmitt, morphemes and phonemes play an important part in forming words (Schmitt, 2008). Comprehension in young children often works before pronouncing any words or just with limited number of expressions, e.g., mum or dad. The most dominant element in the process of communication above all is the vocabulary, without which a language user unlikely to successfully express and understand any message (Wilkins, 1972, Surmanov & Azimova, 2020; Rosyada-AS & Apoko, 2023). Accordingly, young children use only word fragments to express their actual wishes and

often infer the meaning of novel words from syntactic clues (Woodward & Markman 1998). In early L1 development, basic L1 morphemes and phonemes are acquired and used through an implicit system (Schmitt, 2008), for example when the child struggles with the pronunciation of a word or a chunk of a word as s/he imitates to pronounce it. Nevertheless, after early childhood the explicit system advances in favour of developing the individual's own vocabulary or mental lexicon, which is expected to rely on the declarative memory while the mental grammar is expected to rely on the procedural memory based on the declarative-procedural model (Ullman, 2001).

The step-by-step acquisition of the first language begins in infancy (2 months -1 year), and it depends thoroughly on the implicit learning because the child recognises subjects, objects and feelings and assigns initial voice patterns to them for identification (Yang & Li, 2012). Through further listening, the child infers additional voice patterns which s/he tries to imitate by vocalizing. Having memorized initial voices in the toddler period (1-4 years), the child mispronounces words, but the parents' error correction is inefficient until the pre-schooler (1-6 years) ages when the explicit learning time is to be initiated, and the child acquires the proper pronunciation and meaning of the word consciously (Kristen et al., 2012). In early language acquisition the parental play, later the peer-play may provide the primary learning environment in which the implicit and the explicit learning is the most effective.

Declarative learning also happens in late or adult L2 learning in instructional (school) settings where the individuals recall the implicitly gained L1 grammar information and associate them to L2 grammar explicitly (Dienes & Perner, 1999). In L2 learning the individuals have diversified grammar information, which is represented explicitly, thus the grammar they desire to apply requires volitional control, "...because of the predication explicitness of the representations formed during learning" (Dienes & Perner, 1999: 752). Meanwhile most types of implicit knowledge are composed of characterisation, which solely reflects the attributes of objects or occasions without predicating them in any special linguistic unit. However, after a long immersion into the native speakers' environment, which provide L2 vocabulary rich setting, the extensive practice can facilitate deepening the L2 representations (words) in the implicit system, by the so-called internalizing (Dietrich, 2004). In other words, the meaning of words can be learned simply by deducing them from context rather than by memorization or explicit instruction. Batterink & Neville (2011) found the pattern of research results confirmed that the explicit representations of word meanings can develop rapidly by extensive exposure whereas implicit representations may take more time to incorporate.

### **2.2.5. Flow as performance booster of word learning and processing**

Flow is a mental state of optimal performance accompanied by a deep immersion in the task at a given time with well-defined goals and immediate feedback (Csíkszentmihályi, 2000). The flow state relates to the challenges of the task and the skills obtained by the individual in which the task is seen as an opportunity for action. The pleasure of a task and the expected reward is due to the possible discovery and learning opportunity of a novel ability or expertise as well as of the fun of interaction found within the action. (Csíkszentmihályi, 2000). There are several environmental influences of flow like the personal importance of the task achievement motives (reward) and balance of challenge between the skills and risks. Interestingly, flow happens much frequently at active work than at recreation although the routine inhibits its development (Gold & Ciorciari, 2020). Research reveals that individuals who undergo a flow state feel it as an optimal and high performance of the brain while completely immersing in an activity and all decisions move fluidly to the next effortlessly with distorted time experience (Csíkszentmihályi, Abuhamdeh & Nakamura, 2005), because the joy upholds the flow state as it frees the person from the necessity of focus on the used skill in the task.

All the brain inputs become transmitted towards a single activity due to muted interference from thinking for saving capacity sources by using a quicker and more efficient subconscious form of processing instead (Dietrich, 2004). During the flow state the mind maintains two essential forms of intrinsic motivation mastery of comprehension and autonomy.

### **2.2.6. Flow and explicit / implicit systems**

The mind is in a loss of reflective self-consciousness in which timespan the brain implements any highly practiced skill represented in the implicit system without the interference of the explicit system. The implicit system is associated with the competence-based knowledge supported primarily by the basal ganglia which is applied to the effortless information processing that characterizes the flow state. The explicit system is linked to the cognitive functions located in the frontal lobe and the medial temporal lobe structures, which are responsible for cognitive flexibility. "...the experience of flow is a state of transient hypofrontality that enables the temporary suppression of the analytical and meta-conscious capacities of the explicit system" (Dietrich, 2004: 746). While acquiring or performing a skill the flow experience is needed because the implicit system requires the production of a series of learned, specialized, and independent response patterns. If the facilitating conditions are efficiently combined into production, the cognitive state allows the person to learn new skills,

solve issues and create something novel or manage the acquired skills more efficiently (Gold & Ciorciari, 2020).

### **2.2.7. Flow in video gaming**

The concept of flow is often used by video gamers because they sustain high emotional states for prolonged periods especially which contain highly realistic simulations of virtual environments like multiplayer online games (Borderie & Michinov, 2016). According to the 'GameFlow' model the essential elements must be present to sustain the flow experience, like balance between skill and challenge, control of the situation, clear goal, immediate feedback, concentration, immersion, and social interaction (Klasen et al., 2012). The flow factors are exerted by emotional and attentional processes signified particularly in cognitive and sensorimotor systems and the implication of midbrain reward system structures, which reflects enjoyment and positive game experience (Klasen et al., 2012). In action video games the active confrontation of the enemy initiates events which require effective control and focus, factors which provide objective evidence for the actual presence of flow. Meanwhile the flow is idle when there is no direct enemy presence, which gives opportunity of mapping in the virtual area or discussing the possible opportunities or strategy.

### **2.2.8. Learning L2 words through implicit / explicit representations while video gaming**

Lexical processing in L1 and L2 relies on similar neural substrates, but L1 and L2 grammatical processing differ qualitatively and quantitatively with the area and level of activation and are becoming more automatic at higher fluency (Abutalebi, 2008). Visual perception is an important part of video gaming as it can form a perceptual representation of 'what' there is versus exerting visuo-motor control of 'how' to act, therefore the nature of the stimuli initiates the corresponding system (Dienes & Perner, 1999). The controller usage requires mostly implicit knowledge, but the L2 word learning uses rather explicit, although due to the nature of the video games they can provide occurrences which generate the transition between implicit knowledge into the explicit representation, like when a gamer explains the controller usage in a game by words (Wessel, Haider & Rose 2012). If the game is played in L2, the language exposure is ideally continuous while playing thus the possible intake can be powerful, which may lead occurrences of explicit corrections (Varnosfadrani & Basturkmen, 2009). The written rules of the games also contain high-frequency words or novel vocabulary and grammar of the target language which can be integrated into the participant's interlanguage. The L2 lexis is expected to be dependent on declarative memory at lower L2 knowledge level, i.e., knowledge

of high-frequency words, and rely on procedural memory at higher levels which can be reached throughout frequent practice.

The key to the gamer's word learning success in video games is the knowledge acquisition through implicit and the explicit representations, which happen through immediate feedback of failures (Varnosfadrani & Basturkmen, 2009). For instance, the sequential failures reveal if a gamer's abilities do not match the challenges of the tasks, which implicitly means that one of the gamer's abilities is not up to the difficulty of the game level, although the gamer must find out explicitly what should be improved. This includes remapping the prior actions or game description to discover the exact origin of the failure (Varnosfadrani & Basturkmen, 2009). Explicit learning rests more heavily on conscious awareness and attentional control, meanwhile implicit learning does not, which means that the implicit learning phase may be facilitated by the flow state, which, in turn, frees up working memory capacity and makes the incidental L2 acquisition more successful (Dietrich, 2004). Implicit learning also occurs when the rules are deduced by the knowledge of similar games. On the other hand, the worded rules are learned explicitly by carefully studying the written guideline and by peer explanations, who can provide error correction verbally, preferably through L2 language usage. Furthermore, the participants of video games are expecting error correction occurrences naturally and curiously, either instance can be applied depending on the player's readiness (Varnosfadrani & Basturkmen, 2009). For instance, the existence of such a correction means that the gamer can report or 'verbalize' a sequence pattern of game or even a finger movement. Interpreting implicit knowledge by words is part of the accurate L2 practice because thorough verbalisation it requires a simplified L2 high-frequency word usage. Following Carroll's thought, the explicit correction used in his study included explicit verbal indicators (i.e., *It is wrong, you should rather say that.*), which is in line with the peer conversations in interactive (MMORPG, MOBA etc.) video games where the participants initiate the corrective intent saliently because it is relevant to their ongoing game (Carroll, 2001). All kinds of video games contain occasions of implicit patterns, like places of expectable attacks or clearly akin strength and attributed of dissimilar figures or situations, sequence of actions at a game level or even between game levels, information which may led to recognising a certain, occasionally predictable sequence and helps the gamer to complete the level by providing evocative hints. From a linguistic point of view, the verbalisation promotes evoking sentence chunks and patterns by practicing them when the gamer explains the occurrence to a peer, in addition, all the game figures, places and actions have names and attributes to describe, which provides innumerable nouns, adjectives

and verbs for vocabulary expansion. Consequently, video games may provide mixed feedback thus video gamers can benefit from any kind of correction response depending on the type of game. Besides, the video gamers watch game streaming, gamer podcasts and one to one verbal conversation sessions in chat rooms where anybody can comment on which sentences can be used as language recast that works as a recurrent discourse device. A recast occurs when a communication partner repeats something that a gamer says with more detailed language, or more correct language, e.g., *'treasure box'* and the moderator or peer responds in a more detailed manner, *'Yes, the treasure is in the box'* (Hilte, Vandekerckhove & Daelemans, 2020).

### **2.2.9. L2 language correction as a mean of word acquisition**

The language exposure is continuous while playing a video game, therefore the possible intake can be powerful, motivating and will contain metalinguistic information to some extent. As attention is crucial in language learning (Schmidt, 2001), metalinguistic awareness can cause better performance with the explicit corrections (Varnosfadrani & Basturkmen, 2009). The tasks of the games contain vocabulary and grammar rules of the target language, which can be integrated into the participant's interlanguage (Corder, 1975). In video gaming there is a strong possibility to meet both explicit and implicit language correction in action, because of the situational inference and there is also a probability of peer correction (MMORPG/MOBA) (Dixon & Christison, 2021). Besides, if a video gamer cannot incorporate the correct form at once, then s/he must return to the beginning of the incomplete level and start again or in case of MMORPG/MOBA games the gamer will not be selected for next play, until the participant does not learn to use words correctly. During gaming in action there is no time for error correction, this is possible mostly in idle times with the help of a better gamer in the same room who can help with a quick written message (Pirainen-Marsh, 2010). Gamers are in favour to use high-frequency words when giving orders to other gamers at online games to avoid confusing linguistic errors, because of the rapid nature of the activity (Järvinen, 2002). Long (2007) argues that how feedback can potentially influence learner's language competence and has a significant effect on L2 acquisition. The feedback types can also be differentiated by nature, for example how much metalinguistic information they mediate or how directly they can convey such information. The tutor's feedback and other influential circumstances are important for the student to be able to comprehend more metalinguistic material and produce more uptake (Yilmaz, 2013) or intake (Krashen, 1988). As research on this issue has revealed, the explicit and mixed feedback proved to be the best method of the error correction (Yilmaz, 2013).

## **2.3. L2 language acquisition and use in game play**

### **2.3.1. Child L1 language acquisition in the view of game play**

For children to establish their linguistic and non-linguistic devices the interactive episodes may help to determine the parent's attentional focus and hence the meant language reference. Having determined the functional significance of language, like its primary function and object labelling, learning is based on the way parents use language in the environment of the child (Tomasello & Farrar, 1986). Thus, balanced social interactions and object labelling occurrences are crucial to the child's vocabulary acquisition and subsequent linguistic development (Kristen et al., 2012; Reger, 2014). Activities, such as reading, singing, and playing are the best ways for parents to foster their children's healthy mental development during the first 3 years when language acquisition occurs (Kristen et al., 2012). Playing also includes non-linguistic episodes, which can scaffold the child's early language development by providing predictable and meaningful referential contexts (Tomasello & Farrar, 1986). The development of mental schemes is based on the objects that are carefully displayed by the parents when the child is mapping and denoting objects as mental stimuli through which the s/he formulates voice patterns (Christakis, Zimmerman & Garrison, 2007). To activate the primal vocal apparatus, the interactive episodes with parents may help to determine the attentional focus and meaningful language reference of their actions. The most facilitating way is the joint attention of the adult-child interaction through which the produced non-linguistic context controls the child's attentional focus and utilization of the recognized object-names (Tomasello & Farrar, 1986). More adult-child joint attention induces a virtuous circle in which the child's actual idiomatic attention turns towards novel objects and their labelling. Besides, during joint attention courses the mother and child dyad talk more and are engaged in longer dialogues, which facilitates the development of the child's linguistic competence, because the mother starts her utterance when the child also focuses on the same object (Tomasello & Farrar, 1986). The object reference type impacts the child's vocabulary acquisition, such as playing, which is a powerful vehicle to carry various types of stimulating object references, through their persuasive nature. Symbolic and imaginative play sessions are also powerful vehicles to gain the child's motivation of determining the meaning of novel words of the mother tongue from context in an effortless way and keep the process of acquisition dynamic (Buttelmann et al., 2014).

Symbolic play occurs when children apply objects to symbolize other objects whereas imaginative play occurs when children pretend to be someone, and the rule of the play is given

by the fictional roles. Through more playing sessions the expressions of emotions intentions and compulsions are acquired as well as their linguistic references as words which are all stored in the mental lexicon along with additional constructed categories for novel features (Meadows, 2005). Furthermore, the parent follow-up provides a certain amount of language production, like in playing sessions, when word learning is maximal as well as the emergence of novel linguistic structures. The child play requires not just uttering words, but sentence structures constantly which can be considered a practicing area (Tomasello & Mervis, 1994) that strengthens the comprehension of exposure (Lillard et al., 2013). Playing is equally a powerful vehicle, because the child is attentive, motivated and the way of establishing the meaning of the mother's language is effortless (Tomasello & Farrar, 1986).

#### **2.4.2. Preschool language learning and game play**

Preschool play comprises 30% more vocabulary items than parent-child occasions, which can be rightfully considered as evidence of how employing play for instructional teaching can yield optimal vocabulary and cognitive development. In the preschool period play – as an enhanced milieu in teaching (EMT) – can facilitate the correct responses from children, which are thus reinforcing the results of acquisition (Hill & Tyson, 2009). Acquisition of specific (high-frequency) target words through naturalistic play based on EMT strategies is coupled with book to introduce words (Grabe, 1991). At school age research has found that 7-12 exposures to individual words are necessary for a generative use of an expression (Nagy, 2005). During playing the items of the receptive vocabulary can be ideally associated with novel words that carry multiple contexts and instances, such phenomenon is the best practice in vocabulary acquisition in early childhood (Harris, Golinkoff & Hirsch-Pasek, 2011).

#### **2.4.3. Video gaming and English L2 literacy development in contact**

The video games provide an opportunity for social interactions in which the participant encounters something novel, appealing, and motivating (Sherry et al., 2006). The predominantly verbal (action) games promote memorising basic sentence chunks and patterns by practicing them in verbal communication, in addition, all figures, places and actions have names and attributes as innumerable nouns adjectives and verbs for vocabulary input (Emmerich & Masuch, 2017). Every game has language set up (Ensslin, 2017) and many users exploit the language learning potential regarding the English language because digital media uses English at most extent thus its encouraging chance of practice may be beneficial to English learners. Research found positive correlation among 60% of the responders between their game playing frequency and its usability for language learning they also believe video games are easy

to use as they carry valuable and updated English vocabulary (Blume, 2019). The gamers can enjoy their self-directed language learning because of the competitiveness and because orthographical regularities are difficult to acquire with playing thus the formal education is essential for L2 grammar. After all, games are effective in promoting L2 emergent literacy development for language learners, because the acquired verbal and literacy skills in early years of education are the most advantageously supported with the use of online games (Eisenclas, Schalley & Moyes, 2015).

#### **2.3.4. Video games as out-of-school L2 language usage and learning**

Sylvén and Sundquist (2012) examined the gaming habits of 126 Swedish youth by correlating their language usage to their video gaming habits. The authors found that the video gaming is more popular than television, due to its interactivity. Spoken or written texts that are part of the informal activity of gaming also facilitate the incidental language development, acknowledged by the participants themselves. The gaming texts were the key organizer of the participants' out-of-school language learning because many reported the fun of creating innovative words and reiterating them to describe actual events. Correspondingly, Piirainen-Marsh and Tainio (2009) has found the positive role of repetition in certain games when investigating Finnish teenage gamers who frequently used in-game English expressions in out-of-game conversations. The authors investigated Finnish teenager gamers to find out the role of repetition in certain games and they found frequently used in-game English expressions in out-of-game conversations as well.

Benson and Chik (2011) infer accordingly that video gaming can be considered a primary driving force in language learning for most young adolescents, based on the reports of the participants of a study in which their communicative habits were investigated. The authors noticed that the goal driven action between expert and beginner participants was promoted by communicative interactions which help to develop conversational competencies for the weaker gamers. American and Ukrainian students participated in collaborative gameplay in the *World of Warcraft* (WoW) and the authors noticed several L2 learning episodes, supported by safe learning periods and autonomous learning moments by immersive words.

Chik (2014) focused on game-based language learning and vocabulary enhancement among students living in East Asia who played English, Japanese and Chinese versions of video games. Participants reported how they managed their language choices while playing and how the gaming activity aided their language learning practices. Each of the 153 undergraduate student participants had to write an autobiographical language learning history in 500 words. In the

background information the players disclosed their language preferences in gaming and interestingly English was always the chosen language whenever international students were also present in the game. Participants also reported how they used blogs, group chats and recorded gaming sessions.

They all concluded that video gaming is a cutting-edge facilitator of language acquisition and social practice and indeed carries characteristics of the new way of literacy, like ‘digilect’ (Veszelszki, 2013) and ‘secondary orality’ (Gee, 2009).

### **2.3.5. The language of the virtual world**

This new phenomenon – the virtual world – has launched its own culture recently, thus it should be taken into consideration that this is a unique specialised gaming language full of low-frequency words, as a kind of non-native English variety include in ELF, in conjunction with other cultures and their global projection. This interaction can be explained by the ‘mutual-knowledge hypothesis’ (Gibbs, 1987: 570), which sets the utterances into a meaningful context, by which the member of the group can identify her/himself linguistically. “A context is a psychological construct, a subset of the hearer’s assumptions about the world. It is these assumptions, of course, rather than the actual state of the world, which affect the interpretation of an utterance.” (Sperber & Wilson, 1998: 189)

In the gaming world the utterances are connected to a specific game, as usually a person plays more than one game, thus a player can enact different identities, so s/he can display multiple Discourses (Gee, 2003) parallelly. When a person presents her/himself in a conversation in the social/community sphere, only those will recognize her/him, who belong to the same interest group, therefore they designate their own positions within a company, and even the assumed position of others. They are guided by a given context which is “in this sense is not limited to information about the immediate physical environment or the immediately preceding utterances: expectations about the future, scientific hypotheses or religious beliefs, anecdotal memories, general cultural assumptions, beliefs about the mental state of the speaker, may all play a role interpretation” (Sperber & Wilson, 1998: 189). Naturally, these dissipated looking gaming groups mostly meet in the virtual world, nevertheless linguistics should equally focus on the linguistic components of the communication outside the gaming world, because these linguistic implications of the cultural additions can be relevantly recognised when the group members use this argot along with L1 within their community as a means of autonomy and to discrete themselves from the non-gamers. Godwin-Jones (2014) itemize several circumstances that advocate these conditions, for instance within a game activity when two languages are used

or mixed by the players, it can also occur outside the virtual world with lexical borrowings and code switching that also causes structural changes in other non-native English speakers.

### **2.3.6. English in video gaming world**

When students are asked about prior experience with digital media for language learning strategies and digital game playing behaviours there are always significant amounts of respondents confirming their positive attitude towards interactive digital activity. This is more salient regarding learning English because the digital media uses English extensively, thus its usage may be beneficial to the learners' perceived English language skills as well as to its practice (Gee, 2007). The mobile assisted language learning is available everywhere even in classroom set-ups, because of their linguistic and motivational aspects (Burston, 2014). Interestingly, Blume (Blume, 2019) did not find video gaming as frequent (30%, among 1-13 graders) in the researched population of Germany, although they use English applications to assess their own linguistic strategies. Students who play games, regardless of language, tend to rate their skills slightly higher than those who do not play. A positive correlation between game playing frequency and perceived usage of language learning strategies was found, almost 60% of the responders believe that digital game-based language learning (DGBLL) (Dixon & Christison, 2021) is useful, easy to use, and it carries valuable and updated English vocabulary. DGBLL seems to be negligible although teachers hold positive beliefs regarding DGBLL, likewise the actual gaming behaviours correlate with perceived language learning strategies in school. However, the author found a negative correlation between the usage of digital games and digital media in teaching because the accessible games and ostensive devices do not match the students' actual stimulating demands.

## **2.4. The importance of high-frequency word knowledge at L2 language learning**

### **2.4.1. The niche of high-frequency words in L2 learning**

The role of vocabulary in second language acquisition and foreign language learning is greatly valued, because this element connects the four skills of speaking, listening, reading and writing. Technically, L2 learners have less exposure to the target language than L1 children and to communicate and comprehend the message well in various foreign language spoken and written texts, students need to learn a sufficient number of words and know how to use them in different contexts and for different purposes. Vocabulary consists of individual words and larger lexical items such as phrases and verbs. Knowing and managing vocabulary in the mind is how a word enters/exists in one's mental lexicon, how words interact with each other, and ultimately how

the mind uses them to create meaning. In its broadest sense, knowing a word means knowing adequately all its forms (Cameron, 2001), i.e. how it sounds and is written, what grammatical changes can be made to it, and its relationship with other words and concepts, including usage and patterns with other words. Determining which words to learn first for L2 learners is especially important because it helps them profit most in their learning efforts (Nation, 2006). Besides, vocabulary knowledge is a reliable predictor of various dimensions of L2 proficiency, including the sub-skills of reading, writing, speaking, and listening (Matthews & Cheng, 2015). However, vocabulary learning efforts are mainly focused on single-word items without systematically considering the acquisition of multi-word expressions (i.e., phrasal verbs, idioms, formulaic sequences etc.), this may lead to an essentially incomplete lexical knowledge system, which, in turn, misses promoting successful L2 language acquisition. Regarding the most problematic type of multiword expressions, phrasal verbs and idioms may cause difficulties for L2 learners to comprehend. For instance, the meaning of the phrasal verbs and idioms cannot be easily deduced from the words that make them up, because they are often created by the combination of high-frequency words and prepositions (Park & Chon, 2018). Yet, studies ought to focus on the most essential words to create the most importantly studied word list for the sake of the L2 acquisition of the beginners.

Although studies of high-frequency words are relatively common in academic literature, little research has been conducted on the actual use of these keywords by language learners. Schmitt and Schmitt (2014) suggested rethinking the frequency question to determine that 2,000-word families are still the best limit for high-frequency words. Perspectives, including frequency, coverage, acquisition, and use, it has been suggested that high-frequency words comprise the most common 2–3,000-word families in English. There are 3,000 items that cover 70-90% of the words in different types of texts (e.g., general conversation, TV programs) (Van Zeeland & Schmitt, 2013; Dang & Webb 2016; Dang, Webb & Coxhead, 2022), although understanding written texts, like newspapers (rather broadsheet than tabloid) requires higher vocabulary size of 4,000 words (Nation, 2006).

### **2.5.2. Word Lists**

Video games are a veritable treasure of words and expressions in a semi-authentic context in a quasi-systematic way, thus the games present different variations of a single expression. Every phrase or idiom has also variants of different word families, although this does not mean that the speaker uses all word families of an idiom, mostly the speaker just recognises and infers the

meaning from other occurrences (Bauer & Nation, 1993) or from the surrounding text. The word lists contain only one of the items of a word family which is a common feature of the word lists (Schmitt, 2010).

GSL is the oldest and most influential high-frequency word list created by West (1953), many studies suggested replacing it with a contemporary list (Schmitt, 2010; Dang & Webb, 2016). The most frequent words are those whose frequency order is most strictly fixed for a given type of corpus, like, COCA 2,000, BNC etc., (Nation, 2022), but the benchmark for the observation in such research is the frequency of the usage of a word. If the first most frequent 3,000 words were paired with the CEFR 3,000 list, it would be found that they are almost identical, because an average book or a conversation contains approx. 84 % of the 3,000 most frequent words (Kucera & Francis, 1982; Nation & Waring, 1997). In addition, another list of the most frequent words has been compiled by Oxford dictionaries (Oxford 3,000 | 2020), which contains 3,000-word families necessary for understanding an everyday conversation in English, which also corresponds to the word list of the CEFR 3,000 proficiency levels from A1-B2 (Milton & Alexiou, 2009; Wei & Nation, 2013).

### **2.5.3. Vocabulary types and common learning strategies**

Another important aspect of vocabulary is the learning method, which is based on maximizing the number of times a word is encountered in written and spoken texts, which helps the item to enter the receptive vocabulary and later, with practice, into the productive vocabulary. Describing the five essential steps of vocabulary learning based on research on learner strategies, it starts with having adequate resources for encountering unfamiliar words, developing a clear picture of the new form, learning the meaning, forming a memory link between the form and the meaning, and finally using the words (Read, 2000). Even with all teaching efforts and lexical demands, a legitimate proportion of L2 learners in various contexts miss to acquire even the most frequently occurring 2,000-word families after several years of formal English language instruction. This is due to the frequent failure of the first of the five steps of elementary vocabulary learning, meaning that the learners simply do not encounter the target word in sufficient time to incorporate it into their receptive vocabulary.

Receptive vocabulary knowledge means the number of words recognized and understood, while the number of words used in speaking or writing is called productive vocabulary (Read, 2000). This distinction between receptive and productive vocabulary is important because high-frequency word knowledge is receptive knowledge of words in this study. Nevertheless, studies

in this area have primarily focused on the relationship between reading comprehension and vocabulary acquisition (Grabe, 1991; Goldenberg, Rueda, & August 2008). Although many studies show that vocabulary knowledge is an important determinant of reading comprehension success in second or foreign language education (Shen, 2008; Pigada & Schmitt, 2006), not many studies address the importance of vocabulary knowledge in listening comprehension (Van Zeeland and Schmitt 2013). Regardless of the method (top-down or bottom-up), the learner uses words from her/his lexicon to comprehend the meaning of audial and written texts, therefore lexical competence plays a key role in these processes. In addition, as soon as the learner moves from the position of a teacher-controlled vocabulary to the real use of the foreign language (idioms and phrases), the improvement of the ability to make a student's reasonable guesses becomes the main goal of teaching, indicated that guessing from the context is the most effective strategy of learning (Park & Chon, 2019). Successful exercises include closure exercises, words embedded in context exercises, and context enrichment exercises (Beck McKeown & Kucan, 2013). For knowing which word families are missed in formal schooling, some researchers emphasize the importance of designing and developing tests to measure vocabulary knowledge (Nation & Chung, 2009; Schmitt, Schmitt & Clampham, 2001).

#### **2.4.4. Spectrum of word frequencies in video games**

According to Read (2000), the adequate resource for encountering new words is the first of the five steps of learning any vocabulary including the high-frequency words which may or may not be provided in L2 classroom settings. Video games are able to contribute various audial and written texts that cover different domains with a wide range of vocabulary (Welhouse, Lee & Bancroft, 2015). In addition, the student who is struggling to learn high-frequency words and tends to forget them again, the visual hint may be helpful which video games also present. It is proven that the Word Association Method makes it possible to teach high-frequency words using visual cues, which feature is practically impossible in reading schemes (Moran, 2015) just in comic books. In Schmitt's (2019) vocabulary-focused research program, little is currently known about the words and vocabulary used in video games, including the types of vocabulary games and the frequency of occurrence of potentially learnable vocabulary. The topic of the lexical profile of video games is also under researched, only a couple of studies focused on the vocabulary of video games (Nindyaputri, 2017; Hartanto, 2018; Rodgers and Heidt, 2020, Heidt, Pinchbeck & Rodgers, 2023). According to these studies the lexical profile of video games and vocabulary encounter ratio is compatible or even higher than a language input of television programs and movies.

The researched video games by Rodgers and Heidt (2020) are also referred to as Commercial Off-the-Shelf (COTS) games that can be purchased and used publicly, mainly for recreational purposes. These differ from games for learning (G4L) or better known as games which are designed specifically for educational purposes. Most of the games analysed in this study have higher lexical demands than television and film based on the BNC/COCA lists. E.g., (Grand Theft Auto) GTA V was chosen because it is among the most popular game types and employs the vocabulary corpus of a typical open-world mission-driven game. Playing through GTA V, the player/learner may encounter vocabulary at the 4,000-word list and above, e.g. evidence shows that a L2 learner/player participated in such video game match would be exposed to a comparable amount of learnable vocabulary as watching a season of a television series. On the other hand, Walking Dead had the lowest vocabulary demands of all the games. The analysis of the lexical range of the gameplay showed that knowledge of the first 3,000-word families contributed a 95.74% coverage of the English language, and learners/players that acquired the first 3,000-word families can have sufficient coverage (95%) in reading comprehension and vocabulary learning at school settings. The research mentioned can provide some indication of overall program coverage for each video game and encounters with low-frequency words, with vocabulary levels required to reach 95% and 98% lexical coverage. Knowledge of the first 2,000-word families of the English language and knowledge of proper nouns and marginal words (PNAMW) is required for 95% coverage, and knowledge of 4,000-word families for 98% coverage. However, there is currently no research available that has investigated the vocabulary demands of video games. Prior research shows that video games can be a reliable source of comprehensible input for students to learn vocabulary. Heidt, Pinchbeck and Rodgers (2023) constructed a pedagogical vocabulary list for video games using a multi-method approach. A corpus of ten video game scripts was compared with the spoken English reference corpus to identify words that were relatively more often used in video games. The result was a list of 484 words of common video game vocabulary in order to promote the teaching and learning of these words.

Hartanto (2018) researched the content of the texts appealing in ‘Clash of Clans’, which is a freemium strategy game designed for mobile, developed by the Finnish game developer Supercell. The game takes place in a fictional world with a fantasy theme, where the player is the leader of a village. The task of the player is to build her/his own village from resources acquired by attacking other players and then create the raw materials themselves. The game provides several different means of communication at various levels, e.g., high-frequency

words and beyond, and conversations between the game and the gamers and among the gamers. In the study the numbers of high-frequency vocabulary items were investigated as well as the possibility to practice and recall such vocabulary. This aim was done by making a text census and interviews with participants. The findings revealed that 83% of the 3,786-word tokens of the game belonged to high-frequency words, which equals to a high-frequency word list of 3,000-word level. According to the reports of the participants, they could easily and pleasantly memorize and remember a large number of items.

Other research used samples of video games, like 'Around the World in 80 Days', 'Azkend 2: The World Beneath', 'The Treasures of Mystery Island: The Ghost Ship', 'The Rise of Atlantis' and 'Farm Frenzy'. The common feature of these games is that they can be played online and in co-op mode as well as independently, which give opportunities the gamer for exercising before play with others. Nindyaputry (2017) categorized the vocabulary of the aforementioned video games into frequency groups and the result showed that there were 76.83% of K1 and 6.91% of K2 from the General Service List (GSL) by West (1953; cited in Brezina & Gablasova, 2015), which means the findings cover all together 83,74% of the 2,000 most frequently used words in English. Research of Sylvén and Sundquist (2012) considered video gaming as a means of extramural English learning. The authors themselves created a test based on the 2,000 most frequent word families in English to measure the receptive vocabulary level of the 86 participating Swedish students. According to their findings, due to the interactive nature of the video gaming, it is also suitable for learning 2,000 most frequent English words.

Therefore, second characteristic of how video games contribute to language learning is the play itself since the language is key to playing a game. Reading and listening are involved in understanding instructions or walkthroughs as well as in-game texts, like subtitles or, at the higher level of play, interaction with other players. Game-related interactions can be a means of cooperative learning, from which the personal curiosity rewards the wider knowledge of words which may lead to independent learning. Such strategies can be associated with approaches of vocabulary learning recommended by Nation and Wei (2013). Video games can also be played in an online mode, which suggest an entirely different model in terms of interactivity and gameplay than the insulated offline way. Online video games can be classified into different genres such as action, adventure, simulation, role-playing games (RPGs), first-person shooters (FPS), racing, sports, strategy, etc. The category is relevant to vocabulary because certain genres, like RPGs tend to contain more text and are highly narrative-driven, so they may have a greater impact on vocabulary acquisition (Cabraya, 2016). Online game play

also has characteristics that make them suitable for language learning, such as comprehensible input at diverse levels, self-learning opportunities, subtitles to alleviate comprehension of meaning, repetition to deepen word knowledge and authentic up-to-date language (de Haan, Reed and Kuwada, 2010). Furthermore, Yip and Kwan (2006) also investigated the usefulness of online vocabulary games in increasing English learners' vocabulary knowledge. The results of their study showed that the students taught with online games performed better than the classroom taught control group on the post-test, which concluded that games are more linguistically diverse than what is typically found in the classroom.

Reinhardt (2019) suggests that games may contain more diverse language that would otherwise be more difficult to grasp in the traditional classroom or even in other media such as books, songs, movies, or television, etc. It may be more beneficial to use gaming as an activity outside of other media to expand the vocabulary of intermediate and advanced language learners, as games have a wider range of lower-frequency vocabulary that may not be present in other media. Still, concerning the high-frequency word acquisition by video games and because of their rich content, interactive and repetitive features the high-frequency vocabulary is presented and obtainable in video games which hypothesis is investigated in this research.

## **2.5. The L2 literacy advantage of the video gamers – sociolinguistic view**

### **2.5.1. Specific video game related, low-frequency expressions in societal use**

Video gaming primarily serves entertainment purposes, nevertheless this dissertation aims to reveal its potentials in high-frequency word learning efficacy. The gaming world provides a wealth of linguistic material that will be exploited in what follows regarding second language acquisition, like the possibility of the practice of the high and low-frequency words, usage of L2 loan words and code-switching (Boes & Vinh-Hung, 2017). The most important distinguishing feature of the video game specific, i.e. low-frequency word knowledge and high-frequency word knowledge, according to (Rodgers and Heidt, 2020) is that, the video game specific word knowledge is the leitmotif of originality and expressing the gamers themselves with words from the virtual world in the real world, a kind of survival technic or the foundation of the video gamer culture or the basis of video game culture that synthesizes the virtual world knowledge with the experience of the real world. When video gamers talk about games, e.g., in chatrooms, fun meetings, and game fairs, they use English – the lingua franca of the digital world (Seidlhofer, 2005; Balogh, 2017), hence the gamer world as well (Ensslin, 2017) – as a predominant means of communication among the members of virtual world communities. As a

worldwide phenomenon, video games provide a vast material for language contact studies, which involves the mixing of two languages at the levels of the phonology, morphology, and syntax (Ensslin 2017).

Within this developmental continuum the individual obtains a broad expertise of low-frequency vocabulary use by gradually immersing in the game to expand further abilities ‘to be in action’, which lead to winning within and outside the play, as a kind of an intellectual goal, because a “[G]game, largely a non-narrative form, allows material and consequential interaction: characters and environments are simulate” (Järvinen, 2009: 86). The association between emotions and language is necessary because games are simulations of social interactivities in which people are enacting different identities through which they express their feelings and thoughts, thus gamers, like other human beings, prefer to belong to a social group where they are praised and accepted (Järvinen, 2009). Considering this, each game has its own, low-frequency vocabulary to be mastered to be able to fully participate in a play, and this vocabulary is the best way to learn the virtual rules, names, and places of the game in an entertaining fashion. However, such jargon (Balogh, 2017) used in the outer world of the video games is the result of the communication challenge between the game and the gamer, among the players while playing and in video game related real-life conversations. Outside of the game these utterances are also used by video gamer communities to signify any dissimilar language surroundings in contact (Balogh, 2017), by which the members indicate their domain of interests.

“Games provide a compelling analogy to cultures. Both consist of arbitrary goals and rules that allow people to become involved in a process and act with a minimum of doubts and distraction.” ...” Games fill out the interludes of cultural script. They enhance action and concentration during ‘free time’ ... and a person’s attention threatens to wander into the uncharted realms of chaos.” suggests Csíkszentmihályi (1996: 81) and touches the point, pertaining the importance of gaming from a sociolinguistic point of view. The subcultures created within a society by the gamers are the places where people can escape from the everyday pressure and where gamers can gather without the fear of the anxiety of being intimidated (Horovitz 2019).

These communication problems within the society have risen the awareness of the researchers and article writers of a vast number of reflective articles about how game players utilize in-game and out-of-game information transmission procedures (Stanney et al. 2001) and “channels to blend those worlds into satisfying experiences”, as argued by Consalvo (2009: 297), who

also talks about the challenges of online communication, from which potentially problematic communication issues can be originated, for instance, the misunderstanding of the behaviour of the members of the gaming society, because they are considered unsociable and distant (Derboven, Van Gils & De Grooff, 2012), although they just use their own terminology among themselves. Narrowing the sociolinguistic perspective, video gaming belongs to a more active rather than a passive pastime. It implies various kinds of interaction, e.g., communication between the game and the gamer and with other players as well, thus it can be investigated as a social action just like any other social gatherings. Even if the communication happens in the real or in the virtual world (Thorne, Black & Sykes, 2009) it uses the language alongside other social practices like clothes, behaviour, values, food, habits etc. Language is an inseparable part of the self-expression of any group, as Gee (2003) calls it as Discourse with a capital ‘D’, which emphasizes that voice and style are a means of belonging to the organization. Human beings may be part of many different Discourse communities, for example groups, classes, or families and “when you ‘pull-off’ being a culturally specific sort of ‘everyday’ person, a ‘regular’ at the local bar” ... ”a teacher or a student of a certain sort, or any of a great many other ‘ways of being in the world’” (Gee 2003: 7).

#### **2.5.2.1. Classifying low-frequency video gaming words into ‘gamerlect’ and ‘gamer argot’**

As defined, in gaming the vernacular is English, by virtue of being the default language of most games, and equally a Lingua Franca (ELF) among the participants (Ensslin, 2017). Commonly, in the sports games the territorially appropriate dialect of English is spoken by the speakers, i.e., American English in NBA, British English in Rugby or FIFA, although the players employ rather a special, culturally non-specific, neutral form of ‘International’ English (Stavans & Hoffmann 2015). The sociolinguists have already noticed the exploitable factors of IT and video gaming English, such as the high-frequency words, i.e., basic verbs and sentence patterns and low-frequency expressions, i.e., content nouns, names of game characters and places (Rodgers and Heidt, 2020). For instance, in the commonly named ‘shooter games’ the simpler, yet descriptive up-to-date English is utilized, which contains several action verbs and content nouns from the spectrum of military, medical and mapping domains (Ensslin, 2017). The current version of English commonly used on the internet can be supplemented by language items which any gamer can develop to a quite high level of proficiency, through successful communication in various virtual circumstances.

Several expressions have been invented in linguistics to cover the phrases, abbreviations and emojis utilized by IT experts, internet communicators and video gamers for defining the subject

of the particular Computer Mediated Communication (CMC) research, such as internet-slang, netspeak and new high-tech lingo (Chrystal, 2011), chat-speak (Hilte, Vandekerckhove & Daelemans, 2020) and gamer-speak (Strong, 2018). Veszelszki (2013) introduced the umbrella term ‘digilect’, which seems to be applicable to all kinds of CMC, and as such it has been adopted by many authors. However, findings reveal that the video game related vocabulary is much greater than the words, abbreviations, emojis altogether, and that it is also used in face-to-face verbal conversations to maximum extent. Thus, using ‘digilect’ as an umbrella term seems incomplete regarding gamer vocabulary, because its meaning lacks the possibility of its use in real life. Therefore, I discrete the offline used video game lexis from the online or CMC used video game terms. Namely, the words that appear in the online gamer-gamer communication but have originally occurred in video games are called ‘gamerlect’ (Arnold-Stein, 2021), as a partition within the umbrella term of ‘digilect’. The offline used version filled with subcultural meanings will be identified as ‘gamer argot’ (Arnold-Stein & Hortobágyi, 2021).

