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**THE EFFECTS OF EDUCATIONAL VIDEO GAMES ON  
ADULT LANGUAGE LEARNERS**



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## ABSTRACT

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Educational games have been studied earlier primarily from the point of view of children and other younger individuals, even though learning is a concept that affects all people regardless of their age. In educational games used in language learning, the studies have been even more limited, because the focus has been in teaching English to K-12 students. In this study, the effects of educational video games will be examined from the point of view of adult foreign language learners. The literature review part will study the effects of educational games found on children, which are then applied to adult learners with the help of literature regarding language learning and adult learning, as well as learning theories. Based on the results found in the literature review, it looks like many positive effects found on adults are similar to those found on children. However, out of five positive effects that were found on children, there were two positive effects that had not been confirmed on adult learners during the previous studies about educational games. These effects were pressure-free learning and improved self-efficacy. To determine whether adult learners could benefit from these two effects or not, an empirical study was conducted in a form of a qualitative survey that was given to 12 adult individuals who tried one of the two following educational games: Influent or LingoDeer. After the results were transcribed, they were analysed by using thematic analysis and classification. The themes used were the effects that had been found on children, and the classification was used to determine whether individual survey answers were positive, neutral or negative. In conclusion, the results were able to show that all the effects that were found on children can be applied to adult learners as well.

Keywords: educational games, adult learning, video games, language learning, qualitative research

## TIIVISTELMÄ

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Oppimispelien vaikutukset aikuisilla kieltenoppijoilla

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Oppimispeljä on tutkittu aikaisemmin lähinnä lasten ja nuorten näkökulmasta, vaikka oppiminen käsitteenä koskettaa jokaista ihmistä ikään katsomatta. Kieltenoppimiseen käytettyjen oppimispelien kohdalla tutkimukset ovat olleet tätäkin suppeampia, sillä niissä on keskitytty pitkälti englannin opettamiseen peruskouluikäisillä lapsilla. Tässä tutkielmassa tarkastellaan oppimispelien vaikutuksia aikuisilla kieltenoppijoilla. Kirjallisuuskatsauksessa selvitetään lapsilla havaittuja oppimispelien vaikutuksia, joita sovelletaan aikuisiin käyttämällä apuna kieltenoppimiseen ja aikuisten oppimiseen liittyvää kirjallisuutta, sekä oppimiseen liittyviä teorioita. Kirjallisuuskatsauksen avulla saatujen tulosten perusteella näyttää siltä, että ainakin oppimispelien hyödyt aikuisilla ovat pitkälti samat kuin lapsilla, mutta tiettyjen hyötyjen ilmenemistä aikuisilla ei ole vielä todennettu käytännössä. Viidestä kirjallisuuskatsauksessa havaitusta vaikutuksesta kahta ei ole aikaisemmissa tutkimuksissa varmistettu hyödyttävän aikuisia oppijoita. Nämä kaksi vaikutusta ovat oppiminen ilman painetta ja parantunut minäpystyvyys. Selvittääksemme sen, voivatko aikuiset oppijat hyötyä näistä vaikutuksista, tehtiin empiirinen kyselytutkimus, jossa 12 aikuista kokeili yhtä kahdesta oppimispelistä, jotka olivat Influent ja LingoDeer. Litteroinnin jälkeen kyselyn tulokset analysointiin käyttämällä teemoittelua ja luokittelua. Teemat muodostettiin käyttämällä aikaisemmin lapsilla todettuja vaikutuksia, ja luokittelua käytettiin määrittämään, ovatko yksittäiset vastaukset positiivisia, neutraaleja tai negatiivisia. Johtopäätöksenä voitiin todeta tulosten viittaavan siihen, että kaikkia aikaisemmin lapsilla löytyneitä vaikutuksia voidaan soveltaa myös aikuisiin oppijoihin.

Asiasanat: oppimispelit, aikuisopetus, videopelit, kieltenoppiminen, kvalitatiivinen tutkimus

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# 1 INTRODUCTION

Despite the high amount of adults who play video games, the research of educational video games seems to focus greatly on children's learning. This is problematic, because learning is an important part of human life, no matter how young or old the person is, as it affects everything from simple everyday chores to one's career performance.

In this study, we focus on the effects of educational video games on adult learners. While the meaning of the word "adult" may vary between people from different backgrounds and nationalities, it is used here to refer to individuals who are 18 years old or older, and it is assumed that they have finished at least the primary education. Additionally, it is worth noting that the terms "game" and "video game" are used interchangeably in this study, unless stated otherwise. Both terms will be defined more clearly in the following chapters.

The reason why a study like this is needed comes down to multiple factors, but one of the most significant ones was highlighted by the Covid-19 pandemic, a global health-related crisis that showed us the need for non-physical alternatives to many activities that have been arranged mostly in person in the past. Along with other digital educational content, video games have the potential to teach people a wide variety of skills and subjects without the need of face-to-face interaction with a teacher or other students. While the times of strict social distancing might be in the past, educational games could still provide a way of learning for those who are unable to attend physical classes for other reasons, like physical impairments or geographical distance. Also, while educational games are developed for pedagogical purposes (Bi, 2013), they can provide an entertaining and effective alternative to more traditional learning tools, such as text books (Dobrescu et al., 2015).

Additionally, while this study isn't about the history of educational games, it should be underlined that the phenomenon itself has relatively long roots compared to many other topics in the field of information technology: One of the most successful educational games, *The Oregon Trail*, was originally developed in the 1970's (Loh, 2015), and many other games have been released ever since,

yet the research about the actual benefits of educational games is still somewhat lacking.

Because learning and education are both rather broad subjects, a conscious decision was made to focus specifically on foreign language learning. While language learning from educational games has been studied before, the studies in the past seem to have focused greatly on children's learning despite the potential interest or even need adults – the writer of this study included – might show towards learning new languages. While there are some studies about educational games in language learning that focus on college students, a scoping review by Xu et al. (2019) indicated that most studies regarding digital game based language learning focused on K-12 students learning English (Xu et al., 2019). Based on these factors, the main research question of this study is phrased in the following way:

- What effects do educational video games have on adult foreign language learners?

In order to provide a sufficient answer to this question, we will start this study with a brief introduction to games in general and how they have been used in education in the past. The study is split in two parts: The literature review and the empirical study. The first one of these two part was conducted as a literature review where the source material consisted of material that was acquired primarily from online sources. Google Scholar and JYKDOK were used to search for the material, with the focus being on peer-reviewed articles from relevant scientific journals, though few, selected books about educational games were used as well to add slightly older but still relevant information. The second part, the empirical study, is based on the findings of the literature review and a survey that was given to a limited group of adult individuals who had agreed to try out one of the given language learning games, and it gives us a chance to inspect the effects of educational games on adults in practice.

In the next chapter, "Video Games in Education", the focus is in the background of educational games and how they differ from other similar terms, such as serious games and gamification. After that, we move on to a subchapter that explains what benefits children have gained from educational games in the past, and what kind of issues and challenges there may have been. The benefits are displayed first as a list to add visual clarity, after which the listed benefits will be explained more in detail. The chapter will also discuss game based language learning, with examples of how educational games have been used in the past.

In the third chapter, we will discuss adults as learners, which requires understanding the differences between adults and children when it comes to learning something new. The first subchapter of the third chapter inspects three learning related differences between adults and children identified by Merriam and Bierema (2013), which are the life situation, life experience and the level of development. Additionally, topics like motivation, preferred learning environments and certain learning methods will be discussed as well. After that, the next

subchapter will explore a limited set of learning theories that were used in a study by Arghode et al. (2017) about adult online instruction and learning, that can also be applied in the context of educational games and foreign language learning. In practice, the subchapter will provide a brief overview to each theory, which are behaviorism, cognitivism, constructivism, humanism and andragogy, or more specifically, Knowles' theory of andragogy. Finally, the usefulness of the theories in the context of educational games will be evaluated.

From there, we move on to the fourth chapter of the study, where we will be summarizing what was learned during the previous chapters and apply this information in a way that we can make generalizations regarding how the use of educational video games can affect adult foreign language learners. In order to display the main findings of the study in a well organized manner, they are arranged into a table that shows which ones of the significant effects found on children have also been found on adults in previous studies about educational games. The content of the table is discussed more in detail in the text that follows it, meaning that the connections between effects, age categories (adults or children) and theories are explained.

The fifth chapter of the study is about the methods that are used in this study. The first subchapter describes the methods used in the literature review, while the second subchapter is about the methods of the empirical study. In short, the literature used in the literature review consists mainly of peer-reviewed journal articles and certain other scientific sources about educational games, adult learning and learning theories. Everything from the formation of the used search words and the selection of literature to how the selected literature was analyzed will be discussed more in detail in this chapter. The subchapter about the empirical study, the qualitative survey. It is split in two subchapters that describe how the games used in this research were selected, how the participants were chosen and how the survey that was used to gather empirical data was carried out overall. It also describes the methods that were used to analyze the data once it had been collected.

The sixth and the seventh chapter, "Results" and "Result Analysis and Reflection", are all about the results of the empirical study. First, the results of the qualitative survey are each separated in their own respective subchapters under the "Results" chapter based on what effect or theme they fall under. In these subchapters, the results belonging to that theme are then analyzed based on how positive, neutral or negative they are. After this, the results are interpreted and analyzed more in depth in the chapter "Result Analysis and Reflection". This chapter also includes suggestions for further research topics.

In the conclusion chapter, the most important findings of the study will be summarized. The conclusion also acknowledges any identified limitations related to the used literature, the main findings and the interpretation of those findings. Finally, suggestions for further research topics will be offered.

## 2 VIDEO GAMES IN EDUCATION

Before we move on to the main topic of this study, the educational games, let's take a look at the terms "game" and "video game". Michael and Chen (2006) define games in the following way:

Games are a voluntary activity, obviously separate from real life, creating an imaginary world that may or may not have any relation to real life and that absorbs the player's full attention. Games are played within specific time and place, are played according to established rules and create social groups out of their players. (Michael & Chen, 2006, s. 19)

However, the word "voluntary" is somewhat problematic, since there may be times when playing a game is not completely voluntary. For example, if a teacher decides to integrate games into formal classroom education, the act of playing the selected game is not as voluntary as it would be outside of the classroom setting. A definition from a game designer Greg Costikyan would exclude the mention of games being voluntary by simply describing games as interactive entertainment (Costikyan, 2002), but this simplified definition isn't free from issues either, because there are games that haven't been developed mainly for entertainment purposes, even though they may include entertaining features to make the game more engaging for the player. Yet another definition describes game as a system where people participate in a conflict that was created artificially, has a set of rules and results in an outcome that can be measured (Salen & Zimmerman, 2004, p. 80).

The varying definitions are acknowledged by McFarlane (2015), who ends up stating that while different writers have suggested different definitions for games, they usually include two common things: A game must have at least one player and it should have a set of rules (McFarlane, 2015), and this somewhat broad definition will be used in this study to prevent possible term related conflicts that might arise otherwise.

Since this study is about educational video games, it should be emphasized that when we mention the word "game" from now on, we will be talking about video games, unless stated otherwise. To keep things simple, we define the

term "video game" simply as any kind of game that can be played on a digital device, such as a computer or a smartphone.

While the vast majority of games we see on today's market are known for their entertainment value, educational games are games where the primary goal is to teach people some specific skills or school subjects. Of course, this does not mean that games developed for entertainment purposes couldn't teach something. The most striking example could be the learning of English language skills. Since many commercially available games use English as their main language, the player may end up picking up words unintentionally, or in case of games that are heavy on story content, understanding the story requires one to learn the language the story is written in. Also, if the game has online multiplayer content, understanding other players requires understanding the main language the playerbase of the chosen server is using, and in these cases, the learning might not even be a conscious process. Additionally, there have been cases when these so called "normal" games have been used in formal education. For example, medical undergraduate students have used virtual world called Second Life to learn radiology in the past (Lorenzo-Alvarez et al., 2020).

Based on what has been mentioned so far, it seems that learning from games could be split into two categories: Learning from the games that are meant as entertainment and learning from games that have been specifically developed to teach something. While both of these would be interesting topics to study, we will only focus on learning from educational games. In other words, games that have a pedagogical purpose (Bi, 2013). In the next subchapter, we will provide a brief introduction to educational games, and try to explain what separates them from two other terms that might get mixed up with them: Gamification and serious games.

## 2.1 Gamification, serious games and educational games

Gamification, serious games and educational games are three similar terms that all refer to slightly different things. While serious games and educational games have many things in common – so many, that educational games can be seen as a subcategory of serious games – gamification should not be mixed up with either one of the two other terms. Simply put, gamification is the act of using game elements in something that is not a game (de Marcos et al. 2016), while educational games and serious games are both considered games. As for what separates serious games from educational games, it usually comes down to the content, but that will be discussed later. For now, let's take a look at the concept of gamification.

Like stated earlier, gamification means the usage of game elements in something that is not viewed as a game (de Marcos et al., 2016). For example, according to Reinhardt (2018), learning tasks and even whole courses can be gamified by adding features that are typically associated with games, such as levels, leaderboards, and badges (Reinhardt, 2018, pp. 9–10). While other definitions do

exist, it seems to be commonly agreed that the goal of gamification is to motivate someone to do tasks they might not be otherwise interested in by adding game elements into them (Plass et al., 2016).

Based on two studies regarding gamification, it seems like its effectiveness could depend on the subject that is being taught, the technology that is being used and the age of the players (de Marcos et al., 2016; Su & Cheng, 2014). An experiment by de Marcos et al. (2016) studied the effects of gamification, educational games, and social network on groups of undergraduate students. While some of the early results seemed promising, the groups using gamification and social approaches performed worse in the final examination than the other groups, including the one that was using an educational game (de-Marcos et al., 2016). However, in the study conducted by Su and Cheng (2014), the effects of mobile gamification on children were found to be quite positive (Su & Cheng, 2014).

From gamification, we move on to serious games. While most video games are games that put emphasis on the entertainment value, serious games focus on other things. According to Dörner et al. (2016), there is no single definition for serious games that would be agreed on by all scholars who have been studying the topic, but the games are still used for many different purposes from training surgeons to introducing individuals to terms like sustainable development (Dörner et al., 2016; Loh et al., 2015). According to some scholars like Tyni et al. (2022), serious games and educational games are two terms that mean the same thing. Others, however, suggest that educational games are their own term that simply falls under the umbrella term of serious games (Pérez-Colado et al., 2019; Bi, 2013), meaning that all educational games are serious games, but not all serious games are educational games. This study chooses to follow the latter definition.

Simply put, educational games (also known as "edugames") are games that strive to educate the player. From relatively simple subjects like basic pre-school mathematics to more complex concepts like college economics, they can provide an entertaining way of learning for both children and adults alike (Kiili et al., 2015; Dobrescu et al., 2015). To demonstrate the effectiveness of educational games on college students, Dobrescu, Greiner and Motta (2015) studied whether or not playing an educational game can lead to similar learning outcomes as written material by splitting a group of undergraduate economics students in two, where one of the groups studied the same material from a text book, and the other from an educational game. In the end, it was found that there was no difference in the test performance between the two groups, but the ones who were playing the educational game had enjoyed the learning process more than the students who were studying from the book. (Dobrescu et al., 2015). Another similar study that's more in line with the topic of language learning was conducted by Tang and Taguchi (2021), where one group participated in Chinese language online lessons and the other one in a scenario-based educational game. In the end, it was determined that both groups of students were able to learn the same things, but the game-based group had been more engaged and motivated (Tang & Taguchi, 2021).

In practice, educational games offer a way to teach people with examples that can be close to real life situations (Merriam & Bierma, 2013), they show how the player progression in an encouraging way, such as points and achievements. They are also quite flexible, since they are not tied to a specific place in a way classroom education is.

## 2.2 The effects of educational games on children

Like it was mentioned in the previous subchapter, educational games can teach different kinds of topics from basic school subjects to college courses. Unlike possible learning from video games that have been developed for entertainment purposes, educational games have been created for the very purpose of education. But how well do they actually work? This chapter discusses the effects of educational games on children that have been discovered in earlier research. At the beginning of this subchapter, there will be a few general words about language learning from educational video games based on some previous studies about the subject. Once that has been discussed, the focus will be on what actual positive effects have been found earlier, after which some negative effects, issues and challenges related to educational games themselves and their use in formal education will be examined.

When it comes to learning foreign languages from educational games, clear positive effects have been recorded in the past. A scoping review of educational game-based English language learning by Xu et al. (2019) examined 59 different studies regarding the topic, out of which almost 80% had reported positive effects, 10% reported mixed results, and only one had reported a negative result (Xu et al., 2019). Outside of studies about English language learning, the benefits of educational games have been found in teaching children from bilingual families their so called home language, or the one that's not widely spoken in the country they currently live in (Eisenclas et al. 2016)

In addition to foreign language learning, there is evidence that educational games can also help learning less used native languages. For example, a study by Dalton and Devitt (2016) assessed how a game using a virtual world as a platform was able to provide Irish children a meaningful way to learn the Irish language, which can be considered important since even though Irish is taught in schools, only a small minority of children and teenagers are able to speak it (Dalton & Devitt, 2016). This suggests that educational games could be seen as an environment where even declining or otherwise rare languages can be used actively.

Positive effects of educational games found in earlier studies vary slightly, and the following list is used to display them in an orderly manner.

- Making learning an entertaining and engaging process (Kiili et al. 2015; Duh et al. 2016; Long & Aleven, 2017).
- Improving motivation and attitude towards learning (Sung & Hwang, 2013).

- Enhancing understanding of the subject and improving learning performance (Sung & Hwang, 2013; Kiili et al. 2015; Duh et al. 2016).
- Enabling learning without pressure related to exams and assessments (Kiili et al. 2015).
- Improving self-efficacy of the learner (Sung & Hwang, 2013).

Making learning an entertaining or engaging process was mentioned in some form in most literature sources (Kiili et al. 2015; Duh et al. 2016; Long & Alevan, 2017; Gray et al. 2019). In fact, the focus on how fun, motivating or interesting the games can make learning was so strong in some studies, that the amount of research on how well they are actually able to teach a specific subject or a topic seemed much lighter in comparison. Still, there were some studies where the learning performance was clearly focused on, like in Duh et al. (2016), where the children using an educational game learned to write Cyrillic letters faster than the children who didn't play the game (Duh et al. 2016). In similar terms, a study by Kiili et al. (2015) shows that playing a well-designed educational game even for even a short period of time can improve the skills of the player in the subject that's being taught (Kiili et al, 2015).

Of course, this doesn't mean that the entertainment value of educational games should be overlooked: If the game is entertaining enough, it will encourage the player to keep playing, allowing the player to learn more while doing so. On the other hand, if the player doesn't find the game interesting, they might refuse to play it again (Michael & Chen, 2006). Examples of how educational games are made more entertaining and thus, more appealing, include adding multiplayer elements that encourage positive social interaction (Gray, 2019) and including eye-catching colors and other visual aspects designed to attract attention from children (Duh et al. 2017). Of course, the very interactive nature of games can also be seen as an aspect that makes educational games engaging (Mohd Nizam & Law, 2021), which could be one reason why one of the participants in a study about a simple, digital crosswords game reported getting so engaged in the game that they forgot it being a form of word exercise (Goumas et al., 2020) despite the game lacking high quality visual elements that could be expected from modern video games.

As for the elements that are used to improve motivation towards learning in educational games, they seem to be generally related to the feeling of personal achievement and the social aspect. Sung & Hwang (2013) noticed that especially collaborative game-based learning seems to be an effective way to improve the motivation of the students. According to de Marcos et al (2016), one way to boost motivation is to use trophies, badges and leaderboards, because they create competition between the players, which in turn encourage further playing and learning. However, de Marcos et al. (2016) also points out that they noticed that the positive motivational effects only lasted for a short time, but unlike with Sung & Hwang (2013), the study was conducted on young adult students instead of sixth graders (Sung & Hwang, 2013; de Marcos et al, 2016).

Enhancing understanding of the subject and improving learning performance often comes down to how well the game is designed, and developing a game that is both educational and engaging can be difficult (Long & Alevan 2017; Gray et al. 2019), though elements that can improve the educational effectiveness are offering immediate feedback (Vanbecelaere et al. 2020) and enabling repetition, which is an important part of learning even outside educational games (Gray et al. 2019).

Games allowing learning without pressure related to exams and assessments probably doesn't require detailed explanations. Simply put, if the game is engaging enough, the students won't focus on how they are being assessed, even if their performance in the game would be being evaluated by others (Kiili et al, 2015).

The final one of the positive effects listed earlier is improving the self-efficacy of the learner, or in this case, the player. In Graham (2022), self-efficacy is said to be a belief that an individual has what it takes to succeed in a specific task (Graham, 2022). Improvement of self-efficacy can happen when someone makes progress by completing tasks in an educational game, especially when they are playing the game on their own, but self-efficacy – along with pride – may also grow when the player compares their own performance with others' (Sung & Hwang, 2013; Gray et al. 2019). When self-efficacy is improved this way, it resembles the way how motivation can be improved through competition according to de Marcos et al. (2016), where the possibility that elements like leaderboards could be used to gain both positive effects in the same educational game is suggested.

While the benefits listed above have been identified from studies that include educational games used outside the context of language learning, most, if not all of them can be applied to language learning as well. While there is evidence that games can lead to similar or even better learning outcomes than more traditional learning methods (Dobrescu et al., 2015; Duh et al. 2016), most studies don't measure the effectiveness of the game against something else, but focus on other benefits like increased levels of engagement and motivation that were mentioned earlier. While effectiveness is certainly important, it could be argued that it doesn't matter much if the learner isn't interested in the subject that's being taught in the first place.

Like with most research topics, educational games are not perfect. Despite their many positive effects, there are also negative effects, challenges and other concerns. One unique challenge that arises from using educational games on minors is the short attention span of young children, though the scale of this issue relies on how engaging the game is (Mohd Nizam & Law, 2021). However, balancing the game to be entertaining without losing its educational effectiveness might be difficult (Long & Alevan, 2017; Gray et al. 2019). Additionally, if a game is used as a part of formal education, Kiili et al. (2015) suggests that an educational game can be more effective if a teacher or instructor participates in the learning process instead of letting the child play on their own (Kiili et al. 2015), and learning performance can be improved even further by allowing the students

to spend time discussing the knowledge they gained during the gaming session (Sung & Hwang, 2013).

Another concern regarding educational games on children has been whether or not the learning performance or level of engagement would have something to do with the gender of the player. This might have something to do with how some people still associate video games with male children despite the amount of girls and women in modern video game communities. Whatever the reason for this concern is, neither Mohd Nizam & Law (2021) nor Moser et al. (2015) were able to find significant gender based differences that would affect the children's capability to play educational games (Mohd Nizam & Law, 2021) or otherwise learn using digital technologies (Moser et al. 2015).

### 3 ADULTS AS LANGUAGE LEARNERS

The previous chapter worked as an introduction to educational games in general and then provided information about the effects that the games can have on children, from a list of benefits to few concerns and issues. Now, it's time to move from children to adult learners. In the first subchapter of this chapter, the focus will be inspecting how adults learn in a more generic level. What this means in practice is that both similarities and differences between adults and children as learners will be identified and discussed, and then this information will be applied to language learning. The second subchapter then introduces certain learning theories, after which their suitability in the context of educational games will be analyzed.