#### **2.5.2.2. The origin of ‘gamerlect’**

Playing video games online triggers gamers to initiate immediate information exchange, which is indispensable for tracking and interpreting virtual events. That is why quick in-game information exchange is crucial, e.g., 70% of gamers use in-game chat services (Damsa & Fromann, 2018), and 15% of gamers share and gain information on social networks. 8% of them use out-of-game voice/video platforms (Damsa & Fromann, 2018), which are also important communication channels. The gamer argot and its online form ‘gamerlect’ is filled with English loans that are being reused for social conversation purposes. In contrast, non-gamer social media and mobile community users employ a moderate number of English expressions, emojis and abbreviations jointly, as described by Veszelszki (Veszelszki, 2010, 2012, 2016 (a), 2016 (b)) or Balogh (2014, 2017) or Chik (2014), Benson and Chik (2011), Hilte, Vandekerckhove and Daelemans (2020), Strong (2018), Veszelszki and Parapatics (2016), Balogh and Veszelszki (2019). Accordingly, the CMC can be viewed as written speech or as a non-standard register by invoking Maynor (1994). It is also argued that CMC uses lexical borrowings and code-switching, which is a characteristic only of this particular ‘internet language’ or ‘digilect,’ or so-called online code switching as a trait of the new bilinguals of the cyberspace (Márku & Bartha, 2015).

In terms of video game-related vocabulary the gamers’ language usage comprises only a narrow segment of the communication domains at first sight, although, since a gamer plays several

types of video games or genres in her/his youth, to a certain extent their insight into the different accessed domains can be expanded by the importance of the timespan they spend in front of the screen. In addition, the sports video games also provide semi-authentic circumstances through their virtual environments, because the rules are identical to those of the real games (Consalvo, Mitgutsch & Stein, 2013). Consequently, Grosjean's 'complementary principle' of bilinguals (Grosjean, 1997a) is compatible with the video gamer's English language application, because their English knowledge is utilized and evolved complementary by playing on various game instruments.

### **2.5.2.3. Examples of the usage of 'gamerlect' in international research**

In Chik's research (2014) 153 undergraduate student participants reported using blogs, group chats, and recording gaming sessions and provided a reading jargon list extracted from game texts. This study also implies that the game-related texts in both the native language (L1) and a foreign language (L2) form the capital of knowledge for language learning.

Hilte, Vandekerckhove and Daelemans (2020) focused on the social media writing habits of the Flemish-Dutch secondary school teenagers by scrutinizing 1384 Facebook conversation entries shared by volunteers. Numerous conversations contained English expressions in a normal colloquial order; some were adapted to Dutch, i.e., written according to the Dutch pronunciation rules. Examples: English words inserted into a Dutch sentence: *ben home alone nu* ('[I] am home alone now'); English word by Dutch pronunciation: *naais* (nice), *goed* (good); English word with Dutch suffix: *haar cadeaus sucken* ('her gifts suck'), (Hilte, Vandekerckhove & Daelemans, 2020: 7). They also investigated the idiosyncratic linguistic adaption and accommodation of the participants' language use and called it 'chatspeak'. In their conversations the participants wanted to facilitate interaction and regulate social distance by accommodating words and sentence markers, such as girls have greater preference for expressive typographic markers, like emojis or the usage of capital letters. On the other hand, the boys have used much more colloquial language and more abbreviations. The claim for social approval among teenagers is resolute, thus linguistically indicated (Gumperz, 1968, 1983). The register depended on how the speaker would communicate face to face, which strengthened the orality maxim. Several patterns were detectable, e.g., the gamers' language utilization was much more divergent than other messages. Many conversations contented English expressions in a normal colloquial order and some of them were adapted to the speaker's L1.

Strong (2018) targeted the gamer language and its utilization on social networks and he narrowed his focus to the MMORPG games among young French gamers, which consist of multichannel texts in which different linguistic channels work together as a system. Through discourse analysis of short excerpts selected from the written conversations or messages that are complemented with explicative pictographic elements and the system of structural differences. The author calls the language of the written messages ‘gamer-speak’ in which a non-standard, fictive language creation has a conceptual generator effect on the chat room and social network conversations. The results of the discourse analysis were classified according to word formation modes: English loans adapted to the target system: *gear, hunter, tank, tooltips, mate, quest, avatar, dungeon*. Shortenings, shift amelioration, pejoration, and widening/narrowing: *PvP, JcJ, IRL, bot, me, AOE, hunt*. Blends: *healadin*, (Healing Paladin), *holy, quest, dungeon*. Composites: *rebuff, hpal; raid lead* (chief de raid). New creations: QQ (crying); *hor2* (hordeux, horde); (Strong, 2018: 120).

#### **2.5.2.4. Examples of the usage of ‘gamerlect’ in Hungarian research**

E-sports fans form a separate cast within the video game society, because such electronic games root back to real games and a high number of participants do real sport activity alongside with the e-sporting (Békési & Kovács, 2020). Secondly, players of these types of games are most likely to become professionals, due to the growing number of e-sport events and opportunities to play for money, thus their group characteristics follow a different pattern than that of MOBA or MMORPG group members (Békési & Kovács, 2020:40). Furthermore, players of sport e-games can benefit linguistically considerably well from gaming, since the rules of the real and the electronic versions are identical, and the sport related expressions can be reused in all walks of life. Using the same language allows the peers to adapt sport related, low-frequency English vocabulary into Hungarian; although they are most likely to have a Hungarian equivalent, video gamers adhere to English phrases instead, e.g., *team, race, sprint, chicane, sector, DRS*, from Forma 1; *attack, glove, ring, ducking* from boxing; *foul (fault), jump, time-out, defender, block, assist*, from basketball.

Balogh (2014) conducted different research regarding gaming language use. In one of her first studies, she ran an online questionnaire that contained 9 general questions about gaming habits and 3 questions related to gaming vocabulary (Balogh, 2014: 48). 55% of the 104 Hungarian participants admitted to being gamers. 44% of the respondents were women. The video gamers were subgrouped into ‘hard-core’ and ‘casual’ gamers, depending on who plays more frequently, and with which type of game, thus the members of a subgroup might be aware of

the coinciding expressions from the same type of games. The respondents replied positively about the grouped low-frequency words, and all confirmed that the casual gamers have limited familiarity with such gamer ‘jargon’. Respondents recognised 71% of the game related words, due to overhearing expressions from other gamer friends (Collins, 2007). Youngsters are open to exert to utilize themselves unusual words or expressions.

Balogh and Veszelszki (2019) researched the linguistics role of the ‘taunts’ in the *League of Legends* (LoL) game. Pre-written insults are kept in a phrase bank, a possibility for the players to write or say acceptable disturbances, in the heat of the game, to deteriorate the enemy. The authors analysed these sentences because the examples are perfect to scrutinize the latest linguistic modifications made by gamers. It is utmost important to understand the pragmatic language use from the context to find out the motivating factors in the communication (Balogh & Veszelszki, 2019). Gamers usually establish cooperation among peers, whereas such purposeful low-frequency expressions used by the enemy, even in a polite way, can offset the communication within the group. Thus, the taunt plays a tactical role in a game, like a game within the game, it has a kind of ludic function, namely, losing a cool head can yield to lose the game. Besides, by using such aural and written tactics, the gamers can enlarge the spectrum of their communication, eventually they can have retroactive contributions. Examples: “*she failed her ult, lol*” (she failed [to use] her ultimate ability, laugh out loud); ‘*So be it ... summoner... You will lose*’ (So be it player, you will lose); ‘*her Q has big dmg*’ (by hitting key Q, she can cause a big damage); etc. (Balogh & Veszelszki, 2019: 98-99).

### **2.5.3. Social imprints of video gaming: Low-frequency word use in code switching**

#### **2.5.3.1. The ‘gamer argot’ as a verbal out-of-game low-frequency word utilization of video gamers**

During out-of-game, between video gamer and video gamer communication an eloquent, clandestine video gamer phraseology or ‘argot’ is employed in which the players adopt and eventually borrow words from foreign languages (mostly from English) to accurately express their actual personal interests (Arnold-Stein, 2021). Thereby, the gamer’s way of speaking may function in a bilingual mode (Grosjean, 1997a) because the utterer operates in two languages concurrently, which are in their mental lexicon (Libben & Goral, 2015). Since video gamers manage an outstanding number of high-frequency words and low-frequency phrases (Hartanto, 2018), their proficiency may be sufficient to extend their L2 video game-related words into their everyday speech, therefore, the gamer argot is a potential terrain to code-switching.

A considerable number of academic papers have endeavoured to collect and analyse low-frequency gamer related words, expressions, and abbreviations from written or spoken communication on digital gadgets (Piirainen–Marsh & Tainio, 2009); (Reinders & Wattana, 2011); (Sylvén & Sundqvist, 2012); (Hortobágyi, 2017(a), 2017(b)); (Emmerich & Masuch, 2017), in the aim to understand their linguistic behaviour better. All of them ascertain the computer mediated language (CMC) and the video gaming argot have an intense effect on today’s video gamer language utilization. Having reviewed the international and Hungarian examples of gaming words and word formation methods, Study 3 provides a detailed report.

### **2.5.3.2. Additional cognitive advantages of bilingual video gamers**

As detailed in the earlier part of the dissertation the action video games have an enhancing effect on neural growth by requiring players to communicate in foreign language sentences, keep track of several on-screen moving items while simultaneously manipulating on the controller, therefore gamers are processing the visual and auditory information successively in a fraction of a second, which “indicates [that] a relationship may exist between action video game play and multisensory processing” (Green & Seitz, 2015: 111). The gamers are also benefitting of vocabulary development to secure their language proficiency (De Haan, Reed, & Kuwada, 2010), which correlates with their inner game performance, because the more diversified their vocabulary, the greater the chance of winning at any games, and that is the greatest motivating factor for the participants (Liddicoat, 1991). Video games in which participants must utilize a foreign language (English – Ensslin, 2017) equally teach the players to process information faster to respond quicker. Having examined their lingual and cognitive advancement, “bilinguals were found to be significantly ahead of their monolingual counterparts in verbal and non-verbal reasoning, divergent thinking and subject matter attainment” ... “bilinguals [seem] to be more creative...” (Liddicoat, 1991: 19), especially, if they play video games (Baniqued et al., 2014). Besides, video gamers are required to be more inventive, a quality which helps to infer the meaning of words in context, which also accelerates their language proficiency.

### **2.5.3.3. Gamer low-frequency expressions in a sentence**

Rodgers and Heidt (2020) analysed word frequency of video games and found that they have higher lexical demands than television and film based on the BNC/COCA lists. For instance, when playing GTA V a video gamer may encounter vocabulary at the 4,000-word family and even above. The analysis of the lexical range of the gameplay showed that knowledge of the 4,000-word families and above contributes more than 95.74% coverage of the English

language. The above-mentioned research also demonstrates that the possible encounter of low-frequency words, which are mostly present at 95% or above English lexical coverage, is extremely high. However, there is currently no other research available that has investigated the exact low-frequency vocabulary extent of video games.

Apart of the spoken language, from a pragmatic point of view, the chat room or social network communication is rather a ‘written-spoken’ language (Márku & Bartha, 2015), or an imprint of the spoken language. As a result, differently pronounced phrases and written onomatopoeic terms are very frequent as well as innovative word creations in online media (Keszler, 2000). The word formation processes are the most interesting part, low-frequency words are modified by the users and created novel words regardless grammatical or orthographical rules (Fazakas, 2015). Attempting to analyse expressions grammatically requires placing them into a current organization of any discourse, namely which foreign expressions play pragmatical roles within a clause. Also, it is necessary to know the size the domain covers (i.e., game type) and the similarity of mental functioning of the interlocutor and the receiver (i.e., casual, or hard-core gamer), which is deductible from the similarity of their speech patterns and seriality (Kugler, 2015). Normally, the patterns are bonded in the in-the-game conversations (gamerlect), compared to an out-of-game discourse (gamer argot), where the patterns are loose or there is no pattern at all. Besides, in an out-of-game discourse the game related low-frequency expressions are used to interpret events as they would be in a video game, thus the connotation of such phrases is evoked by the interlocutors’ intention and interchangeable video game experience. The pragmatic intention constructs different frames with grammatical strata (Langacker, 2006: 17, cited by Kugler, 2015: 21), by which sentences are being elaborated from the basic to the most complicated ones. The verb functions as the organising principle in a sentence, and because the verb is usually in Hungarian, but the sentence frequently contains low-frequency English words, e.g., proper, or concrete nouns, few adjectives, consequently all sentences should be considered bilingual. Example sentences<sup>2</sup>: (verb, **English**, -*inflection*)

**Flame tongue Weapon/Totem** 50% helyett 25% **healing reduction-ös rebuffer-ot ad**, kétszer **stack-el**, a **rebuff** ugyanúgy 5 **sec-es marad**.

*‘Flame tongue (sword) weapon/totem gives (only) 25%, instead of 50% healing reduction rebuffer (decreased healing), (if s/he) stacks (gets) twice, the rebuffer (lasts for) 5 seconds.’*

A **Mass Dispel** 5 ember helyett 10 **friendly** és 10 **enemy targetre** hat.

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<sup>2</sup> Example sentences are from gamer365.hu website (Gamer365, 2021).

*'The Mass Dispel has effect on 10 friendly and 10 enemy targets, instead of 5.'*

#### **2.5.3.4. Video gamer argot as bilingual practice**

According to Weinreich (1979), bilinguals use two languages alternately, a statement equally endorsed by Hoffmann (2000), who argues that bilingualism is the ability to use two languages at a similar level and to be able to manage a communication successfully in either of them. Consequently, bilingualism is the constant and prosperous usage of two different languages by an utterer engaging in a conversation with a different speaker in one or both languages. A person may be able to speak both languages, but he/she uses only one of them or can use both languages but is fluent in just one, thus the proficiency level may differ to a certain degree in the four linguistic skills (speaking, reading, writing, listening). The above definition must be considered in this case, since the proficiency level of these four skills depends on the type of game being played, as will be exemplified later. As a result of the constant exposure to English the video gamers must be considered to be bilingual because they communicate in a “collaborative game-playing activity orient to the co-presence of two languages in the setting and deploy bilingual resources in organising their action and participation” (Piirainen-Marsh, 2010: 3012) with real members in virtual communities.

Young video gamers, who have learned their basic English in classrooms, having acquired their communicative proficiency during video gaming, ought to be considered rightfully as bilinguals (Crystal, 2011), because they utilize the English language on a daily basis, and frequently practice code switching and translanguaging, by accessing words and features of other languages, in order to maximize their ‘communicative potential’ in their ‘discursive practices’ (Garcia, 2009: 112). However, linguists such as Schlobinski, do not consider the non-native English video game players as bilinguals, because their language utilization is heterogenic and game dependent, thus cannot be generalised (Frehner, 2008). In this dissertation, Crystal’s view is followed, extended with Garcia and Kleifgen’s (2018) because they proposed the notion of ‘emergent bilinguals’ in those students who “...become bilingual, and are able to continue to function with their home language practices, as well as in English” (Garcia & Kleifgen, 2018: 24). Video gamers have been researched from comprehensive linguistic points of view, such as vocabulary development, pragmatic language skills, code switching and borrowing, and willingness to communicate, respectively by Sylvén and Sundqvist (2012), Cabrera (2016), Hing (2015), Prensky (2003), Reinders and Wattana (2011) and Horowitz (2019) etc.

#### **2.5.3.5. Code-switching and code-mixing in general bilingual conversation**

Code-switching and code-mixing are delicate instances of language contact in situation; thus, code-mixing occurs when speakers insert L2 words into native L1 phrases or sentences, while in code-switching a speaker shifts from one language to another to create a special effect by using external terms believed to display intellect thus to raise awareness (Appel & Muysken, 2006). Code switching and code mixing are common phenomena occurring in a multilingual society which uses two or more languages. The ‘code’ is mastered by an autonomous individual and inserted into one’s language with conscious and specific reasons; while the mixed code (code mixing) occurs in a primary code or code base used as a function of indication of the individual’s autonomy, “because the language chosen is more fit for talking about a given subject” ... [and] ... “switching is not an isolated phenomenon, but a central part of bilingual discourse” (Appel & Muysken, 2006: 117). This phenomenon cannot be understood without Poplack’s (1980) description adopted by Appel and Muysken (2006), in which he stresses that in code-switching the “speakers emphasize a mixed identity through the use of two languages in the same discourse” (Appel & Muysken 2006: 119), to which Wardhaugh (2005) adds: “a number of answers have been suggested, including solidarity, accommodation to listeners, choice of topic, and perceived social and cultural distance”...[that is why code-switching represents an identity]... “In other words, the motivation of the speaker is an important consideration in the choice” (Wardhaugh, 2005: 104). In the video gamers’ perspective, this dissertation advocates the practice of the code switching along with Wardhaugh’s and Appel and Muysken’s description, which applies perfectly to the video gamers’ usage of the case in which the management of utterances signifies the person’s relationship to of affiliation with a certain group or subculture.

There are many types of code-switching and code-mixing based on the juncture or the scope of switching where the utterances take place, usually without changing the topic. Code-mixing often occurs within one sentence; one element is uttered in L1 and the rest in L2. Hoffman (2000) along with Appel & Muysken (2006) talks about inter-sentential switching, which occurs between clause or sentence boundary, where each clause or sentence is in one language or another. Intra-sentential code switching happens at exclamation – Appel and Muysken calls them ‘tag-switches’ (Appel & Muysken, 2006) – and certain set phrases of one language are inserted into the utterance of another one. In addition, Wardhaugh (2006) argues that code-mixing is present mainly in informal interactions. Types of code-mixing, such as intra-sentential code-mixing arises within a phrase, at a clause or a sentence boundary; intra-lexical code mixing happens at a word boundary.

### **2.5.3.6. Code-switching and code-mixing in video gamers' speech**

The first point of the video gamer's code switching is to establish the frequency of words that are inserted into the sentence. Video gamers hardly used any high-frequency words in their out-of-game conversations because such words have perfectly applicable Hungarian equivalent, besides that words would not serve any concealing subcultural effect in conversation. The inserted words must be the information rich low-frequency word spectrum in order to serve a concealing and a subcultural role (Myslín & Levy, 2015). The significance of creating a video gamer own colloquial language not just enhances the gamer's autonomy but also simulates social interactivity by creating new expressions and phrases, which later can be extended to a full diary of gamer argot. The current low-frequency English utterances are created with the usual word formation strategies, such as borrowing neologisms, deriving and by tailoring them into Hungarian sentences causing code-switching.

Code-switching is an inevitable result of multilingualism because anyone who can speak more than one language adopts a preferred channel according to the circumstances in which the language will be coherent to the person addressed (Poplack, 1980), as Dorleijn and Nortier deemed code-switching: "CS being in general a highly informal mode of speech" (Dorleijn & Nortier, 2009: 127). Therefore, a bilingual speaker is likely to switch rapidly from one language to another, due to certain conditions and for various reasons. Code switching within a video gamer-video gamer out-of-game conversation carries the most significant specific game related utterances which can be considered as linguistically interesting and content rich, not just for the sake of playing, but also to save time in exchanging information. These linguistic choices are working as an impetus for the gamers, thereby they are made continuously as they are strongly connected to the sense and rhythm of the game. In this case, code-switching carries a communicational, thus a social role, like in video gamer out-of-game conversations as "Computer Mediated Communication contains a lot of colloquial forms and other features that are usually associated with spoken language" (Dorleijn & Nortier, 2009: 127). The video gamer area is virtual, and it has its own terminology – mostly low-frequency English words and some game specific non-English e.g., Japanese words etc. –, thus the utterances refer to a particular situation or a device within and out of a game. When the players are discussing with each other they are used such low-frequency words to contextualize the interaction and thus create additional meanings within the information exchange activity. Accordingly, video gamers use code-switching or code-mixing to insert the extra content-bearing word, because only personal interpretations and implications create a much more practical parlance for them. Furthermore,

the different games have certain fun groups, and the conversation can be sustained if the utterances are appropriate -, they must install these gaming words into their everyday talk to be understood. Regarding change in pronunciation, this occurs at the phonological level, as when a Hungarian person utters an English word, but modifies it according to the Hungarian phonological structure. For instance, ‘**holy edges**’ is pronounced by some gamers as /holi ɛdʒɛʃ/ as the word sounds much ‘cooler’ (Arnold-Stein, 2021).

This is the usual way to indicate her/his recognition in a certain team or (video gamer) subculture, signifying the information that is an important part of the person’s individuality. Moreover, the members of a subculture need to be recognised by the society, they usually bear meaningful idiosyncrasies like punk hair or black nail polish, asymmetrical hair styles and black pants, tight t-shirts (Haenfler, 2013), unlike video gamers, who rather try to keep themselves hidden (Dymek, 2012). Gumperz (1968, 1983) assumes that human cognition is relevance-oriented: people pay attention to information that seems to be relevant to them and “a similar always looks for the similar” (Sapir, 2020), which has a particular importance in the teenagers’ life who are very interested in each other. While punk music fans can be recognized from miles away, identifying video gamer chatter requires great attention. Thus, the terminology used by gamers is generated by social factors as Wardhaugh (2005) emphasises regarding code-switching: it is always motivated by linguistic and/or social factors, i.e., gap filling, prestige, language attitudes, style switch, group solidarity. Switching also occurs when specialised technical terms are needed about screen resolution, team names or references to a computer brand, all these are expressed in English and mixed with the speaker’s native language. Likewise in verbal/written references to video gaming activity combined with low-frequency English terms and extended with prefixes or suffixes (or both) of the native language, thus generating novel hybrid creations like loan-blends.

#### **2.5.4. Video gaming words recycled: translanguaging, diglossia and bidialectalism**

##### **2.5.4.1. Defining gamer argot in translanguaging, diglossia or bidialectalism**

The video gamers interact within the games by spoken and written messages, and they keep their specialised vocabulary as a kind of jargon or terminology which is incorporated in the gamer speakers’ slang. Slang is an informal common speech used by the younger generation, based on words with changed meaning usually relating to something that sounds rather charming. Video gamers often use this slang to prevent others from understanding, thus, in this dissertation the concept is identified as ‘argot’ which, by definition is the language of thieves.

These disguising expressions are used outside the virtual gaming world in the real life and can be recognised in the video gamers' regular everyday conversations to hide the meaning of the conversation. The gamer argot is used not just to keep outsiders away from contacting them rather as a signature of their affiliation of interest. That is why this phenomenon is considered to be in the interest of a significant part of sociolinguistics which studies the usefulness of the language within the social composition as a habitual action of a social organisation by the language habits (Fishman, 2006), i.e., the subcultural slang used by a group within a society. The users of these utterances form fellowship groups in their real lives, into which only those who have mastered this language are welcomed. Naturally, they can be called geeks or numbs to denote that they just play games and feel well only in front of a screen, but interestingly they also have a wide range of indicatory words, with which they address their peers successfully.

#### **2.5.4.2. Translanguaging by video gamers**

The specialized vocabulary that characterises the language practice of the video gamers is composed by initiating various linguistic features provided by different games or linguistic modes also prompted by games. Such language utilization can be considered like translanguaging (Garcia, 2009), because during a gamer-gamer conversation the game jargon makes maximum sense, even in non-game related topics. Translanguaging arises when a participant relates the vocabulary of a particular game to another type of game or uses it figuratively in an instance of reality. Gamers can liberate the possibilities of translanguaging by the extent of which they are mutually familiar with the games in a conversation (Wei, 2018), by inserting foreign (English) phrases into different contexts to extend their connotations. In translanguaging there is no hierarchy between the occurring languages, they are all interrelated, because the name of a particular item makes sense in L2 only for an individual or in the community (Garcia & Wei, 2014). Translanguaging also scaffolds expressive and transformational language modes in which the conversational modes are also changing through the multilingual terms (Garcia & Wei, 2014). Consequently, the edification of the gamers depends on the deployment of each speakers' repertoire in order to learn and develop from each other in the ways of extending language knowledge and equalize distances of language practices (Garcia, Skutnabb-Kangas & Torres-Guzmán, 2006). Such situational language usage in which two languages are used in different circumstances within a population, often by the same speakers, can be called diglossia (Ferguson, 1959).

#### **2.5.4.3. The video gamer argot as diglossia**

Diglossia is seen as a kind of bilingualism in a community in which there are varieties of a language with different prestige (Gvozdanovic', 2014). There must be a substantial body of literature that incorporates the essential values of the speech community (Ferguson 1959) which is perceptible in the video gaming examples. Ricento, an author of books of language policy and political theory, also argues that there are languages within a language which have a “socially constructed hierarchy, indexed from low to high” (Ricento, 2012: 34). Therefore, from a sociolinguistic perspective, related to the video gamers, anyone who can apply the gaming jargon properly is accepted by the members of the subculture, as the idiomatic sign of their affiliation. Its spheres of use involve informal, interpersonal communication, i.e., conversation among friends, game opponents and possible business associates. Comparing the hard-core and the casual gamer elocution, a kind of symbolic value is also observable which shows their common root. More specifically, the hard-core gamers who use English gaming terms frequently utilize the high variant of the diglossia in which they often operate with the game specific connotations in their utterances that cannot be interpreted in L1, whereas the casual gamers speak the low variety, because they use fewer game related English words. The video gamer vernacular is virtually written in chat rooms and social media sites, from that diglossia can be easily explored.

Differences among hard-core gamer subcultures are minor, since the gamers are eager to understand each other while gaming, thus their in-game use of phrases is identical, although their out-of-game way of speaking could deviate by topical area. The broadcasted version of the gamer argot spoken by the hard-core gamers has the high prestige, it is also formalised, although its forms are often ‘filtered’ by certain game types which are not introduced to the public. Understanding such formalised gamer argot can be considered as status symbol (Adler 1977), because such knowledge requires a broad comprehension of the video games that can be materialised in the job market.

#### **2.5.4.4. Bidialectalism in the video gamer argot**

Moreover, there are differences also in pronunciation, the regular use of two or more dialects or diglossia of a language by a person, is called bidialectalism within a speech community (Hazen, 2001). Often one of the two is the ‘standard’ dialect and the other one is a region or culture specific dialect; in this case such dialectal differences can be caused by the English phrases in the video gaming vernacular. The more English phrases are used in the speech the bigger the chance to speak dialectally, because English pronunciation differs considerably from the Hungarian one. The differences are not regional, rather they are cultural and can be

traced back to the mentioned hard-core and casual gamer dichotomy, i.e., the hard-core gamers utilize far more English words than the casuals. It could mean that, the hard-core gamers have greater chance to utter English words properly, although they also have a likelihood to play game sessions with people with variant accents (Arnold-Stein, 2021).

### **2.5.5. Video gaming in relation to the socioeconomic status (SES), accessible devices and motivation**

#### **2.5.5.1. Motivational agents of language learning**

This part of the dissertation is focusing on the facilitators and motivators of English language learning as an extramural activity. The positive attitudes and behaviours toward the culture connected with the target language acquired by students through direct instruction or modelling provided by their favoured classroom teachers may arouse interest in the target language (Malow-Iroff, O'Connor & Bisland, 2007). School teachers need to have an accurate knowledge and a positive mindset of the target language, including its social, inter/cultural, educational, and socio-economic forces, which play an important part in the process of language learning, because all can be regarded as substantial motivators of the students. Having or lacking inter/cultural connections with the target language and culture has been found to be influential in the formation of students' decision about their target language knowledge (Butler, 2015). An intensive target language and cultural immersion, i.e., even a short-term experience within a native speaker environment may have a positive effect on instrumental motivation and results in seeing the world differently (Villegas & Lucas, 2002), which strengthens the individual's intension to communicate with a social group (Zimmermann, 2000) and thus creates integrative motivation (Dörnyei & Ushioda, 2013).

Traditionally, English is taught as a foreign language (EFL) in Hungary, because this is the most used foreign language by the population (European Commission, 2012), often as mediator between non-native English speakers and even in official use for business purposes (Holmes, 2017), besides it is also the primarily chosen FL by the largest proportion of the public at all levels of education (Dörnyei, Csizér & Németh, 2006; Csizér & Lukács, 2010). The omnipresent abundance of information provided by the Internet also provides an opportunity to satisfy communication needs, where English is required as a mediating tool. (Lee, 2019). Social networks are the most visited sites in which the short videos and music clips are the most appealing and watched phenomena (Dogoriti & Pange, 2014), as well as the interactive video games, which thus involve more cooperation and English language usage (Sylvén & Sundquist, 2012). Therefore, there cannot be longer assumed that EFL learning is taking place solely in

the classrooms, because the students can have unlimited exposure to the target language (English) outside of their classroom settings.

#### **2.5.5.2. Video game play as the virtual zone for integrative L2 learning and practice**

The other motivating factor to play video games is the opportunity of executing actions which are impossible to perform in reality (Sherry et al., 2006), because the virtual reality games provide the opportunity to encounter with the wished world with the feeling of residing a realistic but created sphere with its own rules (Slater et al., 2006). Games with formal rules are usually starting with verbal or written instructions and it can be passed along from one gamer group to another. All plays are social and by taking part students learn how to have a good relationship with others by co-operating with rules (Vigotsky, 1978a) that is why the games are democratic. According to Huizinga's *Homo Ludens* (Alexander, 1958), playing is a free activity and it can absorb into itself intensely and utterly which Csikszentmihalyi calls flow (1996). The play also has immaterial attributes, i.e., no material interest or profit is involved. In play children must decide what to do, go along with a plan and solve any problems which arise along the way (Piaget, 1973). It is characterised as intrinsically motivated focused on means rather than its end, distinct from explanatory behaviour, nonliteral, free from external rules, actively engage the players (Rubin, Fein & Vandenberg, 1983) which description completed Gray (2013) by play is self-chosen and self-directed, intrinsically motivative, guided by mental rules and imaginative and educative by nature.

In real life humans opt for the least effortful way to achieve their goal. In games the longest the better, because the attention of the means is stronger than on the ends. The primary objective of play is to get hold of the object which the participant has not got. Competitive play is directed toward the goal of scoring points and winning. The educational power of games is in its triviality, and it is ideal to practice new skills, try out new ways of doing things because play has no real-world consequence, besides nobody is judging, so player is free to fail which is equivalent to freedom of experiment. Experiencing failure also provides capacity for feedback from which a virtuous circle of learning can be initiated, besides, it is a safe and fun place to practice (Gray 2013). Games are highly repetitive thus the repetition supports the development of motor cortex for movement as well as for muscles that engage in (Gray, 2013).

The action video games particularly challenge the abilities of the participants, indicating constantly by successful or failing combat situations as immediate feedback. On the one hand, the successfully completed tasks indicate the gamer's prosperous abilities, as well as failures

reveal if gamer's abilities are not matched to the challenges of the tasks. Online multiplayer interactive games provide ideal ambiance for implicit opportunities for learning while doing (Batterlink & Neville, 2011), e.g., having discovered the virtual area by identifying the objects (target), the items are usually being vocalized (command) while applying them in the game (action) to achieve the goal of the game level (win). This causes a virtuous circle (target/challenge → action → win/lose → reorganization → target/challenge) and the driving force of this chain is the communication among participants which aims to uphold the tension with novelty (Derboven et al., 2012; Emmerich & Masuch, 2017). The active confrontation of the enemy initiates new game events which are defined moments of high game occurrence and requires effective control and focus. The emotional and attentional processes signify in cognitive and sensorimotor systems, besides the implication of midbrain reward system structures reflects enjoyment and positive game experience (Klashen et al. 2012), although the gamer is having hardships which reward might be postponed (Borderie & Michinov, 2016).

Language has rules as play do, like morphology, syntax, and phonology, so speaking is also rule based, but free and creative activity (Lewis, 2003). Player also interested to create new characters to present in a game, usually ages can be mixed thus elders can teach young about how to play a game which also provide opportunity for people to socialize in order to observe cultural innovations, like new words or perceive accents or diglossia (Arnold-Stein & Hortobágyi, 2021). Encountering and acquiring novel words are valuable for cognitive development, because of paying attention, remembering thinking ahead are all elements of intelligence (Gray, 2017). Having developed all social, cognitive, and linguistic comprehension an individual also feels the motivating effect of the aim of winning.

### **2.5.5.3. The hidden potential of video gaming in motivation of L2 learning**

The video gaming activity can further provide positive motivative factors without the necessity of moving abroad or of paying a fee to a foreign language teacher, as the gamer experiences the operation of a target language community and their immediate reaction to one's language level. Playing a game itself carries positive feelings about the activity, makes the language learning process entertaining, and will assist to determine individual differences in success and provide valuable feedback to help decrease the possible achievement gap (school grades) for low-income students (Hanghøj et al., 2018). Studying another language formally becomes an experience through which the students must be encouraged to develop tolerance towards their peers while understanding better their own society or cultural group. Video gaming democratizes the participants with different SES, because the players do not appear in person

but convey just the perceptions of their avatars (Worth, 2015). Finally, the restraining force of SES may be eliminated by video gaming therefore it is an important variable of this study requiring an analysis of the students' living circumstances and childhood facts to enhance both EFL teaching and its practice.

In Hungary even if research provides information regarding the relationship between SES and language learning (Nikolov, 2009; Reger, 2014; Tanabe, 2016; Polonyi et al., 2020; etc.), this dissertation would like to fill substantial gaps related to students' access to English education in this region and domain, including parental SES, students' availability of electronic learning devices and video gaming habits. Nikolov (2009) found a significant connection between parents' educational levels and primary school students' EFL learning. Similar associations between SES and the students' language learning were reported at the secondary school level as well. However, this research tries to fill the scientific gap by seeking a relationship among SES, school grades and video gaming.

#### **2.5.5.4. Socioeconomic status (SES) and English learning**

Further contextual factors, such as parental socioeconomic status (SES), L2 learning and motivations also need to be considered to have a comprehensive understanding of young students' English learning habits (Kormos & Kiddle 2013). Research in motivation factors for language learning has found significant changes in recent years due to the realistic imitations that can be conducted by the latest highly efficient technical means. Devices, such as VR, are even able to replace human presence successfully, thus they influence socio-environmental factors, like intrinsic and extrinsic motivation as foundation elements of self-determination theory (Dörnyei & Ushioda, 2013). Intrinsic motivation refers to one's motivation for the sake of enjoyment and interests, whereas extrinsic motivation is one's motivation driven by utilitarian reasons. The self-determination theory also considers which socio-environmental factors support language learners' basic psychological needs by facilitating intrinsic motivation, i.e., to achieve higher degree of self-perceived competence or to feel autonomous (Dörnyei & Ushioda, 2013) which have been providing a continuous interplay between language learning and identity formation (Firth & Wagner, 1998; Lankshear, 1997; Willinsky, 1998; Zimmermann, 2000) of any EFL user.

Family, education and the occupation of the parents, household income, race/ethnicity, and even the characteristics of the neighbourhood are typically used as indicators of SES (Davis-Kean 2005). In view of the parental SES, Butler, Sayer and Huang (2018) argue that SES is "a category that represents an individual's or a group's relative economic resources" (Butler, Sayer

& Huang, 2018: 2). Wigfield et al. (2006) identified four major influential parental factors: parent, family, and neighbourhood characteristics; parents' general beliefs and behaviours; parents' child-specific beliefs; and parent-specific behaviours. Divergences by SES in L1 also have a developmental influence, especially at an early stage these were found to remain throughout the school years, i.e., parents' educational level was positively correlated with primary school children's comprehension performance in a FL (Farkas & Beron, 2004). According to Wigfield et al. (2006), all four parental factors interact with each other and influence their child's motivation and achievement. Lee and Burkam (2002) conducted a larger-scale study in the United States, showing that the highest-SES children scored 60% higher in cognitive skills than the lowest SES children.

Parents' educational and income levels influence the children's speed of L2 learning as well as their degree of mastery of L2. Other findings related to parental influence revealed a richer home literacy environment, like having greater verbal interaction within the family, larger collections of books and travelling more often abroad, all of which facilitate the children's language and literacy development (Goldenberg et al., 2008). Besides, low SES is "an important obstacle to physical growth, cognitive development, and socio-emotional development, as it guarantees less access to the opportunities associated with European lifestyle such as traveling" (Hill & Sandfort, 1995: 106), which also may give intensive and overall opportunities for using L2.

Moreover, it can be assumed that learning English is mostly influenced by the secondary school learners' SES because English is often associated with global economic power (Kormos & Kiddle, 2013; Butler, Sayer & Huang 2018), language of music video clips (Marone, 2018) and video gaming (Sylvén & Sundquist, 2012; Roach & Utami, 2017; Acquah & Katz, 2020), these being the three most watched or performed online activities of schoolchildren. Parents with higher SES impose higher demands on their children, thus in such a strong effort-oriented environment, children also tend to discern stronger obligations to meet their parents' expectations (Steven & Stigler, 1992) and feel more motivated to get extracurricular classes and/or acquire exclusive access to learning. For instance, effective communicative competence in learners' English and its cultural information are inseparable (Akl, 2007; Beamer & Varner, 2001). Meanwhile these entail a need of costly traveling or language-specific on-site learning (Pence & Macgillivray, 2008). Furthermore, students with higher SES tend to show higher academic achievement (Caldas & Bankston, 2004; Chiu, 2007; Tomul, 2008) and register in universities more than their lower income peers (Li, 2007). Social class, housing, and access to

literacy resources have also a considerable impact on the acquisition of L2 practicality as much as on the possible academic achievement. After all, English achievement has a potentially significant impact on access to higher education and future career opportunities (Butler & Le, 2018). However, higher SES parents invest their own resources to provide a more supportive learning environment, yet the extent to which such resources work beneficially for the children's learning may vary depending on the children's age and the contexts in which the learning takes place.

While high-SES parents maintained strong beliefs and high expectation for their children's ability to learn English over time, lower-SES parents gradually lowered their expectations through the middle school years (Butler, Sayer & Huang, 2018). English education is increasingly exam-driven, and students may define their expectations by their SES backgrounds in middle school. Parents with lower income might feel that their children have fewer opportunities to learn English successfully (Butler & Le, 2018). More precisely, whereas higher SES students tend to increase their intrinsic motivation and self-perceived competence, lower SES students tend to lower them (Butler & Le, 2018). Lower SES students have higher anxiety during the upper primary school years (Chiu, 2007), although there are various devices which allow students to have access to self-teaching websites or other edutaining applications, such as video games, to develop schoolchildren's cognitive and language skills, because all language related competences appear to be improved by exercising on such applications (Roach & Utami, 2017).

#### **2.5.5.5. Socioeconomic status (SES) and L2 proficiency level**

On the out-of-school learning side, there is no doubt that SES and L1 or L2 proficiency play interaction and as a methodologically coherent discipline has been existing in research for decades (e.g., Dixon, Wu & Daraghmeh, 2012; Pace et al., 2017; Lindholm-Leary, 2017; Volodina, Heppt & Weinert, 2021). Nevertheless, their work is undoubtedly a prime example of an attempt finding explanation of the backdrops of children living in low SES situations, – and that is a problem identifier oriented social science approach, rather than a solution provider. The history of connections between SES and L1 and L2 proficiency is, therefore in fact, a philosophy of research approach that considers factors that transcend matter, and through a specific research methodology can grasp and evaluate the processes that take place behind the surface of purely material social phenomena.

For instance, research that inspected the development of bilingual skills in low SES language minority of Spanish-speaking children to determine whether language and preparation of

writing outcomes are related to the language of instruction in kindergarten and first grade (Lindholm-Leary, 2017). In addition, this research explained the causes of low SES children's bilingual and biliterate language production and the origin of their lack of understanding in relation to various (always bilingual, a combination of bilingual and only English) instruction configurations of language of instruction. The most important finding of the study is that L1 proficiency greatly influences young children's L2 (English) proficiency.

The study of Volodina, Heppt & Weinert (2021) examined the effects of out-of-school language management like the proportion of minority (L1) and majority (L2) language use and SES at German primary school students with a migrant background. The study observed dispersion between SES and majority language use in home language utilization and the results validate the positive effect of majority language use at home which increases at higher SES.

Pace et al. (2017) identify three potential pathways through which SES may influence language development, such as child's attributes, frequency and depth of parent-child interaction, and availability of learning resources, which imply a complex interaction between a child's own language learning skills and its environmental support. In the findings of the research, it was found that children from low-income backgrounds consistently fall behind their better SES peers on standardized measures of language ability, they fail to set long-term directions, which causes gaps in their academic achievement. Language teaching should employ methods that target these pathways by focusing on their best practice. The study indicates that children acquire and use language primarily through a culturally varied contexts in which measurement methods are sensitive.

Dixon and Daraghmeh's (2012) research profiles the bilingual children, with 'general assumptions' i.e., their L1 and L2 language skills are usually unbalanced, their low socioeconomic status (SES) also meant low proficiency in both languages, and parents mostly speak a social language at home which promotes its development only. The authors found that children who had high proficiency level both languages were equally illustrated in the low, medium, and high SES categories, "demonstrating the achievability of strong vocabulary in two languages for children of different SES" (Dixon & Daraghmeh, 2012: 25). Even though children with low SES status meant of possessing reduced levels of both languages, the high level of language proficiency in the ethnic and English language were frequent. As expected, children with middle and high SES predominantly showed low ethnic language and high English proficiency. Children who hear both languages at home were most likely to know both languages poorly, as well as children from diverse backgrounds who have mostly been exposed

to either language tend to be strong in that language. These results confirm previous findings in relation to SES and home language exposure which means influential knowledge of bilingual children. Conclusively, it is important for teachers to assess bilingual children's L1 and L2 proficiency along with parental SES to find the best way to strengthen bilingual children's L2 vocabulary.

## **2.6. Choosing the proper measurement instruments**

### **2.6.1 Testing the effect of video gaming and the concurrent L2 language use on EF**

#### **2.6.1.1. Testing Executive Functions**

Executive functions (EF) are a heterogeneous set of metacognitive processes related to planning and problem solving (Diamond, 2013), organizing goals, and directing behaviour toward the goals. EF depends on working memory, inhibitory control, and cognitive flexibility (Miyake et al., 2000). In relation to language learning, the EFs control cognitive functions and regulate basic abilities such as attention, memory, orthographical and semantic processing, and abstract thinking, respectively. A limited working memory capacity can also be linked to limited social interactions which are fostering careless behaviour (Zorza, et al., 2016), which in turn can be attributed to poor language performance. Nonetheless, intelligence and EF have no direct connection (Jacobson, Williford & Pianta 2011), EF plays an underlying role in the self-control of behaviour and emotional self-regulation (Blair & Diamond, 2008).

There are several methods to test executive functions in the field of cognitive psychology, such as Verbal Fluency Test (VFT), Stroop Test (ST), Boston Naming Test (BNT), Trail Making Test (TMT) to analyse the performance of cognitive mechanisms. A Stroop test has been used in several studies to examine questions regarding the automaticity of reading, language processing and cognitive control (Stroop, 1935). ST is widely used in bilingual circumstances to compare the reaction time of mono- and bilingual individuals. The adoption of linguistic research stems from its linguistic nature, i.e., the participants are requested to name the colour that does not match the meaning of the written colour word (incongruent task). The reaction time is usually much longer than just reading out loud the written colour words (congruent task) and the time difference between the two conditions is called the Stroop (interference) effect (Stroop, 1935).

#### **2.6.1.2. Stroop test in bilingual research**

In a bilingual context the Stroop test (ST) measures language interference and control in L1 and L2 as well as assessing the bilingual advantage hypothesis (MacLeod, 1991; Coderre & Van

Heuven, 2014; Brugnolo et al., 2015). In the bilingual version of ST, the stimuli colour terms are in L1, and the task requires answers in either L1 or L2 depending on the congruent or incongruent scenario. When there is congruency between the language of the written colour words (e.g., Hungarian) and the language in which the answer is sought (Hungarian) the intralingual or within language ST effect occurs. Whereas if there is incongruency between the language of the written colour words (e.g., English) and the language in which the answer is expected (Hungarian) the interlingual or between language interference occurs (Brauer, 1998). Since the bilinguals operate with shared or integrated mental lexicon for words of L1 and L2, thus the access to its content is nonselective as in Green's inhibitory model (Green, 1998), can assume that their reaction time may differ from their monolingual counterparts, because one language must be inhibited in a monolingual task evoking competition between lexical representations (Green, 1998).

Despite such cross-language competition, the common constellation of bilingual studies is that the ST intralingual interference is greater than in the interlingual condition (Brauer, 1998; Rosselli et al., 2002; Wang et al., 2016; Kousaie & Phillips 2016; etc.). The phenomenon of interlingual ST effect is usually smaller than the intralingual ST effect, which is termed 'within language ST superiority effect' (McLeod, 1991). According to McLeod (1991) the average difference of the ST effect in the interlingual cases is approximately 75% of the intralingual instances, which is in tally with the findings of Sabourin and Vinerte which was 74.3% (Sabourin & Vinerte, 2020). In relation of bilingualism, ST has been used to confirm the word processing theories including a wide variety of language pairs, such as German and English (Brauer, 1998), Spanish and English (Fang, Ovid & Alva, 1981; Rosselli et al., 2002; Naylor, Stanley & Wicha, 2012) Dutch and English (Roelofs, 2010; Goral, 2019) and Chinese and English (Fang, Ovid & Alva, 1981; Coderre & van Heuven, 2014).

### **2.6.1.3. Verbal Fluency test in bilingual research**

The verbal fluency test (VFT) is frequently utilized as a neuropsychological measure of efficiency assessing lexical and semantic competence to scan cognitive function by lexical retrieval. It has been successfully employed on executive functioning testing, which refers to general self-regulation and control processes that involve working memory, processing-monitoring, and inhibitory control (Miyake et al., 2000). In the VFT the participant is requested to verbalize as many words as possible from a given category (semantic VFT) or starting with a specific phoneme (phonemic VFT) within a pre-set time, usually in 60 seconds (Schmidt et al., 2019). The total number of items that the person is able to produce is counted, which gives

the final score. The VFT has been used widely in bilingual research for evaluating both vocabulary proficiency and inhibitory control skills (Roberts & Le Dorze, 1997; Portocarrero, Burright & Donovanick, 2007; Escobar, Kalashnikova & Escudero, 2018). The research focus is on the role of bilingual experience in the improvement of abilities that underlie monolingual and bilingual children's performance on VFT. The general outcome of such research is that the bilinguals underperform their monolingual peers in semantic fluency (Portocarrero, Burright & Donovanick, 2007) depending on their onset of submerging into L2 environment. However, the study found factors, like high linguistic proficiency level in both languages and advanced cognitive abilities, which may facilitate the performance of bilingual individuals on VFT (Luo, Luk & Bialystok, 2010; Escobar, Kalashnikova & Escudero, 2018).

A perfect example of using VFT is illustrated by Zorza et al. (2016), in which the participants were asked to name animals, grammatical naming for verbs and phonological words starting with the sound [p] under 1 minute. The test was related to information monitoring, working memory, sustained attention, inhibitory control, cognitive flexibility, and semantic processing. The EF implication was lower when it was a semantic rather than a phonological naming. The students had also to measure the social behaviour of their peers. It was found that the EF performance can be accounted by the variability of school performance (41%), social behaviour (29%) and peer ratings of prosocial behaviours (15%). On the other hand, in Escobar et al.'s (Escobar, Kalashnikova & Escudero, 2018) study the authors analysed primary school monolingual and bilingual children with comparable high English proficiency level. The participants were measured with letter and category VFT. The results revealed that bilinguals outperformed monolinguals on the VFTs, but performance was similar on the inhibitory control measures, more specifically, the high proficiency level played a vital role in both VFTs, which induces different cognitive skills and processes that are the elements of the inhibitory control (Schmidt et al., 2019). After all, these results indicated that vocabulary proficiency plays an integral role in comparing monolingual and bilingual VFT performance.

## **2.6.2. Finding the appropriate high-frequency vocabulary test device**

### **2.6.2.1. Word frequency and vocabulary level**

“One measure of usefulness is word frequency, that is, how often the word occurs in the normal use of the language.” (Nation & Waring, 1997: 7). Every phrase or idiom has also variants of different word families, although this does not mean that the speaker uses all word families of an idiom, mostly the speaker just recognises and infers the meaning from other occurrences (Bauer & Nation, 1993) or from the surrounding text. As Laufer and Nation explains:

“understanding the word’s meaning cannot be called productive knowledge” ... “this is mechanical reproduction, not production, consequently passive vocabulary size is considered to be larger than the active size” (Laufer, 1998: 257). There are many examples of word lists, such as COCA/BNC, Oxford 3,000/5,000 and CEFR 3,000/5,000, among others. An average book or a conversation contains approximately 84 % of the 3,000 most frequent words (Kucera & Francis, 1982; Nation & Waring, 1997) which corresponds to the word list of the CEFR 3,000 or up to the receptive vocabulary level B1 (Alderson & Banerjee, 2001). Milton & Alexiou provide a table (2009: 200, Table 12.3), in which the CEFR 5,000 standards and the vocabulary level of the Hungarian EFL learners are juxtaposed. The authors counted 2750-3250 words for B1 level and 3250-3750 words for B2 level, which must be known to achieve the B1 or B2 level of proficiency. This research follows the 5,000-word families by CEFR which grants a competent comprehension of a text over B2 level, which is in accordance with the numbers of the literature review of Milton and Alexiou (2009).

#### **2.6.2.2. Approaches of vocabulary testing in video gaming research**

The video gaming research frequently focuses on the active vocabulary of the gamers, because this area is much more captivating and it changes more rapidly by the latest game trends, thus it can be comfortably applied in longitudinal or qualitative research methods with no more than dozens of participants. For example, Piirainen-Marsh and Tainio (2009) used transcription of data from video recordings of 2-4 players while playing games in their homes in Finland. Each recording contained 5 hours of communication while playing in the ‘Final Fantasy’ series in which the participants must collaborate verbally; thus, the recordings were selected for the relevance to the word repetition phenomenon in focus. The researchers counted the repeated utterances and their frequency and how the repetition affects the players’ engagement of interactions and their way of speaking. When measuring the speech of the participants in Norway, Pettersen (2019) explains the advantages of quantifying the advanced, low-frequency words of video gamers, that advanced words were defined as polysyllabic words (three syllables or more). The researcher analysed voice-recorded open-ended questions in terms of fluency, vocabulary use, and articulation. Eventually, he compared the found vocabulary scores to the participants’ English grades. Reinders and Wattana (2011) conducted their survey similarly to the latter, by also analysing recorded conversations in Thailand, when scrutinizing the effects of interactions within the game with special regard to the participants’ willingness to communicate (WTC) in Massively Multiplayer Online Role Play Games (MMORPG). The 16 participants were mixed by gender and their English proficiency, ranging from beginner to

intermediate level and categorized according to their English grades from school (Reinders & Wattana, 2011). The aforementioned research focuses on the participants' knowledge and habitual usage of low-frequency words.

On the other hand, as a quantitative research example de Haan, Reed and Kuwada (2010) used vocabulary recall test after a game play with 80 female adult undergraduates who were split into teams of two, where one played on an MMORPG and the other watched the game play. According to the results, the game observer was able to manage acquiring a substantial number of novel words, even at some cases more than the players who were under a great cognitive pressure due to their involvement with the game play. The research fails to concern the frequency range of the scrutinized vocabulary.

### **2.6.2.3. Application of a vocabulary measurement test in video game research**

There are only couple of examples of research which provide considerable points of utilizing vocabulary levels in the view of high-frequency words, for instance Sylvén and Sundquist (2012) viewed video gaming as a means of extramural English learning activity. The authors themselves designed a test based on the 2,000 most frequent word families of English to measure the 86 Swedish student participants' receptive vocabulary level. The multiple-choice format of the task is used to measure the passive vocabulary level, an idea which comes from the classical vocabulary levels test (VLT) format, although the words were modified by the authors in order to adapt it to the difficulty level of the participants' results of the mandatory national test as a reference point of the evaluation. Cabraja (2016) had a total of 25 results from the partakers in Sweden, who were around 18 years old and attended an advanced English class, so all of them had the same educational level, but with different grades in English. The survey was administered in two parts, in the first part the background information about the participants' attitudes, gaming habits, grades and their own English proficiency were obtained. The second part of the study was a VLT, which jointly with the first questionnaire intended to examine the effect of the out-of-school learning habits on the participants' receptive vocabulary level by comparing the students' grades to their VLT results. The above-mentioned research provided insights into the structure and the process of a research focusing on video gamers.

### **2.6.2.4. Vocabulary Levels Test (VLT) design**

According to Schmitt, et al. (2001: 56), a VLT is a "test designed to measure the degree of mastery of the most frequent words of English", thus applicable for studies which aim to analyse the participants' receptive vocabulary which is more accessible for measuring purposes. The

linguistic researchers have been using approved and valid diagnostic devices such as (New) or (Updated) Vocabulary Levels Test (VLT, NVLT, UVLT), Vocabulary Size Test (VST), Productive Levels Test (PLT), Lexical Frequency Profile and Computer Adaptive Test (CATSS) among others (Beglar, 2000; Schmitt, Nation & Kremmel, 2020). The VLT instrument was elaborated by Laufer and Nation (1999) and then revised by Schmitt, Schmitt and Clapham (2001), whose works were further developed by Nation and Beglar (2007). Mclean and Kramer (2015) updated it by keeping the VLT format. Later the authors modified the words, due to some words having become outdated and obsolete, and created the NVLT format, which has been further edited by Webb, Sasao and Ballance, (2017), thus the updated (U) NVLT format is the latest version. Nevertheless, the NVLT format has been still used in recent research, as the two latest versions differ only in the word sets. “The NVLT is intended as a test that measures an examinee’s knowledge of the written form-meaning link of decontextualized vocabulary frequency bands.” (McLean & Kramer, 2015: 6). Furthermore, the VLT can be successfully administered online, because of the simplicity and clarity of the multiple-choice format, as Alderson and Banerjee (2001: 152) states, (the) “... computer-based testing relies overwhelmingly on selected response, typically multiple-choice questions.”, whose results are immediately counted and displayed automatically, after completing the test. These examples show that the VLT format can be perfectly utilized as a diagnostic or a comparative instrument for measuring purposes of receptive vocabulary knowledge to be able to correlate the outcomes of the examinees for analytical purposes in vocabulary related studies (He, 2019; Schmitt, Nation & Kremmel, 2020).

#### **2.6.2.5. Advantages of administering VLT in research**

VLT can be used freely for research purposes and are available online (Cobb & Free, 2004), still due to the specific nature of this research, i.e., the common English users are compared to specific vocabulary users, like video gamers, a common ground must be found. The issue was generated by the question whether the high-frequency words can also be learned by video gamers or not, which provides a common ground for the comparison of the video gamer and the non-gamer student groups. Without declaring such mutuality, the VLT cannot be used, and the results would be distorted, and the research would lose its purpose. There are several advantages to employ the VLT – or its modified versions –, for example, a greater number of participants can be measured at the same time, and it can provide numerical results for the researcher to calculate statistically appropriate results for answering the research questions. Also, the test instrument has already been successfully used in different countries, and the

outcomes of the VLT in research “indicated the direct relation between vocabulary size and the ability to use English” (Schmitt, Schmitt & Clapham, 2001 cited by Cabraja 2016: 6).

#### **2.6.2.6. The L2 proficiency levels of the target population and the test level**

Although the English level of the games can be ranged from level A1 to C1 (Hing, 2015), and their vocabulary used often higher than 4,000 most frequent words (Nindyaputri, 2017; Hartanto, 2018; Rodgers and Heidt, 2020, Heidt, Pinchbeck & Rodgers, 2023) the video gamers usually play games at their level of L2 knowledge or slightly above to stay within the scope of their comprehensive input (Krashen, 1982). The L2 (English) language level of the secondary school students is to be investigated normally around B1 level, which equals the knowledge of the 3,000 most frequent word, but the video gamers may easily reach B2 level or above. Therefore, the base level would be B1 in this study because that is the standard of the secondary school-leaving exam (Szilágyi, 2020). The Hungarian secondary school students’ school leaving exam is required to be at the Common European Framework of Reference (CEFR) B1 vocabulary level (CEFR, 2022), which knowledge needs to be proved successfully by the students at the exam. However, in favour of answering a research question, i.e., whether the video gamers perform better in a vocabulary level test, the level of the questionnaire must operate at a higher level (B2) than the level of the leaving exam (B1), because that provides a buffer of the higher proficient participants (Laufer, 1998), therefore B1 level is used as a median in this research.

#### **2.6.3. Validity**

The validation of the test instrument is to be discussed next in line, because “Validity would be the degree to which it could be shown that there is a correspondence between the real-world facets and the test facets – as physical setting, topic and participants –, and score meaning could only be generalized to corresponding real world tasks” (Fulcher & Davidson, 2007: 16). Thus, the validity process must endorse the individual items used by the survey to substantiate the generalisability of the information that a researcher is seeking for. For the validation process this dissertation uses Kane’s validation framework reviewed by Purpura, Brown and Schoonen (2015).

##### **2.6.3.1. Construct**

According to research, the 10 most frequently occurring words account for about 25% of the words used in any kind of speech and writing, the most frequent 1,000 words appear approximately 75% in informal texts and colloquial speech, while the third 1,000-word families

account for around 90% of a non-academic writing or speech (Laufer & Nation, 1999). Therefore, words were grouped into frequency bands (Nation & Waring, 1997), such as first 1,000, second 1,000, etc. for linguistic research purposes, to provide a measurable scale of the size of a student's receptive vocabulary knowledge. Passive or receptive vocabulary knowledge refers to the number of words known by language learners at a given language proficiency level (Nation, 2006). Naturally, the student's receptive vocabulary knowledge and ability are very strong and reliable predictors of the students' receptive language proficiency (Ha, 2021). For instance, the orthographic knowledge of words was closely related and of equal importance to listening and text comprehension (Ha, 2021; Atas, 2018) which are important for productive abilities (Shin, Chon & Kim, 2011).

In relation to target language use (TLU) domains (Purpura, Brown and Schoonen, 2015), the non-gamer students encounter the English language oftentimes by watching films (tv series) or podcasts, chatting with a pen friend or on holiday abroad, besides the school lessons. Such L2 practical experiences are important to which "learners always link their progress in language learning" (Laufer, 1998: 256). At the English lesson, the students must provide equalized performance, and it is not in the teachers' interest to deal with the outstanding cases, since the language gaps should be filled first with those who are lagging behind. The TLU domains that are used in the school settings also reflect the types of language and processes that are intended to be measured in this research for linguistic purpose, i.e., to determine the possible difference of the variously grouped students' performance. The contents of the school tests meet with the TLU domains; therefore, they are carefully chosen to comply with the school standard due to its given and assessed demands (i.e., school leaving exam). The TLU in the case of video gamers may happen daily, which is asked in the pre-questionnaire, where the English language learning habits of the participants are collected.

This dissertation intends to examine whether an incidental EFL learning style group (i.e. video gamer) has a receptive vocabulary knowledge advantage over a normal EFL high school language learner group (i.e. instructed) in high-frequency word families. Only the high-frequency word families can be a real basis of a research, because such words are learned ordinarily in school classroom settings, of which all participants (both groups) are part of, and obtain their English grades and where they are prepared for the final exam (B1), which level all students must eventually reach (Szilágyi, 2020). The data collection occurs through two questionnaires, in the first the general L2 learning and video gaming habits are asked, and the second survey contains a test to measure the level of the participants' high-frequency word

knowledge. The selection of the participants is random, as the data collection takes place at the school IT classes and the survey/test is presented only to the English learner students, among whom the ratio of video gamers and non-gamers is random. Due to the wide range of abilities of the researched participants the instructions are provided by the introduction page of the website and explained by the IT teacher when it is necessary. The VLT performance of the participants is based on the proper choices of words of the examinee which is added up and recorded by the website. The Study 1 part of the research is not interested in the use of practical lexis of the video gamers in the view of the game specific words, like proper nouns, e.g. names of imaginary places and persons. Rather, to review whether the video games can provide incidental learning opportunity of the high-frequency word families, that either group (i.e. video gamers, non-gamers) can use in classroom settings or real life. Such interpretation is established by the facts presented in the introduction part of this dissertation.

Also, the study employs further comparison of the control group (non-gamers) and video gamers by other variances, like 'gender', 'watching films in English', 'gadgets used for gaming', 'time spent on gaming' and 'participants' SES' respectively, as well as the final juxtaposition of the VLT test results of the players of different video game types to conclude the most effective video game type that is able to convey high-frequency words. The further correlation of the VLT test results with the participant's school grades of English, by following Cabrera's (2016) study, is to reveal the extent to which the contribution of the high-frequency words to the English grades at the school. Using several variables in the calculations allows a broader linguistic perspective on the measured data as to provide stronger evidence for the research construct.

The indicators used can be measured by a performance sampling device, like the VLT which provides numerical results for statistical calculations (Nation, 2006). The VLT test measures one's word family knowledge level and affirms one's receptive vocabulary level up to 10,000-14,000 entries (Nation, 2006), which level is much over the scope of this research. The VLT uses the base word of a word family which is a group of words that share a common base to which different prefixes and suffixes might be added (Laufer & Nation, 2001). The collection of scores occurs by matching the VLT items (words) properly (Table 1), which provide meaningful and statistically significant index of the participants' word knowledge level. For instance, based on the research of Sylven and Sunquist (2012), Cabrera (2016) and Schmitt, Schmitt & Clapham, (2001) the VLT device can be used in non-native English-speaking settings or with bilingual, special-language users like video gamers and large population studies.

In addition to supporting the vocabulary advantage in favour of the video gamers the research uses two other tests and comparisons, i.e., Stroop and VFT test to analyse the possible cognitive advantages of the video gamers as a factor which reflects the extra motivating power of video games which was widely experienced by the video gamers according to the pre-questionnaire. The computerized Stroop on PsyToolkit (Stoet, 2010) website was modified by the school IT administrator into a two-languages (L1-Hungarian, L2-English) version to acquire a proper measurement instrument. Modifications were made to receive comparable data, e.g., this program provided sessions in which the L2 case required L1 answer, and it aggregated the reaction times into seconds. The participants received on screen description of the task in L1, but they also received a quick explanation by the interlocutor. In VFT test there was the traditional paper/pencil data-collection method used. In the semantic VFT test the students had to list names of vegetables, due to the vocational profile of the school. All the tests were administered in the school regular English and IT lessons as part of playful English language learning. Besides, by exploring the differences of the participants' cognitive condition in relation to video gamers and non-gamers, this exploration attempts to confer that the video gamers are rather (English) second language learners and frequent L2 users, thus can be considered as bilinguals.

### **2.6.3.2. Prototype studies**

The most complete confirmation of such a study can be found in the research administered by Schmitt, Schmitt & Clapham, (2001) with 801 EFL learners from several countries, where the researchers found the high reliability in their test version (VLT) by comparing them to previous test versions, and the test items appeared to be effective in differentiating between better and weaker students. However, a carefully selected group whose language proficiency is well known ought to be used to conduct the pilot testing after which the test instrument is ready for use on the target population. Concerning video gaming research that used VLT, in Cabrera's (2016) study the author compared the L2 vocabulary level of MMORPG action video gamers with the performance of the participants' non-gaming peers in a high school in Sweden and by using the VLT he obtained a total of 25 results from 18-year-olds advanced English class attendees. Sylvén and Sundquist (2012) designed a test based on the 2,000 most frequent word families of English to measure the 86 Swedish student participants' receptive vocabulary level. The authors followed the classical VLT format, although the words were modified to adapt them to the mandatory national test as a reference point of the evaluation. Dixon and Daraghmeh (2012) use a 'low', 'medium' and 'high' classification of participants in terms of

SES, which perfectly covers the comparative needs of this research. Regarding to usage of Stroop and VFT tests, Bialystok, Craik and Luk (2012) conducted a study in which the effect of video gaming on the brain processes was in the focus. The authors paid attention on the changes of the brain functions and the actual presence of the bilingualism in favour of the video gamers. The usage of Stroop and VFT tests in cognitive process research is frequent, e.g., Magnúsdóttir, Haraldsson & Sigurdsson's (2019) quantitative study in which Stroop and VFT test were used to explore individual cognitive differences. In connection with video gaming and cognitive performance both Stroop and VFT tests were used by Roselli et al. 2002, Banquied et al. (2014), and Matern, van der Westhuizen & Mostert (2020). Özçetin et al., (2019) assessed adolescents about the effect of video games on cognitive functions in a cross-sectional study. A comparison of the internet-based PsyToolkit with the laboratory-based E-prime 3.0 was performed by Kim, Gabriel & Gygax (2019), and the results demonstrated that PsyToolkit is a usable method for conducting ordinary-, and psycholinguistic analyses that employ the effects of response time and correct responses.

### **2.6.3.3. Scoring**

The measurement is based on the strong likelihood that participants encounter and use high-frequency words in real-world language application, which is reflected in their performance on the VLT, thus indicating their performance on similar tasks in all TLU domains. The score is given for one proper answer, thus matching a word with its meaning means one point.

In this study the maximum score (120) represents 4,000 lemmas, so there is a buffer that allows those with better language skills to remain within the measurement range. The numerical spectrum of the results was converted into a 100-point scale based on the percentages of the results to create a better calculation basis for the statistical computer program. The scores became the numerical indicators of participants' test performance which allowed the researcher to infer the pattern of L2 efficiency elicited by the tasks. This means that the participants' VLT performance (i.e., their L2 receptive vocabulary level) generates observable statistical results like histograms, which are relevant for linguistic conclusions. The ultimate goal of the study is to reveal the difference, if there is any, in the vocabulary level of the grouped participants. The interpretation of the scores is based on the interchangeability of the conditions among assessors, so the conclusions and generalizations connect the observations of examinees under different measurement conditions.

The interpretation of the scores is a subsequent step of the validation, in which the proper answers of each participant are aggregated to provide integer numerical results, which can be

employed for the statistical comparison of the participants' vocabulary knowledge (Goeman & de Jong, 2018). The study uses a second version of Schmitt's Vocabulary Levels Test (Table 1), which contains 30 items, each consisting of six words which must be matched to three definitions or explanations (Schmitt, Schmitt & Clapham, 2001). The 30 items and the proper answers add up to 180 items all together measuring up to 5,000-word level, which were reduced to 120 items after piloting. Around 50% (60 items) is expected to be the standard 2,000-word count, which correlates with the figures of Milton and Alexiou's table (Milton & Alexiou, 2009), which is favourably equal to the minimum of level B1. The numerical results would be added up from the successful answers of the 120 multiple-choice items, 15 multiple choice questions measure up to 500 word-family level, means, 30 items measure up to 1,000 word-family level, thus the median would be 60 items which measure up to 2,000 word-family level, 90 items equal to 3,000 and eventually the 120 items are to 4,000 word-family level (Schmitt, Schmitt & Clapham, 2001). The final score of each participant needs to be divided by 1.2 (or divided by 120 then multiplied by 100) to calculate the percentage of the participants' vocabulary level to make the results more diagram friendly.

VLT tests are available in monolingual and bilingual versions, which differ only in the language of the explanation sentence (Schmitt, Nation & Kremmel, 2020). To preserve the reliability of the VLT and to determine the possible circumstances of its use, the possible results of the research must be subject to expert review, therefore it is desirable to revise the compliance of the "correlation between the sum scores obtained for two separate administrations of the test in the same population" (Goeman & de Jong, 2018: 54). In other words, the test must be run twice to check whether it produces a similar score in both samplings. Thereby, in this research the pilot testing is initiated twice by involving two discrete groups of participants whose L2 language word count is known.

#### **2.6.3.4. Piloting**

Before the data collection the questionnaire and the VLT were both piloted. The questionnaire consisted of 36 questions (variables) from which the first 16 was about school, age, residency, source of learning L2 words, SES etc. Those who answered 'yes' for whether playing video games, the survey continued with the favourite game types, time spent on video gaming, gadgets used for gaming, etc. The answers of the variables were given to provide readymade options for the answerer in order to facilitate and quicken the response. However, after piloting the first survey, there was an additional option added, i.e., 'anything to add', as video gamers were missing their latest favourite games from the list, so it was worth adding an option for

them to share their own latest favourite games. Likewise, the ‘time spend on video gaming’ question also needed a clarification, because it turned out the daily gaming time is very flexible (e.g., weekend playing time can be extra-long), thus inestimable by exact hours, therefore 3 time interval were given to simplify the response, as well as, an extra explanation sentence was provided which asked the video gamer participant to calculate the weekly gaming times and divide it by 7. Other modification on the first survey was not made. According to Laufer & Nation (1999) the unmodified VLT measures vocabulary level accurately, a statement which is also proved by several research by Schmitt, Schmitt and Clapham (2001), Nation and Beglar (2007), Schmitt and Kremmel (2018). Since the performance of the students who graduated in 2020 was completely known, they were asked to take part in the piloting process request to which they responded willingly. They were divided into two groups based on the percentage of their final exam performance. Group number one was the weaker group by which the minimal (around 1,500- 2,000) word knowledge was assessed. The second group was the higher performer students whose performance was used to check whether the 180 items VLT (up to 5,000-word count) is over their word knowledge with minimum 15 entries which equals to 500-word counts. Having evaluated the piloting participants’ outcomes (Table 2) the test level was lowered, because the best performer students reached no higher than 110 entries which meant that the items above 120 (4,000-word count) seemed unnecessary. In this case the test was not modified, i.e., words were the same as in the original test, just adjusted to the highest level of the inspected population. The second reason of the adjustment is that the measurement became more precise in the lower 1000- and 2000-word level where the majority of the students expected to be. This decision was made based on the experience of the skipping or error items in lower levels (Li & Kirby 2015) and because of this research works on the lower level of word knowledge (1,000-3,000) the researcher solved this latent issue this way, which was confirmed by the piloting.

**Table 2. Results of the piloting**

Participants	Results of final exam listening and reading part in %	Results of VLT up to 2000-word count in %	Results of VLT up to 5000-word count in %	Results of VLT up to 4000-word count in %
Nr 1.	48%	71%	10%	45%
Nr 2.	52%	76%	15%	47%
Nr 3.	51%	79%	19%	46%
Nr 4.	47%	75%	14%	41%
Nr 5.	56%	78%	17%	49%
Nr 6.	78%	100%	69%	86%
Nr 7.	85%	100%	71%	87%
Nr 8.	91%	100%	73%	90%
Nr 9.	95%	100%	74%	92%
Nr 10.	89%	100%	70%	89%
Nr 11.	92%	100%	72%	90%

### **2.6.3.5. Reports**

Descriptives are reported at the beginning of each part of the ‘results’ as well as statistical assumptions, e.g. normality and equal variances which interpretation is necessary in order to properly choose the statistical test type, e.g. at normal distribution the researcher can only use t-test or Pearson correlation as a parametric test. The violations are considered and each of the calculation method is chosen accordingly, because they might affect the results. The calculation of reliability estimates is reported when evaluating generalizability. It also reports the quality of the measurement, because only consistent and precise calculations support the results, and further research can only be based on such measurements.

## CHAPTER THREE

### METHODOLOGY

#### 3.1. Methodology

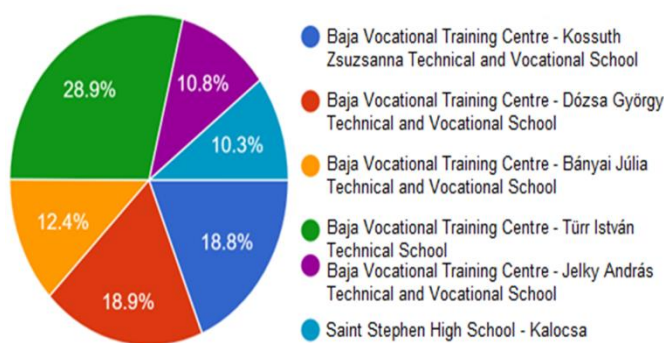
The primary purpose of this research is to compare the high-frequency word knowledge of a substantial proportion of secondary school students who play video games with those who do not. The entire research project consists of three main study parts in which each linguistically important effect of video gaming is presented to get a comprehensive picture of the activity. The main research question is sought to reveal the facilitative effect of video gaming in promoting the frequently used vocabulary and the type of game which has a better impact on high-frequency vocabulary, as discussed in Study 1. For this purpose, the cooperatively played game types were grouped, i.e., MMORPG and FPS/TPS, adventure and MOBA, from which the research assumes that the participants can acquire most of their high-frequency vocabulary. Sports games are also immensely popular, and since their vocabulary transfer through auditory effects is great (De Haan, Reed, & Kuwada, 2010), the vocabulary learned can be significant. The research uses other important variables, like digital devices used for gaming, because players usually utilize the latest digital devices. Furthermore, the socioeconomic status (SES) of the participants is also studied to reveal whether the video gamers necessarily use more expensive devices, or the used devices are not in connection with their VLT test performance.

In this case the quantitative, cross-sectional research method was the best choice as the most efficient sampling method since the difference in knowledge at a given point in time was examined as well as more than hundred participants was expected. The research also includes a language knowledge test, so a feasible and widely used measuring instrument had to be found. The data used for this research were collected by an online distributed self-developed questionnaire (Table 3) and a vocabulary levels test (Table 1). Both the survey and the test were conducted during regular IT classes at the schools. The survey comprised 36 independent variables (Table 4), e.g., the participant's age, residence, school type, school grade of English, any other learned language(s), language preference for watching movies, parental SES and video gaming habits, gadgets used for gaming, time spend on gaming, most played video game(s), respectively. In Study 2, the work focuses on the effect of video gaming on the cognitive functions. This part of the research was performed and computed independently in the same population at the same school, and by comparing the results of the gamer and non-gamer students of Stroop and VFT test results.

**Table 5. Geographic area of the research**



**Table 6. Proportion of participants by school**

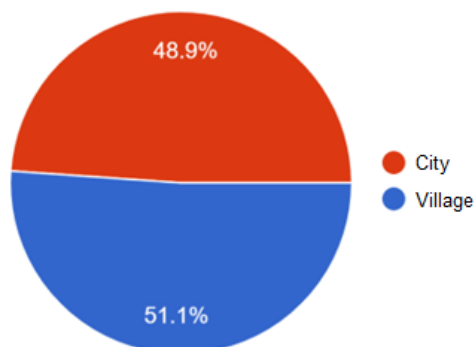


### 3.2. Participants

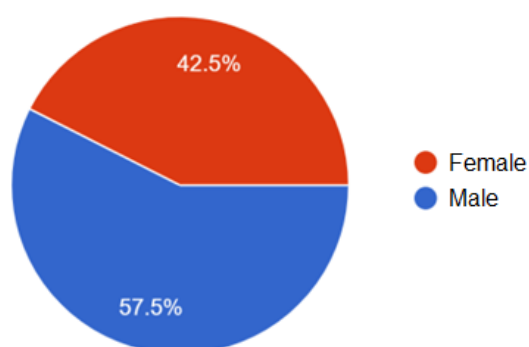
#### 3.2.1. Participants of the main study; (Study 1)

The participants were from the Hungarian districts of Baja and Kalocsa (Table 5), attending secondary schools of the Baja Vocational Training Centre (Table 6), and several students from the Szent István grammar school in Kalocsa in the school year of 2020/2021. To fulfil the objectivity of the research the participants were randomly selected from each of the school classes, as the questionnaire was administered as a regular school activity since it was conveniently administered during IT classes. The teachers' presence also attested the students' positive attitude towards their partaking in video game related research. Eventually, out of the approx. 2,500 pupils, 907 English language learner, right-handed students participated and filled out the online questionnaire, of which 890 valid responses were received (n=890). Although the results cannot be used for statistically representative generalizations of the entire Hungarian 14-19-year-old population, it is still a significant amount of data for drawing considerable L2 English language-related conclusions.

**Table 7. Residence of participants**



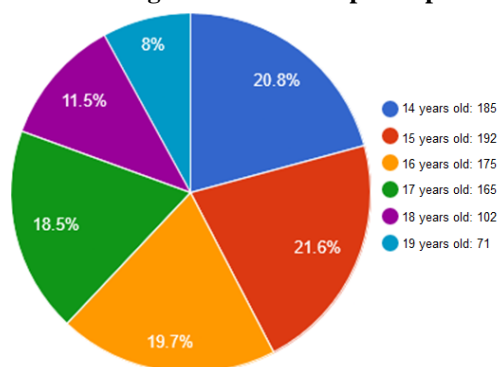
**Table 8. Proportion of the participants' gender**



The proportion of the students by residence is balanced, because 48.9% of the participants live in the surrounding cities and the rest (51.1%) live in villages (Table 7). On the other hand, the

dispersion of the students by school type is imperfect, because 45% attend vocational schools (3 years education), 41% is from technical schools (5 years education) and only 10.3 % is from the grammar school (4 years education). Also, it is important to note that the ratio of genders is nearly equal, 42.5% female and 57.5% male, which gives an even clearer picture of the research (Table 8). The age distribution of the participants was relatively balanced (Table 9). Consent was also earned from school principals and the study received ethics approval by the responsible committee.

**Table 9. Age distribution of participants**



### 3.2.2. Participants of the Stroop and Verbal Fluency tests; (Study 2)

The participants were not chosen randomly, all the students (N=157), attended the Kossuth Zsuzsanna technical and vocational school in Kalocsa, Hungary, study English and were present at school when the sampling occurred. The age distribution of the population of 9-13 graders ranged between 14–19 years. Verbal consent was obtained from all the participants following a full description of the study. Distribution of participants: video gamers: 92 / non-gamers: 65. Female: 97 / male: 60. All of them had begun to learn English in elementary school, around the age of 10 (depending on the type of the school) and continued learning it in the secondary school. All the participants had normal or corrected-to-normal eyesight and proper colour recognition. However, the participants who, in addition to English, learned another language, were excluded from this study. There was no pre-questionnaire used at this study, but at the task the participants' gender, class, age and video gaming preference (yes/no) only were recorded during the performance of the tests.

### 3.2.3. Participants of word collection; (Study 3)

The expressions collected in the interviews are presented in Study 3, which examines the low-frequency, video game words in the everyday communication of video gamers and whether this English language use could be part of a subcultural phenomenon, and if so, what verbal traces were found to support this. The participants joined voluntarily, (N: 21, female: 3; male: 18) and

attended the Kossuth Zsuzsanna technical and vocational school in Kalocsa, Hungary during the school years of 2019-2022. They all studied English and provided valuable help for this research. The age distribution of the population of 11-13 graders ranged between 16–18 years.

### **3.3. Instruments**

#### **3.3.1. Instruments: development and administration of the survey and the test instrument**

The online survey creator websites served the research perfectly, although each of them had its advantages and disadvantages, e.g., the charts were more convenient in the Google Forms so it was more suitable for the questionnaire and the results could have been converted into an Excel file in the Microsoft Forms hence it was more applicable for the VLT. The general questions (age, gender, residency etc.) of the self-developed survey are aimed to provide more basic information for comparisons, although the students helped to create the list of video games and types because the local students play different types of video games compared to the online type lists.

Any analyst can obtain vocabulary tests of English from the ‘Lextutor’ website (Cobb & Free, 2004). Permission is not required to use these tests in any research, although acknowledgement in any thesis or publication is appreciated. Alderson and Banerjee (Alderson & Banerjee, 2001) also call attention to the computer delivered testing that supports the construction of a questionnaire and makes the response more secure, and the calculation of the scoring is quicker. Due to the multiple-choice form, the internet is also ideal for vocabulary testing, so computerized online sampling can represent a new direction in linguistic testing (Sawaki, 2012). Therefore, the research favoured the VLT instrument form developed by Laufer and Nation (2001) because it accurately measures the vocabulary levels, can be administered online to a large number of participants, and after converting the test items to Microsoft Forms, the results can be downloaded in different lists charts and diagrams. The administration of the survey and the test occurred in the IT classes and commenced when the IT teachers gave permission to the students to start answering the survey, which, after the website (Google Forms) recorded the answers online, opened the link of the VLT (Microsoft Forms).

Regarding the reliability of the VLT, the SPSS provides Cronbach’s alpha reliability coefficient calculation, which quantifies the internal consistency of tests and measures. The benchmark value is .7 for Cronbach’s alpha, and in this study  $\alpha = .97$ , so this level indicates that the items are consistent with the measures in Study 1, so it is considered reliable (Table 10).