#### 3.1 How do adults learn?

According to Merriam and Bierema (2013), there are three significant differences between adults and children when it comes to learning. These differences are the life situation, life experience and the level of development (Merriam & Bierema, 2013). Similarly, adults and children have different desires and expectations when it comes to learning content, and this should be kept in mind when games or other applications are designed for children or adults, respectively (Duh et al. 2016). Now, let's take a closer look at the differences identified by Merriam and Bierema (2013).

The first difference mentioned by Merriam and Bierema (2013) is the life situation. Generally speaking, adults have more responsibilities in their everyday lives, but they can also make more choices than children can when it comes to choosing what they do and don't want to learn, partially because adults don't have to participate in compulsory education the way children do. On the other hand, the other responsibilities adults have can limit the time adults can spend on different activities, which means that adults must prioritize those activities. Those activities may include learning, and unless the person is motivated to learn

the subject, they may not wish to spend time on the learning process, and even if the person was interested in a subject they wish to learn, they might be so busy they simply don't have enough time to sign up for formal education. (Merriam & Bierema, 2013). According to Tam (2016), time-related prioritizing can affect even older adults who have already retired, because even though they may technically have more time available in their everyday lives than those who are still working, they also understand that they are not going to live forever. This causes them to consider what they wish to do with the time they have left more carefully than a typical younger adult would. If an elderly person feels that learning something is not worth their time, they simply won't participate in learning (Tam, 2016). Additionally, not all courses are free to attend, and there can be times when a person simply cannot afford to spend money on any additional education, no matter what their age is. To make matters even more complicated, life situation also includes the place where the person lives, and like Tam (2016) implies, if the locations offering courses and other learning activities are too far away, people may not wish to, or are physically unable to attend such activities (Tam, 2016).

The second difference between adults and children is the amount of life experience. In "Foundations of adult and continuing education" by Ross-Gordon et al. (2016), an interesting example is used to show how the life experience can affect the ways adults and children interpret the same sight: When a young child sees a bird, their mind creates a memory of a winged animal. However, when the father of the child sees the same bird, they compare the sight with the knowledge and experiences they have gathered before, which may lead the father into trying to identify the species of the bird (Ross-Gordon et al., 2016). Just like in the previous example, adults tend to interpret new information through a lens created by what they have learned before, leading into various conclusions. In addition to this, Tayler (2015) mentions that experiences have a significant impact on the formation of personal identity and self-awareness, as well as our capacity to learn and change in the future (Tayler, 2015). Therefore, it could be said that we are all products of our personal experiences.

While life experiences may help adult to understand the world better than a child does, it can also lead to problems. If an adult has had negative or even traumatic experiences related to learning situations or a specific topic that's being taught, these experiences will affect learning in a negative way (Merriam & Bierema, 2013). Negative life experiences related to things other than the learning situation or the topic can also affect learning in negative ways if the experiences are significant enough. An unfortunate example of this would be a person with health problems or someone who has just experienced the death of a family member (Tam, 2016).

The third learning-related difference is the level of development, which according to Merriam and Bierema (2013), can be explained in the following, simplified way: A toddler learns basic skills like walking and talking, but a slightly older child focuses on learning skills that allow them to learn even more. For example, learning to read allows one to learn from written books. An adult who knows how to read may focus on more complex things that are often tied with

certain social roles, like their work position. (Merriam & Bierema, 2013). These are just general examples, however, and it could be argued that adults may wish to learn things that enable further learning, just like children do. An example of this would be an adult who starts learning a foreign language so they can read the original version of a book or an article without having to worry that something was lost in translation.

Another important thing to consider is that the level of development. While development can mean many things from social or emotional development to a general term used by scholars like Taylor (2015) while discussing the abilities a child has mastered so far and comparing them with what they call potential development (Taylor, 2015), we will focus on the brain development. The level of development doesn't just separate children from adults, but individuals from each other regardless of their age. Immordino-Yang et al. (2019) suggests that brain development and thus, learning, depends on social-emotional experiences, which are, in turn, related to the environment and the culture the person lives in. Generally speaking, negative experiences and substandard living conditions in childhood, especially during the first eight years, can have permanent negative effects on human brains and their development, whereas positive experiences and safe environments that support the well-being of an individual have a positive effect that works as a foundation for future learning, health and behavior (Taylor, 2015; Immordino-Yang et al. 2019). In reality though, while early childhood is certainly an important part of life that affects the upcoming stages of life, it's not only the childhood situations that affect the brains and the development of the person, but all past experiences.

While people do learn in different ways during their childhood, adolescence and adulthood, positive and negative experiences will always have some kind of impact on the person. Like Immordino-Yang et al. (2019) mentions, even a person who has reached the middle adulthood, the time of life when the brain is considered to be fully mature, environmental factors, different activities and social interactions affect their brains and can even prevent possible cognitive decline associated with aging (Immordino-Yang et al., 2019). Based on this information, it seems clear that there's a strong link between life experiences and the level of development.

All three of the differences that were mentioned can be linked to motivation. Multiple scholars agree that the only way to get an adult to learn something is understanding what motivates them. The reasoning behind this is that when an adult recognizes the benefits of learning something specific, they are more willing to accept new information. Of course, there are those individuals who wish to learn new things because they are able to derive joy from the learning process itself, but in many situations, the will to learn something is based on a wish to somehow improve one's life situation. (Merriam & Bierema, 2013; St. Clair, 2015; Tam, 2016). For example, a person may wish to learn the first language of a foreign person they are dating or they might wish to get a college degree to improve their standing in the job market. For elderly people, the main motivation may be as simple as keeping up with the society (Tam, 2016). This is why St. Clair (2015)

suggests teachers to motivate adults they are teaching by making links between the subject and the personal experiences of the people they are teaching (St. Clair, 2015). However, since groups consisting of adults tend to be more diverse when it comes to life experiences and personal needs than groups that consist of children, it may be difficult to come up with examples that everyone in the group can relate to (Merriam & Bierema, 2013).

Additionally, the teacher or, by extension, the designer of an educational video game, should not only focus on making the examples relevant, but also consider other things that might affect the motivation of the adult learners. For example, while de Marcos et al. (2016) found that competition increases the motivation of younger people, older adult learners interviewed in Tam (2016) specifically state that competition is something they wish to avoid. Instead, they wish to learn in a pressure-free environment (Tam, 2016). Speaking of environment, the learning environment itself can affect the willingness to participate in learning activities. For example, while some people may wish to attend formal, organized courses, others may prefer more informal learning activities, and there are always those who wish to learn completely on their own (Tam, 2016).

If we move on from general learning differences between adults and children and start looking at the differences found in language learning, one thing worth noting is that according to Lichtman (2016) children seem to rely more on implicit language learning methods than adults, who tend to use more explicit methods, though this may at least partially be because of the way different age groups tend to be taught in formal education, not because of natural tendencies or even cognitive development. Implicit learning means that learning happens unintentionally when the learner is exposed to something, or in this case, a foreign language. Unlike implicit learning, explicit learning is intentional and requires more cognitive resources, but it also enables people to learn grammatical rules faster. The part where level of development shows here is how the implicit and explicit methods are mixed. While adults may develop explicit knowledge even in implicit learning situations, so far, similar seemingly spontaneous development of explicit knowledge has not been found in children. (Lichtman, 2016). There are some indications however, that children – especially young ones – have an advantage over adults in language learning, because certain parts of brains that affect the development of language are active during early childhood, but not later in life (Tayler, 2015).

To sum things up, the learning differences between adults and children are related to life situation, life experiences and the level of development (Merriam & Bierema, 2013). Because of these three factors, adult learners tend to be more diverse group than children, which in turn makes teaching adult groups more challenging. While motivation is an important part of learning to both adults and children, the sources of motivation can be vastly different, which is why using similar methods to motivate children and adults may not be effective, or they might even be counterproductive, a good example being how children can be motivated by competition according to de Marcos et al. (2016), but older people interviewed by Tam (2016) explicitly state that they wish to avoid it (de Marcos

et al., 2016; Tam, 2016). In language learning, both adults and children have their general strengths and weaknesses, since while the brains of young children enable them to acquire language skills in a way that adults can't, adults are able to develop explicit knowledge even in implicit, unintentional, learning situations (Tayler, 2015; Lichtman, 2016).

### 3.2 Learning Theories

While many different learning theories have been formed in the past, it would be impossible or at least quite inconvenient to include them all into this study. Instead, the focus will be on learning theories that have been used in the past either in the context of adult language learning, learning games or, ideally, both of them. Five theories – or four theories and one model depending on how one defines the word "theory" – analyzed by Arghode et al. (2017) in a study about adult online learning and instruction are a fitting place to start, because their general nature allows them to be used in many different contexts, not just online learning.

The first one of the theories, behaviorism, is based on the idea that learning is caused by external stimuli and subsequent responses. In other words, all learning happens through conditioning (Najmolhoda et al., 2015; Arghode et al., 2017). According to Arghode et al. (2017), behaviorism is one of the most influential learning theories, and it centers around the idea that people can be conditioned to learn. In practice, this would mean that efficient learning requires creating a controlled learning environment where desired responses are reinforced, while any non-desired responses will result in a corrective feedback (Arghode et al., 2017). Despite behaviorists believing that behaviorism applies to all learning, Arghode (2017) thinks that behaviorism works best when a repetitive skill is being taught, and mentions that it's also often used in forms of online learning where a person answers to a question and is only allowed to move on to the next question after they choose the right answer. Whenever an incorrect answer is selected, they are told why the answer is incorrect (Arghode, 2017). In language learning, some behaviorists believe that observing the world is enough to stimulate children to produce sounds, which are then reinforced by adults (Najmolhoda et al., 2015).

The second theory we will mention is cognitivism. Arghode et al. (2017) tells that cognitivism focuses on mental processes rather than the learner's real life activities, which means that it's related to how knowledge is acquired and how the human mind stores, processes and retrieves information. From the point of view of cognitivism, learning should be facilitated through simple, structured presentations. While cognitivism focuses on mental processes rather than the learning activities themselves, it does emphasize the idea of engaging learners through instructions that seem appealing in the eyes of the learner. It does however discard the idea of motivation being important factor in learning, believing that people can learn even when they are not feeling particularly motivated, as

long as the learning activities themselves are interesting and engaging (Arghode et al., 2017).

Constructivism, the third one of the learning theories under inspection, is a theory where learning is seen as something that's based on the learner's actions. In other words, effective learning cannot happen unless the person is willing to learn something and is ready to put actual effort into the learning process. One of the key beliefs is that creating knowledge involves not only active mental effort, but also social interaction. Personal experiences are also held in high regard, because new knowledge is constructed on top of the existing one. (Arghode et al., 2017; Dan et al., 2022). Based on previous studies conducted by scholars such as Kukulska-Hulme & Viberg (2018), Poláková (2019) and Dan et al. (2022), constructivism – and by extension, social constructivism that focuses more on social interaction than the regular constructivism – seems to work well with language teaching and learning, because it emphasizes interaction with other people like classmates and teachers and encourages the development of critical thinking (Kukulska-Hulme & Viberg, 2018; Poláková, 2019; Dan et al., 2022). Thanks to the focus on active learning, constructivism theory works well with the idea of mobile applications and even educational games as can be seen in Poláková (2019), where a constructivism-based mobile application for language learning was used to study if a mobile application can teach vocabulary as well as traditional education methods can. While both groups had improved during the study, the final results showed that the group using the mobile application had improved more (Poláková, 2019). In the context of educational games, studies related to constructivism include Padirayon et al. (2019), where a mobile game called Decimal Fun-Pro is used to show how students can build new knowledge based on previously acquired knowledge (Padirayon et al., 2019).