**Table 10. Reliability coefficient.**

Case Processing Summary			
		N.	%
Cases	Valid	890	100
	Excluded	0	.0
	Total	890	100
Reliability Statistics			
Cronbach's Alpha		N. of items	
.973		890	

Practicality is key to this study, so using a valid, reliable, and online administrable VLT instrument can also provide immediate visual feedback for the answerers about the results and hopefully participants willing to use their results to check, evaluate and rethink their own vocabulary level, and consider continuing their learning to reach the next level.

### 3.3.2. Instruments: development and administration of Stroop and Verbal Fluency tests

The computerized bilingual Stroop test was used to obtain the appropriate and comparable data, for example, number of answers and summarized reaction times in seconds. In the VFT test, the traditional paper/pencil data collection method was used. In the semantic VFT test, students had to list vegetables, because of the professional profile of the school. The computerized ST used 4 basic colours in Hungarian *piros* (red), *zöld* (green), *kék* (blue) and *sárga* (yellow) and English (red, green, blue, yellow) respectively. The program measured the participants' reaction time (RT), status of the answer (correct, wrong, timeout), the pressed key and the colour word, and the colour the word is presented in. In the first session the English stimuli words of colours were displayed in mixed congruent and incongruent cases requiring English answers (intralingual condition), while in the second session English congruent and incongruent probes required Hungarian answers (interlingual condition), totalling 120 items. For example, in the first session called congruent trials, if the word **green** was shown on the screen, the participant had to react by pressing 'g' on the keyboard, whereas in the second session, in the incongruent trial if the word **green** appeared on the screen (where the meaning of the word and the colour of its appearance are different), the participant had to react with the 'p' key on the keyboard as the initial letter of the Hungarian word *piros* (red), because the word appeared in red. The computer version of ST was chosen for two reasons. First, it is more precise to measure the milliseconds while the participant presses the key than to measure the time with a stopwatch; furthermore, since the students use their phones or computers to meet all their needs and all their interests, employing a computerized task may provide a habitual environment for the tests.

The results were also downloadable, which made the statistical calculations easier. The computer-generated results include the ST effect calculation, which is the incongruent minus the congruent RT data for each participant in intralingual and interlingual cases.

In the VFT participants were asked to name vegetables (veg.) both in L1 and in L2 (semantic task) and any other words starting with the sound [s] (phonological task) for 1 minute in each session. Each valid word produced in each test was counted and the eventual number was recorded by the interlocutor. It has been used the VFT semantic and the VFT letter as two different outcomes because they measure different concepts words built into in the ones mental lexicon. Time schedule: the testing was conducted between September 2021 and October 2021 (Table 5).

### **3.3.3. Instruments: procedure of word collection**

In the qualitative part of the study, first, the students compiled as many video game related words and phrases they could from 'gamer365.hu' blogsite (Gamer365, 2021) and 'Kjúbcast' (Kjúbcast, 2021) gamer podcast site for qualitative research purposes. The game type groups were the following: *The League of Legends* from MOBA games, *The Walking Dead – (Telltale)* from adventure games, and *FIFA* and *F1* from sports games, in addition these games promoted different communicative skills. The proper nouns were eliminated, such as the names of the places or figures, F1 races, or teams, to promote the more frequently and commonly used words, namely concrete nouns, verbs, or adjectives. After pre-categorization, the students allocated 60 word-families from each game category (3x60=180 items), which consisted of nouns, verbs and adjectives. The word material was differentiated by game types to be able to acquire a broader view of both hard-core and casual gamers, because the latter were more likely to come across a familiar word. Certain occurrences were found where the participants clearly interpreted the meaning of the sentences; however, several single word examples were hard to decrypt without referencing to any game. There were several recurring instances, but eventually, there was found 69 expressions as valuable examples. The phrases were divided into morphological groups in which the 'gamerlect' word formation methods were clearly discernible. The Study 3 also discusses how the video game-related word knowledge appears in a video gamers' everyday vocabulary usage in relation to diglossia or bidialectalism and translanguaging.

### **3.4. Timeframe, and piloting**

The research is administered from October 2020 to June 2021 (Table 11). The data sampling was distributed among the 9<sup>th</sup> to 13<sup>th</sup> graders – from age 14 to 20 – who study English and are planning to take their final exam at medium (B1) or advanced (B2) level. The questionnaire and

the test were run online and anonymously. Before the samplings, the piloting took place to check and adjust the level of the VLT to the participating population (Table 11). In the 2019/2020-2021/2022 academic years, several interviews were conducted during which, as a qualitative part of the research, a video game-related glossary was collected among those video gamer students who volunteered. The purpose of collecting video game related words was to find out how video gamers utilize their low-frequency game-related English expressions in their real-life conversations.

#### **Table 11. Timeframe**

Phase 1: Initiating the research: documents, requests, surveys and the VLT, November 2019 to October 2020.

Phase 2: Pilot questionnaire of testing of the VLT, October 2020.

Phase 3: Data collection by the survey & VLT, November 2020 to March 2021.

Phase 4: Evaluation of data of the survey, March 2021.

Phase 5: Evaluation of VLT data by using SPSS software May 2021 to June 2021.

Phase 6: Stroop and VFT tests, September 2021 – October 2021.

Phase 7: Interviews, verbal data collection from the gamer students, October 2019 to November 2021.

### **3.5. Research questions**

Main research question:

To what extent video gaming contributes to the receptive vocabulary proficiency, inhibitory control, and lexical retrieval of EFL learners?

Study 1.

What is the relationship between video gaming and the receptive vocabulary proficiency of high-frequency words of the participating high school students?

For reaching comprehensive answers, the research question is further divided into sub-questions inquiring about measurable concepts.

- a) Is there a significant difference between the VLT scores of the participating video gamers and non-gamers?
- b) Is there a significant difference between the VLT scores of the female and male participants?
- c) Is there a significant difference between the VLT results of the ‘watching videos in English’ group and the control group?
- d) Does the ‘time spent on video game play’ correlate with the participants’ VLT results?
- e) Is there a difference between participants VLT results with different SES background?
- f) Do the participants’ English grades at school correlate with the participants’ results in the VLT?
- g) To what extent the device video gamers use contribute to their VLT results compared to the control group?

h) Players of what video game type have the highest VLT scores compared to the control group?

Study 2.

Is there a difference between the inhibition and lexical retrieval of gamers and non-gamers?

Stroop test:

a) Is there a significant difference between the intralingual interferences of the video gamer and the non-gamer groups?

b) Is there a significant difference between the interlingual interferences of the video gamer and the non-gamer groups?

Verbal Fluency test:

a) Is there a significant difference between the performance of the video gamer group of students compared to their non-gamer peers in the VFT letter 's' (L1 & L2) cases?

b) Is there a significant difference between the performance of the video gamer group of students compared to their non-gamer peers in the VFT category (L1 & L2) cases?

Study 3.

Main research question:

Does the game-related low-frequency English vocabulary used by the interviewed video gamer participants in out-of-game situations differ from other domestic and international examples?

With the video gamer students, a wordlist was assembled to highlight,

a) the embedding methods of the video gaming words into sentences,

b) examples of video game words used by interviewed video gamers that have different meanings compared to examples taken from the literature,

c) the pronunciation of the gaming words by the interviewed secondary school gamers.

### **3.6. Hypotheses**

According to articles of Al-Jifri (2017), Eisenclas, Schalley & Moyes (2015), Thompson & von Gillern (2020), Piirainen-Marsh & Tainio (2009), Reinders and Wattana (2011), Sylvén & Sundquist (2012), Cabraja (2016), Horowitz (2019) and Pettersen (2019) the video game players use the video game activity to practice several TLU domains, in addition to entertainment. Exercising the TLU domains through playing games may induce incidental vocabulary learning which can also lead to a deeper understanding of words meaning as it is more likely to become productive knowledge than explicit vocabulary learning, like swotting (Shin, Chon & Kim, 2011). Furthermore, video games are not just a virtual area for incidental vocabulary learning (Calvo-Ferrer & Belda-Medina, 2021), but a veritable treasure of frequent words and expressions in a semi-authentic context presented in a systematic way, thus the video games may present miscellaneous variations of a single expression (Nindyaputri, 2017;

Hartanto, 2018; Rodgers and Heidt, 2020). The choice can be further accounted for the fact that the video game play is a pleasant, effortless, and voluntary activity that provides an occasion to use the declarative (explicit) and the procedural (implicit) subcomponents of the working memory (Dienes & Perner, 2002; Rose, Haider & Buchel, 2010), which support the understanding and repeating of written and verbal TLU domains.

H 1. It is assumed if the members of the video gamer group extend their L2 learning with incidental L2 learning events they can acquire a great deal of high-frequency words in favour of their receptive vocabulary size.

Although English is taught in schools, not all the extracurricular activities can be used equally effectively to extend English learning, such as watching films, listening to music videos (Marone, 2018) and playing video games (Sylvén & Sundquist, 2012; Roach & Utami, 2017; Acquah & Katz, 2020). For instance, watching video clips or movies in English are trendy activities, but video gaming may provide extra motivating factors (Dörnyei & Ushioda, 2013), such as the chance of winning as an expected reward (Berridge, 2001). Accordingly, if L2 learners watch English movies or listen to music videos thus developing their L2 language learning, they can acquire many high-frequency words for the benefit of their receptive vocabulary.

H 2. The VLT results of the video gamers and the movie watchers in English may diverge.

Video gaming time in the research literature differs, e.g., Pujol et al. (2016) talks about weekly 9 hours that may cause negative effects in children, although Király et al. (2017) cannot determine the number of hours that would be problematic, therefore the unbiased results of the research will be reported.

H 3. It can be assumed that if the time spent playing video games grows, the number of acquired-practiced high-frequency words may increase, but only up to a moderate playing time.

Regarding the difference of the VLT results grouped by the participants' gender, there have been no relevant literature, although according to Desai et al. (2010) there are more boys among the video gamers than girls.

H 4. There is no hypothesis concerning the difference of the VLT results grouped by the participants' gender.

It is also assumed that the cooperative or online playable multiplayer video games (e.g., MMORPG) are the most effective virtual area to exploit the TLU domain practice (Cabreja,

2016), because the players' action relies on each other's contribution, which is based on quick information exchange. Supporting this, research by Cornillie, Thorne and Desmet (2012), Butler (2015), Eisenclas, Schalley and Moyes (2015) found that the FPS, TPS, MMORPG or MOBA video games are the most powerful promoters of English high-frequency literacy. Moreover, Harris, Golinkoff and Hirsch-Pasek, (2011), Roach and Utami (2017), Lee et al. (2012), argue that in action games there are more opportunities to discuss details and read written explanations to clarify the video gamers' concept or strategy, so in such games there is an immediate exchange of information. Likewise, Hanghøj et al. (2018) and Derboven, Van Gils and De Grooff (2012), endorse the cooperative video games which provide the social area for participants to play together. On the other hand, the single player games or game modes may use English words, nevertheless the player is usually just a receiver of the information (Calvo-Ferrer and Belda-Medina, 2021).

H 5. If the player plays an online multiplayer video game that uses multiple communication channels, it may further contribute to expanding the player's receptive vocabulary.

There are additional environmental influencing factors in L2 English vocabulary acquisition that are worth evaluating because further statistical computations can broaden the scope of the interpretation of the linguistic analysis, thereby increasing the value of the research. For instance, it is assumed that the children with higher parental SES can acquire higher L2 vocabulary level which may be reflected in their VLT results. As a support of this, there are studies that have examined the relationship between SES and L2 vocabulary knowledge (e.g., Steven & Stigler, 1992; Butler, 2015; Butler & Le, 2018). In addition, as it has been reported in research by Hill and Tyson (2009), the parental involvement in the middle school times is essential, because parents with higher income can afford balanced care and time with their children. Furthermore, SES may influence language development, such as a child's attributes, frequency and depth of parent-child interaction, which imply a complex interaction between a child's own language learning skills and its environmental support identified by Pace et al. (2017). Parental SES and smart devices are also linked because parents who can afford better devices are also likely to expect better overall student performance (Davis-Kean, 2005). Children with middle and high SES predominantly showed low dialectal language and high English proficiency, so L1 proficiency may not influence young children's L2 (English) proficiency as highlighted in Dixon and Daraghmeh's (2012) and Lindholm-Leary's (2017) research. The positive effect of majority language use at home which increases at higher SES as in the study of Volodina, Heppt & Weinert (2021) examined the effects of out-of-school

language management like the proportion of minority (L1) and majority (L2) language use and SES at German primary school students with a migrant background. In this case this means that, if a parent can speak English (L2), it can be helpful to use it with the child.

H 6. If the student's parental SES is higher the receptive vocabulary level could also be more advanced.

Furthermore, the video gaming activity may have a positive consequence on the player's cognition, i.e., EF and inhibition of automatic responses, which can be assessed by the Stroop test (Toth, Kowal & Campbell, 2019) as well as lexical retrieval and inhibition assessed by the verbal fluency test (Luo, Luk & Bialystok, (2010)). The proficiency level plays an important role in both VFTs and ST, which may refer to different cognitive skills and processes that are parts of the inhibitory control (Schmidt et al., 2019). Testing EF may be a non-linguistic parameter, although it reflects the language processing, the object of attention and the possible supplementary effect of video gaming. For instance, there is a clear connection between the bilingual proficiency and the better EF performances, e.g. more proficient students can recall more L1 or L2 words in VFT (Roberts & Le Dorze, 1997; Portocarrero, Burrigh & Donovan, 2007; Escobar, Kalashnikova & Escudero, 2018). Following the ICM model and assuming the 'non-selective' access to the mental lexicon, a smaller interference effect is expected in the interlingual cases than in the intralingual occurrences (Brauer, 1998; Rosselli et al., 2002; Wang et al., 2016; Kousaie & Phillips, 2012, Tytus, 2018). The level of L2 immersion through video gaming may also facilitate the participants' performance in both Stroop and VFT tests (Banquied et al., 2014; Matern, van der Westhuizen & Mostert, 2020). Video gaming activity promotes quick problem solving, improvement of attention and aligned thinking as an aftereffect (Banquied et al., 2014; Zorza, 2016), which might mean more precisely recognised colours and more pronounced words.

H 7. If the participant is a video gamer, their performance on the ST and VFT may differ from their non-gamer peers in favor of video gamers.

The applied tests in this research, i.e., VLT, Stroop VFT, must be familiar to the researched students, because their L2 word knowledge level is verified with vocab tests during their school years, which exemplify the final level that students must achieve (Alderson & Banerjee, 2001). This level must also be maintained by the technical school students in Hungary, who study English and complete their studies with an equivalent of a high school diploma. Apart from

English, German, French, Russian, Croatian are also available to be studied by the students just like in other schools in Hungary (Dörnyei et al. 2006; Csizér and Lukács, 2010).

Interestingly, through participation in any vocabulary testing (VLT, VFT), like in any receptive vocabulary training, the retrieved words can become productive knowledge because the definition selection requires (receptive) familiarity of the words (San Mateo-Valdehita & Criado de Diego, 2021). Conjointly, in research regarding the connection between receptive and productive vocabulary knowledge, scores showed correlation, and the authors found a stable relationship between them, which was strengthened in high-frequency words, especially at the 3000-word level, which is the level expected for the best participants in the present research (Yamamoto, 2011; Miralpeix & Munoz, 2018).

H 8. If video gamers use game-specific, low-frequency words in addition to high-frequency words, their vocabulary can be even more diverse, which can also be the backbone of higher-level proficiency (de Haan, Reed & Kuwada 2010). Although this research does not seek to prove the existence of a relationship between the knowledge of high-frequency words and L2 language proficiency, deeper language practice or online conversation with other non-native speakers can be very useful in on-site learning (Pence & Macgillivray, 2008), or to commence academic studies (Caldas & Bankston, 2004; Chiu, 2007; Tomul, 2008).

## CHAPTER FOUR

### RESULTS

#### 4.1. Findings of the survey

Having evaluated the results of the survey the irrelevant cases had to be omitted, which meant that all participants of the survey were 907, however some of the students did not take part in the VLT, thus their first survey was avoided. Likewise, in several cases, there were no relevant answers in the first survey, so their answers were also ignored. After deleting the inapplicable survey/test results 890 answers suitable for statistical calculations remained (n=890). The first and most interesting result was the ratio of players to non-players, a group which consisted of 244 students (27.6%), while the video gamer group consisted of 646 students (72.4%) (Table 12). The gender distribution of video gamers was 187 female and 459 male students. The video gamer participants can cover TLU domains (English), because there are 536 video game players who prefer to play games in English, which is 83.3% of the video gamer responders (Table 11). In addition, the English language is used overwhelmingly more (83.3%) than Hungarian (12.5%) in the games played by the video gamer responders (Table 13).

Table 12. Distribution of video gamers and non-gamers

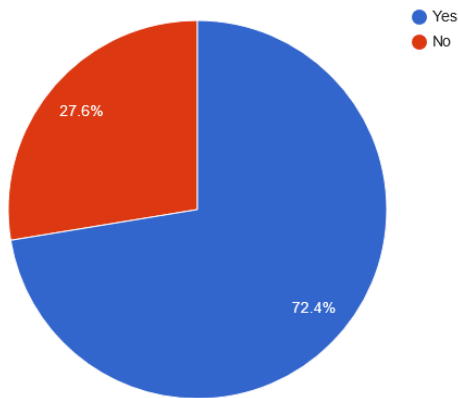
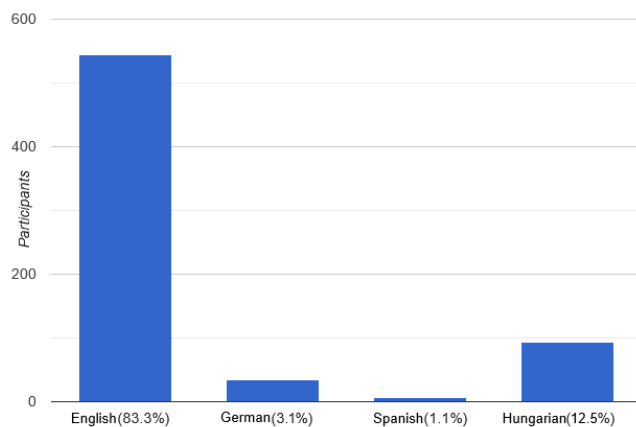


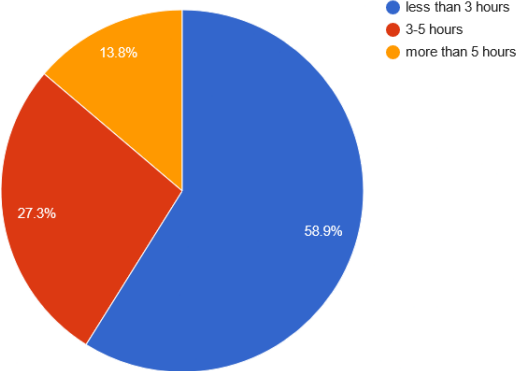
Table 13. Languages used for playing



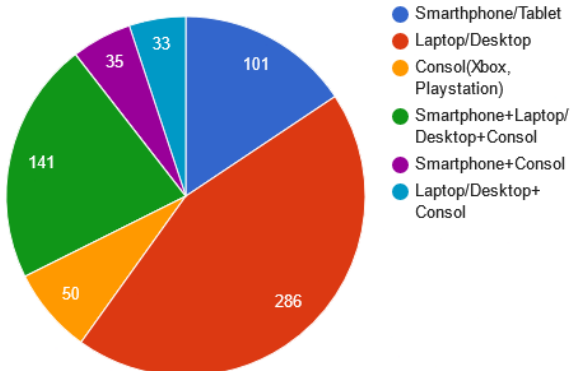
There were students with Spanish and German language knowledge among the users of video game play because several students learn one additional language at Saint Stephen's High School- a language which could be German, French or Russian and at Bányai Technical school there is an opportunity for learning the Spanish language as well. Video games are available in various languages, so the participants can use them for educational purposes. Furthermore, the participating video gamers can be categorized, among others, according to the played hours per day (Table 14), the quality and the type of their devices (Table 15) and the game type they are primarily playing (Table 16). The video gamers are various in their playing simultaneously

various kinds of video games that include FPS/TPS, MMORPG, MOBA and adventure games, sports games, card games, etc., therefore the video gamer participants can cover several TLU domains. In this dissertation the online multiplayer video games are called ‘cooperative games’ and are the ones preferred mostly by the hard-core gamers. Meanwhile social media, platformer, and card, puzzle and board games addressed as ‘single player games’, are chosen by the soft-core gamers (Table 14).

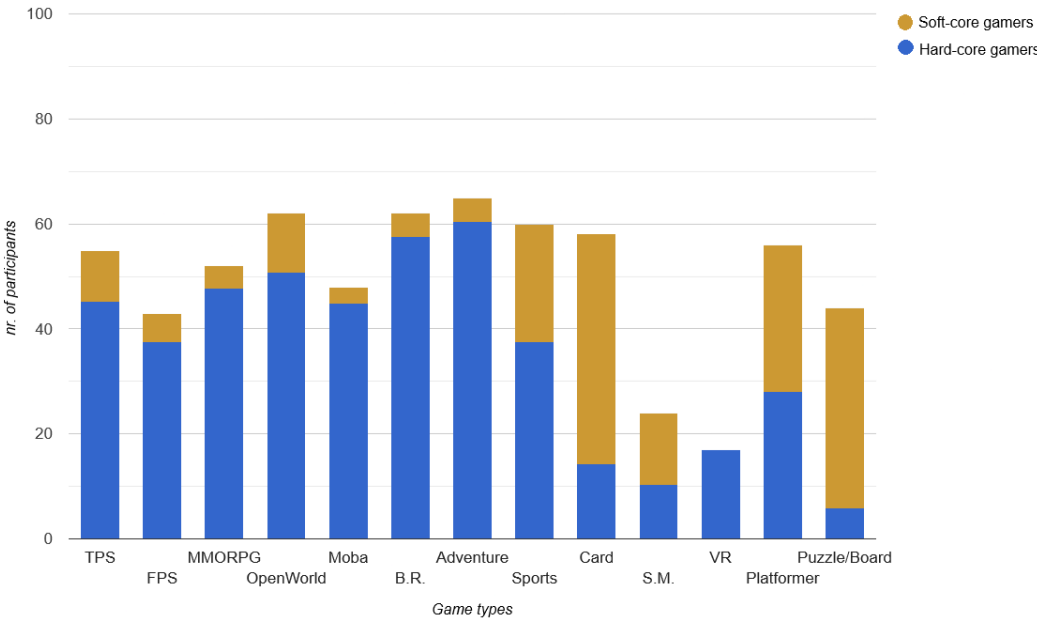
**Table 14. Daily video gaming time.**



**Table 15. Gadgets used for video gaming.**



**Table 16. Favourite game types by number of votes<sup>3</sup>**

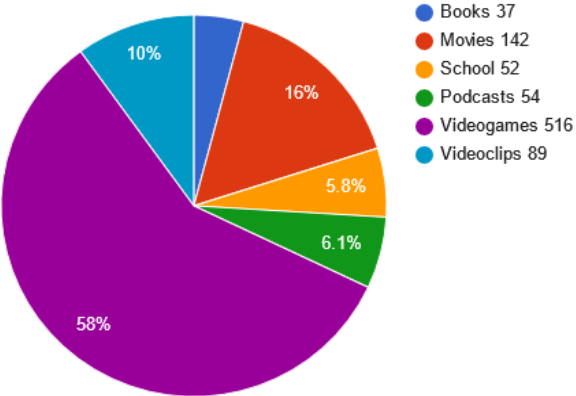


However, from a linguistic research point of view, the most interesting graph is the one in which the participants declare their origin of word knowledge (Table 17). Most video gamer respondents declared that they acquire their word knowledge from video games, out of 646,

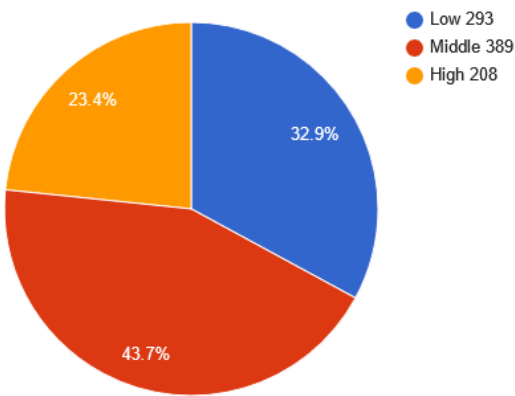
<sup>3</sup> The total number of responses may be more than the number of participants because players play multiple game types at the same time, so it was possible to vote for more than one favourite.

516 (58%) responded positively that question. The answers confirmed another assumption, watching movies as a means of learning words was the second most favoured source with 16% of the voters. Video clips could be also a useful source of word learning, because 10% of the participants voted for that option. Reading is an effective and inexpensive means of L2 learning, although, the survey shows that books are preferred for 4.2% of the participants and school is preferred only for 5.8%. There is a strong possibility of that listeners of the podcasts (6.1%) are also video gamers, but it was not asked in the survey.

**Table 17. Where do you learn the most English words from?**

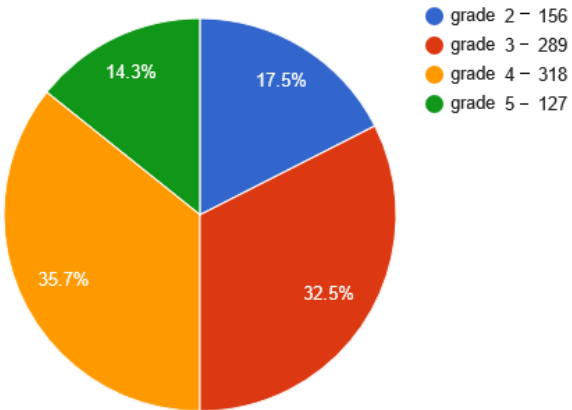


**Table 18. Distribution of parental SES**



Additional non-linguistic variables, which are used to calculate statistically relevant results to clarify and supplement the research questions, include the students’ socioeconomic background (Table 18), the number of times they watched English-language videos, and the participants’ English grades (Table 19). There was no lowest grade (grade - 1) among the English grades because the administration software rounded the grades up from 1.75, so there were no students who failed or received the lowest grade. Observing the SES diagram, it is important to see that the participants from ‘high’ SES are the least represented, meaning that students from participating schools tend to belong to the middle and lower social classes (Table 16).

**Table 19. Distribution of the participants’ English grades**



There were also a few other non-linguistic variables that were not worth conducting statistical analysis on, because they did not affect the knowledge of the high-frequency words between the grouped participants. Respondents answered questions such as body type, desired level of English, desired exam type, etc.

## **4.2. Statistical calculations of Study 1 and Study 2**

For the statistical calculations SPSS 25 was used, in case of normally distributed datasets the difference of the means of data sets gave the statistically interpretable, i.e., numerical, results. If histograms and P-P plots did not provide clear answers about the normality of datasets (Table 19), further Kolmogorov-Smirnov (K-S) analysis must have been performed. For comparing the difference of the means of two datasets one-way ANOVA statistical calculation was used (e.g. gamer – non-gamer), or in case of comparing means of more than one dataset the Tukey HSD (parametric) or Games-Howell (non-parametric) post hoc test were used which provides ANOVA calculations among the means of the datasets including extra features, like presenting the statistical differences of more than two datasets in one table. The ANOVA calculations were extended with a regression model which shows that observed changes in the independent variable can cause alteration in the dependent variable and provide numerical evidence of the effect of the variable. In case of a not normally distributed data set a non-parametric Mann-Whitney U statistical test was employed. Regarding two variables changing together at a constant rate, a correlation analysis as statistical measure was administered which expresses the extent to which two variables are bonded together. This is a useful statistical test device for reporting straightforward relationships without declaring a statement about cause and effect.

### **4.2.1. Results of the statistical calculations of Study 1**

#### **4.2.1.1. Results of comparison the video-gamer and the non-gamer group**

Observing that the extent of the skewness and the kurtosis of the 'video gamers' dataset are close to 0, as seen in the descriptive statistics (Table 20) and in the histograms (Table 21), a normal distribution can be seen. Nevertheless, with the 'non-gamers (no)' the numbers are close to 1, which means that the dataset is presumably not normal, the K-S calculations must have been carried out to clarify the picture (Table 22). Having calculated the K-S normality test of both datasets in which the significance figure must be bigger than 0.05, it was found that the 'non-gamers' dataset,  $D(244) = .18, p = 0.00$  violates the assumption of normal distribution, so it was not normally distributed, on the other hand,  $D(646) = .08, p = .20$  indicates that the

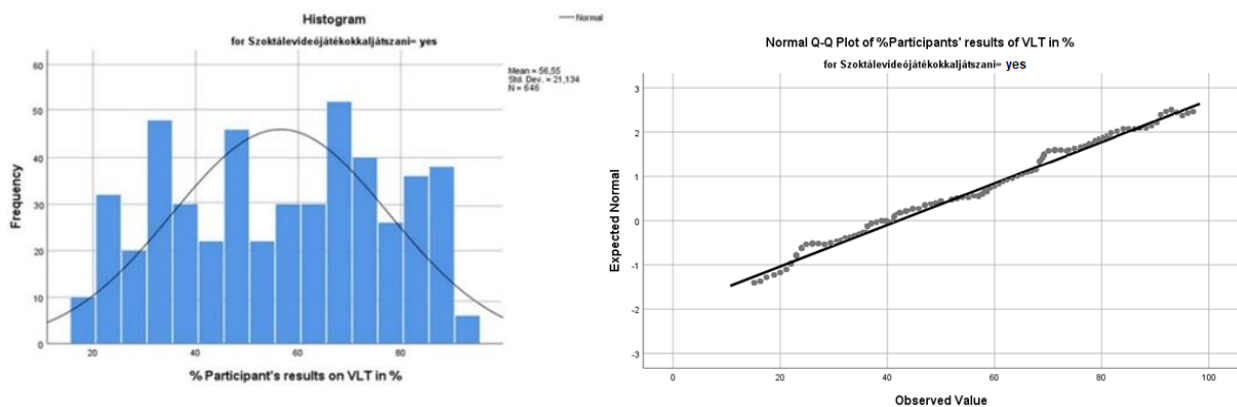
‘video gamer’ dataset was normally distributed. In conclusion, only a non-parametric test can be used on the datasets to obtain reliable and precise statistical results. The difference of the means of the two groups is recognisable in the descriptives (Table 20) and are visible in the boxplot diagram (Table 23).

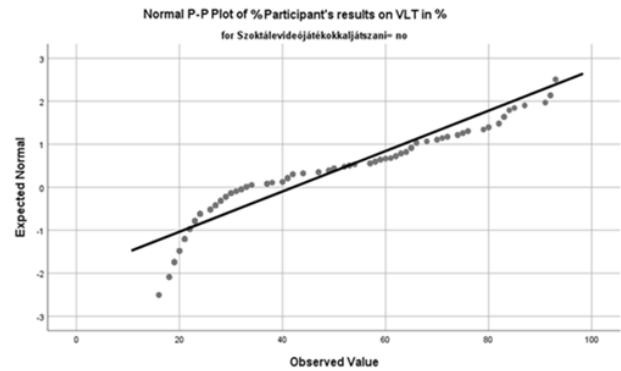
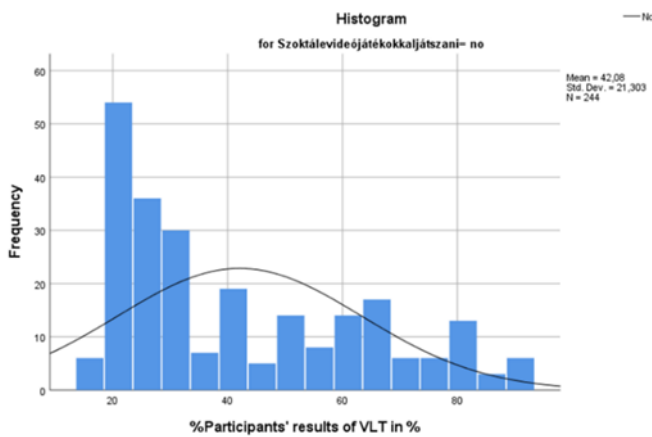
**Table 20. Descriptive Statistics**

Participants' results of VLT	N	Mean	Median	Mode	SD	Skewness	Kurtosis	Range
Gamers (yes)	646	56.55	54	70	21.30	-.09	-.68	77
Non-gamers (no)	244	42.08	33	22	21.13	.75	1.16	77
Watch movies (yes)	142	50.63	51	50	12.86	-.08	-.98	60
Female	369	47.60	47	25	20.46	.32	-1.13	77
Male	521	53.97	54	32	21.38	.92	-1.25	76
SES low	156	30.94	24	20	17.03	1.98	3.39	76
SES middle	779	51.99	50	50	20.75	.17	-1.16	77
SES high	145	69.80	75	78	20.69	-1.23	.61	76
English Grades-1	0	.00	00	00	.00	.00	.00	0
English Grades-2	171	24.30	23	22	4.11	.57	.07	21
English Grades-3	181	36.18	35	34	6.97	1.13	1.56	43
English Grades-4	228	57.14	55	58	13.45	.47	-.08	73
English Grades-5	299	72.65	74	82	12.03	-.32	-.88	52
Time spends gaming < 3	379	53.87	52	45	20.59	.06	-1.16	77
Time spends gaming 3-5	177	56.04	58	35	20.79	-.00	-1.24	74
Time spends gaming 5<	90	56.47	55	85	21.14	-.00	-1.20	73
Smartphone / tablet	101	46.17	45	50	20.72	.54	-.76	75
Laptop /desktop	286	57.70	59	50	19.81	-.11	-1.05	77
Consol (Xbox; Playstat.)	50	51.90	52	32	19.28	.09	-1.18	69
Sm.ph. + comp. + cons <sup>a</sup> .	141	55.79	54	34	21.26	.09	-1.31	74
Smartphone + consol	35	48.71	48	35	21.43	.43	-1.25	66
Computer + consol	33	63.21	67	75	18.48	-.69	-.43	66

a. Smartphone + computer + consol

**Table 21. Histograms and Q-Q plots of the VLT scores for video gamer and non-gamer groups**





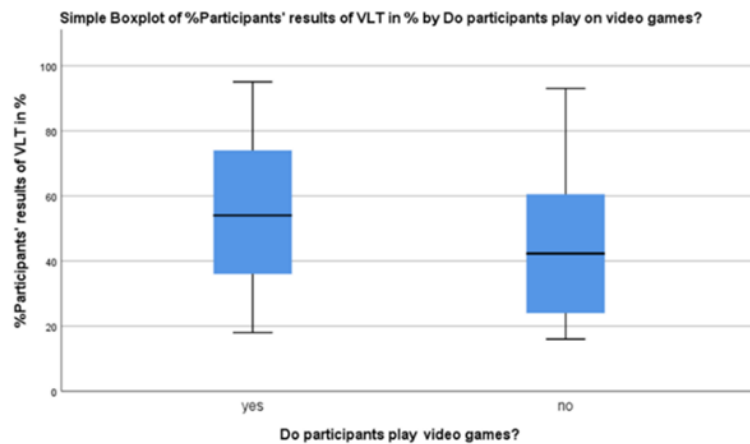
**Table 22. K-S test for normality of the datasets for video gamer and non-gamer groups**

Do the participant play video games?	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Non-gamers (no)	.181	244	.000	.883	244	.000
Gamers (yes)	.085	646	.200*	.955	646	.118

\* This is a lower bound of true significance.

a. Lilliefors Significance Correction

**Table 23. Boxplot of means of the VLT test results for video gamer and non-gamer groups**



Because of the not normally distributed data set, a non-parametric Mann-Whitney U statistical test was used to compare the mean values of the data sets. The outcomes of Mann-Whitney U show statistical ranks from which the conclusion can be inferred in favour of the video gamer participants (Table 24). The numerical results indicated that video game players had significantly greater VLT results than non-video game players in the studied secondary school population,  $z = -8.29$ ,  $p < .001$ . This is confirmed by the test statistics: the video gamer group

had significantly higher results on VLT than the non-gamers in the researched secondary school students,  $U = 50429.00$ ,  $p < .001$ ,  $r = .27^4$  (Table 24).

**Table 24. Mann-Whitney test ranks of Gamers / Non-gamers**

Do you play video games?		N	Mean rank	Sum of Ranks
%Participants' results of VLT	No	244	329.18	80319.00
	Yes	646	489.44	316176.00
	Total	890		

**Test statistics<sup>a</sup>**

	%Participants' results of VLT
Mann-Whitney U	50429.00
Z	-8.298
Asymp. Sig (2-tailed)	.00

a. Grouping Variable: Do you play video games? (Yes/No)

**4.2.1.2. Results of comparison of the gender groups**

Considering the skewness and Kurtosis at the 'Female' and 'Male' descriptives (Table 20) and inspecting the histograms (Table 26), the data sets are most likely not normally distributed, so a normality test had to be performed. Having calculated the K-S normality test of the dataset of the 'Female' group, it was found that  $D(369) = .12$ ,  $p = .00$  violates the assumption of normal distribution, consequently it is not normally distributed, as well as the dataset of 'Male',  $D(521) = .10$ ,  $p = .00$ , is not normally distributed (Table 25). Because of the not normally distributed data sets, a non-parametric Mann-Whitney U statistical test was used to compare the mean values.

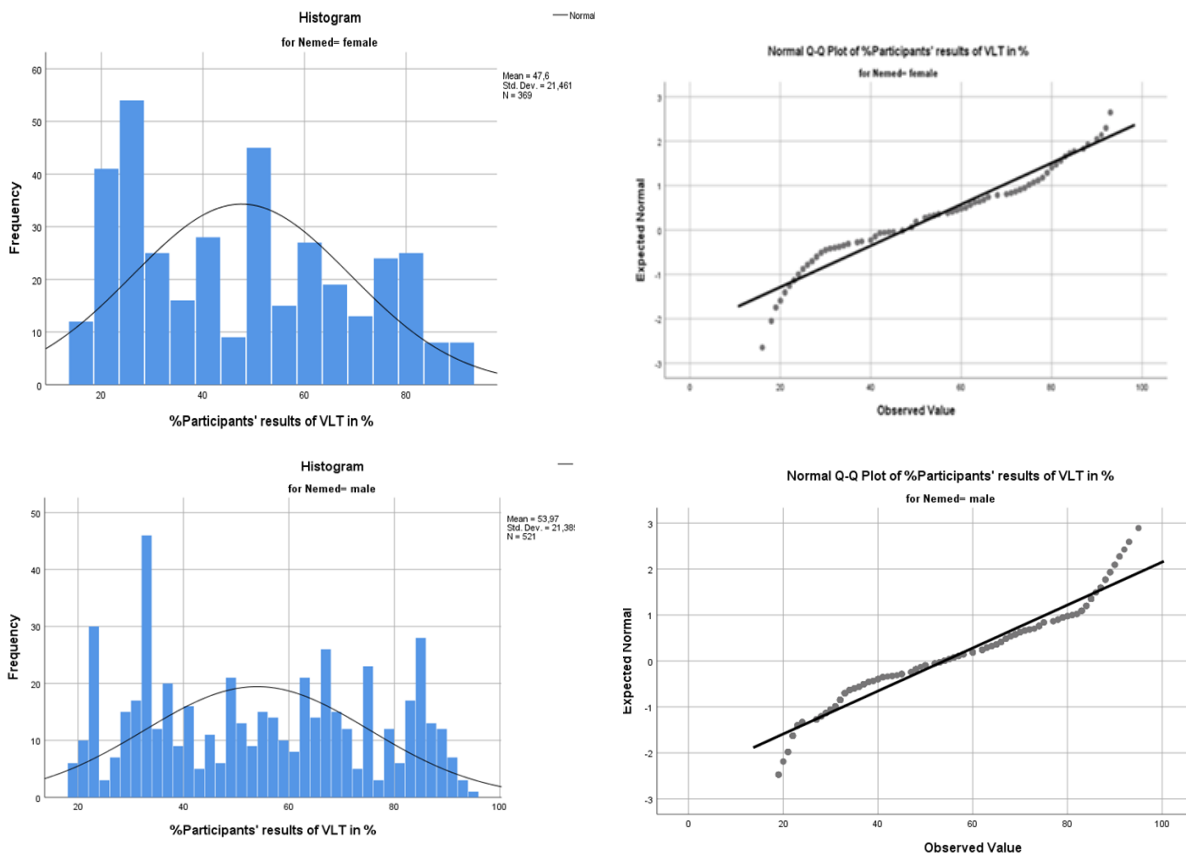
**Table 25. K-S test of normality of the participants' Gender**

Participants results of	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
VLT in %?						
Female	.127	369	.000	.934	396	.000
Male	.105	521	.000	.945	521	.000

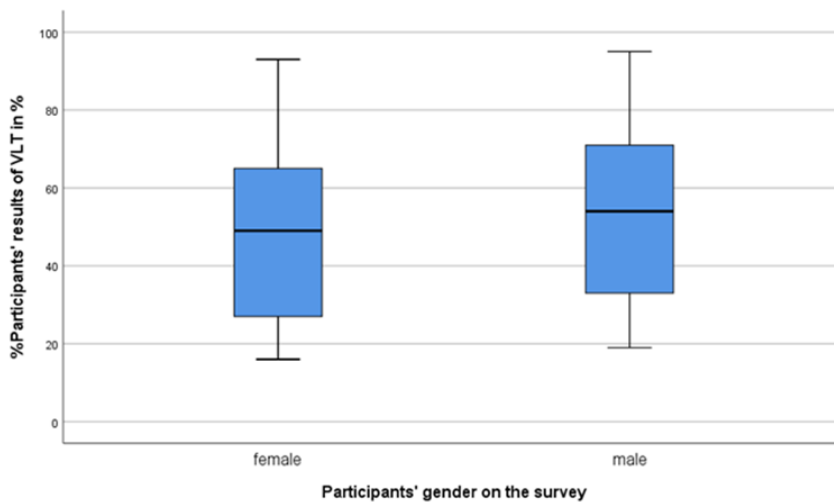
a. Lilliefors Significance Correction

<sup>4</sup> The strength of the effect is generally as follows:  $r$  less than 0.3 = weak effect,  $r$  between 0.3 and 0.5 = medium effect and  $r$  greater than 0.5 = large effect (DATAtab Team, 2024).