Humanism in learning context emphasizes human development and feelings. From humanistic point of view, it is believed that the learners themselves are responsible for their own learning, while instructors are seen as facilitators (Arghode et al., 2017). Based on Arghode et al. (2017), humanists see learning as something more than simple cognitive and behavioral processes. Instead, it's a process that involves motivation, decision-making and displays of responsiveness (Arghode et al., 2017). While studying humanistic approaches in second language course books, Javadi and Tahamsbi (2020) found that many educators use humanistic approaches to make the study materials fit the needs and preferences of individual learners, which supports the idea that in the eyes of the humanists, learners should be first seen as human beings, and only then as learners. Humanists also seem to recognize that simple need isn't enough to motivate someone to learn, but the study material should provide cognitive or emotional stimulation (Javadi & Tahamsbi, 2020).

The last theory would be andragogy, but according to Arghode et al. (2017), it shouldn't be called a theory since it doesn't match the criteria to be classified as such. Instead, they see it as a model that is part of humanism, which helps educators to better understand adult learners (Arghode et al., 2017). McCray (2016) however sees andragogy as a theory and the beginning of Adult Learning

Theory, while also noting how other scholars don't always call andragogy a theory, but something akin to a foundational truth (McCray, 2016) or even simply a synonym to adult education, like seen in Blackley & Sheffield (2015). While debating over whether or not andragogy should be called a theory or not isn't very relevant when it comes to our topic, the effects of educational games on adult language learning, it is worth noting that Arghode et al. (2017) and McCray (2016) have significantly different points of view when it comes to the very definition of andragogy along with its potential status as a theory. McCray (2016) specifically refers to Knowles' theory of andragogy that consists of a limited set of principles or "assumptions", while Arghode et al. (2017) seems to treat andragogy as a more broad concept (McCray, 2016; Arghode et al., 2017). While the theory selection in this chapter was based on Arghode et al. (2017), andragogy will be treated as Knowles' theory of andragogy, because it offers a clear and important set of principles related to adult learning and the adult learners themselves that shouldn't get completely mixed up with other theories, even humanism.

The first four principles of Knowles' theory of andragogy are the following: First, while the person matures, their self-concept moves from a dependent personality towards a self-directed human being. Secondly, adults keep gathering so called reservoir of experience, that works as what Knowles calls a rich resource of learning. The third principle is that the readiness to learn in adults is related to the developmental tasks of their social roles. The fourth is that people's perspective of time changes as they mature, and adults become more problem centered than subject centered than children when it comes to learning. (Knowles, 1980, 44-45; McCray, 2016). According to McCray (2016), Knowles adds two more principles later, which are that the strongest motivators for adults are internal instead of external, and that to learn, adults must know why there is a need for them to learn something (McCray, 2016). It is also important for adults to feel accepted and respected in learning situations, as well as feel what Knowles calls "a spirit of mutuality" between adult learners and their teachers (Knowles, 1980; Arghode et al., 2017).

All five theories mentioned so far have their own views on how the learning process happens, but what they have in common is that they all offer ideas on how to improve learning. Behaviorism and cognitivism put more emphasis on learning process itself than the feelings or the personality of the learner, while constructivism, humanism and andragogy all recognize the impact personal experiences affect people and therefore, learning. Because of their different focuses and points of view, certain theories may work better with educational video games than others. Based on earlier overviews, the core beliefs of behaviorism and constructivism seem to work best as theories that educational games could be based on. While Arghode et al. (2017) only mentions a form of online learning that includes a set of questions that the learner answers gets to progress once they pick the right answer (Arghode et al., 2017), there are already educational games that include similar mechanics. For example, LingoDeer Plus has minigames where the player selects one of the given words based on what they believe will fit into the sentence. If the selected word is correct, the word will be highlighted

with green color, the player is given words of encouragement and they move on to the next question. If, however, the player selects a wrong word, one life is lost and the selected word will be highlighted in red, after which the game will show the right answer and the player moves on to the next question as long as any lives are left. While the player doesn't get actual explanation why the word was correct and they won't get to try again, the red highlight, loss of virtual life and the game showing the right answer can be seen as a form of corrective feedback (LingoDeer Co, Ltd., 2019). Because the player can always play the same level later to get a better score, the game is in line with the constructivist idea of constructing new knowledge from existing knowledge.

Aspects of humanism and Knowles' theory of andragogy can be applied to educational games as well. While not in quite as straightforward way as behaviorism and constructivism, an interesting, well-designed game can work as a facilitator for learning like a human educator would and it could provide cognitive or emotional stimulation in different way than traditional learning material could, which are both important traits of humanism according to Arghode et al. (2017) and Javadi & Tahamsbi (2020). From the point of view of Knowles' theory of andragogy, while educational game may not provide an adult with an explanation for why they should learn something, the game may allow an adult learner to use their previous knowledge as a base for further learning, which is something that Knowles' andragogy has in common with constructivism. Since the use of digital games rarely depends on where and when they are used, they also allow the learner to be more independent than when they participate in, for example, formal classroom education. Therefore, the games are in line with the first principle of Knowles' theory of andragogy, which emphasizes the role of an adult as self-directed human being (Knowles, 1980, 44-45; McCray, 2016).

When examined from the point of view of educational games, cognitivism is the odd one out. Unlike the rest of the mentioned theories, it focuses more on the mental learning process than the learning activities. It also discards the idea of motivation as an important factor of learning, while still recognizing the usefulness of engaging, interesting learning materials (Arghode et al., 2017), which is seemingly contradictory, depending on how the word "motivation" is defined. Like seen in studies by Kiili et al. (2015), Duh et al. (2016), Long & Aleven (2017), games can make learning engaging, interesting and even entertaining so in a way, they are in line with what cognitivism sees as the ideal learning activities. However, as increasing the player's motivation is an essential part of educational games (Sung & Hwang, 2013) and its importance to children and adult learners alike has been recognized in several sources like Merriam & Bierema (2013), St. Clair (2015) and Tam (2016), cognitivism cannot be considered an ideal theory to be used when educational games are analyzed, let alone developed.

## 4 EDUCATIONAL GAMES IN ADULT LANGUAGE LEARNING

In previous chapters, five positive effects of educational video games were found in the context of children's learning, and the strongest emphasis seemed on learning through entertaining, enjoyable activities (Kiili et al. 2015; Duh et al. 2016; Long & Alevan, 2017), that aim to increase the engagement aspect. This can be important even when the effects of educational games are studied from the point of view of adult learners, because while educational games are primarily supposed to educate the player instead of entertaining them, the success of the game can still depend on how the player feels about the game. According to Michael and Chen (2006), if the player doesn't consider the game they are playing as entertaining, they might not want to play it again (Michael & Chen, 2006). However, it should also be kept in mind that with adult learners, motivation and the understanding of why something needs to be learned seem to affect the adults learning performance more than the simple entertainment value (Merriam & Bierema, 2013; McCray, 2016; Tam, 2016). Like Duh et al. (2016) mentions, adults and children have different desires and expectations when it comes to their learning content (Duh et al. 2016), so while educational games can be beneficial to adults and children alike, a game developed for children might not work on adults and vice versa.

Based on the positive effects of educational games that were found on children in the previous studies and a set of learning theories that were introduced in the previous chapter, the following table was formed. Findings from previous studies about adult learners using educational games were also applied to see which effects have been found effective on adult learners in the past. To be specific, the table works as a generalized visual presentation about the current situation of what effects were found explicitly on adults in the previous studies, and it does not include effects that could be possible but are not yet proven by empirical studies. The table also includes references to the respective studies where certain benefits were noticed in practice.

TABLE 1 *Effects of educational games on adults and children*

<i>Effect</i>	<i>Adults</i>	<i>Children</i>	<i>Supporting theory</i>
<i>Increased engagement</i>	Dobrescu et al. (2015) Tang & Taguchi (2021)	Goumas et al. (2020)	Cognitivism
<i>Increased motivation</i>	de Marcos et al. (2016) Tang & Taguchi (2021)	Sung & Hwang (2013)	Humanism
<i>Improved performance</i>	Dobrescu et al. (2015) Tang & Taguchi (2021)	Duh et al. (2016)	Behaviorism Constructivism Knowles' andragogy
<i>Pressure-free learning</i>		Kiili et al. (2015)	Humanism
<i>Improved self-efficacy</i>		Gray et al. (2019) Sung & Hwang (2013)	Humanism

Despite the limited amount of studies about educational video games on adults, increased level of engagement has been found on adults and children alike. According to Arghode et al. (2017), even cognitivism that usually focuses more on the mental learning processes than how something is learned recognizes the importance of interesting and engaging learning activities (Arghode et al., 2017), and both of these traits can be applied to educational games. Good examples of this can be found in Dobrescu et al. (2015) where a group of undergraduate economics students were able to learn from an educational as well as students who learned about the same subject from a textbook, and found the educational game more enjoyable than the textbook (Dobrescu et al. (2015). Similarly, in Tang & Taguchi (2021), students playing an educational video game were not only able to learn Chinese as well as students who took online classes, but also feeling more engaged and motivated (Tang & Taguchi, 2021). In a study about children's game-based learning, Goumas et al. (2020) encountered a child who got so engaged and interested in the educational game teaching English vocabulary they were playing that they forgot it was a tool made for learning (Goumas et al. 2020).

While engagement was an effect that was hardly questioned or debated on in the previous studies, the idea of motivation increased by educational games was a highly different case. Motivation is certainly an important factor when it comes to learning, which has been shown in many past studies including, but by no means limited to Merriam & Bierema (2013), St. Clair (2015), and Tam (2016). In educational video games used on adults, both de Marcos et al. (2016) and Tang & Taguchi (2021) found that the game increased the motivation of the players. However, in de Marcos et al. (2016), the increased motivation only lasted for a short while even though the motivation increasing elements were actually identified in the study (de Marcos et al., 2016). Tang & Taguchi (2021) didn't notice such decline in motivation, but their study was conducted in more limited timeframe than the study by de Marcos et al. (2016), so it is unclear if they could have encountered similar phenomena had the study itself lasted longer. Of course, it is important to keep in mind that the subjects the games were teaching were quite different in the two studies: de Marcos et al. (2016) aimed to teach concepts related to information and communications technology, while Tang &

Taguchi (2021) used the game to teach the Chinese language (de Marcos et al., 2016; Tang & Taguchi, 2021). Still, it can be said that games do increase motivation, but more research is needed to clarify if the effect really decreases over time on adults regardless of the subject the game is teaching, and if so, why. Of course, the content and features of the game might also affect how motivating it is. For example, from the humanistic point of view, the study material has to fit the needs and preferences of individual learners, and to motivate the learner, cognitive or emotional stimulation is needed (Javadi & Tahambsi, 2020). This suggests that the games used in the study by de Marcos et al. (2016) may have not been stimulating enough to keep the students' interest.

The final one of the effects that were noticed in both adults and children is the improved performance. Depending on the point of view, educational games can improve the learning performance of both adults and children. On one hand, it is shown in studies by Dobrescu et al. (2015), Tang & Taguchi (2021), Kiili et al. (2015) and Duh et al. (2016) that educational games can teach the players a wide variety of skills and subjects. On the other hand, Dobrescu et al. (2015) and Tang & Taguchi (2021), both studies that focus on adult students, only prove that games can teach as well as alternative methods such as textbooks and online lessons. While the participants of both studies found the game more entertaining than the other learning methods, the studies do not state that the games would lead to better performance, only equal. Nevertheless, educational games have the capability to teach adults efficiently, even when the subject is a foreign language, as seen in Tang & Taguchi (2021). The specific game features that affect the learning performance can vary, but from the point of view of behaviorism, including features that are based on the idea of conditioning would be beneficial. From the point of view of constructivism and Knowles' theory of andragogy however, a game that allows the player to construct new knowledge based on what was learned before would be more beneficial.

Two effects related to the use of educational games that haven't been studied from the point of view of adults yet are pressure-free learning and the improved self-efficacy. On children, the benefit of pressure-free learning was noticed in a study by Kiili et al. (2015), where the participants were playing an educational game to learn mathematics and it was found that the students concentrated on the game without caring about how others may have evaluated them, unlike they would have in normal exam situations (Kiili et al., 2015). Lowering pressure and the potential emotional stress caused by it can be seen as a positive effect from the humanistic point of view, since it emphasized the importance of human feelings in learning situations. Unfortunately however, while the feeling of pressure and stress is certainly not exclusive to children, there's a severe lack of research about how educational games can affect the level of pressure experienced by adult learners.

Improved self-efficacy on children playing an educational game was noticed by Sung & Hwang (2013) and Gray et al. (2019). While Sung & Hwang (2013) only noticed the improved self-efficacy on students who were cooperating while playing, in Gray et al. (2019), simply mastering the rules of the game was able to

cause feelings of self-efficacy (Sung & Hwang, 2013; Gray et al., 2019). Just like in the case of pressure-free learning, however, self-efficacy wasn't mentioned in the studies of adults using educational games either. Still, since self-efficacy is closely related to the feelings and beliefs of an individual (Graham, 2022), humanistic approaches could be used to improve it even in a game that is meant to teach adults. Proof from empirical studies would be needed to confirm this, however.

In total, three out of five effects found on children had been found on adults as well. Despite this, it is important to consider that the same games were not used on adults and children. Because of the fundamental differences between adults and children, like the sources of motivation, the educational games meant for adult learners should include elements that are relevant to the target group (St. Clair, 2015). Instead of simply making the game fun to play, an effective educational game should include tasks and examples based on what an adult learner might need or wish to learn. A practical example of this can be seen in a language learning game LingoDeer Plus, that offers a minigame where the player has to answer questions based on conversations they hear, which resembles a situation they might encounter in real life (LingoDeer Co, Ltd., 2019). Also, since adults and children tend to be in different life situations (Merriam & Bierema, 2013), another thing that should be kept in mind when adults are being taught is that their other responsibilities may affect how much time they can spare for learning activities. As educational games are not usually related to a specific time or space, they could be valuable learning tools for those who are unable to attend formal language courses, yet wish for more interactivity than textbooks can offer.

## 5 RESEARCH METHODS

In this chapter, the methods used in this research are described. Furthermore, the reason why these methods were selected is also explained. As this research consists of two parts, the literature review and the empirical part, this chapter is divided in two subchapters. The first subchapter tells how the literature review was conducted, what sources were used and how the literature was selected. It will also offer a table that shows the distribution of content within the most significant sources that are used in the literature review. The second subchapter will explain why and how the empirical part was conducted, which means in practice that it will consist of information regarding things like how the participants were selected, how the empirical data was collected, how the data was analyzed.

### 5.1 Literature Review

The literature sources used in this study are a combination of articles that were acquired through Google Scholar and JYKDOK. Additionally, few selected books, such as Knowles (1980), Michael & Chen (2006) and Merriam & Bierema (2013) were used to add older, but still relevant information that was mainly needed to provide sufficient definitions to theories, important key words and other terms that are used in the study. Additionally, Merriam & Bierema (2013) proved to be a valuable piece of literature whenever there was a need to compare children's learning with adult learning, because the amount of peer-reviewed articles regarding that particular subject was rather limited.

The main search words used to search for the online source materials were "educational games", "serious games", "gamification", "adult learning" and "language learning". Naturally, variations such as plurals and singular forms - and an abbreviation "edugames" in the case of "educational games" - were used as well to ensure that no significant source would be left out due to careless use of the search engines. Search words were also combined with each other to find sources that examine more than one of the required topics. When

the situation called for it, additional searches were made to acquire literature related to more specific terms such as "life experience", "human development", "constructionism" and "adult learning theory".

In the case of online articles, a conscious decision was made to exclude most content that was published before the year 2015. While few important older sources like the books related to adult learning were used, one of the source-related goals was to keep the study fresh by using sources that have a higher chance of still being relevant in today's world, while still ensuring that the diversity of sources doesn't suffer because of the limited time range. The actual quality of the sources was mainly ensured by filtering out most of the literature that did not belong to the category of peer-reviewed articles, after which the promising sources were selected based on their titles and abstracts.

The few references, such as the book by Merriam and Bierema (2013), used in this study that were acquired from outside the category of peer-reviewed articles were only added after careful consideration based on personal judgement and the relevance of the content. Adding such material was essential however, since the search process itself wasn't always easy and the available material proved to be rather limited. Academic literature about certain learning theories like behaviorism and cognitivism in the context of game-based learning or even language learning was especially difficult to find. The most significant, recurring sources and the focus of their contents are shown in the table below.

TABLE 2      *Content distribution of the significant sources*

<i>Source</i>	<i>Adults</i>	<i>Children</i>	<i>Language learning</i>	<i>Educational games</i>
<i>Arghode et al. (2017)</i>	X			
<i>de Marcos et al. (2016)</i>	X			X
<i>Dobrescu et al. (2015)</i>	X			X
<i>Duh et al. (2016)</i>		X	X	X
<i>Gray et al. (2019)</i>		X		X
<i>Goumas et al. (2020)</i>		X	X	X
<i>Kiili et al. (2015)</i>		X		X
<i>McCray (2016)</i>	X			
<i>Merriam &amp; Bierema (2013)</i>	X			
<i>Michael &amp; Chen (2006)</i>				X
<i>Sung &amp; Hwang (2013)</i>		X		X
<i>Tam (2016)</i>	X			
<i>Tang &amp; Taguchi (2021)</i>	X		X	X
<i>Xu et al. (2019)</i>			X	X

## 5.2 Qualitative Survey

The empirical part of this study had two goals. One of these goals was to see if the effects that were identified on both adults and children in previous studies (increased engagement, increased motivation and improved performance) would show up in the survey results as well. The second goal was to gather data that would show us if the two additional effects that were previously found on minors (pressure-free learning and improved self-efficacy) can be applied to adults in the context of educational games.

In practice, the data was gathered through an online survey created with Webropol. Before the participants would proceed to the survey, they were asked to play a language learning game for at least 15 minutes. To minimize the possibility of incompatible devices, the participants were allowed to choose from two different games: Influent (Howland, 2014) and LingoDeer (LingoDeer Co, Ltd., 2017). It should be noted that LingoDeer had two different versions, a phone application and a browser version. While both versions are approximately the same when it comes to the learning content, they were listed separately in the survey just in case the different layouts and other things related to the user experience might somehow affect the results.

The survey itself was offered in both Finnish and English, and the questions were divided in five categories that were named after the results of the literature review. In total, the survey consisted of 21 questions, out of which 5 were background questions and one, the final question, was completely open so the participants could write down additional thoughts if they wanted to. While the background questions like age, gender and how long the participant chose to play the game were given as multiple choice questions, the questions about the five categories – the five effects of educational games – were accompanied by open text fields in which the participant would write their answer. Because people experience things like engagement, motivation and pressure in different ways, the aim was to gather qualitative data through questions that allow the participant to share their personal experiences and feelings about the game.

### 5.2.1 Data collection

There are multiple reasons why the data was gathered through a survey instead of other qualitative data gathering methods, the main one being the flexibility. Unlike an interview, an online survey isn't limited to certain time or place. The participants were encouraged to take the survey right after they had played their chosen educational game, and if the time spent playing would have been limited to a set time or a controlled space, it could have affected the level of engagement, or at the very least made the research situation feel more formal than it was supposed to be. Because both Influent and LingoDeer are meant for individual learning, not classroom education, it serves the purposes of this research to allow the participants to have a high level of autonomy during the research process. Additionally, an online survey allowed people to participate regardless of their

geographical location and made participation possible for those who might still wish to avoid close contacts after the Covid-19 pandemic. Naturally, the drawbacks of an online survey were also considered. In an interview, the interviewer is able to ask the interviewee to clarify their answers or even ask additional questions, but this is not possible in an anonymous online survey. Furthermore, the environment where the participant decides to play the game and take the survey cannot be controlled, which could affect some of the results. Despite these disadvantages, a survey was selected as the data gathering method because of the benefits mentioned earlier.

The study used convenience sampling, and in practice, the participants were selected based on their availability and willingness to participate in the study. A link to the survey was sent to the participants through an e-mail message or a private message in an instant messaging platform called Discord. Discord participants were from servers unrelated to educational games and learning. The main criteria for the participants was the age of the participant. Because the research question is "What effects do educational video games have on adult foreign language learners?", the participants were required to be at least 18 years old. Other than that, anyone interested in trying out Influent or LingoDeer was allowed to participate in the research, as long as they would be able to answer to the questions in English or Finnish. Still, the group of participants ended up to be quite limited, as only 12 individuals ended up taking the survey and finishing it. The age distribution of the participants was wide, however: The youngest participants were between 21–29 years old, while the oldest were over 60. Even though the largest group of participants consisted of those who were 21 – 29 years old, this still lowers the possibility that the results would only apply only to one group of adults. In the table below (table 3), the background information about the participants is shown more in detail.

TABLE 3 *Participant background information*

<i>Age</i>		<i>Gender</i>	
18-20	0	Male	4
21-29	7	Female	5
30-39	1	Other	2
40-49	0	Did not wish to answer	1
50-59	3		
60+	1		
<i>Tried educational games before</i>		<i>Game that was chosen</i>	
No	6	Influent	3
Yes	6	Lingodeer (Android)	8
<i>Time spent playing the selected game</i>		Lingodeer (Browser)	1
15 minutes	2		
15-30 minutes	8		
30-60 minutes	2		
Over 60 minutes	0		

## 5.2.2 Thematic Analysis

The questions in the survey were divided between five separate categories (Increased engagement, increased motivation, improved performance, pressure-free learning and improved self-efficacy), excluding the separate background questions that were asked at the beginning of the survey. Each one of the five categories consisted of 3–4 questions, which can be seen in table 4.

TABLE 4 Survey questions and their categories

<b>Question</b>	<b>Category</b>
<i>For how long did you play the selected game?</i>	<i>Increased Engagement</i>
<i>Did you find the game fun to play? If so, what aspects of the game were fun and / or interesting?</i>	
<i>Did you find the game boring? If so, what aspects of the game were boring?</i>	
<i>How likely will you keep playing the game in the future? Why / why not?</i>	
<i>What aspects of the game increased your motivation towards language learning?</i>	<i>Increased Motivation</i>
<i>Did the game encourage you to study the selected language outside of the game? Why / why not?</i>	
<i>How relatable or relevant did you find the examples that the game was using to support your language learning?</i>	
<i>What did you learn from the game?</i>	<i>Improved Performance</i>
<i>What aspects or features of the game improved your performance?</i>	
<i>What aspects or features of the game decreased your performance?</i>	
<i>Did you find the game easy to play? Why / why not?</i>	<i>Pressure-Free Learning</i>
<i>Did you feel stressed while playing the game? During what parts of the game did you feel stress or pressure?</i>	
<i>Did you experience feelings of anxiety during the gameplay?</i>	
<i>What parts of the game gave you a sense of accomplishment?</i>	<i>Improved Self-Efficacy</i>
<i>Did your confidence in using a new application increase or decrease during the gameplay?</i>	
<i>Did your confidence in learning a new language increase or decrease during the gameplay?</i>	

Since the empirical part of this study was based on a set of categories identified in the literature review, thematic analysis – a method that focuses on finding

recurring themes – was selected as the method that was used to create the categories in which the survey questions were placed, and what was then used to analyze the results of the survey. In practice, the themes were based on the previously identified effect categories, which were then used to categorize the data that was gathered in the survey. First, both the Finnish and English answers were transcribed and then transferred into a text document, in which the answers – excluding those that were about background information – were sorted under the five categories or “themes”. Answers to the final, optional question were also left outside of the themes during this phase, as they often repeated what the participant had already written in their previous answers, or they could not be strictly associated with any particular theme. After the transcribed answers had been placed into their respective theme categories, they were color-coded based on what game the answer was about. Next, answers within each category were inspected for common themes and other similarities, which were highlighted and collected to a table. After that, the content was classified based on whether it could be seen as positive, negative or neutral.