**Table 26. Histograms and Q-Q plots of the participants' VLT scores by Gender groups**



**Table 27. Boxplot of means of the VLT results for gender groups**



The mean values are close as seen in the boxplot diagrams (Table 27), and the statistical ranks calculated by the Mann-Whitney U showed the lack of significant difference between the 'Female' and the 'Male' groups (Table 28). The results indicated that there was no significant difference between the VLT results of the groups of 'Female' and 'Male' students in the studied secondary school population,  $z = -1.54$ ,  $p = .06$ . The results of the test statistics also implied that

there was no significant difference between the VLT results of the groups of the ‘Female’ and the ‘Male’ groups in the studied secondary school population,  $U = 78939.50$ ,  $p = .06$ ,  $r = .05$  (Table 28).

**Table 28. Mann-Whitney test ranks of the gender groups**

Participants gender on the survey.		N	Mean rank	Sum of Ranks
%Participants’ results of VLT	Female	369	398.93	197204.50
	Male	521	428.48	249290.50
	Total	890		

**Test statistics<sup>a</sup>**

%Participants’ results of VLT	
Mann-Whitney U	78939.50
Z	-1.54
Asymp. Sig (2-tailed)	.06

a. Grouping Variable: Gender, (Female, Male), video gaming (no)

**4.2.1.3. The effect of watching movies on VLT scores**

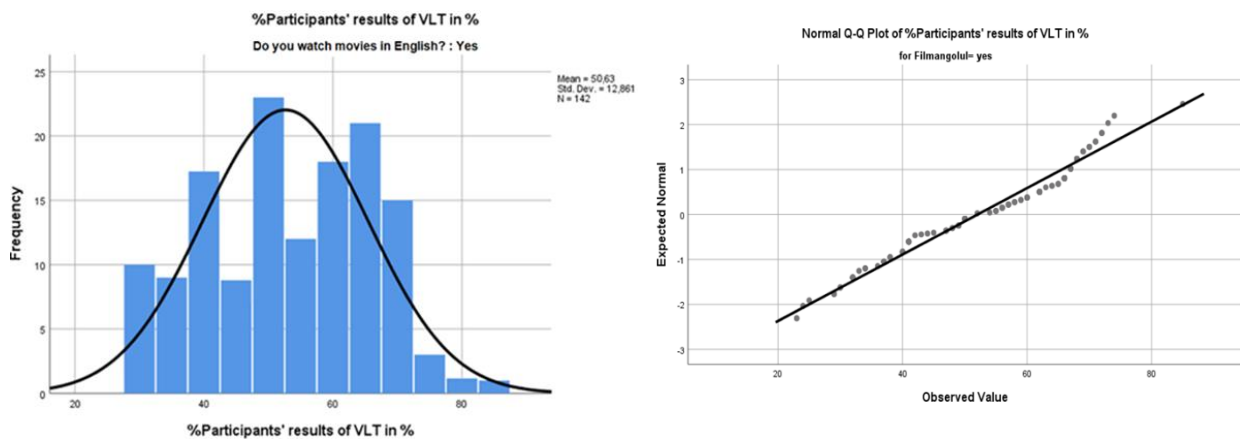
The histogram does not clearly show the normality of the dataset (Table 30). Having calculated the K-S normality test of the dataset of the control (non-gamer) group, it was found that  $D (244) = .18$ ,  $p = .00$  violates the assumption of normal distribution, consequently it is not normally distributed. The K-S indicating that the distribution of VLT scores in the group of people who “watch movies in English” was also not normal,  $D (142) = .17$ ,  $p = .00$  (Table 29). The difference of the means is visible in the boxplot diagram (Table 31).

**Table 29. K-S test of normality of ‘Watching movies in English?’**

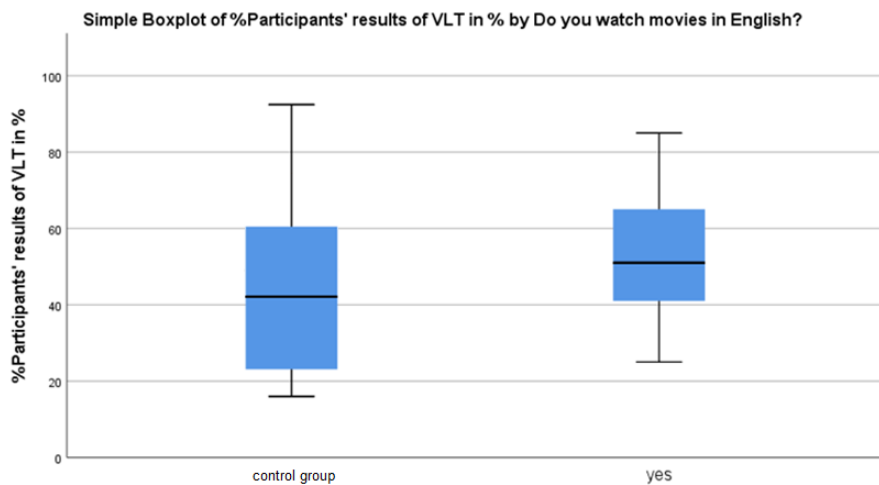
Do you watch movies in English?	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Watch movies (yes)	.179	142	.000	.963	142	.001
control group (non-gamers)	.181	244	.000	.833	244	.000

a. Lilliefors Significance Correction

**Table 30. Histogram and Q-Q plot of ‘Watch movies in English?’**



**Table 31. Boxplot of means of the ‘control group’ and ‘Do you watch movies in English?’**



The mean of the control group (non-gamer) is  $M = 42.08$ , and the mean of the group of ‘Watching movies in English’ is  $M = 50.63$ . Due to the non-normal distribution of the datasets a non-parametric test (Mann-Whitney U) was utilized. The results indicated that there was no significant difference between the VLT results of the groups of ‘Watching film in English’ and the control group in the studied secondary school population,  $z = -1.48$ ,  $p = .11$ . The results indicated that there was no significant difference between the VLT results of the groups of watching film in English and the control group in the studied secondary school population,  $U = 48926.50$ ,  $p = .11$ ,  $r = .07$  (Table 32).

**Table 32. Mann-Whitney test ranks of the ‘control group’ and ‘Do you watch movies in English?’ group**

	Do you watch movies in English?	N	Mean rank	Sum of Ranks
%Participants' results of VLT	control group	244	329.18	80319.00
	Yes	142	374.95	67442.50
	Total	386		

**Test statistics<sup>a</sup>**

	%Participants' results of VLT
Mann-Whitney U	48926.50
Z	-1.48
Asymp. Sig (2-tailed)	.11

a. Grouping Variable: Do you watch movies in English? (Yes)/control group

**4.2.1.4. Correlation of the VLT results with video gaming time, English grades and SES**

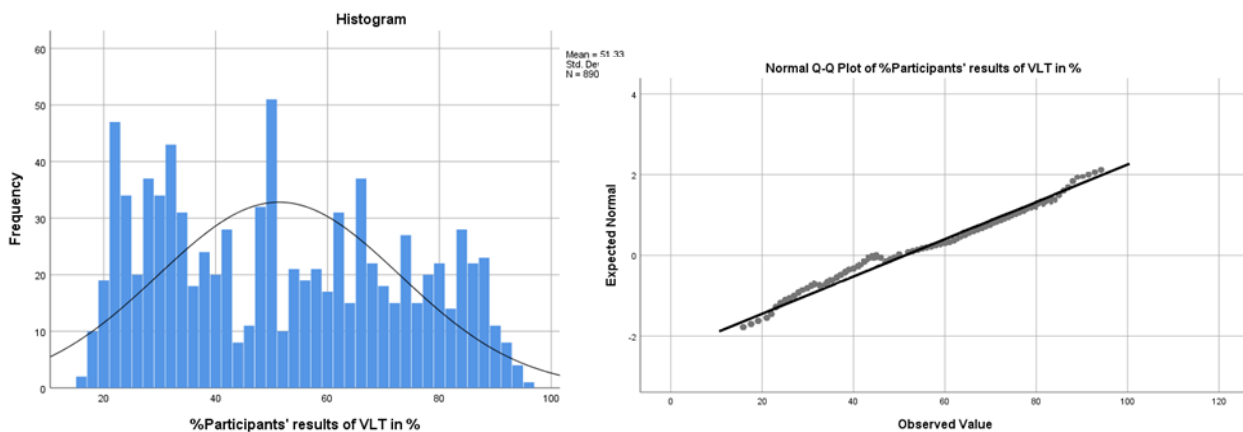
In this part of the study the scope of the analysis is extended with the participants' socio-economic status (SES), the time they spend gaming and their English grades at school. The purpose of correlating the students' grouped survey responses with their VLT scores is to obtain a deeper understanding of the relationship between extracurricular variables, video gaming habits and receptive vocabulary. Descriptives (Table 33) and histograms give clear picture of the variable (Table 34).

**Table 33. Descriptive Statistics of the participants' VLT results, English grades, parental SES and video gaming time**

Variable	N	Mean	Median	Mode	SD	Skewness	Kurtosis	Range
Participants' VLT res.	890	51.33	50	70	21.63	.18	-1.01	77
Participants' English grd.	890	3.71	4	2.5	1.15	-.36	-1.15	5
Participants' parental SES	890	1.13	1	2	.92	.50	-1.56	3
Part. v.g. time <sup>a</sup>	646	.98	1	2	.35	-.33	5.00	3

a. Participants' time spend on video gaming.

**Table 34. Histograms and Q-Q plots of 'All participants' results of VLT in %**



The non-parametric Spearman rho correlation analysis can be utilized. It was found that the participants' 'VLT test results' correlated significantly with the participants' 'SES',  $r(890) = .33, p < .001$ , and the participants' 'time spent on gaming'  $r(646) = .25, p = .00$ , and 'English grades'  $r(890) = .88, p = .00$ , (Table 35).

**Table 35. Correlation between VLT results and the groups of English grades, SES and gaming time**

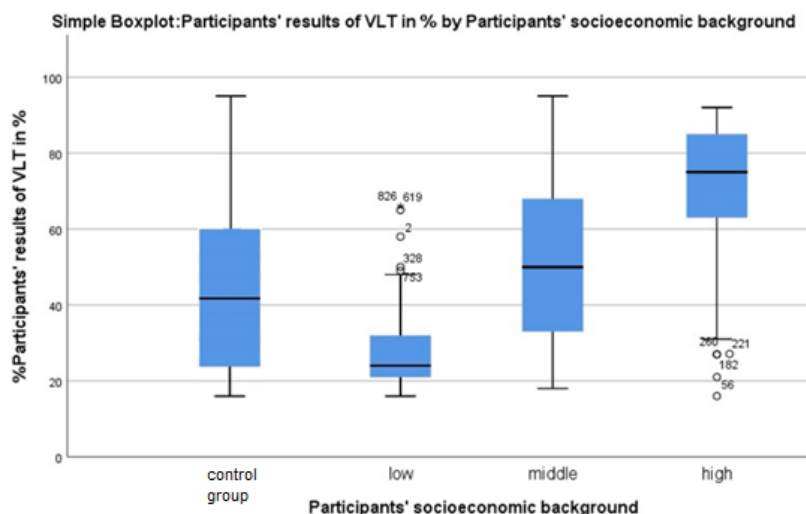
Spearman rho's correlation		Participants' English Grades	Participants' SES	Participants' time spent on gaming
Participants' VLT results	Corr. Coeff.	.881**	.331**	.253**
	Sig.	.000	.000	.000
	N	890	890	644

\*\* Correlation is significant at the 0.05 level (2-tailed)  
 \* Correlation is significant at the 0.01 level (1-tailed)

The correlation coefficient ( $r$ ) describes the strength and the direction of a relationship between the variables. There is a weak correlation between 'time spent playing games' and their VLT scores with  $r = 0.25$ . The participants' SES has a medium effect on VLT results, because  $r = 0.33$ . However, the relationship is strong in the case of participants' English grades  $r = .88$ .

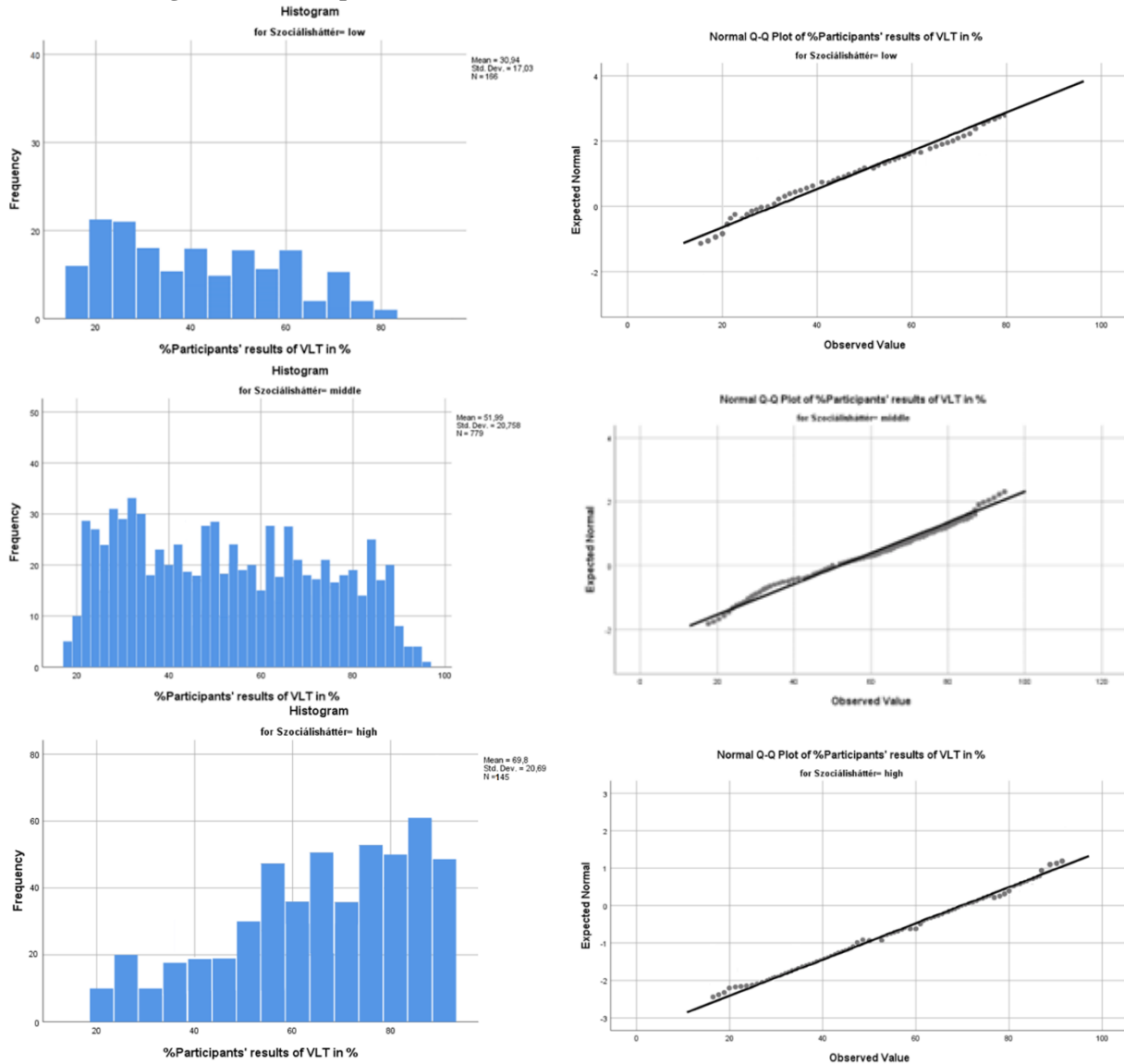
In order to obtain a clearer statistical picture, the ANOVA was also conducted to determine the influences of SES and gaming time on VLT results. In this part of the study the analysis is continued with the comparison of the participants' SES with that of the non-gamer (control) group. Concerning the participants' SES, the picture is explicit (Table 36) because the tendency is visible, the higher the SES, the higher the VLT results, although the outliers<sup>5</sup> at both the low and the high cases show that even participants with low SES can produce exceptional VLT results, and equally, the participants with high SES may fall short. The skewness and kurtosis of the datasets in the descriptives (Table 38) and the histogram (Table 37) do not clearly show the normality of the dataset.

**Table 36. Boxplot of parental SES**



<sup>5</sup> The outliers were removed in statistical calculations.

**Table 37. Histograms and Q-Q plots of Parental SES**



Among the gamers the median values increase with the playing time until 3-5 hours per day with a steady interquartile range, although after more than 5 hours of video gaming the median value decreases sharply with a narrowing trend of the interquartile range (Table 39). This reduction of the median value and the range means that there were fewer good VLT results than in the 3-5 hours cases, as it is affirmed by the statistical analysis. In the K-S normality test of the dataset of non-gamer (control) group it was found that  $D(244) = .18, p = .00$ , which violates the assumption of normal distribution, therefore it is not normally distributed. The rest of the variables, i.e., SES low  $D(166) = .17, p = .20$ , SES middle  $D(579) = .16, p = .10$ , SES high  $D(145) = .15, p = .07$ , are normally distributed (Table 39).

**Table 38. Descriptive Statistics**

Variable	N	Mean	Median	Mode	SD	Skewness	Kurtosis	Range
Control group	244	42.08	33	32	21.30	.75	-.68	77
SES low	166	30.94	24	20	17.03	1.98	3.39	76
SES middle	579	51.99	50	50	20.75	.17	1.16	77
SES high	145	69.80	75	78	20.69	-1.23	.61	76

**Table 39. K-S test of normality of the groups of SES**

Participants results of	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
VLT in %?						
Low	.176	166	.200*	.723	166	.102
Middle	.165	579	.106	.953	579	.076
High	.150	145	.078	.846	145	.055

\*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

The assumption of the homogeneity of variances was examined through Levene's test, revealing significant results across the different SES groups ( $p = .00$ ), (Table 40). Consequently, the assumption is not met, so only the Games-Howell test can be used, because the sample sizes and variances are unequal across the groups.

**Table 40. Levene's Test of Equality of Error Variances<sup>a,b</sup>**

%Participants' results of VLT in %	Levene Stat.	df1	df2	Sig.
Based on Mean	9.28	2	887	.00
Based on Median	14.06	2	887	.00
Based on median and adj. df.	14.06	2	817.228	.00
Based on Trimmed Mean	12.19	2	887	.00

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Dependent variable: % Participants' results of VLT in %

b. Design: Intercept + SES

The ANOVA results showed a statistically significant difference in VLT results among the control group and the SES groups  $F(2, 887) = 51.29, p = .00$ . The results showed significant differences between the non-gaming (control) group and the low SES group,  $F(2, 887) = 16.91, p = .03$ , and between the non-gaming (control) group and the high SES group,  $F(2, 887) = 16.91, p = .00$ , (Table 42). The Partial Eta squared measures the proportion of the total variance in a dependent variable, which is related to the SES in the video gamer groups defined by the independent variable, in this case  $\eta^2 = 0.10$  which indicates a large effect (Table 41).

**Table 41. Tests of Between-Subjects Effects (ANOVA) - SES**

Source	Type III.		Mean square	F	Sig.	Partial Eta Squared
	Sum of squares	df				
Corrected Model	43132.98 <sup>a</sup>	2	21566.49	51.29	.00	.10
Intercept	603417.63	1	603417.63	1435.16	.00	.61
SES	43132.98	2	21566.49	51.29	.00	.10
Error	372939.89	887	420.45			
Total	2761048.00	890				
Corrected Total	416072.88	889				

<sup>a</sup> R Squared = .104 (Adjusted R Squared = .102)

Dependent Variable: %Participants' results of VLT in % <sup>b</sup>

**Table 42. Multiple Comparisons (Games - Howell)**

(I) Grouped Game Types	(J)SES	Mean Diff. (I-J)	Std. Error	Sig.	95% Confidence Interval	
Control group	Low	11.14	2.17	.03	21.10	17.98
	Middle	-9.91	2.62	.06	-27.22	-14.88
	High	-27.72*	3.96	.00	-48.17	-29.55
Middle	Control group	9.91	2.62	.06	27.22	14.88
	Low	21.05*	2.22	.00	15.74	26.36
	High	-17.81*	3.17	.00	-25.48	-10.14
High	Control group	27.72*	3.96	.00	48.17	29.55
	Low	38.86*	3.73	.00	29.96	47.76
	Middle	17.81*	3.17	.00	10.14	25.48

Based on observer means.

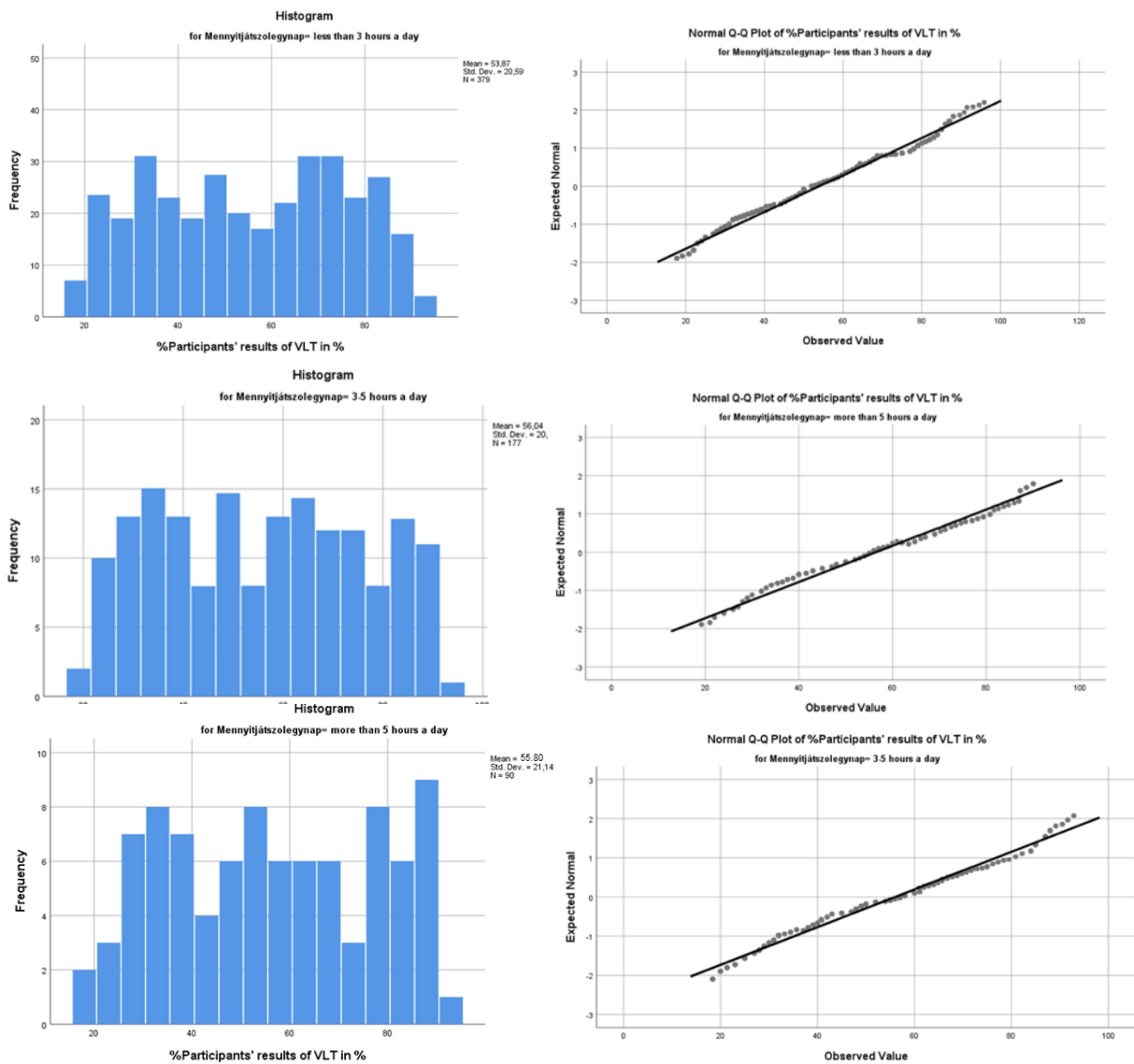
The error terms is Mean Square (Error) = 420.45

\*. The mean difference is significant at the .05 level.

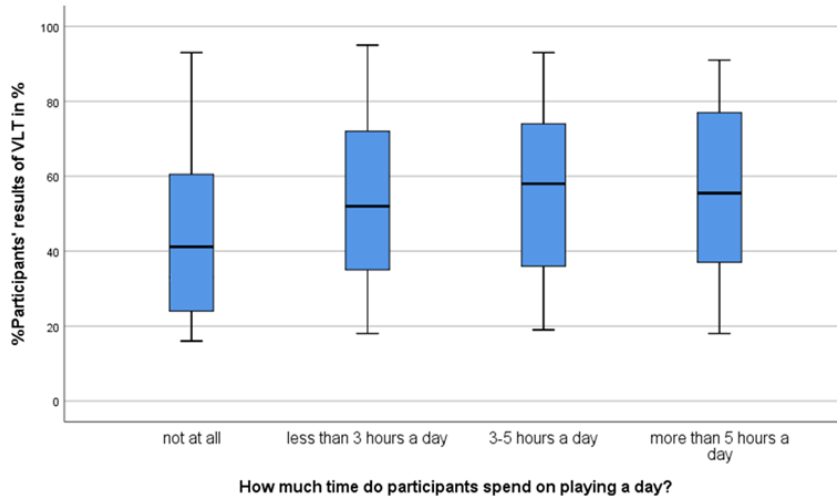
Given lack of significance, the null hypothesis is upheld, suggesting that the mean of the middle SES group VLT scores does not differ significantly from the mean of the VLT scores of the non-gamer (control) group.

The following calculation is administered to determine the effect of gaming time on VLT scores comparing the grouped gaming times to the non-gamer (control) group. Regarding the participants' playing time, the daily playing time should be calculated by dividing the weekly average by 7, because too many factors influence the daily playing time, e.g. school, weekdays/weekends. Among the gamers the median values increase with the playing time until 3-5 hours per day with a steady interquartile range, although after more than 5 hours of video gaming the median value decreases sharply with the narrowing trend of the interquartile range (Table 44). This reduction of the median value and the range means that there were fewer good VLT results than in the 3-5 hours cases as it is affirmed by the statistical analysis. The skewness of the datasets in the descriptive statistics (Table 45) and the histogram (Table 43) do not clearly indicate the normality of the datasets.

**Table 43. Histograms and Q-Q plots ‘Time spends on video gaming’**



**Table 44. Boxplot- ‘Time spends on video gaming’**



**Table 45. Descriptive Statistics of the groups of ‘Time spends on video gaming’**

Variable	N	Mean	Median	Mode	SD	Skewness	Kurtosis	Range
Control group	244	42.08	33	32	21.30	.75	-.68	77
Less than 3 hours	379	53.87	52	45	20.59	.06	-1.16	77
3-5 hours	177	56.04	58	35	20.79	-.00	-1.24	74
More than 5 hours	90	55.80	55	85	21.14	-.00	-1.20	73

The K-S normality test of the dataset of non-gamer (control) group found that  $D(244) = .18, p = .00$ , which violates the assumption of normal distribution, therefore it is not normally distributed. The rest of the variables, ‘less than 3 hours’  $D(379) = .15, p = .20$ , ‘3-5 hours’  $D(177) = .17, p = .10$ , more than 5 hours  $D(90) = .12, p = .06$ , are normally distributed (Table 46).

**Table 46. K-S test of normality of the groups of gaming time**

Test	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Not at all	.181	244	.000	.883	244	.000
Less than 3 hours	.154	379	.200*	.755	890	.060
3-5 hours	.173	177	.102	.654	890	.098
More than 5 hours	.125	90	.069	.481	890	.072

\*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

The assumption of the homogeneity of variances was examined through Levene’s test, revealing non-significant results across the different ‘gaming time’ groups ( $p = .91$ ), (Table 47). Consequently, the assumption is met, so the Tukey HSD post hoc test can be used because the sample sizes and variances are unequal across groups.

**Table 47. Levene’s Test of Equality of Error Variances<sup>a,b</sup> of the groups of gaming time**

%Participants’ results of VLT in %	Levene Stat.	df1	df2	Sig.
Based on Mean	.16	3	886	.91
Based on Median	.07	3	886	.97
Based on median and adj. df.	.07	3	787.393	.97
Based on Trimmed Mean	.07	3	886	.97

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Dependent variable: % Participants’ results of VLT in %

b. Design: Intercept + Gaming time

The ANOVA results showed a statistically significant difference in VLT results among the control group and the ‘gaming time’  $F(3, 886) = 22.64, p = .00$ . The results showed significant differences between the non-gaming (control) group and all of the ‘gaming time’ groups,  $F(2, 886) = 22.64, p = .00$ . However, there is no significant difference between the less than 3 hours group and the 3-5 hours group,  $F(2, 887) = 22.64, p = .66$ , and the 3-5 hours and the more than 5 hours group,  $F(2, 887) = 22.64, p = .99$  (Table 49). The Partial Eta squared measures the proportion of the total variance in a dependent variable, which is related to the gaming time in

the video gamer groups defined by the independent variable, in this case  $\eta^2 = .07$  which indicates a medium effect (Table 48).

**Table 48. Tests of Between-Subjects Effects (ANOVA) of the groups of gaming time**

Source	Type III. Sum of squares	df	Mean square	F	Sig.	Partial Eta Squared
Corrected Model	29628.83 <sup>a</sup>	3	9876.27	22.64	.00	.70
Intercept	1849214.19	1	1849214.19	4239.69	.00	.82
Mennyitjatszolegynap	29628.83	3	9876.27	22.64	.00	.07
Error	386444.04	886	436.16			
Total	2761048.00	890				
Corrected Total	416072.88	889				

<sup>a</sup> R Squared = .071 (Adjusted R Squared = .068)  
 Dependent Variable: %Participants' results of VLT in % <sup>b</sup>

**Table 49. Multiple Comparisons (Tukey HSD) of the groups of gaming time**

(I) Grouped Game Types	(J) Time spend on video gaming	Mean Diff. (I-J)	Std. Error	Sig.	95% Confidence Interval	
Not at all	Less than 3 hours	-11.79*	1.71	.00	-16.20	-7.38
	3-5 hours	-13.96*	2.06	.00	-19.27	-8.65
	More than 5 hours	-14.39*	2.57	.00	-21.02	-7.76
Less than 3 hours	Not at all	11.79*	1.71	.00	7.38	16.20
	3-5 hours	-2.17	1.90	.66	-7.07	2.72
	More than 5 hours	-2.60	2.44	.71	-8.90	3.70
3-5 hours	Not at all	13.96*	2.06	.00	8.56	19.27
	Less than 3 hours	2.17	1.90	.66	-2.72	7.07
	More than 5 hours	-.43	2.70	.99	-7.39	6.53
More than 5 hours	Not at all	14.39*	2.57	.00	7.76	21.02
	Less than 3 hours	2.60	2.44	.71	-3.70	8.90
	3-5 hours	.43	2.70	.99	-6.53	7.39

Based on observer means.  
 The error terms is Mean Square (Error) = 436.16  
 \*. The mean difference is significant at the .05 level.

#### 4.2.1.5. Comparison of the 'devices used for gaming' with the control group

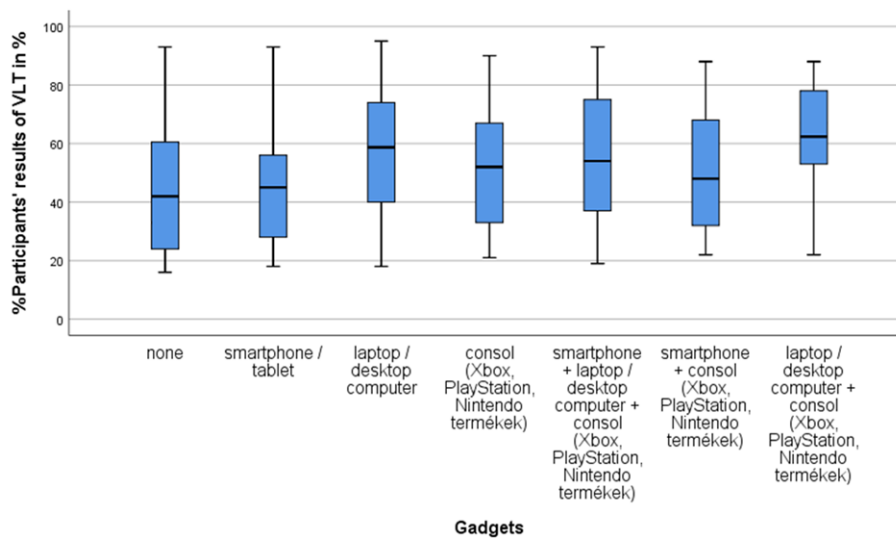
The next part of the study continues by comparing of the participants' gaming gadgets with the control group. The explanation of the questionnaire emphasized that the answer should only include the device(s) owned, and if there is more than one, only the one on which the participant spends the most time playing should be included in the answer. The purpose of juxtaposing the students' gadgets used for gaming with their VLT scores is to find the most effective choice of device for gaming. An ANOVA analysis was conducted to assess the impact of various devices used for video gaming. The skewness and kurtosis of the datasets in the descriptives (Table 50) and the histogram (Table 51) do not evidently show the normality of the dataset. Having calculated the K-S normality test of the dataset of the non-gamer (control) group it was found that  $D(244) = .18, p = .00$  violates the assumption of normal distribution, consequently it is not normally distributed. The rest of the variables, i.e., smartphone / tablet  $D(101) = .14, p = .20$ , computer  $D(286) = .15, p = .11$ , consol  $D(50) = .16, p = .07$ , smartphone + consol  $D(35) =$

.15  $p = .20$ , smartphone + computer + consol  $D (141) = .11$ ,  $p = .20$ , computer + consol  $D (33) = .14$ ,  $p = .20$ , are normally distributed (Table 53).

**Table 50. Descriptive Statistics of the groups of devices used for video gaming**

Variable	N	Mean	Median	Mode	SD	Skewness	Kurtosis	Range
Control group	244	42.08	33	32	21.30	.75	-.68	77
Smartphone/tablet	101	46.17	45	50	20.72	.54	-.76	75
Laptop/desktop computer	286	57.70	59	52	19.81	-.11	-1.05	77
Consol (Xbox, Playstation)	50	51.90	52	32	19.28	-.09	-1.18	69
Smartphone+consol	35	48.71	48	35	21.43	.43	-1.25	66
Smartphone+comp+cons.	141	55.79	54	34	21.26	.96	-1.31	74
Laptop/desktop+consol	33	63.21	67	72	18.48	-.69	-.43	66

**Table 52. Distribution of the means of the devices used in relation to the VLT results**



**Table 53. K-S test of normality of the groups of the devices used for gaming**

Test	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Not at all	.181	244	.000	.883	244	.000
Smartphone / tablet	.144	101	.200*	.932	101	.054
Laptop / desktop computer	.151	286	.111	.966	286	.114
Consol	.163	50	.075	.946	50	.107
Smartph. + comp + consol	.117	141	.200*	.939	141	.060
Smartph. + consol	.157	35	.200*	.898	35	.059
Laptop + consol	.145	33	.200*	.930	33	.063

\*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

The homogeneity of the variances assumption is required to run the proper test, because the sample sizes of the groups of gadgets used for gaming sharply differ. Therefore, the Levene's test for equality of variances is calculated, which shows that variances were equal,  $F (6, 883) = 1.11$ ,  $p = .35$ . A non-significant p-value suggests that the assumption of homogeneity of variances is met (Table 54).

**Table 54. Levene's Test of Equality of Error Variances<sup>a,b</sup> of the gaming devices**

%Participants' results of VLT in %	Levene Stat.	df1	df2	Sig.
Based on Mean	1.11	6	883	.355
Based on Median	.696	6	883	.653
Based on median and adj. df.	.696	6	777.077	.653
Based on Trimmed Mean	.987	6	883	.433

Tests the null hypothesis that the error variance of the dependent variable is equal across groups

a. Dependent variable: % Participants' results of VLT in %

b. Design: Intercept + Gaming devices

In the ANOVA table (Table 55) the between-groups and within-groups variability is apparent, the higher F-ratio indicates larger differences among group means relative to within-group variability. The p-value is below the .05 significance level which suggests that the mean of at least one group of 'gadgets used for gaming' is significantly different. The Partial Eta squared measures the proportion of the total variance in a dependent variable, which is related to the device users in the video gamer groups defined by the independent variable, in this case  $\eta^2 = .10$  which indicates a large effect (Table 55).

**Table 55. Tests of Between-Subjects Effects (Univariate ANOVA) of the groups of gaming devices**

Source	Type III Sum of squares	df	Mean square	F	Sig.	Partial Eta Squared
Corrected Model	42896.30 <sup>a</sup>	6	7149.38	16.91	.00	.103
Intercept	1291612.52	1	1291612.5	3056.17	.00	.776
Gadgets	42896.30	6	7149.38	16.91	.00	.103
Error	373176.57	883	422.62			
Total	2761048.00	890				
Corrected Total	416072.88	889				

<sup>a</sup> R Squared = .103 (Adjusted R Squared = .097)

Dependent Variable: %Participants' results of VLT in % <sup>b</sup>

On the Tukey HSD Post Hoc table (Table 56) the specific group differences are readable, i.e., there is an insignificant difference between the non-gamer (control) group and the users of 'smartphone / tablet', 'consol' and 'smartphone + consol'. The results showed significant differences between the non-gaming (control) group and the computer-using group,  $F(6, 883) = 16.91, p = .00$ , and between the non-gaming (control) group and the smartphone + computer + consol user group,  $F(6, 883) = 16.91, p = .00$ , as well as between the non-gaming (control) group and the computer + consol user group,  $F(6, 883) = 16.91, p = .00$  (Table 56).

**Table 56. Multiple Comparisons (Tukey HSD) of the groups of gaming devices**

(I) Grouped Game Types	(J) Gadgets	Mean Diff. (I-J)	Std. Error	Sig.	95% Confidence Interval	
'control group'	Smartphone / Tablet	-4.09	2.43	.62	-11.28	3.10
	Computer	-15.62*	1.79	.00	-20.92	-10.33
	Console	-9.82	3.19	.06	-19.25	-.39
	Sm. Ph. + Comp.+ Consol	-13.79*	2.17	.00	-20.14	-7.28
	SmartPh. + Consol	-6.64	3.71	.55	-17.62	4.34
	Computer + Consol	-21.13*	3.81	.00	-32.40	-9.87

Based on observer means.