## 6 RESULTS

In this chapter, the results of the empirical part of the study will be presented. The data was gathered through a survey that was taken by twelve individuals that were over 18 years old and willing to try one of the two language learning games, Influent or Lingodeer. The data consists of both English and Finnish answers, because the participants were allowed to take the survey in either one of the two languages. All the Finnish quotes that are used in this chapter are translated to English, but the original quotes can be found in appendix 3. The results will be presented in the following order: First those that are about the increased engagement, then the increased motivation, improved performance, pressure-free learning and improved self-efficacy. Finally, the information gathered from the optional question that was given to the participants at the end of the survey will be briefly discussed. Unless a single game is mentioned separately in the text, the answers were similar in both games.

### 6.1 Increased engagement

According to Dobrescu et al. (2015), educational games can provide an entertaining and effective alternative to more traditional learning tools (Dobrescu et al., 2015). The importance of the entertainment value is that if the game is entertaining enough, according to Michael and Chen (2006), it will encourage the player to keep playing it, which in turn allows the player to learn more (Michael & Chen, 2006). In the survey, the level of engagement was measured by asking the participants questions about how long they played the game, what they found fun, what they thought was boring, and how likely they would keep playing the game again in the future. A strong, recurring theme in the answers was the emphasis on what the participants found fun and interesting, and one of the participants summarized their experiences in the following way:

*"(The game) was fun to play. I liked that the exercises were different, so it didn't get boring. Game was really engaging." (LingoDeer Browser player, 21-29 years old)*

Most of the participants agreed that the game they had selected was fun to play, but not all of them did. Among those who did not find the game fun to play, common factors were age, gender and lack of previous experience about educational games. Out of all the participants who were older than 50 years old, only one described the game as fun to play, whereas only one of those who were 21 – 29 years old told that they didn't find the game fun. As for the gender factor, the two individuals who gave a neutral answer were both male, as was the other one of two participants who clearly expressed that they didn't find the game fun to play. Also, none of the ones who gave a neutral or a negative answer when asked if they found the game fun to play had played educational games before participating in this study. Interestingly enough, all these people still expressed willingness to try the game again in the future. In fact, out of all the people who took the survey, all except one participant stated that they would keep playing it, or they might at least try it again if they wanted to learn a new language. Those who didn't find the game particularly fun to play found the game interesting, or useful enough to consider playing it in the future:

"An interesting game, but I'm not quite sure about fun." (LingoDeer Browser player, 51-59 years old) \*T1

"The game was pretty interesting if one wanted to learn, but I wouldn't play it for fun. If I wanted to learn a new language, I might check it out again." (LingoDeer Browser player, 21-29 years old) \*T2

Those who did find the game fun mentioned similar things that they had considered fun or interesting. Simplicity was one of the things that was mentioned by multiple participants when they were asked about what they thought was fun in the game:

"Playing the game was easy and nice, good things were the simplicity of the exercises and the repetition." (LingoDeer Browser player, 21-29 years old) \*T3

"Playing was easy and required an appropriate amount of attention to maintain (the player's) interest." (LingoDeer Browser player, 60+ years old) \*T4

Not all participants found the games easy to play, however. Two participants who had both chosen to play the browser version of LingoDeer expressed their feelings about the game in the following ways:

"...As for the sentences, I did not first understand that one should find an empty space from the boxes." (LingoDeer Browser player, 51-59 years old) \*T5

"It was a little bit hard to navigate and understand what's supposed to be done." (LingoDeer Browser player, 21-29 years old) \*T6

Another thing that was mentioned by multiple participants was the variety of exercises. Two LingoDeer players saw the variety of exercises as a positive thing,

while one of the Influent users would have hoped for more game modes and general variety:

"There could have been more game modes, but it wasn't boring. There were quite a few same items that could have been replaced with something else." (Influent player, 30-39 years old) \*T7

Unlike LingoDeer, Influent made it possible for the player to explore their virtual surroundings and discover new words. This was mentioned by two Influent players, who enjoyed exploring the in-game apartment:

"Playing the game was unique and interesting. Opening closets revealed new items, which made exploring very interesting." (Influent player, 30-39 years old) \*T8

"In the game, it was fun to explore the apartment and learn foreign words that way." (Influent player, 21-29 years old) \*T9

In Influent, immersion seemed to matter as well, as one of the players told in the "other" section of the survey that the only negative thing in the game was that they couldn't pet a cat they encountered in the game.

In addition to what has been mentioned so far, the participants identified several other things that affected their level of engagement in a positive way: Two participants mentioned the visual style of the game in positive light, one liked that they were able to see how their skills improve, and another found the game fun because it doesn't judge the person if they pronounce a foreign word incorrectly. Negative things were also mentioned: One of the LingoDeer players told that while playing the game wasn't exactly boring, it was rather slow. Another participant expressed their disappointment towards the low amount of languages the game offered, which is why they didn't find the game very interesting.

To put it briefly, the main things that affected how engaging or fun the game was were the simplicity, variety of exercises, visual style, and in Influent, exploration and discovery. All except one participant told that they might play the game again, and even though many participants agreed that the game was fun to play, not all of them did. Instead of focusing on fun, they would keep playing the game because they felt it was "interesting" or an useful tool for learning.

## 6.2 Increased motivation

Questions 10-12 asked about increased motivation, if the game encouraged the participant to study the language outside of the game, and how relatable or relevant the participants thought the examples used in the game had been. In the survey, five out of twelve participants told that the game encouraged them to study the language outside of the game. The most commonly mentioned things that affected motivation were easiness, variety, and the combination of sound

and text. As for the relevancy of the examples that were used in the games, all participants except for two LingoDeer players told that they found the examples relevant or relatable. The first one of these participants felt that the studying should start from something else than fruit words, and according to the second one, the game made the player repeat potentially irrelevant phrases like "I am American" too much at the beginning. Meanwhile, those who did find the examples relevant mentioned that the sentences were simple, useful and suitable for everyday use.

Five participants mentioned easiness in their answers to the questions about increased motivation. While in some answers the term "easy" was used without explanations, others were slightly more specific in what they found easy. For one participant, it was the easy beginning that increased their motivation, while some others found easiness in progression or the language they had chosen:

"Progression felt easy and logical." (LingoDeer Browser player, 60+ years old) \*T10

"In the game you can, for example, notice that the words of a certain foreign language are not so difficult after all." (Influent player, 21-29 years old) \*T11

In the "other" section of the survey, one participant even compared LingoDeer to similar game, DuoLingo, stating that LingoDeer was more easy and beginner-friendly. On the other hand, one participant - a LingoDeer player - found the game explicitly difficult. Specifically, they thought that the sentences that were used as examples were too difficult and appeared too soon. While another participant found some parts of the game difficult as well, they didn't see it as a strictly negative thing. When asked about what aspects of the game increased their motivation towards language learning, they gave the following answer:

"When the same question started repeating itself once you got it wrong, after which you looked at it more closely so you wouldn't have to repeat the same thing too many times." (LingoDeer Browser player, 21-29 years old) \*T12

The second most frequently mentioned thing in the answers about increased motivation was variety, which was mentioned by four participants: Two LingoDeer players and two Influent players. While one of the LingoDeer users appreciated that the game taught full sentences instead of just individual words, the other one was pleased by the language choices. As for the Influent players, one of them liked that the game included lots of different scenarios, and the other one enjoyed the freedom to explore the virtual environment on their own:

"...When one could freely move within the apartment, it was easier to control learning. I could focus on words that I found interesting." (Influent player, 21-29 years old) \*T13

The combination of sound and text was the third most commonly mentioned thing among the answers about increased motivation, and one participant saw this as an advantage over book-based learning:

"It is more comfortable to learn on computer than from a book. You can listen, at the same time, how the words are pronounced." (LingoDeer Browser player, 50-59 years old) \*T14

Additionally, the participants were able to listen to the same word multiple times if they wanted to, regardless of the game. This was noticed by one of the LingoDeer users, who phrased their thoughts in the following way:

"...You could repeat certain words, so you could hear enough how that word is pronounced" (LingoDeer Browser player, 21-29 years old) \*T15

When the participants were asked if the game increased their motivation to study the language they selected outside of the game, five gave a clearly positive answer, and one had partially done so by writing down notes while they had been playing. One of the Influent users pointed out, however, that they felt like they had to study outside of the game if they wanted to learn the foreign language, because the game content was too limited:

"Somewhat yes. The game taught only individual words instead of, for example, sentences or grammar, if I wanted to learn the language better, I would have to do it elsewhere. The game helps you to get started, though." (Influent player, 21-29 years old) \*T16

Out of those who gave a neutral or negative answer, two told that they didn't particularly like language learning in the first place, and one felt that language learning requires so much effort that even starting the process requires a high level of motivation:

"To learn a language so you know it even just a little bit requires so much that you don't feel like starting it without strong motivation." (LingoDeer Browser player, 50-59 years old) \*T17

Additionally, one participant mentioned that the reason why the game didn't encourage them to learn the language outside of the game was because they thought that learning from the game was much easier. The results also showed slight gender-based variation, as the only ones who explicitly stated that the game didn't encourage them to study the language outside of the game were two individuals who identified as male and one who preferred not to say. As the other male participants had more positive answers, it is safe to assume that this is a matter related to individual learning preferences and other differences that are not related to the gender of the participant.

### 6.3 Improved performance

The improved performance was measured by questions that asked the participants to specify what they learned from the game, what aspects of the game

improved their learning performance and what aspects decreased the learning performance.

The answers to the question where the participants told what they learned from the game mainly consisted of what individual words or other language-related things like grammatical gender the participant had learned during their gaming session. Even the one participant who felt that they didn't learn much from the game told they noticed that the Japanese sentence structure differs from the Finnish one, and that they might be able to recognize negations.

The aspects that the participants felt improved their learning performance consisted of answers about repetition, playing at one's own pace, the combination of text and sounds, and clear words and exercises. Examples of these can be seen in the following answers:

"Freedom to move in the environment and playing on your own pace. Also the possibility to repeat difficult words, which would show up as text, not only sound with each click." (Influent player, 21-29 years old) \*T18

"I really liked that you can also listen, not only read the language." (LingoDeer Browser player, 21-29 years old)

"The clear display of choices and an easy way to check the correctness of the selection." (LingoDeer Browser player, 60+ years old) \*T19

Individual participants also added the existence of pictures and one of the exercises the game offered to the aspects that improved their performance, and that the vocabulary was well suited for everyday life.

The question after the one about increased performance asked the participants about what decreased their performance. While one participant told that nothing in the game decreased their learning performance, a negative theme that was repeated in multiple answers was something akin to confusion or uncertainty. Four participants told that their performance was affected negatively because they had trouble understanding the exercise, or in the case of one LingoDeer browser user, the website in general:

"First, I was confused by this exercise where you had to cross out wrong word." (LingoDeer Browser player, 21-29 years old)

"I didn't immediately understand what I was supposed to do. Maybe I didn't check well enough." (LingoDeer Browser player, 50-59 years old) \*T20

"The website was a little bit difficult to figure out." (LingoDeer Browser player, 21-29 years old) \*T21

The second most often mentioned aspect that decreased the performance of more than one participant was more related to the selected language than the game itself. Out of the three people who mentioned this, one had trouble remembering the meanings of similar sounding words, the second was frustrated because they kept writing a difficult word incorrectly and then got the same word again too

soon, and the last one had trouble learning Japanese characters even though they didn't have issues with pronunciation. The final thing that was mentioned by multiple participants was unique to Influential users. More precisely, it was mentioned by two out of the three participants who chose Influential as the educational game they decided to try. This thing was the limitations of the virtual environment. While one of these participants simply mentioned that all the drawers in the game couldn't be opened, another participant described the issue more in detail:

"I might not say "decreased", but "limited". The game environment was very small, and one could only learn words related to items found in homes and not, for example, those found in the outside world or even words related to a simple conversation." (Influential player, 21-29 years old) \*T22

Finally, the aspects that were only mentioned in individual answers were the difficulty to focus on text and speech at the same time and what words were used to teach the language in certain LingoDeer lessons. Namely, mixing fruit words with words that were used in a more generic everyday setting.

## 6.4 Pressure-free learning

Pressure-free learning was something that had been left rather vague in the context of adult learners in previous studies. In order to bring clarity to the issue, the participants were asked three questions about the subject. First question aimed to find out if the participants found the game easy to play, the second one asked about possible stress the participant may have experienced during gameplay, and the third one asked if the participants experienced feelings of anxiety.

Seven out of twelve participants told directly that the game was easy to play, and four others rated the game somewhat easy. Out of these four, one was pleased by the user interface, but felt like some of the exercises required trial and error before they were able to understand them. Additionally, one participant gave an answer that could be interpreted as neutral, and a translated version of that answer can be seen below:

"Yes and no. At some points I had to think what exactly the game wants me to do." (LingoDeer Browser player, 21-29 years old) \*T23

Unfortunately, one participant encountered technical issues that affected their ability to play the game. Even though they found their chosen game - Influential - itself somewhat easy to play, they added that they weren't able to play it on their own computer because of issues that may have been caused by incompatible hardware.

When the participants were asked about the stress they may have experienced while playing, eight participants told that they hadn't experienced any stress while they were playing, three had experienced stress, and a single Influential

player stated that while the game itself wasn't stressful, they felt partially stressed during a specific but optional game mode:

"Partially, playing against the clock felt stressful." (Influent player, 30-39 years old)  
\*T24

One of those who didn't feel stressed clarified that while they didn't feel stressed, they were sometimes annoyed when they didn't remember the correct words. The three individuals who replied that they did experience stress during gameplay were all LingoDeer players who hadn't tried educational games before. One of these three experienced stress because they restarted the game multiple times but never got very far, the second participant felt stress and frustration because of a difficult exercise that the game repeated too soon after the first incorrect try, and the third one felt stress during a specific exercise where the player was supposed to build a sentence out of boxes that had specific characters in them:

"When I was building sentences out of boxes. You had to get it completely right, which was difficult. When it was wrong, the right answer was shown in the bottom corner from where you had to copy it and try again and again. I would have wanted to skip the exercise every now and then, but I didn't find an option for that. On the other hand, you don't learn by skipping things." (LingoDeer Browser player, 50-59 years old) \*T25

As for anxiety, only two participants replied unequivocally that they experienced anxiety while playing. The causes of anxiety were the same as the causes of stress. More specifically, the participants who experienced stress because of the recurring difficult exercises or playing against the clock experienced anxiety in those situations as well. There was also a participant who experienced a feeling they described as something that could be called mild anxiety after a few failed tries in the exercises, though they didn't regard it as a completely negative thing, as they regarded it as something that's normal for a learning situation.

## 6.5 Improved self-efficacy

Information about improved self-efficacy on adult learning from educational games was even more limited in the previous studies that were examined in the literature review than the information about pressure-free learning. In fact, the information seemed to be practically non-existent, which is why asking questions about this theme from the participants during the survey was important.

In the survey, improved self-efficacy was measured by asking the participants about what parts of the game gave them a sense of accomplishment, if playing the game affected their confidence in using a new application, and if playing affected their confidence in learning a new language.

What gave the participants a sense of accomplishment most often was getting something right. This was mentioned by seven participants in one form or another. While some specified that their sense of accomplishment was increased

by correct word choices, some mentioned right sentences, finding the right items based on sound and memory, or just making right choices in the game in general. Immediate feedback after every question was also told to increase the sense of accomplishment, as were getting good points and the existence of the cheerful LingoDeer mascot. Individual participants also mentioned that their sense of accomplishment was increased thanks to the clear learning paths LingoDeer offered, and when they understood the exercises they were supposed to complete. A minor but interesting finding was also that the LingoDeer mascot was only mentioned in this context by two participants who identified as female but were from different age groups, and getting good points by two others who identified as male, yet also had a significant age difference.

When the participants were asked if playing the game increased or decreased their confidence in using a new application, none of the participants replied "decreased". In total, seven participants told that playing increased their confidence to try new applications, though one of them was a LingoDeer player who didn't mention applications in general. Instead, they specified that they might be willing to try another game or application similar to LingoDeer. Another one got particularly interested in language learning applications, as they hadn't known of their existence before participating in this study. The rest of the participants told that playing the game didn't affect their level of confidence in one way or another, and for one participant, the reason for this was their general curiosity towards new applications and learning:

"I have always been ready to try out new applications, if they include something interesting to learn." (Influent player, 30-39 years old) \*T26

The results about the level of confidence about language learning were similar to how playing the game affected the participants' level of confidence in trying new applications. None of the participants felt that playing would have decreased their confidence to learn new languages, and majority – eight participants – thought that the game increased their level of confidence. For one participant, the reason behind this was simply that they found the content of language learning games interesting, while another participant pointed out the non-judgemental nature of games:

"In a game no one will think that you are stupid if you make mistakes." (LingoDeer browser player, 50-59 years old) \*T27

There was also slight variety on how the game increased the participant's confidence. Some thought that the game encouraged them to learn completely new languages, whereas two participants would rather use the game to maintain language skills they have already gained elsewhere. There was also one participant who didn't think that the game increased their language learning confidence in general, but it did seem to slightly increase their confidence with the language they were studying through the game:

"Well, not really on a general level, but it may have increased confidence a little bit with the language that was selected, because the language didn't feel so difficult after all." (Influent player, 21-29 years old) \*T28

Also, just like with the answers to the question about confidence in using new applications, the rest of the participants felt that the game had no effect on their level of confidence in the context of learning new languages either.

## 7 RESULT ANALYSIS AND REFLECTION

In this chapter, the findings of the literature review are compared with the survey results in order to determine what effects educational video games have on adult foreign language learners. The first subchapter examines how well the effects that were found on both adults and children in the literature can be seen in the survey results, and in the second subchapter, results regarding the effects that were not found in the previous studies during the literature review will be presented and analyzed. The third subchapter will then work as a summary under which the key points of the previous two subchapters will be collected along with an answer to the main research question of this research: *What effects do educational video games have on adult foreign language learners?*

### 7.1 Engagement, motivation and performance on adult learners

In the literature review, it was shown that increased engagement, increased motivation and improved performance were noticed in the earlier studies in both adults and children alike. More specifically, on adults, all three effects were mentioned by Dobrescu et al. (2015) and Tang & Taguchi (2021), while each one of these three effects on children were studied by different groups of researchers, Goumas et al. (2020), Sung & Hwang (2013) and Duh et al. (2016), respectively. Engagement is an important factor in educational games according to Michael & Chen (2006), as it affects how willingly someone will return to an educational game.

In the survey results, there was a heavy emphasis on the entertainment value of the game, as most participants agreed that the game was fun to play. However, not all did. In fact, the older the participant was, the less likely they seemed to consider the game fun as only one of the participants who were over 50 years old described the game as "fun". Also, men seemed to be less likely to use the word "fun" while describing the game regardless of their age, but since the amount of young male participants was very low, it would not be safe to

make assumptions based on such limited data. An interesting finding was, that even though some participants did not find the game fun to play, all except one participant told that they would consider playing the game again in the future. While some of the participants truly enjoyed playing the game, those who didn't focused on the more practical side by emphasising how interesting or useful they thought the game was. Even though this is certainly an interesting finding, it is not completely surprising, as some of the literature sources used in the literature review, such as Merriam & Bierema (2013) and McCray (2016), explain that adults are often motivated by other things than just the entertainment value.

Simplicity of the game also affected the participants' level of engagement, but alone it wasn't enough to cause someone to be more or less willing to play the game again. The differences between games were rather small here, even though *Influent* with its virtual apartment was slightly affected by immersion level, as was shown by one *Influent* player who would have liked to interact with a cat they found in the virtual apartment. There were also slight differences in how certain variety-related issues manifested: One person found the language choices of *LingoDeer* too limited while one *Influent* player wished for more game modes and was disappointed by how often the same items appeared. In other words, both games got slight critique because of their limitations, but for different reasons. Despite the critique, the games also received praises, as some enjoyed the amount of different exercise types in *LingoDeer* and *Influent* players liked to explore and interact with in-game items.

In a study by de Marcos et al (2016) the increase of motivation lasted only for a short while on adult learners (de Marcos et al., 2016). Unfortunately due to the timeframe and the nature of this research, we were unable to study the long-term effect of the language learning games to be able to confirm or disprove their findings. Instead, the focus was in the short-term effects. According to Javadi and Tahambsi (2020), motivation can be linked to how well the study material fits the needs and preferences of individual learners, and adult learners require cognitive and emotional stimulation to stay motivated (Javadi & Tahambsi, 2020).

The effects of motivation were studied in the survey by asking what aspects of the game increased the participants' motivation, if the game encouraged the participants to study the selected language outside of the game, and if they found the examples used in the game relevant. Things that most often increased the participants' motivation, according to their own words, were easiness, variety, and the combination of sound and text. When the participants were asked if the game encouraged them to study outside of the game, the results were mixed as only 5 out of 12 participants gave a clearly positive answer. For example, one who gave a negative answer told that learning from *Influent* would be easier. Similarly, another participant stated that learning from the game - *LingoDeer* in this case - was more comfortable than from a book, as they could listen to the words instead of just reading them. On the other hand, there was one *Influent* player who felt that they would have to learn outside of the game, as the content of the game was too limited, which shows that variety - or lack of it - matters as well.

Like the sentences above suggest, the questions about motivation were the ones where the differences of the two games would show up. Influential users praised the game because it gave them a virtual area to explore and different game modes, but the educational content it offered was rather limited, as the game only taught individual words instead of grammar and full sentences. Meanwhile, LingoDeer users enjoyed playing a game that taught them full sentences, but there was no virtual area to explore and the player had slightly less control over what they would learn because they couldn't simply use an avatar to select interesting items or words. Instead, they were given exercises that resembled structured lessons. While all Influential players seemed to be happy with the examples the game offered, not all LingoDeer players were happy with theirs. Even though majority of them saw the examples as relatable or relevant, there was one who didn't seem to mind most examples, but criticised how often the game asked them to write "I am American", which is understandable as even though the participants' nationality wasn't asked during the survey, they were gathered mainly through personal Finnish contacts and a Finnish Discord server. Other critique was aimed towards how the examples were organized, as another LingoDeer player would have preferred to start from something else than fruit words. Still, as only two out of twelve participants criticised the relevancy of the examples, it is safe to say that the vast majority of the participants found the examples relevant.