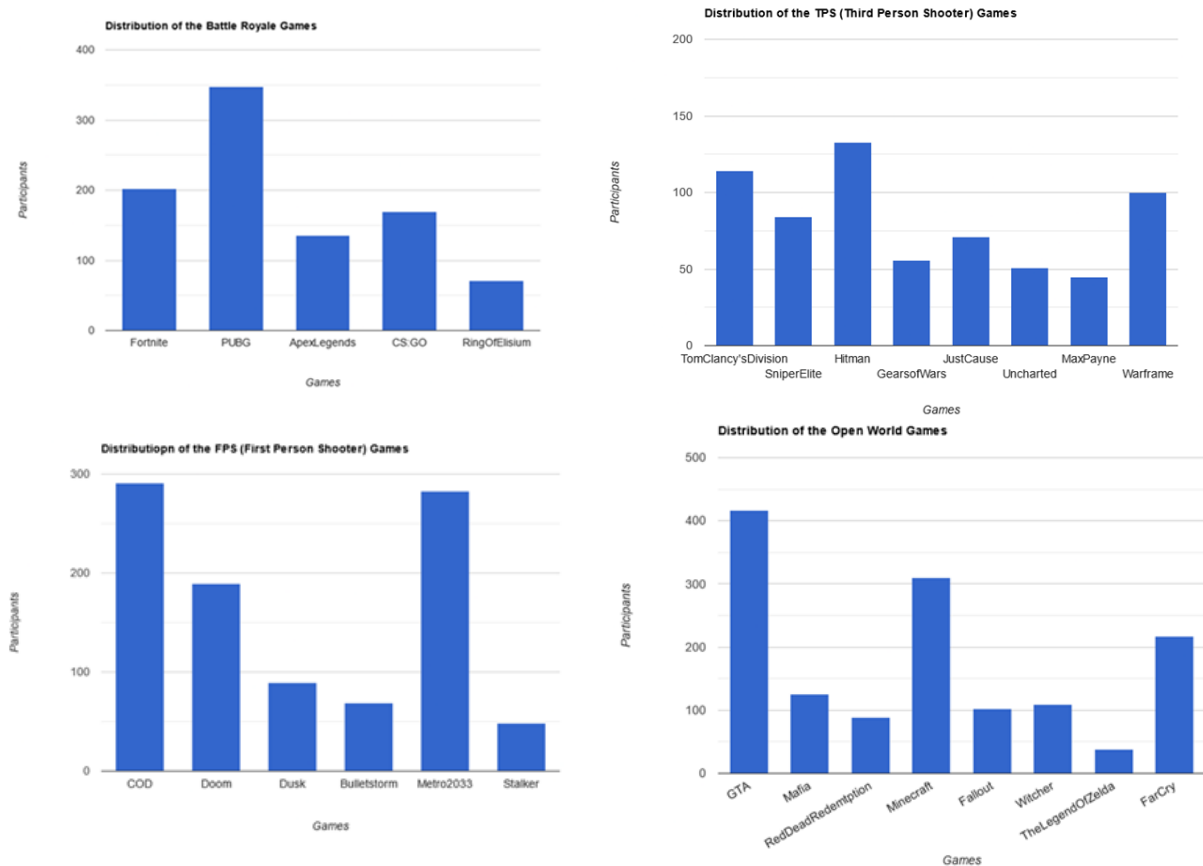
The error term is Mean Square (Error) = 436.16

\*The mean difference is significant at the .05 level.

#### 4.2.1.6. Players with the highest VLT scores by video game type

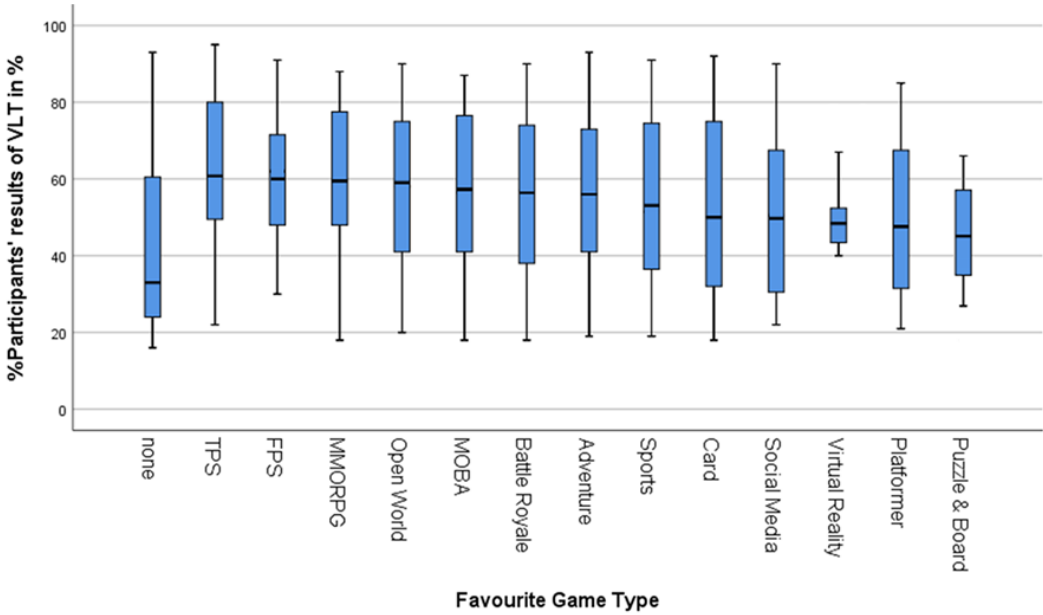
The subsequent part of the study focuses on finding the most effective video game types related to the VLT results, in which the VLT results of the participants' grouped favourite game types was compared with the VLT results of the non-gamers (control) group. Participants were asked to select one game from each video game type listed in the questionnaire that they play (or none if they do not play that type of game) and indicate which one they play most often. The explanation of the questionnaire emphasized that the answer should only include the recently played video games from every game type, since the video gamer usually plays more than one game at a time. The distribution of the most chosen (played) and favoured video game types shows assorted options for grouping (Table 57).

**Table 57. Examples of the distribution of the most played games by game types**



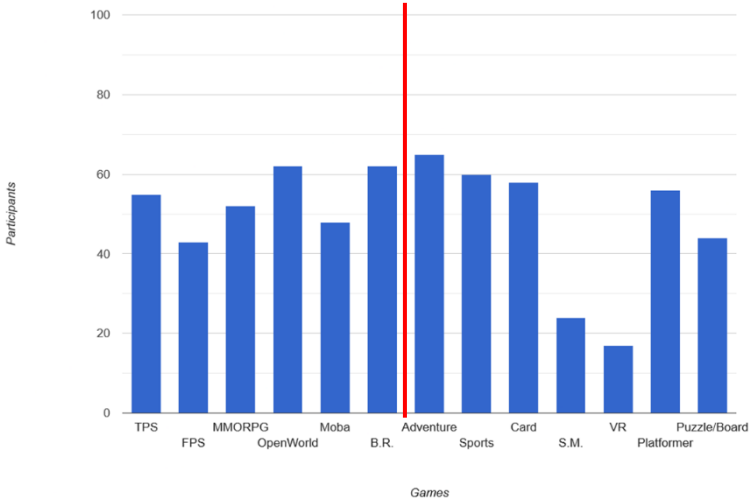
The tendency of means by video game types is shown in Table 58 and Table 59, although statistical calculations cannot be performed. Hence, the game types must be first arranged into groups to calculate their average means to provide the basis for comparison with the control group.

**Table 59. Boxplot of means of the favourite game types**



Therefore, after having labelled the game types, these were classified into ‘cooperative’ and ‘single player’ groups. The cooperative here means that these game types have an online multiplayer mode, their players can communicate with each other verbally and a co-op mode is also available. On the other hand, the single player game types implies that they are mostly played by a single person or at the same physical location with another (non-English speaker) player (Table 60).

**Table 60. Bar chart of distribution of the most favourite game types**



The adventure and the sports games were classified into the single player, because although these can be played online, e.g., FIFA, with less communication than at an FPS, MOBA or MMORPG, most of the gamers play them individually at home. Therefore, these games were included into the single player group. The function of grouping video game types that are

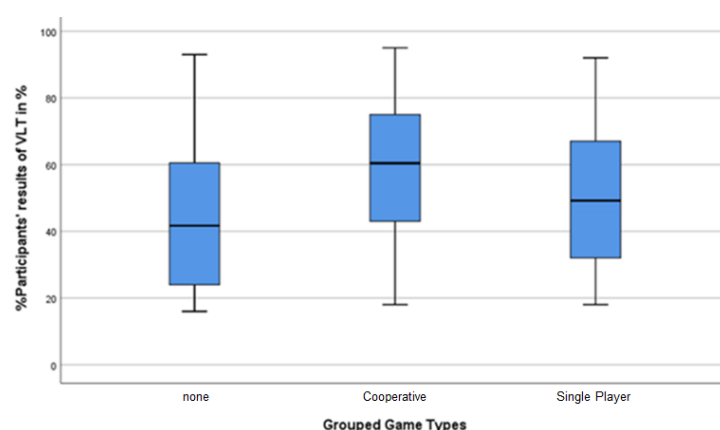
similar in nature, i.e., playable online with other English-speaking players, is to aggregate their mean numbers. Also, video games, which can be played in English without the option of online communication, were placed in another group to calculate their aggregated means to the non-gamer (control) group (Table 61). The difference among the grouped means is detectable in the boxplot diagram (Table 62).

**Table 61. Accumulated descriptives of game types of the VLT results**

game type	Cooperative <sup>a</sup>	Single player <sup>b</sup>	Non-gamers	Total
Mean	61.68	51.42	42.08	51.33
St. dev.	18.26	23.34	22.30	21.63
N	387	259	244	890

- a). Group of collectively playable interactive games with the possibility of the online communication with foreign gamers (in English).  
 b). Group of multi-, or single-player games without the possibility of online communication (couch-, or local-multiplayer).

**Table 62. Boxplot of means of the grouped game types**



An ANOVA analysis was conducted to assess the impact of various game types. Having calculated the K-S normality test of the dataset of non-gamer (control) group, it was found that,  $D(244) = .18, p = .00$  violates the assumption of normal distribution, consequently it is not normally distributed. The rest of the variables, ‘cooperative’ games  $D(101) = .11, p = .20$ , ‘single player’  $D(286) = .12, p = .10$ , are normally distributed (Table 63).

**Table 63. K-S test of normality of the grouped game types**

Participants results of	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
VLT in %?						
Cooperative	.113	387	.200*	.965	387	.108
Single player	.129	259	.106	.945	259	.061
Non-gamers (no)	.181	244	.000	.883	244	.000

\*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

The homogeneity of the variances assumption is required to run the proper test, because the sample sizes of the groups of gadgets used for gaming diverge. Therefore, the Levene’s test for equality of variances is calculated which shows that the variances were not equal,  $F(2, 887) =$

58.98,  $p = .00$ . The significant  $p$ -value suggests that the assumption of the homogeneity of variances is not met (Table 64), therefore the Games-Howell non-parametric test must be used.

**Table 64. Levene's Test of Equality of Error Variances<sup>a,b</sup> of the grouped game types**

%Participants' results of VLT in %	Levene Stat.	df1	df2	Sig.
Based on Mean	19.37	2	887	.000
Based on Median	12.53	2	887	.000
Based on median and adj. df.	12.53	2	818.103	.000
Based on Trimmed Mean	18.08	2	887	.000

Tests the null hypothesis that the error variance of the dependent variable is equal across groups

a. Dependent variable: % Participants' results of VLT in %

b. Design: Intercept + Grouped game types

in the ANOVA table (Table 65) the between-groups and within-groups variability is apparent, the higher  $F$ -ratio indicates larger differences among group means relative to within-group variability. The  $p$ -value is below the .05 significance level which suggests that the mean of at least one group of grouped 'game types' is significantly different.

**Table 65. Tests of Between-Subjects Effects (ANOVA) of the grouped game types**

Source	Type III.			F	Sig.	Partial Eta Squared
	Sum of squares	df	Mean square			
Corrected Model	48843.96 <sup>a</sup>	2	24421.98	58.98	.00	.11
Intercept	2131060.49	1	2131060.49	5147.04	.00	.85
GroupedGameTypes	48843.96	2	24421.98	58.98	.00	.11
Error	367228.91	887	414.01			
Total	2761048.00	890				
Corrected Total	416072.88	889				

<sup>a</sup> R Squared = .99 (Adjusted R Squared = .97)

Dependent Variable: %Participants' results of VLT in % <sup>b</sup>

On the Games-Howell Post Hoc table (Table 66) the specific group differences are straightforward, i.e., there is an insignificant difference between the non-gamer (control) group and the single player group. The results showed non-significant differences between the non-gaming (control) group and the single player group,  $F(2, 887) = 58.98, p = .06$ . However, there is a significant difference between the cooperative group and the single gamer group,  $F(2, 887) = 58.98, p = .00$ , and between the control group and the cooperative group  $F(2, 887) = 58.98, p = .00$  (Table 66).

**Table 66. Multiple Comparisons (Games-Howell)**

(I) Grouped Game Types	(J) Grouped Game Types	Mean Diff. (I-J)	Std. Error	Sig.	95% Confidence Interval	
Non-Gamer	Cooperative	-19.60*	1.58	.00	-21.79	-14.34
	Single player	-9.34*	1.93	.06	-15.62	-6.51
Cooperative	Non-Gamer	19.60*	1.58	.00	14.34	21.79
	Single Player	10.26*	1.72	.03	2.95	11.05
Single Player	Non-Gamer	9.34*	1.93	.06	6.51	15.62
	Cooperative	-10.26*	1.72	.03	-11.05	-2.95

<sup>a</sup> R Squared = .99 (Adjusted R Squared = .97)

Dependent Variable: %Participants' results of VLT in % <sup>b</sup>

\*. The mean difference is significant at the .05 level.

The Partial Eta squared, which measures the proportion of the total variance in a dependent variable and is related to the video game types in the video gamer groups defined by the independent variable, in this case  $\eta^2 = .11$ , which indicates a large effect (Table 65).

### **4.3. Statistical outcomes of Study 2**

#### **4.3.1. Cases of the Inhibition and lexical retrieval**

This part of the research was administered as an independent study, although the participants were from the same area, but only from two out of the previously scrutinized five schools. The present study relates to the main interest of the research, to retain the structure of the study the data related to the main research will be explained in the discussion part. For all further interference analyses, the indicator of the ST effect size was used. The indicators of the ST effect were computed by subtracting the RT of the congruent cases from the RT of the incongruent cases for each participant and these became the outcome variable. The means of the ST effect of both congruent and incongruent cases were compared in the grouped cases of the independent variables, i.e., the video gamers to the non-gamers, to reveal their impact on cognitive abilities.

#### **4.3.2. Findings of the Stroop test**

First, the percentages of the errors were downloaded and these suggest a negligible variation in both groups (smaller than 4% on average), in the non-gamer group – 2.8% at the congruent L2, 4.8% at the incongruent L2 (intralingual condition), while 3.5% at the congruent L2-L1 and 5.1% at the incongruent L2-L1 (interlingual condition); and in the video gamer group – 1.6%, at the congruent L2, 3.3% at the incongruent L2 (intralingual condition), and 3.9% at the congruent L2-L1, 4.9% at the incongruent L2-L1 (interlingual condition). The means of RT of the congruent and incongruent cases, standard deviation, and means of the interference effects are presented in Table 73. The percentage of the intralingual and interlingual effect ranges between 70%-75%. Also, the video gamer participants are slower in both L1 and L2 cases, because the higher proficiency means that the brain must choose from more words and this increases the interference, so they are slower, as expected. The descriptives (Table 67) and the histograms are not clearly showing the normality of the datasets (Table 68); therefore, the test of normality must be calculated (Table 69).

**Table 67. Mean ST reaction times in seconds and the calculated interferences**

Test	Mean	SD	N	min.	max.	range
ST Video gaming habit (yes)						
Congruent	39.88	9.90	92	19.46	52.39	32.93
Incongruent	101.69	19.60	92	82.00	141.12	59.12
Intralingual interference	63.47	10.79	92	45.04	85.54	40.50
Interlingual interference	45.96	12.00	92	26.56	66.52	39.96
ST Video gaming habit (no)						
Congruent	41.05	12.85	65	20.06	53.21	33.15
Incongruent	102.89	22.03	65	85.26	149.54	64.28
Intralingual interference	60.68	12.71	65	38.74	83.01	44.27
Interlingual interference	41.73	10.14	65	21.84	63.01	41.17

Note. Total N = 157.

Having calculated the K-S normality test of the intralingual dataset of the gamer group, it was found that  $D(92) = .06, p = .18$ , which does not violate the assumption of normal distribution, consequently it is normally distributed. Regarding to the intralingual dataset of the non-gamer group  $D(65) = .09, p = .20$ , which means it is also normally distributed. The dataset of the interlingual dataset of the gamer group, found that  $D(92) = .09, p = .20$ , which does not violate the assumption of normal distribution, so it is normally distributed. As well as the interlingual dataset of the non-gamer group, where  $D(65) = .06, p = .20$ , which means it is also normally distributed. (Table 69).

**Table 69. K-S test of normality of the Stroop groups**

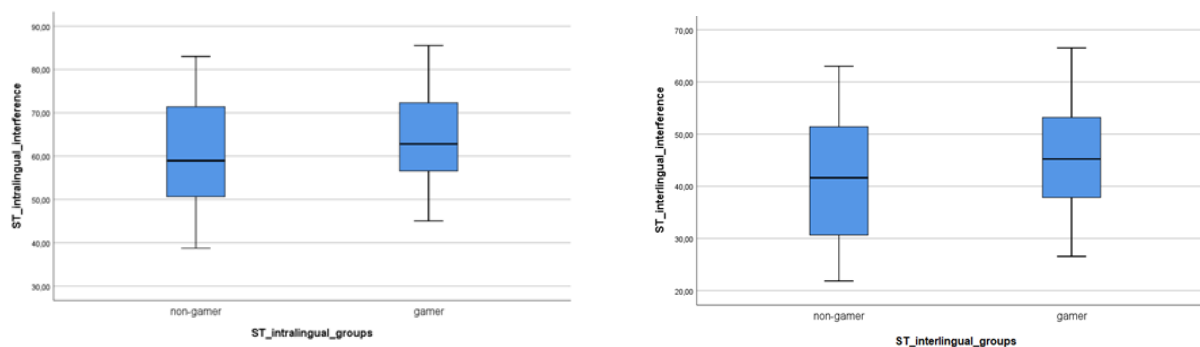
Test	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Intralingual_gamer	.067	92	.182	.957	92	.054
Intralingual_non-gamer	.099	65	.200*	.980	65	.161
Interlingual_gamer	.093	92	.200*	.958	92	.082
Interlingual_non-gamer	.069	65	.200*	.978	65	.130

\*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

The difference between the means of the groups can be seen in the box plot diagrams which also indicates the assumption of homogeneity of variances (Table 70).

**Table 70. Boxplots – Means of the Stroop test interlingual and intralingual interferences by groups**



The means of the interference scores were compared using a t-test between the interference effects of the gamer and the non-gamer group to answer the main research question. In the intralingual cases, the non-significant *p*-value indicates that the assumption of homogeneity of variances is met (Table 71). Video gamer intralingual interference was insignificantly higher ( $M = 63.47$ ,  $SD = 10.79$ ) than found in the non-gamers ( $M = 60.68$ ,  $SD = 12.71$ ),  $t(155) = -1.74$ ,  $p = .08$  (Table 72).

**Table 71. Independent Samples Test of the intralingual cases**

		Levene's E. of V.*		t	df	Sig (two tailed)	Mean diff.	Std. error diff.	95% conf. interval	
		F	Sig.							
Intralingual interferences	Equal variances assumed	7.49	.07	-1.74	155	.08	-3.17	1.81	-6.76	.41
	Equal variances not assumed			-1.67	116.91	.09	-3.17	1.89	-6.92	.57

\*Equality of Variances

**Table 72. Independent Samples Test of the interlingual cases**

		Levene's E. of V.*		t	df	Sig (two tailed)	Mean diff.	Std. error diff.	95% conf. interval	
		F	Sig.							
Interlingual interferences	Equal variances assumed	2.96	.08	-2.38	155	.01	-4.22	1.77	-7.73	-.72
	Equal variances not assumed			-2.31	122.88	.02	-4.22	1.82	-7.84	-.61

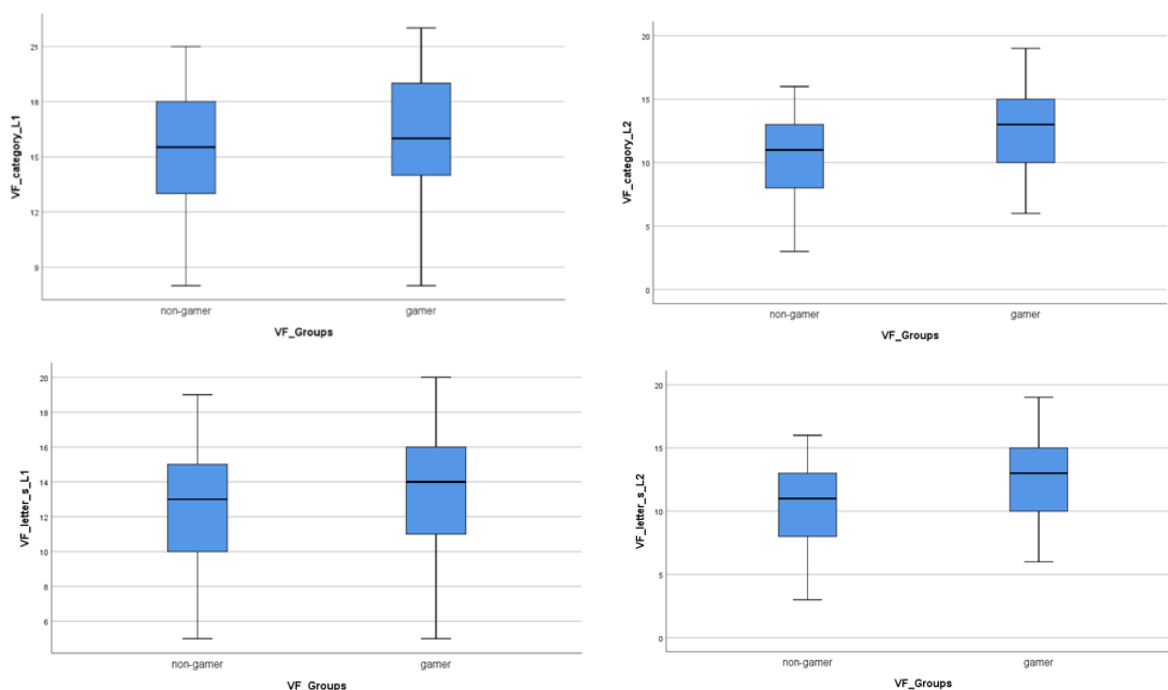
\*Equality of Variances

In the interlingual cases, the non-significant *p*-value suggests that the assumption of homogeneity of variances is met (Table 66). The video gamers' interlingual interference was significantly higher ( $M = 45.96$ ,  $SD = 12$ ) than the non-gamers' ( $M = 41.73$ ,  $SD = 10.14$ ),  $t(155) = -2.38$ ,  $p = .01$  (Table 72).

#### 4.3.3. Findings of verbal fluency test

The VFT category and the VFT letter [s] cases were used as two different outcome variables to calculate the difference between the performance, i.e., number of pronounced items, of the video gamer and the non-gamer participants, to find out their relationship for answering the main research question. The boxplot diagrams are clearly showing the differences of the means of the VFT groups of the category and letter cases (Table 75). As it is clearly seen on the boxplot diagrams, the video gamers gave more answers than the non-gamers in all conditions, although this does not mean that their accumulated performance was significantly better. The descriptives (Table 76) and the histograms are not clearly showing the normality of the datasets (Table 73, 74); therefore, the test of normality must be calculated (Table 77). The difference between the means of the groups can be seen in the box plot diagrams, which also indicates the assumption of the homogeneity of variances (Table 75).

**Table 75. Boxplots – VFT category and letter ‘s’ groups L1 & L2**



Having calculated the K-S normality test of the VFT category L1 of the gamer group, it was found that  $D(92) = .10, p = .07$ , which does not violate the assumption of normal distribution, consequently it is normally distributed. Regarding to the VFT category L1 of the non-gamer group  $D(65) = .09, p = .05$ , which means it is normally distributed. The dataset of the VFT category L2 dataset of the gamer group is  $D(92) = .08, p = .20$ , which does not violate the assumption of normal distribution, so it is normally distributed. As well as the VFT category L2 dataset of the non-gamer group  $D(65) = .10, p = .09$ , which means it is also normally distributed. (Table 83).

**Table 76. Mean VFT scores of the groups of the gamers and non-gamers**

Test	Languages					
	L1			L2		
	Mean	SD	N	Mean	SD	N
VFT category (veg.)**						
Video gaming habit (yes)	16.21	3.03	92	12.70	3.29	92
Video gaming habit (no)	15.48	3.12	65	10.37	3.19	65
VFT letter [s]**						
Video gaming habit (yes)	13.46	3.65	92	12.85	3.18	92
Video gaming habit (no)	12.68	3.36	65	10.23	3.25	65

Note. \*\*VFT test: The higher score is the better. Veg. = vegetables

Having calculated the K-S normality test of the VFT letter L1 of the gamer group, it was found that  $D(92) = .08, p = .20$ , which does not violate the assumption of normal distribution, consequently it is normally distributed. Regarding the VFT letter L1 of the non-gamer group,  $D(65) = .10, p = .09$ , which means that is normally distributed. In the dataset of the VFT letter

L2 dataset of the gamer group  $D(92) = .08, p = .20$ , which does not violate the assumption of normal distribution, so it is normally distributed (Table 77).

**Table 77. K-S test of normality of the VFT groups**

Test	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
VFT category gamer L1	.105	92	.073	.967	92	.007
VFT category non-gamer L1	.098	65	.057	.973	65	.050
VFT letter 's' gamer L1	.087	92	.200*	.974	92	.060
VFT letter 's' non-gamer L1	.100	65	.181	.971	65	.039
VFT category gamer L2	.089	92	.200*	.973	92	.050
VFT category non-gamer L2	.101	65	.095	.966	65	.038
VFT letter 's' gamer L2	.084	92	.200*	.975	92	.070
VFT letter 's' non-gamer L2	.103	65	.083	.968	65	.035

\*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

As well as in the VFT letter L2 dataset of the non-gamer group,  $D(65) = .10, p = .08$ , which means that it is also normally distributed. (Table 77).

**Table 78. Independent Samples Test of the VFT L1 category cases**

		Levene's E. of V.*				Sig (two tailed)	Mean diff.	Std. error diff.	95% conf. interval	
		F	Sig.	t	df					
VFT L1 category	Equal variances assumed	.43	.51	-1.39	155	.16	-.73	.52	-1.76	.30
	Equal variances not assumed			-1.40	142.41	.16	-.73	.51	-1.75	.29

\*Equality of Variances

The means of the interference scores were compared using a t-test between the VFT category L1 and L2 cases of the gamer and the non-gamer group. In the VFT category L1 samples, the non-significant  $p$ -value indicates that the assumption of homogeneity of variances is met (Table 78). The mean of the video gamer VFT category L1 cases was not significantly higher ( $M = 16.21, SD = 3.03$ ) than found in the non-gamers ( $M = 15.48, SD = 3.12$ ),  $t(155) = -1.39, p = .16$  (Table 78). In the VFT category L2 cases, the non-significant  $p$ -value suggests that the assumption of homogeneity of variances is met (Table 79). The mean of the video gamers VFT category L2 samples was significantly higher ( $M = 12.70, SD = 3.29$ ) than the non-gamers' ( $M = 10.37, SD = 3.19$ ),  $t(155) = -4.41, p = .00$  (Table 79).

**Table 79. Independent Samples Test of the VFT L2 category cases**

		Levene's E. of V.*				Sig (two tailed)	Mean diff.	Std. error diff.	95% conf. interval	
		F	Sig.	t	df					
VFT L2 category	Equal variances assumed	.204	.65	-4.41	155	.00	-2.32	.52	-3.36	-1.28
	Equal variances not assumed			-4.43	140.42	.00	-2.32	.52	-3.36	-1.29

\*Equality of Variances

The means of the VFT letter 's' L1 and L2 cases were compared using a t-test between the gamer and the non-gamer group to answer the main research question. In the VFT letter 's' L1

cases, the non-significant  $p$ -value indicates that the assumption of homogeneity of variances is met (Table 80). The difference between the video gamer ( $M = 13.46$ ,  $SD = 3.65$ ) and non-gamer ( $M = 12.68$ ,  $SD = 3.36$ ) VFT letter ‘s’ L1 cases was not significant,  $t(155) = -1.35$ ,  $p = .17$  (Table 80).

**Table 80. Independent Samples Test of the VFT letter ‘s’ L1 cases**

		Levene's E. of V.*				Sig (two tailed)	Mean diff.	Std. error diff.	95% conf. interval	
		F	Sig.	t	df					
VFT letter 's' L1	Equal variances assumed	.59	.44	-1.35	155	.17	-.78	.57	-1.91	.35
	Equal variances not assumed			-1.37	145.03	.17	-.78	.56	-1.89	.33

\*Equality of Variances

In the VFT letter ‘s’ L2, the non-significant  $p$ -value suggests that the assumption of homogeneity of variances is met (Table 81). The video gamers’ VFT letter ‘s’ L2 mean was significantly higher ( $M = 12.85$ ,  $SD = 3.18$ ) than the non-gamers’ ( $M = 10.23$ ,  $SD = 3.25$ ),  $t(155) = -5.00$ ,  $p = .00$  (Table 81).

**Table 81. Independent Samples Test of the VFT letter ‘s’ L2 cases**

		Levene's E. of V.*				Sig (two tailed)	Mean diff.	Std. error diff.	95% conf. interval	
		F	Sig.	t	df					
VFT letter 's' L2	Equal variances assumed	.80	.77	-5.00	155	.00	-2.61	.52	-3.65	-1.58
	Equal variances not assumed			-5.02	139.82	.00	-2.61	.52	-3.64	-1.58

\*Equality of Variances

#### 4.4. Study 3: Video-gaming words recycled, a qualitative study

##### 4.4.1. Findings of the interviews

Low-frequency words and phrases from video games also appear in social network conversations written by video gamers. The video gaming expressions are used more frequently nowadays, since the number of active gamers is growing, as well as that of the classic game specified parlance mostly used by hard-core gamers in various out-of-game communication. Such video gamer parlance occurs in several social network comments in written forms, podcasts, or real-life conversations in audio forms, thus they can be examined efficiently. Furthermore, there are traceable effects of the video gaming on a secondary school students’ online and offline conversational habits with special regard to translanguaging, diglossia and bidialectalism. Therefore, the volunteered students submitted for examination as numerous video game related words and phrases they could from ‘gamer365.hu’ blogsite (Gamer365, 2021) and ‘Kjúbcast’ (Kjúbcast, 2021) gamer podcast sites. The words were collected from the following games: *The League of Legends* from MOBA, *The Walking Dead – (Telltale)* from adventure, and *FIFA* and *FI* from sports games, because these games promoted different

communicative skills. The proper nouns were removed, i.e., the names of the places or figures, F1 races, or teams, to favour the concrete nouns, verbs, or adjectives. After pre-categorization, the students allocated 60 'word-families' from each game category (3x60=180 items), which consisted of nouns, verbs, and adjectives. The students found occurrences where the meaning was clearly implied, although some single word examples were hard to unravel without reference to any game. There were many recurring instances, but eventually, 73 expressions were found as significant examples.

Having completed this list of the low-frequency video gamer words that the video gamer volunteering students frequently re-use in their real-life communications allowed to continue the qualitative part of the research by interviewing the hard-core and the casual gamers to confirm the usage and the variation of the grammatical utilization of the samples, which could be accounted for when assessing the gamer argot linguistically. Therefore, online interviews took place with the volunteer students to discuss the linguistic nature of the collection of low-frequency words from the 180 entries. In the discussions conducted according to the logic of the research questions, the specific local semantic and morphological uses of the obtained written examples (Table 86) were discussed. A year later, the online interviews were unnecessary, due to the end of the lockdown, so verbal discussions were held in the schools during which the latest changes and novel words were reviewed (Table 87), so the 180 entries were reduced due to recurring morphological and grammatical cases. The video gamer students provided further assistance by creating a glossary containing the 73 examples (Table 85). The grammatical usage of the words in the example sentences are detailed in the discussion part.

## CHAPTER FIVE

### DISCUSSION

#### 5.1. Generic objective of the discussion of the findings of Study 1 and Study 2

This dissertation with all its calculations could serve as a modern, flexible framework for cooperation, focusing on shared linguistic interests, like securing high-frequency word knowledge with shared focus of the morphological development of novel low-frequency words. What if the real future of video game related research does not lie in resurrecting the past, but in reimagining it for a new era? The pieces are there, the question is whether the leading video game related research of the future participants will make that leap. Primarily, the importance of monitoring the information of the (English) language acquisition in comprehensive quantitative research is twofold: first, whether the Hungarian video gamer ESL secondary school students have measurable receptive vocabulary advantage regarding high-frequency words as found a study in another non-native English speaker country (Sylvén & Sunquist, 2012). Second, as it has been recorded in studies which researched the effect of video gaming on its users' vocabulary knowledge and management (Al-Jifri 2017, Eisenclas, Schalley & Moyes 2015, Thompson & von Gillern 2020, Peterson 2013 and Cabraya 2016, Pettersen 2019, Horowitz 2019). Moreover, in the qualitative research, the study presents a collection of video game related glossary practiced by local video game players, data which can be valued in a multicultural and multilingual environment. However, there are common language environments for students, such as the classroom, must-see videos and movies, must-read articles and books, from which this research sets its benchmark. Therefore, the reference to the norm in this research is the CEFR-B1 level, with reference to the communicative language activities and strategies (Milton & Alexiou, 2009), that are aimed to illustrate the B1 proficiency level and exemplifies the language items to model their usage (Szilagyi, 2020).

The first valuable information is the proportion of the students studying different foreign languages apart from English (63%) in the studied schools, namely 23% German and the remnant 14% is shared among French, Russian, Croatian language learners, which is in tally with the findings of Dörnyei et al. (2006) and Csizér and Lukács (2010). The percentages suggest that the students of this region meet the same conditions as the students nationwide in Hungary. The English language here is learned, known, and practiced by a high percentage of schoolchildren, owing to their favourite activities usually conducted in English, like watching films, listening to music videos (Marone, 2018) and playing video games (Sylvén & Sundquist, 2012; Roach & Utami, 2017; Acquah & Katz, 2020).

The ratio of players to non-players is striking, namely the video gamer group consisted of 72.4% of the students and the non-gamer 27.6% respectively. 83.3% of the video gamer participants prefer to play games in English, which confirmed the findings about the proportion of video gamers in other countries (Fitzgerald, 2019; Cabraja, 2016). Furthermore, these results go beyond previous reports (e.g. Al-Jifri, 2017; Piirainen-Marsh & Tainio, 2009; Sylvén & Sundquist, 2012), showing that 58% of the video gamers acquire their word knowledge primarily from video games. Further 16% are watching movies in English and 10% voted for video clips as a means of learning words, which is in line with the research argument of Reinders and Wattana (2011). Reading books (4.2%) and school L2 learning (5.8%) are preferred by a margin of the participants and these findings are in accordance with other findings (Acquah and Katz, 2020). All the mentioned activities may strengthen the young individual's instrumental motivation as well as their intention to cooperate with English speaking/user social groups, a fact which encourages their integrative motivation (Dörnyei & Ushioda, 2013).

### **5.1.1. Discussion of the VLT difference between gamers and non-gamers**

Answering the research question: Is there a significant difference between the VLT scores of the participating video gamers and non-gamers?

According to the results, there is a significant difference between the VLT scores of the participating video gamers and that of non-gamers. Test statistics confirm that the researched video gamers' high-frequency vocabulary knowledge is significantly greater than that of their non-gamers' peers. The strength of the effect is  $r = .27$ , and because the amount of  $r$  is less than 0.3, it means that the video gaming has a weak impact on the VLT results. However, it must be noted that the observed  $r$  amount is noticeably close to the border of the medium effect, which is confirmed by the regression calculation.

- The hypothesis was confirmed, so the members of the video game group could acquire a large number of high-frequency words to the benefit of the size of their receptive vocabulary. 83% of the video gamer participants favour playing games in English, which proves that English is a particularly useful language for them. The finding of this calculation is in tally with the findings of Al-Jifri (2017), Eisenclas, Schalley & Moyes (2015), Thompson & von Gillern (2020), Piirainen-Marsh & Tainio (2009), Reinders and Wattana (2011), Sylvén & Sundquist (2012), Cabraja (2016), Horowitz (2019) and Pettersen (2019), who observed that the video game players use the video game activity to exercise several TLU domains through video

games. This computer-generated simulation area also promotes incidental vocabulary learning (Calvo-Ferrer & Belda-Medina, 2021) and seems to be a cornucopia of the high-frequent words and expressions presented in an organized way, which implies that the video games may offer different variations of a single expression (Nindyaputri, 2017; Hartanto, 2018; Rodgers and Heidt, 2020). This also validates why 58% of the participating video gamers favour to extend their school English with video game play. This engaging incidental L2 learning event offered by video games is an enjoyable, effortless, and voluntary activity that supports comprehension and repetition of written and verbal TLU domains (Acquah and Katz, 2020). As can be seen from the result, the video gamers may experience that the more diverse their vocabulary, which is also the basis for higher proficiency (de Haan et al. 2010), the greater the chance of winning an expected reward (Berridge, 2001), which may also function as instrumental motivation (Dörnyei & Ushioda, 2013). Furthermore, the results show that video games effectively support language learning, as this activity provides opportunities for both procedural and declarative learning (Dienes & Perner, 2002; Rose, Haider & Buchel, 2010), as parental play for children (Tomasello & Farrar, 1986; Kristen et al., 2012).

The regression is computed to determine that those participants who play video games perform 10.3% better on VLT than their non gamer peers. Individual contribution of the variable in the model reveals that if there is no video gaming involvement, an average of 42.07 % of the maximum score can be reached in the VLT test, which in turn signifies a 1,500-word level. On the other hand, if a person starts playing video games, s/he can obtain 14.46 % higher score in a VLT test, which shows a 2,000-word level. That extra 15% of the test scores means that on average a gamer knows 500 high-frequency words more than a non-gamer.

All the results can be considered as a promising progress in clarifying the impact of video gaming activity on high-frequency vocabulary advantage caused by video gaming activity as part of language learning.

### **5.1.2. Discussion of findings of gender and watching films in English**

Answering the research question: Is there a significant difference between the VLT scores of the female and male participants? No, there was no significant difference between the VLT scores of the female and male participants.

Pertaining to the gender, the results indicated that there was no significant difference between the VLT results of the groups of 'Female' and 'Male' students in the studied secondary school population. The  $r = .05$ , which indicates a weak effect.

Answering the research question: Is there a significant difference between the VLT results of the ‘watching videos in English’ group and the control group?

No, the VLT results of the groups of ‘Watching films in English’ and the control group have no significant difference in the studied secondary school population. The results indicated that there was no significant difference between the VLT results of the group of ‘Watching film in English’ and the control group, in the studied secondary school population. The  $r = .07$ , which shows a weak effect.

- The hypothesis is refused, because the VLT results of video gamers and those who watch movies in English differ.

The teenagers in this area like watching films (16%), listening to music videos (10%) in English (Marone, 2018), which facilitate their claim to learn and understand the performers’ words, sentences, and the message of the artists. Yet, it is notable that in this research the non-interactive activity could not contribute to high-frequency English literacy significantly (Sylvén & Sundquist, 2012).

### **5.1.3. Discussion of the findings of the participants’ English grades, time spent on gaming, and parental SES**

In the following results the relationships of the correlations are showed with regard to the time spent on video game play, the participants SES and their English grades with the participants’ VLT outcomes. The additional environmental influencing factors in L2 English vocabulary acquisition are important to assess because their statistical results may further enlighten the linguistic analyses.

Answering the research question: Do the participants’ English grades correlate with their VLT results? Yes, the correlation is significant.

The correlation coefficient describes the strength and the direction of a relationship between variables of the participants’ English grades, where the contingency is strong. Partial Eta squared measures the proportion of the total variance of a dependent variable that is associated with SES in all VLT outcomes determined by the independent variable, in this case  $\eta^2 = 0.10$ , indicating a strong effect.

According to the findings, the participants’ English grades correlate significantly and strongly with their VLT test results, ( $r = .88$ ), which means a strong influence. The results of the correlation indicate that since the VLT instrument only measures individuals’ high-frequency word knowledge, thus the high-frequency word knowledge is a prerequisite for better grades.

The good grades are also signifying the mastery of the effective communicative competence of the learners, a competence that may be necessary for an on-site learning (Pence & Macgillivray, 2008), or to achieve academic involvement (Caldas & Bankston, 2004; Chiu, 2007; Tomul, 2008), where accurate and confident English is crucial.

Answering the research question: Is there a difference between participants VLT results with different SES background?

- The hypothesis was verified, because if the student's parental SES is higher the level of the receptive vocabulary is also more advanced.

The correlation was calculated to review the strength of the effect of SES, which is medium ( $r = .33$ ). The between-groups comparison of the means of the SES groups with the non-gamer (control) group showed significant differences between the non-gaming (control) group and the low SES group, between the non-gaming (control) group and the high SES group. The mean of the middle SES group VLT scores does not differ significantly from the mean of the VLT scores of the non-gamer (control) group. The results of the calculations mean that the participants of the low SES cases are significantly underperformed compared even to the performance of the non-gamer (control) group, and although the middle SES group is overachieving the non-gamer (control) group, the difference is insignificant. This means that the advantage of the middle and high SES does not yield straight forward high-frequency word knowledge, but the connection is observable, thus the SES is still one of the main influencing factors of L2 language learning (Butler, 2015; Butler & Le, 2018).

The finding is in tally with data highlighted in Dixon and Daraghmeh's (2012) and Lindholm-Leary's (2017) research. It is confirmed that the children with higher parental SES can acquire a higher L2 vocabulary level, which in turn may be reflected in their VLT results. As a support of this, there are studies that have examined the relationship between SES and L2 vocabulary knowledge. As expected, children with middle and high SES showed higher English high-frequency word knowledge than in the low SES participants' cases as pointed out in Dixon and Daraghmeh's (2012) and Lindholm-Leary's (2017) research. However, the previously reported findings of Volodina, Heppt & Weinert (2021) could not be compared, who examined the effects of out-of-school language management like the proportion of minority (L1) and majority (L2) language use, because there was no question about minority language use in the survey, thus the SES and the minority language use cannot be related. Owing to the minority situation of the researched area these results suggest that the minority language users ought to be the low SES cases. Additionally, this study reached a similar conclusion to Pace et al. (2017), as SES

influences second language development, for example, through children's environmental support.

The parents' income level was positively associated with the participants' VLT performance in English, which may be related to parents having high expectations about their children's ability to learn a foreign language in English, as stated by other findings (Steven & Stigler, 1992; Butler, 2015; Butler & Le, 2018). In addition, parents with higher income can afford a balanced care and spending more time with their children (Hill & Tyson, 2009). Though this study offers no definite cause and effect relationship between SES and students' further education, some of the findings give an indication of areas that may clarify how EFL may help planning tertiary education. This result can also be explained by the fact that the more expensive equipment required for the FPS, TPS or MOBA games gives the participants more opportunity to cooperate in English and thus to be exposed to more extensive vocabulary acquisition and usage. It was found that the complexity of video gaming influences young learners' English learning and motivation over time, which largely prevails a game-based mindset in areas requiring L2 learning and use. For instance, the higher SES children may have a greater preference for cooperative games (FPS, TPS, Adventure etc.), indicating their need for greater autonomy and a lower degree of parental involvement. The gadgets used for gaming connect firmly with the SES, because the better parental SES assumes better or rather more expensive devices.

Answering the research question: Does the 'time spent on video game play' correlate with the participants' VLT results? Yes, it correlates with the VLT results, although the relationship is weak.

- The hypothesis was confirmed, if the time spent playing video games grows, the number of acquired-practiced high-frequency words also increase.

The correlation coefficient of the 'time spend on gaming' indicates a weak relationship ( $r = .25$ ), meaning that the two variables follow each other up to a certain point after which the VLT results no longer rise. There have been different approaches to video gaming time in the research literature, e.g., Pujol et al. (2016) talks about weekly 9 hours that cause negative implications in children, although Király et al. (2017) cannot determine intense gaming time which can otherwise be essentially problematic, and these could be important to correctly interpret the results. Therefore, these results only provide evidence of that the participating students reported 27-30 hours of video game time per week, although most of this occurred on weekends, and exceeding this time beyond 30 hours per week would not have resulted better VLT scores.

The extended calculation results showed significant differences between the non-gaming (control) group and every single 'gaming time' group. However, there is no significant difference between the less than 3 hours group and the 3-5 hours group, and the 3-5 hours and the more than 5 hours group. The Partial Eta squared measures the proportion of the total variance in a dependent variable which is related to the gaming time in the video gamer groups defined by the independent variable, in this case  $\eta^2 = .06$  which indicates a medium effect. The participants' 'time spent on playing' as a variable is a crucial point to understand what moderate gaming time means, i.e., it was found that the participant video gamer students spend at least 1- or 2-hours video gaming, which seems to be a lot, from a traveling point of view such time is perfectly normal for teenagers nowadays, as it practically covers their daily commuting time. Furthermore, a child spends another hour playing at home meanwhile practicing English on a non-violent game that may be educational, and the boxplot diagram also supported that no more than 3 hours a day is facilitative for L2 high-frequency word learning.

#### **5.1.4. Discussion of the findings of devices used for gaming**

Answering the research question: Video game players of which device have the highest VLT scores compared to the control group? Those participants' that indicated computer / laptop in their answer achieved better VLT results.

There is an insignificant difference between the non-gamer (control) group and the users of 'smartphone / tablet', 'consol' and 'smartphone + consol'. The results showed significant differences between the non-gaming (control) group and the computer-using group, and between the non-gaming (control) group and the smartphone + computer + consol user group, as well as between the non-gaming (control) group and the computer + consol user group. After all, having a laptop or a desktop computer participating in a video game means that the VLT result is higher than that of a single console or smartphone user.

The participants' 'devices' as a variable was meant to confirm the basic hypothesis, namely that, parents with higher SES buy more expensive devices on which their children can play more cooperative games, which leads to a better VLT performance. For instance, other variables such as parents' educational status were not included in the study although parental education could be used as an additional influencing factor of general student achievement (Davis-Kean, 2005).

From these results it is clear that the smartphone user gamers are better in VLT than the non-gamer group, although the higher or rather the highest results are achieved with a laptop or a

desktop computer, which the person owns along with a smartphone and console. Since computer owners produce the best results, probably due to the programmability of computers, running different applications also provides opportunities for L2 language practice.

### **5.1.5. Discussion of the finding of the most effective game type**

Answering the research question: Players of what video game type have the highest VLT scores compared to the control group? The players' VLT results of the cooperative game types significantly higher than the VLT results of the players of the single player gamers.

- Consequently, the hypothesis was confirmed, because if the player plays an online multiplayer video game that uses multiple communication channels, the contribution of the gaming activity to acquire high frequency words is greater than using single player games. The results showed non-significant differences between the non-gaming (control) group and the single player group. However, there is a significant difference between the cooperative group and the single gamer group, and between the control group and the cooperative group.

The cooperative or online playable multiplayer video games (e.g., MMORPG) suggested to be the best virtual area to exploit the TLU domain practice (Cabraja, 2016), and high-frequency word knowledge. In addition, the FPS, TPS, MMORPG or MOBA video games seemed to be the most effective in promoting extensive high-frequency literacy by using the target language (Cornillie & Van Heuven, 2014; Butler, 2015; Eisenclas et al., 2015). The findings are in line with research of Harris, Golinkoff & Hirsch-Pasek, (2011), Roach & Utami, (2017) indicating that action games provide more option for verbal/audial information exchange and written briefings. This result ties well with previous studies of Hanghøj et al. (2018) and Derboven et al. (2012), according to which the cooperative video games can provide the right social atmosphere to motivate participants to perform more efficiently. Furthermore, the players in multiplayer video games require to clarify their concept or strategy (Lee, Aiken & Hung, 2012) or recognise the game pattern to trigger discussions (Wessel, Haider & Rose, 2012), which generates high-frequency vocabulary usage, as it is confirmed by the outcomes.

On the other hand, the rest of the games are miscellaneous as to their employed communication channel (e.g., sports, card, or puzzle games), because they utilize just one information channel thus, they are less exploitable for language learning. For instance, the sports games are usually played alone or against a friend, but no more than two participants can play together because of the nature of the sports games. Card games can be played in a multiplayer mode, but there is no or just little communication among the players, and that is mostly in written form. The social

media games are usually about building a village or a city, an activity which is full of written and on-screen data but there is no spoken information exchange.

If the gamer recognises a pattern or another important rule in the game, this can be interpreted as an information treasure that may result in an immediate urgency for sharing it on social-media platforms, thus it can initiate out-of-game communication cases which is part of sociolinguistics, and it is discussed in Study 3.

## **5.2. Discussion of the results of the Study 2**

Testing EF may be a non-linguistic parameter, although it reflects the language processing, the object of attention and the possible supplementary effect of video gaming. The results of the Stroop test are in line with the findings of Toth, Kowal and Campbell (2019,) which means that video gaming has a positive consequence on the player's cognition and EF and inhibition of automatic responses, as well as on lexical retrieval, which was assessed by the VFT (Luo, Luk & Bialystok, (2010). For instance, the video gamer students could pronounce the name of the colours more quickly both in L1 and in L2. However, a significant difference was only in L2 incongruent cases in favour of the video gamers. In addition, the video gamers were able to recall more words, but only L2 cases were significantly more than their non-gamer peers. Following the ICM model and the 'non-selective' access of the mental lexicon, as it is experienced, a smaller interference effect was measured in the interlingual cases than in the intralingual occurrences, which is in line with the findings of Brauer (1998), Rosselli et al. (2002), Wang et al. (2016), Kousaie & Phillips (2012). Video gamers delivered significantly better results than non-gamers, probably because of their quick problem solving, improvement of attention and aligned thinking (Liu et al., 2019; Zorza, 2016).

### **5.2.1. Discussion of the results of Stroop test**

Answering the research questions: Is there a significant difference between the intralingual interferences of the video gamer and the non-gamer groups? Video gamer intralingual interference was insignificantly higher than that found in the non-gamers.

Is there a significant difference between the interlingual interferences of the video gamer and the non-gamer groups? The video gamers' interlingual interference was significantly higher than that of the non-gamers'. The percentage of the intralingual and interlingual effect ranges between 70%-75%, which is like the findings of Rosselli et al. (2002).

- The hypothesis was only confirmed in the case of a difference in the intralingual interference, since if the participant is a video gamer, then only their performance on ST L2 cases differs from their non-gamer peers.

This study was successful in reviewing the working memory, inhibitory control, cognitive flexibility, and lexical retrieval processes in secondary school students. Due to their differing proficiency level, and in view of the nonselective access of the mental lexicon (Green's inhibitory model, 1998) i.e., competition between lexical representations, the presence of the interference effects is observed in the results. Furthermore, it was also found that intralingual interference is greater than in the interlingual condition, which is consistent with another related research (Brauer, 1998; Rosselli et al., 2002; Wang et al., 2016; Kousaie & Phillips, 2012). Regarding the proficiency level, both (intralingual, interlingual) interferences show that the video gamer students' interference index was higher, thus their L2 dictionary items function as conflicting with L1 language items, or so-called cross-language interference (Roselli et al., 2002).

In the dissertation it has been confirmed that the interference was greater in the video gamer students because a certain level of interference means that the person reaches a convincing proficiency level that causes interference, thus their interference was greater than that of their non-gamer peers, which is in line with the results of Roselli et al. (2002) and Tytus (2018).

### **5.2.2. Discussion of the results of VFT**

This study also investigated VFT letter and category tasks, which are deployed to measure lexical retrieval (Miyake et al., 2000) in secondary school-aged L2 (English) learner video gamer and non-gamer students with different English proficiency levels.

Answering the research questions: Is there a significant difference between the performance of the video gamer group of students compared to their non-gamer peers in the VFT category (L1 and L2) cases? The difference of the video gamers and non-gamers in VFT category L1 cases was not significantly higher. However, the video gamers' VFT category L2 samples were significantly higher than that of the non-gamers'.

Is there a significant difference between the performance of the video gamer group of students compared to their non-gamer peers in the VFT letter 's' (L1 and L2) cases? The difference between the video gamer and non-gamer VFT letter 's' L1 cases was not significant. The video gamers' VFT letter 's' L2 mean was significantly higher than that of the non-gamers'.

- The hypothesis was confirmed only in the case of the difference in the VFT ‘s’ letters, since if the participant is a video gamer, his performance on the VFT differs from that of their non-gaming peers.

Two significant differences among the variables have been found, and the most striking one was the dominance of L2 letter ‘s’ condition, in which the video gamer students were found to be significantly better performers than their non-gamer peers. These observations are fully in tally with other VFT research that focused on vocabulary proficiency (Roberts & Le Dorze, 1997; Portocarrero, Burrett & Donovick, 2007; Escobar, Kalashnikova & Escudero, 2018).

In conclusion, the video gamer students’ performance was similar on the inhibitory control measures and the lexical retrieval tasks, more specifically, the proficiency level played a key role in both VFTs and ST, which induces different cognitive skills and processes that are the elements of the inhibitory control (Schmidt et al., 2019). Besides, if the individual mental dictionary contains sufficient items (words) to cause interference or lagging during switching between L1 to L2, the person behaves more as a bilingual than a monolingual language user.

The calculations served the main interest of this study which was researching the effect of video gaming on language learning; therefore, the video gamers test performances were compared with their non-gamer peers. The video gamers presented a significant L2 performance advantage compared to their non-gamers peers in both ST and VFT tasks, which could be considered a result of video game playing as illustrated by Baniqued et al. (2014). It was also found that the video gamers, were slightly quicker on ST, due to their quick association between pictures and action (Cornillie, Thorne & Desmet, 2012; Baniqued et al., 2014) and their enhanced cognitive skills, especially attentional abilities (Matern et al., 2020). The video gamers also performed significantly better on VFT than their non-gamer peers in all L1, L2 conditions, since video gamers possess an outstanding number of game related phrases from which they were able to pronounce examples in the VFT letter [s] task. Besides, video gamers use words from an excessive range of high and low-frequency vocabulary, which they adapt to everyday events (Cornillie, Thorne & Desmet, 2012, Arnold-Stein & Hortobágyi, 2021).

The aim of this study is to make the research more comprehensive by demonstrating that video gaming affects not only the participants’ vocabulary advantage, but also impacts the language control and word recalling measured by VFT and plays a significant role in non-linguistic processes like EF, measured by ST. As a by-product two quick, dependable, and pleasing test instruments have been found, which can be applied in any classroom settings.

### **5.2.3. Discussion of the connection between language testing, receptive vocabulary level and L2 language performance**

There are research precedents according to which the receptive vocabulary scores correlate with the participants' productive abilities or language proficiency. Shin, Chon & Kim (2011) observed that the difference between the size of productive and receptive vocabulary level indicates that receptive scores are significantly higher than productive scores in all brands, but the productive/receptive scales generally showed a continuous increase in the difference between receptive and productive vocabulary as the students' vocabulary size is increased, indicating that words in the lower frequency band will be less likely incorporated into the lexicon of the students' productive vocabulary. On the other hand, at the higher frequency level the words in the receptive vocabulary are likely to be a part of the productive vocabulary knowledge faster and deeper (Shin, Chon & Kim, 2011). There was a moderately significant correlation among the means of the higher frequency levels (between 1,000 and 4,000) of the receptive / productive results (Shin, Chon & Kim, 2011). In the research performed by Yamamoto (2011) receptive and productive vocabulary scores were correlated and the author found a steady relationship between them, which strengthened in high-frequency words especially at 3,000-word level, at which the best participants of the present research are expected. The correlation between the receptive vocabulary knowledge and the productive skills is also recorded by Miralpeix & Munoz (2018).

Interestingly, the combination of incidental vocabulary learning, and output-oriented tasks serves as a means of maintaining productive vocabulary knowledge. By encountering already learned L2 words during reading, students can expand their understanding of vocabulary use, i.e., they can repeat them while reading or in other situations through which the words have developed into productive vocabulary knowledge (Yamamoto, 2011). Over the benefits of measuring the receptive vocabulary knowledge, like easy accessibility online by ready to use test devices (VLT, VST), the receptive training by taking part of VLT testing can also lead to productive knowledge, because the definition choosing task requires the receptive knowledge of the word and the task takers must retrieve different derivations of the words (San Mateo-Valdehita & Criado de Diego, 2021).

## **5.3. Discussion of the results of Study 3**

### **5.3.1. Discussion of the video-gaming words recycled, as a qualitative study**

The main goal of this part of the dissertation was to approach the gamer argot from a different linguistic angle, to seek cases that prove whether gamer argot can be considered an example of translanguaging, diglossia or bidialectalism. From the collected written and possible verbal instances, language management inferences can be drawn regarding the sociolinguistic behaviour of the gamer argot (Ladányi, 2007). Several instances of word formation methods have been collected, such as clipping ('*bot*' from *robot*), acronyms (*WoW* from *Word of Warcraft*, *COD* from *Call of Duty*) and neologisms like eponyms ('*Kazuár*' from the word '*casual*' because they are pronounced almost similarly). The greatest group is the morphological derivations to which most examples belonged. The morphological derivation can be subdivided further according to the behaviour of the stem because the Hungarian gamers can use affixation in two ways, either, by keeping the English pronunciation of the base word or to pronounce the base word as if it were Hungarian. Thus, the findings were grouped based on the results related to pronunciation, as first in order of importance.

- The hypothesis was proved, because video gamers use game-specific, low-frequency words in addition to high-frequency words, thus their vocabulary can be even more diverse.

### **5.3.2. Keeping the original (English) pronunciation**

The first examples are the single words or collocations without affixation, which are a clear illustration of all three viewpoints. For instance, translanguaging happens because an L2 word is used in an L1 sentence with the same or rather with an extended meaning, since each phrase carries a game related meaning, which sometimes differs from the literal meaning of a word. In instances of genuine translanguaging, usually a third party will join the communication to elucidate the meaning of the word, unknown or unfamiliar to one of the two players. In these cases, the words are used figuratively. Keeping the English pronunciation supports the high variety of the gamer argot, because the utterer must possess a great deal of low-frequency word besides the high-frequency words, which could be interpreted as high L2 language proficiency, otherwise the s/he would not be able to provide a correct pronunciation of the jargon. This phenomenon could be considered as a primary element of the gamer diglossia. Using simultaneously two languages or language varieties which are different in pronunciation is undeniably an example of bidialectalism, because in these instances the Hungarian utterer, not perfectly though, articulates the words following English pronunciation patterns. Below there are some examples of the most frequent gamer words used according to the English pronunciation in a Hungarian gaming event.

**Off topic** for touching on another topic; **damage** for damage; **alpha version** for internal testing of a game; **bigdata** for personal data collected by tech giants for selling; **flag** capturing the flag online in a time-based game; Merre vagy **mate?** (Where are you mate?) for mate; **frag** for killing; **cringe** for being embarrassed instead of another person; **gameplay loop** for a repetitive activity in a game; **med kit** for medical kit or tools, (also example for clipping).

The pronunciation of acronyms usually follows the English rules and as such might be considered as an example of translanguaging, as this pronunciation infers that the original concepts expressed by the words are also cognitively present, thus they are not just a meaningless arbitrary combination of letters.

‘**EZ**’ dolog. [i: zi], (easy thing) for something is easy; ‘**TP- haza**’ [ti: pi:] (go home) meaning let’s go; ‘**hú de op**’ [o: pi:], for a very talented person.

Affixes often support the presence of bidialectalism. The examples are taken from context; thus, the Hungarian inflection is visible. In addition, all prefixes and/or suffixes assimilate to the stem to make the pronunciation smoother.

‘**Hipe-olták**’ for forced publicity; ‘**dodge-olsz**’ for to dodge a blow; ‘**unity-ben**’ for creating a new online default ‘game generating’ engine something; ‘**ki-rage-el**’ for to burst out; ‘**pixel-es** vagyok’ (I am pixelated) for the internet feed is slow or the person is tired; ‘adj **shield-et**’ (give me a shield) meaning help me; ‘adj **bandage-ot**’ (give me bandage) meaning help me; ‘**valami off-os**’ (something off-like) meaning anticipated loss; ‘**ki-loot-olom** a hűtőt’ (I am looting the fridge) for taking stuff out of the fridge; ‘**upgrade-elek**’ (I am upgrading) meaning to learn in order to be better in something; ‘**raid-eljük** a boltot’ (let’ raid the shop) meaning many people go into the store to buy some food; ‘**quest-eljük** a boltot’ (let’s conquer the shop, for the same meaning above); ‘**jönnek** a **bot-ok**’ (the bots are coming) the word ‘bot’ derives from ‘robot’ and is a short for non-gamers; ‘**freemium-nak** látszik’ (looks like a free game) meaning just the opposite; ‘**help-elj**’ (help me) literary meaning; ‘**skip-peljük** a napot’ (let’s skip the day) meaning everything is boring; ‘**ki-click-keltük** az embert’ (we have clicked out of the man) meaning to avoid meeting somebody; ‘adj **boost-ot**’ (give me a boost) asking again for help.

### 5.3.3. Affixation according to the Hungarian pronunciation

In case of English words adapted to the Hungarian pronunciation the diglossia cannot be distinguished, or rather, if someone uses a mispronounced English word, this indicates a low variety of video gamer argot. Nevertheless, translanguaging can be implied since the words have originated in a foreign language and such phrases are used with a video game connotation.

‘lement a **HP-ja**’ [hΛ pe:], (his/her health points went down), meaning lost interest or feeling tired; ‘**attack**-oljuk a boltot’ [atak], (let’s attack the shop) meaning buying food in a shop; ‘**lag-golok**’ [lag], (I am lagging) for a momentary lapse in the game flow; ‘**ki-ban-noltuk** az embert’ [ban], (we have banned the person) meaning to; ‘**warn-ollak**’ [varn], for warning; **TK** [te: kΛ], for team kill, bad things have happened in a row.

Interestingly, there are also examples of acronyms that do not follow an English pronunciation pattern, even if the gamers are familiar with the concept and would be expected to use their original pronunciation. By way of analogy, it is supposed that English acronyms that were introduced into the Hungarian common language usage earlier and were pronounced according to the Hungarian phonetic (e.g.: *DVD*, *CD*, *SMS*, *MMS*, etc.) might just as well exert their iconicity in pronunciation for the new acronyms as well. Another possible explanation for pronouncing *NPC* [en pe: ce:] for Non-Player Character; *DLC* [de: el ce:] for downloadable content; *MVP* [em ve: pe:] most valuable player according to Hungarian rules could be that influencers naturalized these acronyms while playing and as such there are no normative linguistic rules determining which acronyms keep their original pronunciation, and which follow the Hungarian one. It has also been observable that the Hungarian pronunciation is much more common in the casual gamers.

Clipping English words and adapting their orthographic representation to meet Hungarian pronunciation rules is a very common process of linguistic adaptation and naturalization in the world of gaming. Later, these words may enter the common Hungarian lexis.

**Soti** for shotgun; **szero** for szerver; **maxos** for ultimate.

The conversational examples below have been written by gamers.

Ebből a **loot-ból** veszek a **soti-ra** egy **upgrade-t**, hogy nagyobb legyen a **damage**.

*I have looted some stuff from which I can buy some upgrade to make bigger damage with my shotgun.*

Elcesztem a **flag-em**, mehetek vissza a **hill-re**.

*I lost my flag, now I must go back to the hill (to fight for it).*

Kaptam egy **boost-ot** a **mate-től**, így már sikerült behúznom pár **frag-et**, aztán elkezdett **lag-golni** és kidobott a **szero-ról**.

*I had got some boost from the mate, so I was able to gain some frags, then (the game) started lagging and got me out from the (game) server.*

#### **5.3.4. Differences between the findings of this study and other studies**

Prior to this study, the notion of ‘gamerlect’ was utilized for marking the gaming expressions used in social media conversations (Arnold-Stein, 2021). Veszelszki (2010) questioned whether phrases or abbreviations of ‘digilect’ were considered sociolect, medialect, or just style. If the ‘gamerlect’ expressions were analysed separately, then online or offline conversation between two players in a non-game situation behaves as a sociolect, as such idiosyncratic language simultaneously carries cohesive, sociative, and disguising functions at once. Whereas, if the same two gamers play together and thus communicate purposefully, then the language is medialect because through a new media product it mediates the exact meaning of the gamers’ phrases in the given media form, in this case, the game. Besides, if a casual or non-gamer uses gamer argot items, either written or spoken, it must be a style element because the conversation fulfils none of the functions mentioned before, instead it is used just for fun or probable for expressing sympathy towards the gamers. It must be emphasized that ‘digilect’ is a perfect umbrella term for phrases and emojis in online chatting. However, the unique language of the games significantly differs from the scope of the interpretation of ‘digilect,’ mainly because emojis cannot be pronounced, but all gaming words can have a communicative function in a spoken language (Arnold-Stein, 2021).

Comparing the words from previous research with the present one, expressions were found with similar meanings, and several others that have become outdated or used differently by teenagers in the researched geographical area. There are some overlaps with the words collected by Balogh (2014) with similar meanings: e.g., *gózik CS-ézik*: meaning, playing with ‘Counter Strike’ game; *PvP-zik*: abbreviation for one to one play; *Map-ol*: player is mapping the game level; *Háj-dol*: player hides; *Hil-el*: player uses healing tool; *COD*: abbreviation for Call of Duty video game, *Kazuár*: casual gamer; *loot*: to obtain; *TP*: town portal; *host*: host; *hero*: hero or figure of a player; *hp*: health point. However, *becsizmáz*: booting; *walkol*: walking; *láma*: lame, such usage of the phrases was unfamiliar to my students. This clearly means that there are differences in the language use of gamer groups living in geographically different areas.

Comparing the collected data to the Dutch (Hilte, Vandekerckhove & Daelemans, 2020) and the French (Strong, 2018) examples, the gamer argot exists in non-native English countries similarly to the single item level with some language-specific differences; thus, the morphosyntactic usage of ‘gamerlect’ items is comparable cross-borderline.

Among the French examples (Strong, 2018), some occurrences were spotted that Balogh (2014) also found and appeared in the database: *tank*, *bot*, *healing*, *rebuff*, *holy*, *root*, *hunter*, *quest*, *PvP*, *avatar*, *dungeon*, *mate*. Certain instances were interesting because of the congruence regarding their usage: e.g., *bot*, *loot*, *mate*, *boost*; the *bot* is the short form of robot, and it also

refers to an odd person or a non-gamer. The term *loot* simply refers to obtain, *mate* indicates a need for a player, and *boost* means help.

A primordial aim of this research has been to shift more intensive attention to the necessity of deeper research in the field, because translanguaging, diglossia and bidialectalism have not been analysed and discussed thoroughly in relation to video gaming before. Word transition between English and Hungarian is an ongoing and accelerated process due to the swift increase in a gamer's glossary in Hungary, from which words are being used more frequently by hard-core and even by some casual gamers. Furthermore, there is the necessity to shift intensive focus to more profound research in internet-based communication as a platform that transfers the latest and most influential trends (e.g., *virus*, *mask*, *pandemic*, etc.).

## CHAPTER SIX

### CONCLUSION

#### 6.1. Recapitulating the main objectives of the research

One of the roles of education is to improve the citizens' language skills e.g., in English (EFL), which must be a high priority in Hungary as well, especially because the universities contribute extra admission points for the language exams. The importance of English in the investigated region stems from the rationale that English-teaching countries benefit from the extensive use of that language for tourism, science, and scholarship. Learning the language is based on successful communication with proper vocabulary and grammar use, as well as the knowledge of the culture.

In summary, the primary objective of this comprehensive research was to investigate the impact of the moderate out-of-school video game activity on language acquisition with special regards to the high-frequency word learning and the low-frequency word subcultural usage, as well as examining the impact of the participants' SES, gender and watching film in TLU (English), and the video game play on the players' extrinsic motivation and the benefits of EF. The secondary aim of the comprehensive study was to analyse the relationship between the measurable result of the gaming activity (VLT, ST, VFT) and the independent variables, such as non-gaming, watching movies in English, favourite games, SES etc., and eventually provide comprehensible graphs and charts or numerical outcomes in percentages. The research was conducted in six secondary schools in the southern area of Hungary, in schools that belong to the agglomeration area of the Baja vocational training centre. Besides, the researcher, as an EFL teacher who used to be a video gamer as well, found himself interested in how video gaming impacts the participants' English language development, therefore all the hypotheses were triggered by the researcher's subjective experiences, like observation of overheard conversations on the corridors and gamer students' performance in the English lessons. In addition, most video gamers are in their teens, so they mostly meet at school and thus they may influence each other.

The analysis of the most quantitative data indicated statistically significant relationships among variables, like school grades in English, used gadgets, parental SES, and video gaming habits, which demonstrated the impact of video gaming on English language learning and usage among the examined participants, although these results cannot be generalized beyond the student participants and the context of the study, because the number of contributors did not reach one thousand. However, according to articles that are dealing with the subject, such phenomena

exist in other parts of Hungary and many non-native English-speaking countries as well. The individual differences may vary, but the role of the video gaming activity had an impact on the participants' language learning strategies as a general tendency. In addition, moderate video gaming exercises facilitate certain cognitive functions or mental abilities including learning, thinking, reasoning, remembering, problem solving, decision making, and attention. Diverging from previous studies which revealed various connections between video gaming and vocabulary development, WTC, and game related vocabulary usage and SES, this study analysed all factors collectively, which makes the effect of each factor even more comprehensible.

Confirming the viewpoint of Krashen's acquisition-learning hypothesis (Krashen, 1982) in the presented literature, during video gaming acquisition occurs rather than learning because of its nature, as it was confirmed in this study. Furthermore, video gaming facilitates the experience of game flow, which makes the participant's reaction of the information stream automatic and instinctive, thus it is rather unconscious; the language of the subsequent level is always slightly higher than the prior; the player constantly monitors the visual and audial inputs, and as a consequence of that, if the input is not comprehensible, the participant may reiterate the trial until s/he is successful; besides, the gamer also filters out the unnecessary information from the well-known information chunks, like the familiar high-frequency words and grammar structures.

The description of Grosjean's language user is more in tally with the characterization of a video gamer than that of a sheer foreign language learner because the video gamer utilizes his/her English language knowledge in the playing sessions as well as at describing everyday occurrences by using game related words, which mostly have an English origin. These words are inserted into their speech causing plain language switching and code mixing, because their proficiency level is higher than that of their non-gamer peers. This definition is the characteristic of a bilingual person rather than that of a simple monolingual individual, who learns a language passionately due to the frequent application of the foreign language, as it was endorsed by the Study 3. Consequently, the English language, including the game related words and phrases, is more a second language than a foreign language for the gamers, especially because they often get and stay connected with their gamer peers beyond borders and even continents.

Among the 646 gamer participants the three most played game types are the cooperative games, namely, the first-person shooter, the open-world, and the battle royale, and according to the findings those who play these video games have better results in the VLT test, hence giving them an advantage in high-frequency word knowledge. Such multiplayer action games that are available online in a multiplayer mode, operate with more intensive audial, written, and on-screen communication than the sports, card, and social media games. The action games offer an on screen, fast-paced sequence of events with maps to be interpreted and written briefing the players statuses, thus they are miscellaneous in their employed communication channels, although sports, card, or puzzle games utilize just single information channels thus they are lesser exploitable for language learning. Furthermore, this research also argued that playing in a multiplayer mode as a social event can provide both procedural and declarative learning occurrences caused by the communication circle while creating a right social atmosphere to motivate participants to perform better. The multiplayer video games also tend to have more challenging and complicated plots and patterns or frequent new game content that drives the player to actively initiate communication with the peers, which in turn generates discussions on social-media platforms as out-of-game communication as discussed in Study 3. After all, the research participant players prefer to play action games principally, whose players were found to have significantly higher VLT scores.

Regarding the socioeconomic situation of a video gamer, Study 1 revealed the connection between SES and VLT results, which was positive, also there was connection between the used gadgets and the VLT results, which means that a desktop or a laptop computer is the best to be used to play any kind of video game as an out-of-school language learning activity. Study 2 verified the hypotheses about the impact of video gaming on the person's cognitive functions and demonstrated that video gaming plays a significant role in the language learning process, alongside with presenting what reliable and entertaining test instruments can be applied in classroom settings. It is advisable for teachers and parents to maintain elevated expectations for their children and to promote autonomous studying styles. Besides, the teachers ought to consider video gaming as an effective language learning activity which may yield edutaining events. The parental SES is a critical area which influences the students' instrumental motivation as well as their integrative motivation to be able to discover the world by themselves.

In connection with the social prejudices, proven by the interviews in Study 3, the video gamers use avatars behind which they can always hide their real self, even after a negative behavioural experience the gamer simply changes her/his avatar and continues playing, or eventually may

find a different channel to play. The gamers usually look for companions to play and if they do not feel contented, there are thousands of different playrooms to favour. Their aim is to play, not to get offended, that is why gamers prefer to be in the virtual area as a club, together with peers who understand them to enjoy and tackle the challenges that the game provides.

The results of the present research also confirmed that the activity of play or rather the playfulness in language learning is the key to the success of the out-of-school language learning. Play also facilitates the effortless improvement and development toward a higher proficiency level which is based on the high-frequency vocabulary knowledge, which is the most crucial factor of fostering better fluency and WTC. In turn, these elements assist the progress of proper grammar, therefore the participants require instructional education as it is observed in the correlation between the language grades and video gaming. The video gamers are also effective in publicizing their extensive literacy knowledge and using the target language daily, since the gamer/learner is part of a (virtual) reality environment. Video gaming as an extensive extramural activity can be treated as a facilitator of leaning English, through which the participants can meet gamers from other countries. The scope of this study emphasizes the need for obtaining a more global perspective of EFL studies which forms the basis of the more communicative aims and ways of using foreign language teaching methodology.

## **6.2. Limitations of the research**

There have been certain limitations to the study, for instance the study focused only on two secondary school types (technical, vocational) although there are several grammar schools in the city area, the results of which could have been interesting. The study was also limited in that it was based on a sample of students in a single, yet not the most developed region of Hungary, finding more contrasting numbers could enlarge the scope of the research. Furthermore, the conditions have been limited, it would also be interesting to bring more independent variables into the study, for example, other extramural L2 learning habits that would have modified the scope of the research. The results of similar school types of the local educational centre could be stimulating to compare secondary school students' ST and VFT performance to understand how their interests have been changing recently. There have been examples from abroad, although correlating results from more countries could have made the research more coherent. The original data set was composed of two different cohort groups, and at the time, it was not possible to have the same students take the same test, so the long-term

changes cannot be observed. Nevertheless, the research has shown significant findings regarding the field of language learning outside of the classroom.

### **6.3. Future implications for teachers**

As mentioned in the previous part, it could be desirable to extend the scope of the research to the neighbouring countries as well, which requires greater funds and collaboration between institutions and their researchers. The VLT has proved to be dependable, even if it necessitated massive time load. Furthermore, the future implication of ST and VFT testing instruments in any classroom environment is advised due to their entertaining nature, because during the experiment the tangible spirit of competition was experienced. Also, such testing should be conducted at the start of the school year to form groups or to break the ice after a long vacation. The students enjoyed the exercises, especially those who play video games, as this type of activity resembles their real-life relaxed environment of gaming. This spirit of competition can spread rapidly. The TMT or BNT tests should also be performed frequently for entertainment ends to make the evaluations more enjoyable, thus less stressful. During assessing, the more sensitive students can also get a chance to show their latent potential and really appreciate how entertaining a test can be. This research showed that the students are happy to present their relevant knowledge in a stress-free testing environment, which should always be provided.

The present study has diverse practical and theoretical implications. It is advisable to promote autonomous studying styles and to encourage all parents to maintain high expectations for their children, especially those without high levels of formal education to provide a literacy rich environment to their children. Also, video gaming must be considered an effective extracurricular activity which may contribute as edutainer occasions to low SES families in the future, thus it may be noteworthy to investigate the connection between SES and other facilitating factors more thoroughly. Therefore, there is a need for additional empirical investigation to examine SES more in-depth, therefore qualitative analyses would also be necessary through annual interviews of the students to uncover the long-term changes. As a next step, further studies in the field need a better understanding of the underlying mechanisms of how and why SES influences one's extramural learning and how the widening gaps between classes of the society could be prevented. However, comparing the experience of the English language culture by direct contact or video gaming remains problematic and future research should shed light on this problematic facet of second/foreign language learning.

The everyday language use is impacted by different influencing communication channels, such as social media sites, television, and video gaming, in which the language use has been changing rapidly. Thus, language teachers must follow the linguistic changes to maintain their knowledge and be updated on the actual changes of the virtual world. In addition, the recent tendency of the modification in education and recreation following the worldwide experienced pandemic lockdowns, which led to unfamiliar communicational necessities, also puts teachers to the test in communicating without personal interaction.

Linguists must also keep an eye on such influencing areas, otherwise the realization of the reasons of the latest linguistic changes will be missed. It is hoped that the findings direct the focus onto the utilized languages of the virtual world, with special regard to English. Although the survey was limited to the students of the cities of Kalocsa and Baja, abundant examples were found to support the hypotheses of this research. The internet fosters the transfer of gaming language chunks into the spoken and written vernaculars, with the latest trends visible currently at all levels of society, just think of the frequency of using the words *isolation*, *quarantine*, *virus*, *mask*, *pandemic*, *social distance*, *zooming*, etc., in the past years. As an ultimate conclusion, it is argued that the video gaming activity has been growing steadily in Hungary since the turn of the new millennium and has contributed beneficently to the development of English language competence in teenagers and young adults.

## CHAPTER SEVEN

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**CHAPTER EIGHT**  
**TABLES AND APPENDICES**

**8.1. Tables**

**Table 1. Example of the VLT created by Schmitt, Schmitt & Clapham, 2001**

**2000 level**

1. copy		1. accident	
2. event	<input type="checkbox"/> end or highest point	2. debt	<input type="checkbox"/> loud deep sound
3. motor	<input type="checkbox"/> this moves a car	3. fortune	<input type="checkbox"/> something you must pay
4. pity	<input type="checkbox"/> thing made to be like another	4. pride	<input type="checkbox"/> having a high opinion of yourself
5. profit		5. roar	
6. tip		6. thread	
1. coffee		1. clerk	
2. disease	<input type="checkbox"/> money for work	2. frame	<input type="checkbox"/> a drink
3. justice	<input type="checkbox"/> a piece of clothing	3. noise	<input type="checkbox"/> office worker
4. skirt	<input type="checkbox"/> using the law in the right way	4. respect	<input type="checkbox"/> unwanted sound
5. stage		5. theatre	
6. wage		6. wine	
1. dozen		1. admire	
2. empire	<input type="checkbox"/> chance	2. complain	<input type="checkbox"/> make wider or longer
3. gift	<input type="checkbox"/> twelve	3. fix	<input type="checkbox"/> bring in for the first time
4. opportunity	<input type="checkbox"/> money paid to the government	4. hire	<input type="checkbox"/> have a high opinion of someone
5. relief		5. introduce	
6. tax		6. stretch	

Table 3. The information page of the questionnaire and example questions

**PANNON EGYETEM; TÖBBNYELVŰSÉGI NYELVTUDOMÁNYI DOKTORI ISKOLA, KUTATÁSI KÉRDŐÍV**

A kérdőív a számítógépes (okos-eszközökön is futtatott) játékok használatának gyakoriságát méri a középiskolás diákok között. A kérdőív anonim, viszont az iskola és osztály (életkor) megadása kötelező a könnyebb feldolgozhatóság érdekében. Közreműködésedet ezúton is köszönöm!

**\*Kötelező**

Iskolád neve: \*

Kossuth Zsuzsanna Szakgimnáziuma és Szakközépiskolája

Dózsa György Szakközépiskola, Szakiskola és Kollégium

Bányai Júlia Kereskedelmi és Vendéglátóipari Szakgimnáziuma és Szakközépiskolája

Türr István Gazdasági Szakközépiskola

Jelky András Szakgimnáziuma és Szakközépiskolája

Kalocsai Szent István Gimnázium

Lakhelyed: \*

Falu

Város

Osztályod:

	'A'	'B'	'C'	'D'	'E'	'F'	'G'	Egyéb
9. évfolyam	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. évfolyam	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. évfolyam	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. évfolyam	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. évfolyam	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14. évfolyam	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15. évfolyam	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Következő**

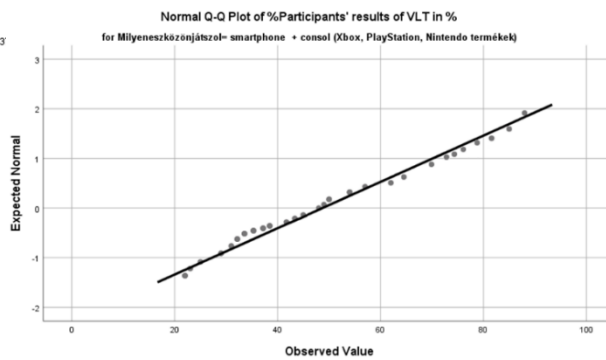
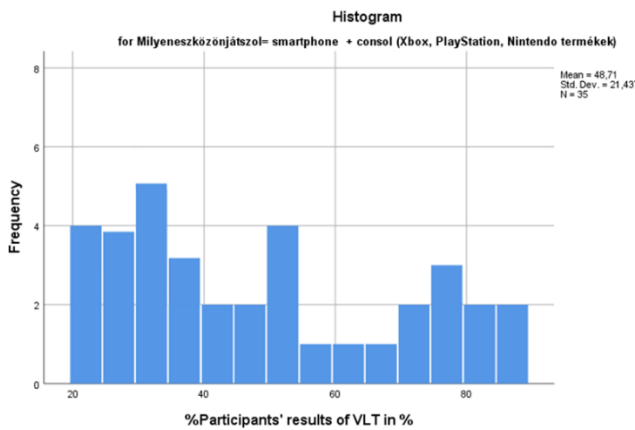
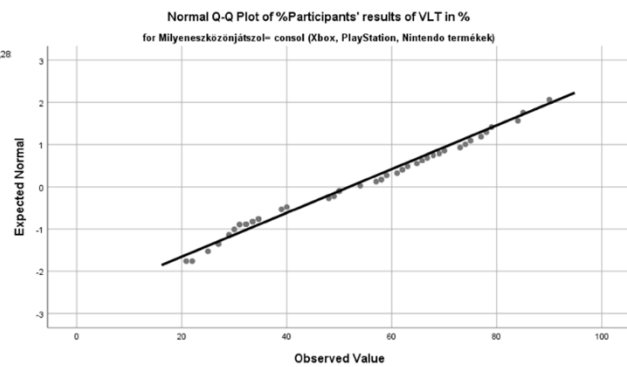
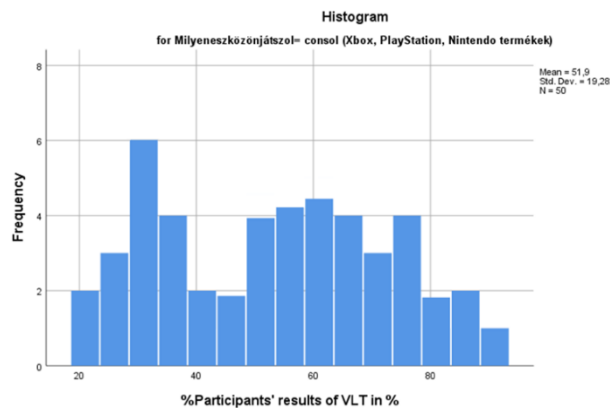
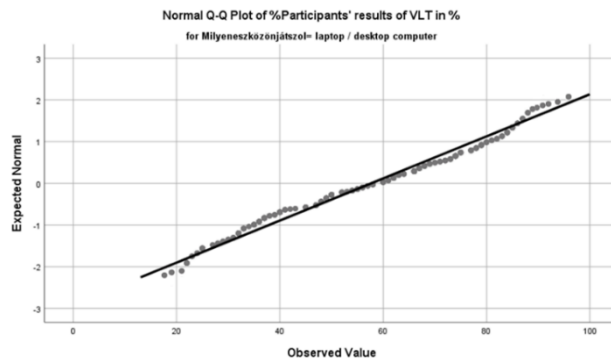
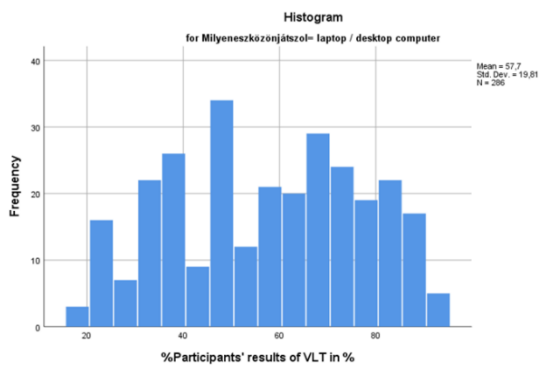
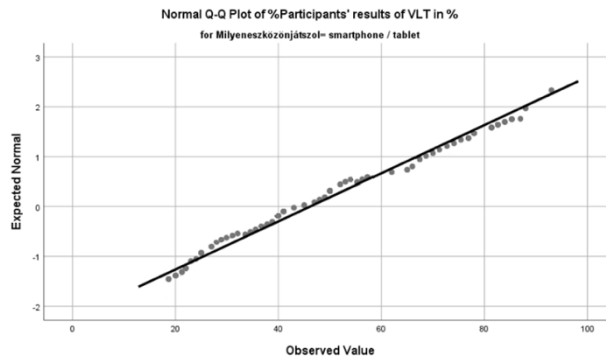
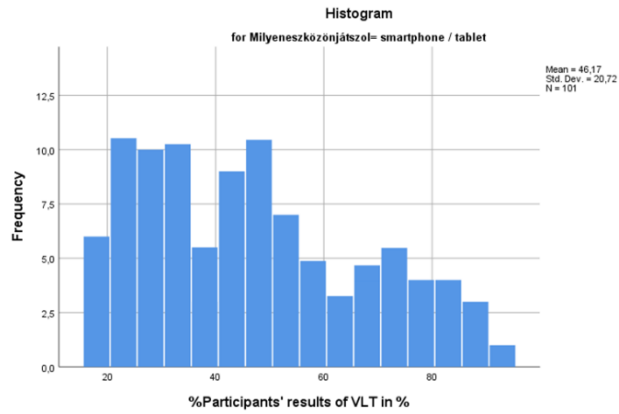
Google Űrlapokon soha ne adjon meg jelszavakat.

Ezt a tartalmat nem a Google hozta létre, és nem is hagyta azt jóvá. [Visszaélés jelentése](#) - [Felhasználási feltételek](#) - [Adatvédelmi irányelvek](#)

Google Űrlapok



**Table 51. Gadgets – Histograms and Q-Q Plots**



**Table 58. Descriptives of grouped game types of the VLT results**

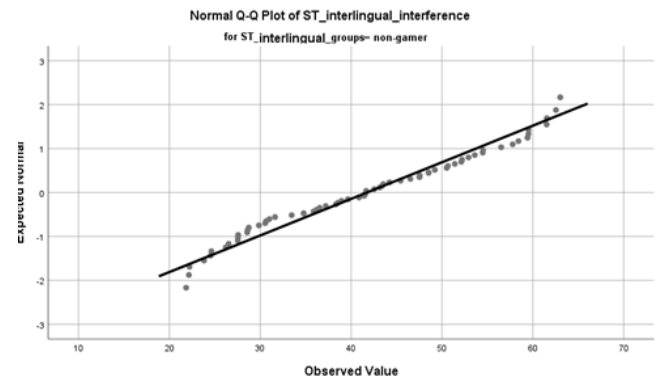
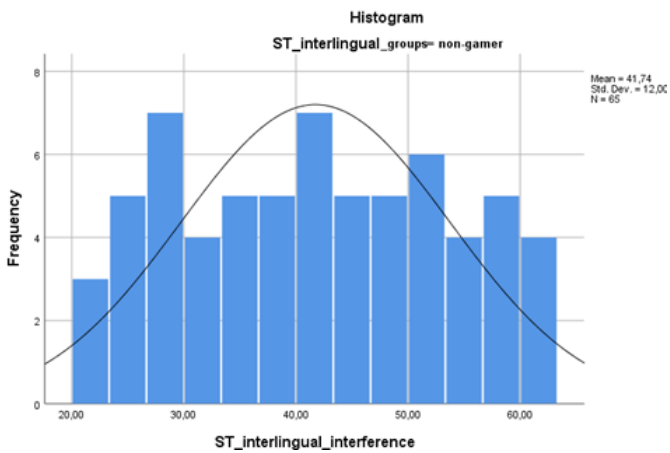
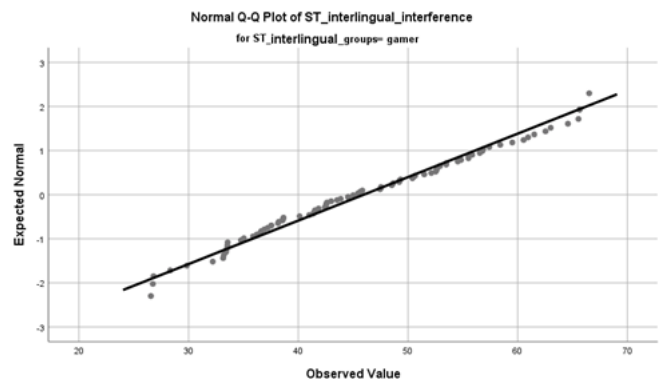
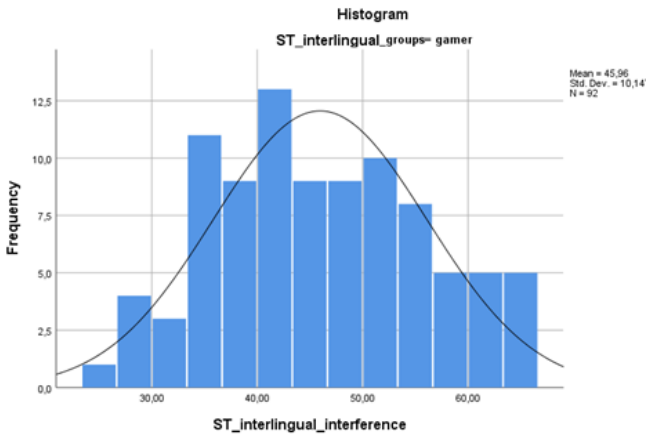
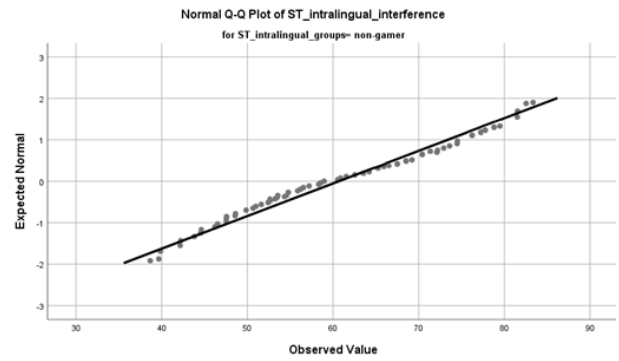
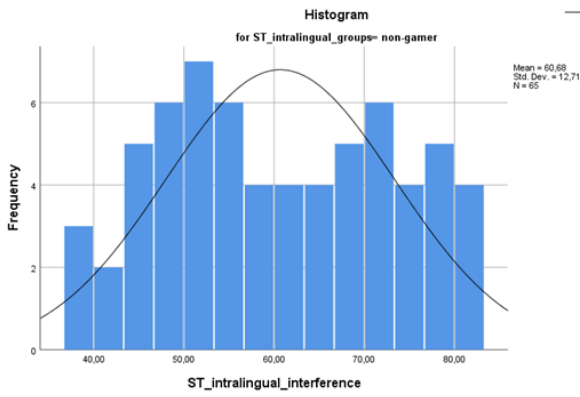
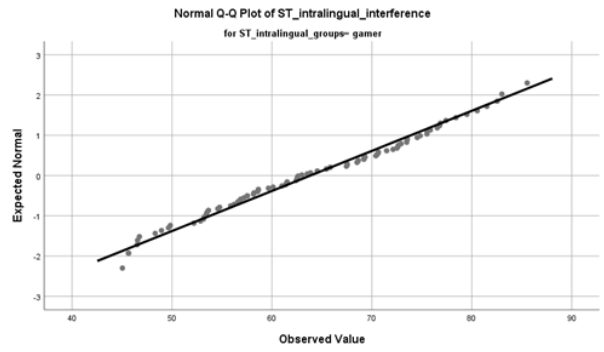
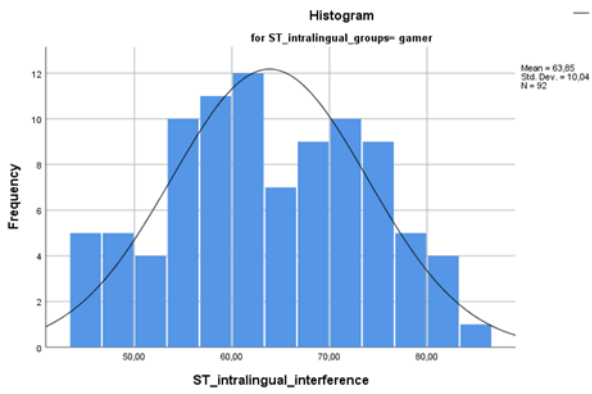
game type	TPS <sup>a</sup>	FPS <sup>b</sup>	MMORPG <sup>c</sup>	Open World <sup>d</sup>	MOBA <sup>e</sup>	B. R. <sup>f</sup>	Adventure <sup>g</sup>	Sports <sup>h</sup>	Card <sup>i</sup>	S. M. <sup>j</sup>	VR <sup>k</sup>	Platformer <sup>l</sup>	Puzzle, board <sup>m</sup>	non-gamers <sup>n</sup>
Mean	60.91	60.02	59.31	58.61	58.00	56.87	56.26	55.17	52.34	52.04	50.41	48.29	47.39	42.08
St. dev.	21.30	16.82	19.52	20.26	19.45	21.83	19.78	21.43	23.40	21.81	10.91	19.90	15.26	21.03
N	55	43	52	62	48	62	65	60	58	24	17	56	44	244

Note. **Multiplayer mode available, participants can communicate verbally (through Discord), co-op mode available**

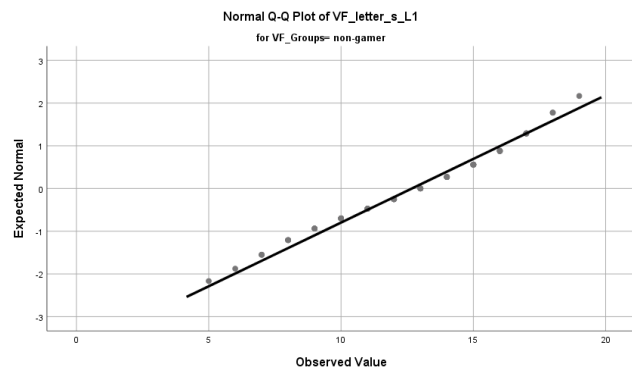
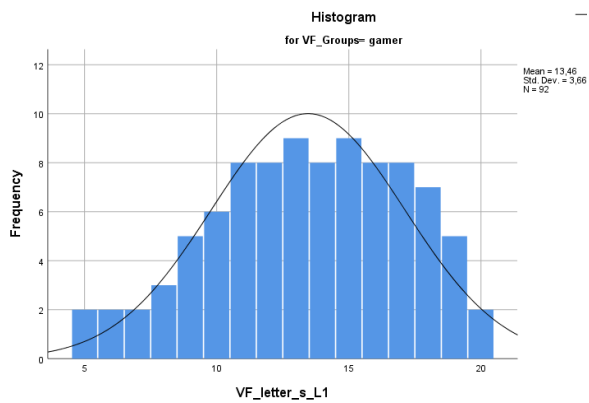
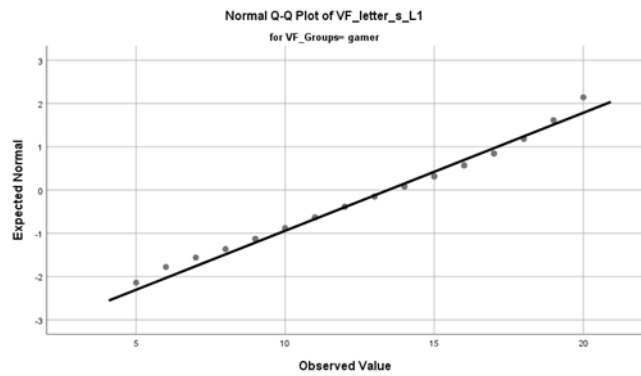
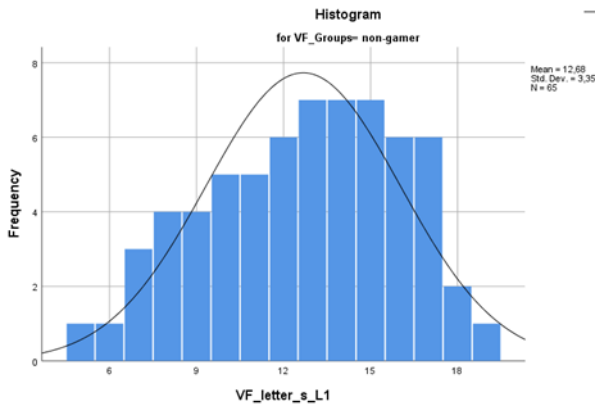
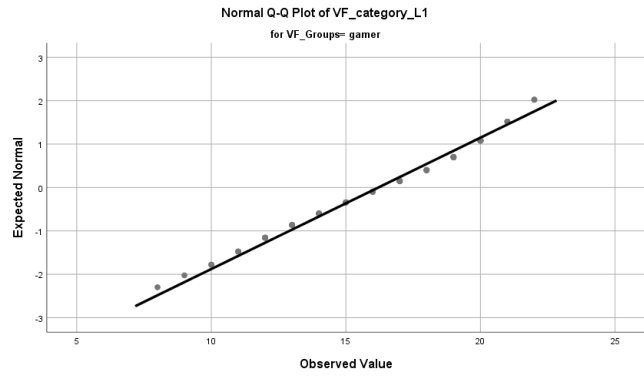
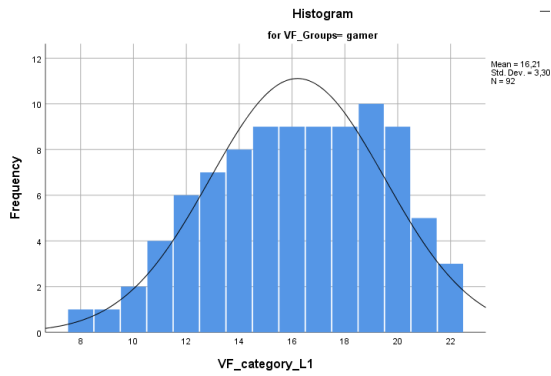
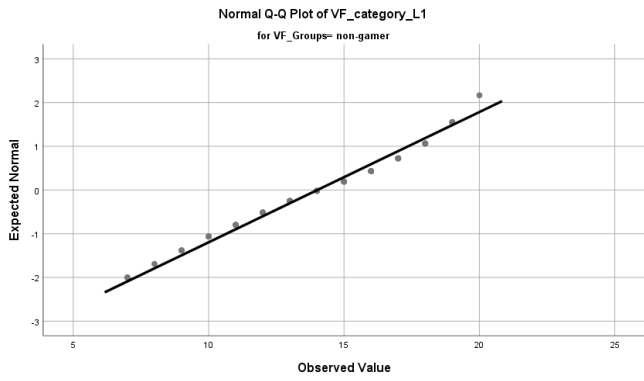
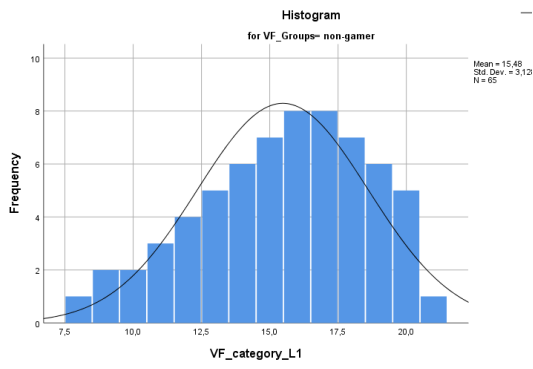
Among the choices may be overlaps, therefore the sum is bigger than 890.

- a). *Third Person Shooter*, e.g., Hitman, **Tom Clancy's Division**, **Warframe**, **Sniper Elite**,
- b). *First Person Shooter*, e.g., **Call of Duty**, **Battlefield Series**, Metro 2033, **Dusk**, **Doom**, **Paladins**
- c). *Massively Multiplayer Online Role-Playing Game* e.g., **Word of Warcraft**, **Metin 2**, **Tera**, **Star Wars: Old Republic**
- d). *Open World*, e.g., **GTA**, **Minecraft**, **Red Dead Redemption (online)**, **Mafia Series**
- e). *Multiplayer Online Battle Arena* e.g., **League of legends**, **Dota 2**, **Heroes of the Storm**, **Smite**
- f). *Battle Royale*, e.g., **PUBG**, **Fortnite**, **Apex Legends**, **Counter Strike: Global Offensive**
- g). *Adventure*, e.g., **The Walking Dead** (Telltale), **Tomb Raider Series**, **Life is Strange**, Beyond: two souls
- h). *Sports*, e.g., FIFA, NBA, NHL, Football Manager Series, Tekken Series, F1, Moto GP
- i). *Card*, e.g., **Hearthstone**, **Yu-Gi-Oh! Legacy of the Duellist**, Gwent, **Artifact**
- j). *Social Media*, e.g., Cat Mario, Farmerama, Candy Crush Saga, **Forge of Empire**, **Farmville**
- k). *Virtual Reality*, e.g., Superhot VR, Resident Evil VII, **Beat Saber**, Moss, Tetris Effect
- l). *Platformer*, e.g., Mario Series, Cuphead, **Rayman Series**, Inside
- m). *Puzzle and Board*, e.g., Portal II, **Guitar Hero**, Untitled Goose Game, **Knowledge is Power**, Jewel Quest
- n). The group of non-gamers is the control group.

**Table 68. Histograms, Q-Q Plots – Stroop test results**



**Table 73. Histogram and Q-Q plots – VFT L1 groups**



**Table 74. Histogram and Q-Q plots - VFT L2 groups**

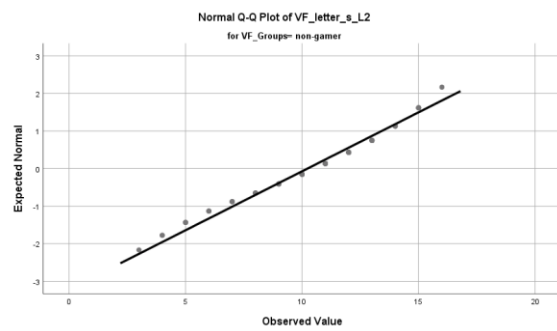
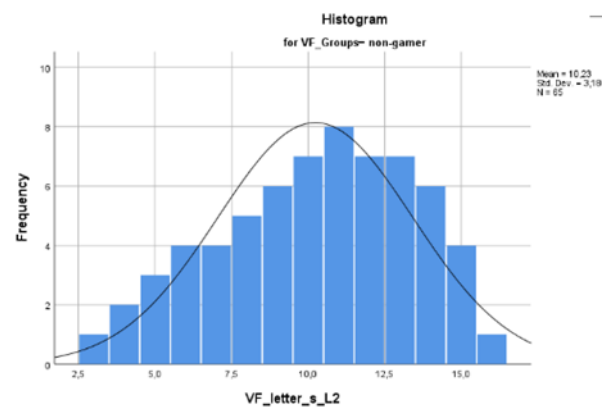
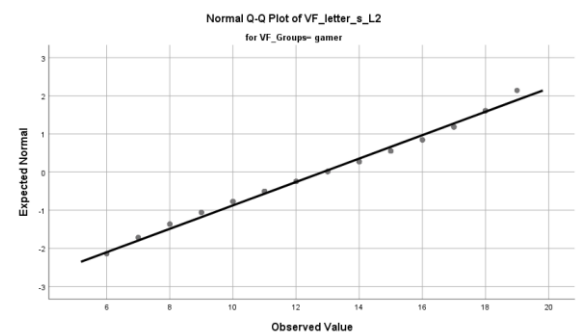
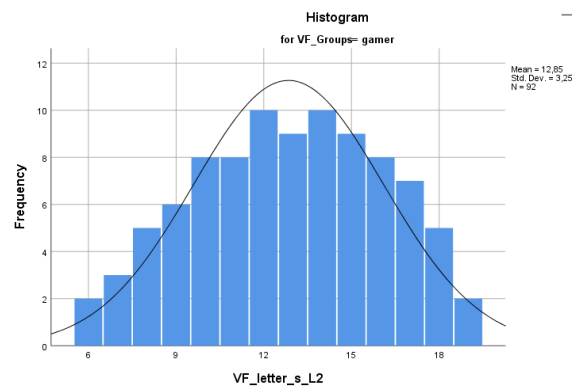
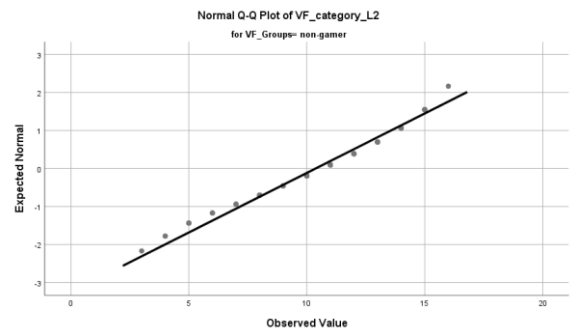
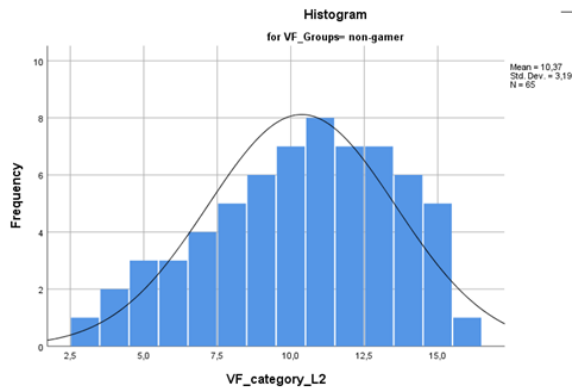
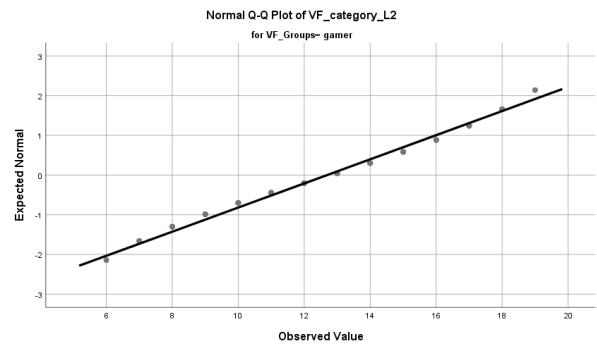
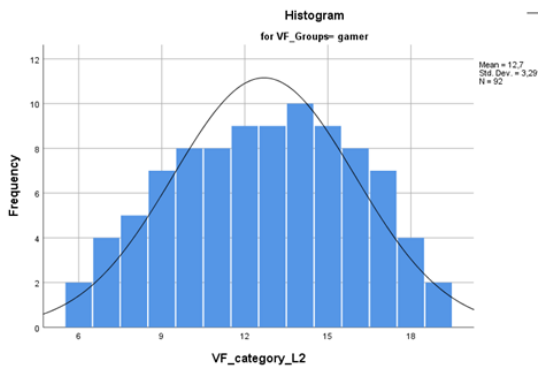


Table 82. Glossary of findings

<b><u>Original word</u> usage in Hungarian speech</b>	<b><u>Pronunciation</u> (of the local video gamers)</b>	<b>Explanation</b>	<b>Usage by the local gamers</b>
adj <u>bandage-ot</u>	[ˈbændɪdʒɒt]	health problem	give me help
adj <u>boost-ot</u>	[buːstɒt]	give me a hand / help	
adj <u>shield-et</u>	[ʃɪld ɛt]	give me a hand / help	
<u>alpha version</u>	[ˈælfə ˈvɜːʒən] or [ɔlfə vɜrʒɪɔː]	for internal testing of a game	raw, rough
<u>attack-ojek</u> a boltot	[ɒtɒkɔljuk] a boltot	go into the store to buy	go into the store to buy
<u>bigdata</u>	[bɪg dɒtə]	for personal data collected by tech giants for selling	important info
<u>boost</u>	[buːst]	(used as in English) ask for help	
<u>bot</u>	[bɒt]	(abbrev. of robot)	disliked person
<u>bug-os</u>	[bugɔʃ]	Problem with the game	something is disliked
<u>CoD-ozik</u>	[kodɔzɪk]	playing with Call of Duty game	
<u>combo</u>	[ˈkɒmbɔː]	(used as in English) usage of 2 or more items together	
<u>co-op mode</u>	[ˈkɔː ɔp]	do something together	
<u>cringe</u>	[krɪndʒ]	for being embarrassed instead of another person	
<u>CS-ézik</u>	[ˈtʃeːzɪk]	playing with Counter Strike game	
<u>damage</u>	[ˈdæmɪdʒ] or [dæməʒe]	(used as in English) damage / negative experience	
<u>DC</u>	[deː ceː]	disconnect	person is offline / not present
<u>DLC</u>	[deː ɜl ceː]	for downloadable content	something is accessible
<u>debuff-os</u> a srác	[ˈdebufː ɔʃ]	Effect that makes the gamer weaker	negative effect on somebody
<u>dodge-olsz</u>	[dɒdʒ ɔls]	avoidance by a sudden movement	avoid meeting somebody
<u>ez</u> dolog	[ɪː zɪ]	(same as English) something is easy	
<u>fast travel</u>	[fɒst trɒvəl]	let's go / transportation needed	
<u>flag</u>	[flɒg]	capturing the flag (win)	aimed item
<u>FOV-os</u>	[fɔvɔʃ]	Field of View	what you see is spectacular

<u>frag-golom</u>	[fræg: ɔləm]	ultimate kill	wishing something bad to someone
<u>freemium-osnak látszik</u>	[fri:miuɒɟ]	looks like free (game), but it doesn't	
<u>gameplay loop</u>	[ˈgeɪmpleɪ lu:p]	a repetitive activity in a game	repetitive and boring action
<u>HP</u>	[hɑ: pe:]	Health Point	actual mood
<u>hipe-os</u>	[haɪp ɔ]	forced publicity	overvalued
<u>holy hedges-be</u>	[hɒli ˈɛdʒɛ]	Named Location in Fortnite game	let us go to a nice place
<u>I need ammo</u>	[aɪ ni:d ˈæm:ə]	(same as in English)	Person is hungry, or short of money
jönnek a <u>bot-ok</u>	[bɒtɔk]	short for non-gamers	
<u>kazuár</u>	[ˈkəzuɑ:r]	casual gamer	
<u>ki-ban-noltuk</u> az embert	[ˈkɪb ən:ɔltuk]	Discontinued playing with somebody	avoid meeting with somebody
<u>ki-click-keltük</u> az embert	[ˈkɪkɪk ɛlt ɔk]	Discontinued playing with somebody	avoid meeting with somebody
<u>ki-loot-olom</u> a hűtőt	[ˈkɪ lu:t ɔlm]	taking stuff (from the fridge)	
<u>king of the hill</u>	[kɪŋ ɒv də hɪl:]	Winning a game	success in something
<u>ki-rage-el</u>	[kɪ reɪdʒ ɛl]	burst out	
<u>lag-golok</u>	[ˈlæɡ:ɔlək]	delay	fatigue
lement a <u>HP-ja</u>	[ˈha:pe:jə]	Health points are down	lost interest or feeling tired
<u>le-nerf-elt</u> cucc	[ˈlɛnɛrfɛlt]	crappy quality	
<u>loot</u>	[lu:t]	(used as in English) to get something	
<u>map-ol</u>	[mɒ pɒl]	player is mapping	Searching for something
<u>mate</u>	[meɪt]	friend or peer	
<u>max-os</u>	[mæksɔ]	most extreme, best, greatest	
<u>med kit</u>	[med kɪt]	Medical kit	help
<u>MVP</u>	[ɛm ve: pe:]	most valuable player	Expressing liking of someone
nagyon <u>aggro-ós</u>	[ɒɡ:rɔ:ʃ]	dangerous situation	dangerous situation

<u>NFS</u>	[ɛnɛfɛʃ]	Need for Speed game	nice car / needed transportation
<u>NPC</u>	[ɛn pe: ce:]	Non-Player Character	disliked person (non- gamer)
<u>off topic</u>	[ɔf 'tɒpɪk]	(used as in English) sensitive data or topic	
<u>off-os</u>	[ɔf: ɔʃ]	something off-like	anticipated loss
<u>OMW</u>	[ɔ: ɛʃm ve:]	On My Way	be there soon
<u>OMG</u>	[ɔ: ɛm ge:]	Oh My God	
<u>op</u>	[ɔ: pi:]	a very talented person	
<u>quest-eljük</u>	[kwɛstɛljɔk]	pursuit	
<u>pause</u>	[ 'pəʊzɛ]	have a break	
<u>pixel-es</u> vagyok	[ 'pɪksɛlɛʃ]	the internet is slow / person is tired	
<u>PLS</u>	[pe: ɛl ɛʃ]	please	
<u>pro</u>	[prɔ:]	(used as in English) expert / finest quality of something	
<u>PvP</u>	[pe: ve: pe:]	Player vs. Player	personal matter
<u>raid-eljük</u> a boltot	[reɪdɛljɔk]	many guys go into the store	
jó a <u>skin</u>	[skɪn]	nice avatar	nice outfit
<u>skip-peljük</u> a napot'	[skɪp:ɛljɔk]	everything is boring	
<u>soti</u>	[ʃɒti]	shotgun	
<u>szeró</u>	[sɛrɔ:]	server computer	
<u>TK</u>	[te: kɑ:]	Team Kill	something awesome / awful
<u>TP</u>	[te: pe:]	Teleport	the person leaves
új az <u>avatar-om</u>	[ɒvɒtɑ:rɒm]	the player's representation in the game world	e.g. new clothes
<u>unity-ben</u>	[ 'juniti bɛn]	game creator engine	leave to solve the problem by itself
<u>upgrade-elek</u>	[ʌp'gre:dɛlek] or [ɒpgrɛdɛlek]	studying, or get more or better of something	
valami <u>off-os</u>	[ɔf: ɔʃ]	anticipated loss	
warn-ollak'	[ 'vɔrnɔ:lɔk]	to warn someone	
XP	[ɪks pe:]	Extra Point	something is awesome

Table 83. Examples of the handwritten collection of the words

Hearts of Iron IV  
WWII Strategic Simulator

1. War - háború
2. Graphics - grafika
3. Kingdom - Királyság
4. Ideology - ideológia
5. Next Election - Következő választás
6. General - Táborszó
7. Division - Hadosztály
8. Research - Kutatás
9. technology - technológia
10. Trade - Kereskedelem
11. Construction - Építkezés
12. Recruit - toborzás
13. tank - tank / harckocsi
14. Armor - fegyverszer
15. Infantry - gyalogság
16. Artillery - tüzérség
17. Disarmed nations - lezavart nemzet
18. Non-aggression pact - megnevezetelmű szerződés
19. stability - stabilitás
20. Diplomacy - Diplomácia
24. Manpower - Emberi erő
22. Factories - gyárak
23. Propaganda - Propaganda
25. Promises - ígéret
25. Cavalry - Lovasoság
26. Fuel - üzemanyag
27. Convoys - konvoj
28. Send attaché - attasé küldése (nagyvonal)
29. Faction - frakció
30. Combat - harc
31. Support - támogatás
32. Navy - tengerészet
33. Region - régió

Call of duty 2

- 1 Hang on - várj
- 2 machine gun - géppuska
- 3 position - pozíció
- 4 artillery support - tüzérségi támogatás
- 5 enemy forces - ellenséges csapat
- 6 coordinates - koordináták
- 7 targets - célpont
- 8 gun - fegyver
- 9 grenade - gránát
- 10 counter attack - ellentámadás
- 11 move - mozgás
- 12 pistol - pisztoly
- 13 ammo - lőszer
- 14 defend - védekezés
- 15 Tank - tank
- 16 hill - dőlés
- 17 German - német
- 18 smoke grenade - füst gránát
- 19 fall back - visszavonulás
- 20 sniper sniper - mesterlövész
- 21 paratrooper - pártiz
- 22 single player - egy játékos
- 23 Multiplayer - több játékos
- 24 options - beállítások
- 25 Audio - hang
- 26 team - csapat
- 27 time - idő
- 28 FPS - First-person shooter
- 29 land mine - talázkő
- 30.

Call of duty: Mobile

1. Download - letöltés
2. quest - kérés
3. Shiny - fényes
4. looting - betöltés
5. Guard - őrs
6. Multiplayer - többjátékos
7. Loadout - felszerelés
8. Stone - kő
9. Clan - klán
10. Leaderboard - ranglista
11. Room - szoba
12. crate - láda
13. sniper - mesterlövész
14. LMG - light machine gun - könnyű géppuska
15. SMG - submachine gun - géppisztoly
16. Shotgun - sörcső
17. pistol - pisztoly
18. knife - kés
19. hill - dőlés
20. health - halál
21. score - pont
22. inventory - táskák, táskák, fegyverek
23. avatar -
24. Victory - győzelem
25. capture - elfoglalás
26. Team - csapat
27. gun - fegyver
28. grenade - gránát
29. invulnerable - invulnerabilis
30. defend - védekezés
31. love - szeretni
32. friend - barát

Genshin Impact

1. Network - hálózat
2. mage - varázsló
3. sword - kard
4. Stand - emelvény
5. portal - portál
6. Scanning - skenálás
7. fire - tűz
8. Gate - kapu
9. Hunt - vadászat
10. cook - főzés
11. Chapter - fejezet
12. mission/quest - küldetés
13. Weapon - fegyver
14. map - térkép/pálya
15. Inventory - táskák
16. Characters - karakterek
17. Bow - íj
18. food - étel
19. Materials - nyersanyagok
20. library - könyvtár

→ help - (helpesél) ~~from~~ ~~help~~ ~~helps~~  
 AFK - away from keyboard - nincs a gépnél  
 FPS - frames per sec - képkocka másodpercenként  
 GL - Good luck - sok szerencsét  
 GG - Good game  
 NPC - Non Player Character  
 RP - Role Play - szerepjáték  
 IRL - in real life  
 HQ - Headquarters - főhadiszállás  
 DM - Death match  
 TDM - Team death match  
 → PLS -  
 SHIP - c. A rapot  
 BAN  
 TPA - teleport Bannigy  
 quest - küldetés  
 I need more - elmissz hajránt  
 wann - figyelmeztetés  
 TK - Team kill  
 @@@

Angol:  
 Jr. - junior - ifjabb  
 Sr. - senior - idősebb  
 WH - wall hack -  
 op -  
 B4 - before - előtt  
 EZ - easy - könnyű  
 G2CU - glad to see you - örülök  
 látás  
 GR8 - Great - nagyszerű  
 \*  
 SIS - mixer - keverő  
 THX - thanks - köszi

Table 84. Discussing the topic with the students