Earlier in this subchapter, it was told that Javadi and Tahambsi (2020), link motivation with how well the study material fits to the individual needs of the learner (Javadi and Thambasi, 2020). In the survey however, things don't seem to be quite this simple. Even though the majority of the participants found the examples relevant, the relevancy alone wasn't enough to motivate everyone to learn. The participants who already disliked learning new languages stated that the game didn't affect their level of motivation one way or another. While they might play the selected game again if they had to learn the language, the game didn't encourage them to study the language outside of the game.

In previous studies, it was shown that educational games can teach people as well as other methods can (Dobrescu et al., 2015; Tang & Taguchi, 2021), but it seems like the advantages the games could have over the more traditional methods haven't been studied. While we did not compare the educational games with other methods in practice, many answers in the survey mentioned an advantage the games have over a traditional textbook: The possibility to combine text and sound. While most participants listed individual words and grammar rules when asked what they learned from the game, the answers to the question about what increased their learning performance were easier to generalize, and other benefits over traditional learning methods were found: Repetition and learning at one's own pace. While these are benefits that can certainly be associated with textbooks, they could potentially offer an advantage over classroom education where one must try to keep up with the teacher and the rest of the class.

In addition to what has been stated already, other things that were told to improve the learning performance of the participants were clear exercises and

nice pictures. On the other hand, unclear and confusing exercises affected performance negatively. While Influent players weren't affected by this issue, some LingoDeer players told that they encountered exercises where they didn't know what they were supposed to do. Despite this, Influent wasn't without its own issues, as one of the players felt that there wasn't enough content, as the game only taught words, or more specifically, names of the items the player could find within the game environment. In addition to issues related to the content of the games, some individuals mentioned that difficult words decreased their learning performance. While two told that they had simply trouble remembering certain words or a foreign writing system, one of the participants seemed genuinely frustrated.

Overall, increased engagement, increased motivation and improved performance had some things in common that linked them together. Easiness was mentioned in the survey results about engagement and motivation, and it could be indirectly linked to performance as well, because difficult words and unclear exercises affected performance negatively. Variety was mentioned in the context of both engagement and motivation, while the combination of sound and text were associated with motivation and performance.

When the results of the survey were compared with the results of the literature review, it was noticed that many of the survey results supported what was found in the literature, but not all things were quite as unequivocal as the previous studies made them seem. For example, entertainment value and other engaging factors of educational games were seen as an advantage by Dobrescu et al. (2015) and Tang & Taguchi (2021), who discovered that from the students' point of view, educational games were more enjoyable than textbooks and more engaging than online lessons. In this survey, it was noticed that nearly all young adults described the games they tried as fun and enjoyable, but only one of those who were over 50 years old described the games as "fun". While this might also be caused by their inexperience regarding educational games in general, there were young people who had never tried educational games before participating in this study either, yet they still found the games fun to play.

The effectiveness of video games as a tool to increase the motivation of learners was also shown to be a rather situational matter. Even though de Marcos et al. (2016) found that the level of motivation decreased after a while, both de Marcos et al. (2016) and Tang & Taguchi (2021) noticed at least a short-term increase in motivation on students who were playing educational games. While the long-term effects were not studied in the survey, there were two people who didn't seem to get much of a short-term increase in motivation either. Both of them told that they disliked language learning in general, and while they might play the game again in the right circumstances, the game did not increase their motivation towards language learning in general. Those who did not mention a general dislike towards language learning in the survey results however seemed to be more easily motivated by the game and five told that the game encouraged them to even learn the language outside of the game.

Unlike increased engagement and increased motivation that both had somewhat situational results, the survey results about improved performance were more uniform. All participants – even an individual who had first told that they didn't learn much – were able to list things that they learned from the game. Likewise, all participants mentioned things that improved their performance, while almost all were also able to identify things that affected their level of performance negatively. Out of all the positive and negative factors, clarity was mentioned in both cases, as participants enjoyed clear exercises but also had the misfortune of encountering unclear or confusing exercises that hindered their performance.

Since all the participants learned from educational games, the survey results alone cannot be used to determine if the games could be better or worse than more traditional learning methods like, for example, textbooks, classroom education or even online lessons. Based on previous studies like the ones conducted by Dobrescu et al. (2015) and Tang & Taguchi (2021), it can simply be stated that they are as effective as textbooks and online lessons. When we consider how the survey results emphasized the combined text and sound as well as learning at one's own pace however, it seems that games could at least give learners an advantage over traditional textbooks that only offer information in a written form. Learning on one's own pace can also be an advantage over classroom education where the participant generally has to keep up with the rest of the class. Of course, this does not mean that textbooks and classroom education couldn't have their own advantages over games, but identifying them would require more systematic comparison and analysis. Additionally, if we examine online lessons instead of traditional classroom education, finding any clear advantages would be more difficult as they generally include sounds and text just like the games do, and depending on how the course is organized, might allow the participant to learn on their own pace as well.

## **7.2 Applicability of pressure-free learning and self-efficacy on adult learners**

On children, Kiili et al. (2015) noticed that educational games can lower the students' feelings of stress by making the students concentrate on playing the game instead of focusing on things that would cause them to feel stressed (Kiili et al., 2015), while Sung & Hwang (2015) and Gray et al. (2019) noticed that the games had positive impact on things related to the self-efficacy of school students. Still, even though it has been shown that educational games can support pressure-free learning and improve self-efficacy, as can be seen in the studies mentioned above, information about how – or if – these two effects show on adult learners was lacking. For this reason, it was important to examine these effects as a part of this study.

Pressure-free learning was studied by asking the participants if the game was easy to play and if they experienced stress or anxiety while playing. A vast majority of the players found the game easy or somewhat easy to play, which suggests that the potential complexity of the games wasn't a significant cause of stress for the players even though some reported having encountered exercises where they had to figure out what they were supposed to do by trial and error. What did cause the participants stress however was certain specific exercises, game modes, and in the case of LingoDeer, excessive repetition of exercises that the player had previously failed. The repeating exercises were also a cause of anxiety. While the participants acknowledged that repetition is a necessary part of learning, one of them would have liked to see an option to skip some of the exercises every now and then. Unlike Influent that allows the player to learn words in whatever order they want to, LingoDeer requires players to complete the so called "lessons" in a specific order. If the player keeps failing exercises by, for example, misspelling words, unlocking new content could take a long time.

Even though Influent didn't require the player to learn things in a specific order, one of the players experienced stress while playing the game. Instead of difficult, unskippable exercises, there was an optional game mode that the participant found stressful because of its time limit. In addition to stress, the timer also caused the participant to experience feelings of anxiety. What was common between all except one of the individuals who experienced stress was that they had never played educational games before. Still, it is unclear if this truly had anything to do with the lack of experience because the causes of stress reported by the participants seemed to be ones that could apply to anyone regardless of their gaming proficiency.

In studies conducted on children, self-efficacy was increased in situations where the students have cooperated while playing and when they have experienced feelings of personal achievement (Sung & Hwang, 2013; Gray et al., 2019). Self-efficacy is directly linked to one's personal feelings and beliefs regarding their own capabilities, which is why in this study, the participants were asked about what in the game gave them a sense of accomplishment, and how the game affected their confidence in using a new application and learning a new language.

Causes for sense of accomplishment varied between the adult individuals who took the survey, but over a half of them reported things that could be described as getting something right. In other words, the participants got a sense of accomplishment when they selected correct words, managed to form sentences correctly, found the right items in Influent, or they made other right choices. Immediate feedback, getting good points, the cheerful mascot, and clear learning paths were also mentioned, though the first three of these could at least partially be seen as visual - or numeral, in the case of good points - representations of the correct choices. More importantly, these results show that adult learners can gain a sense of accomplishment when they play an educational game.

The games also proved to improve people's confidence in using new applications. When participants were asked if playing the game increased or decreased their confidence to try new applications, none of them

replied "decreased". Instead, a slight majority of the participants reported increase in confidence, and the rest responded that they felt no change in their level of confidence at all. While most people didn't clarify why their level of confidence increased or stayed the same as before, one whose answer fell into the latter category mentioned their general interest towards trying new applications that offer them something interesting to learn.

According to the survey answers, the games managed to increase the participants' confidence in learning a new language as well. The distribution of the positive and neutral answers was similar to those that were given to the previous question, as none of the participants told that the game decreased their confidence, majority felt increase in their level of confidence and the rest reported no change. Unlike in the previous question, the participants included more justifications for their answers here. For one, their level of confidence was increased simply because they found the content of the game interesting, while one liked that the game doesn't judge them if they happen to make a mistake. For some, the game encouraged them to learn new languages, while one person told that playing increased their confidence to learn the individual language they decided to learn from the game, because playing made them notice that this language wasn't as difficult as they originally thought it would be. As for those who didn't report increase or decrease in their level of confidence to learn new languages, the game had more value as a tool that could help them to maintain languages they already knew.

Because majority of the participants reported that they had experienced feelings of accomplishment during gameplay and most told that the game increased their confidence in trying new applications and learning new languages, it can be said that educational games are able to improve the self-efficacy of adult individuals.

### **7.3 Educational games on adult language learners**

In the previous subchapters, the five effects of educational games were examined from the point of view of adult foreign language learners, and based on the combined results of the literature review and the survey, it seems that all the effects that were found on children can be applied to adults as well. However, there were some interesting findings that need to be considered.

First, it seems that certain effects that were found on adults in the previous studies were slightly less uniform in the survey results. Dobrescu et al. (2015) and Tang & Taguchi (2021) emphasized how enjoyable and engaging educational games were considered in their studies, but in the survey, it was noticed that while most young people certainly described the games as fun and entertaining, people over 50 generally did not. While the amount of older participants was low, it is most interesting that only one of them considered the game fun. The others put more emphasis on how interesting or useful they thought the content was. As both earlier studies were conducted on students, this seems to suggest that

young adults benefit from what I would call the "engagement-effect", but it would be unwise to apply these results to middle-aged and older individuals without further studies. Instead, if someone wants to use games to teach them, it would be best to emphasize what makes the game useful.

Previous studies about motivation on adults learning from games had somewhat mixed results, so it was important to include questions about this subject into the survey. While the long-term effects were not studied, the short-term effects seemed promising based on how many participants the games managed to encourage to study the languages even outside of the games. However, it was found that the individuals who already disliked language learning did not experience increase in motivation towards language learning in general regardless of how relevant or irrelevant they thought the examples used in their chosen game were. Even though Javadi & Thambisi (2020) link motivation to how well the study material fits the learners' needs and preferences (Javadi & Thambisi, 2020), it seems that if the lack of motivation is strong enough, increasing it requires more than just relevant materials.

Improved performance seemed to be less situational effect than increased engagement and increased motivation at the first glance, based on the survey results. All the participants were able to give examples of what they learned from the game they choose to play, and factors that affected their learning performance in either positive or negative way were also included, like repetition, pace, (un)clear exercises and the combination of text and sound. However, while it is clear that the games can teach the players, it is unclear if the games could be better than other learning tools or methods. At least superficially, the games seem to have advantages over textbooks and classroom education because they allow the learner to listen to the foreign language words unlike the textbooks do, and they allow the learner more freedom and repetition than structured classroom education does, because they do not have to keep up with other people or schedules. Still, this does not mean that textbooks or classroom education couldn't offer some advantages over educational games. For example, a study by Dobrescu et al. (2015) rates the games and textbooks equal when it comes to performance. Also, while we did not encounter a study where games would be compared to traditional classroom education, classrooms are associated with teachers who can potentially help the students with more complex issues than games could. Because this study did not compare people learning from games with people who used other methods, the results cannot be used to determine if games can improve learning performance more than other methods could. The only thing that's clear is that the games are able to teach foreign languages to adult individuals.

The two effects that were not found on adults in the studies that were used in the literature review were pressure-free learning and improved self-efficacy. Despite the lack of previous studies, the survey results were promising. Vast majority of the participants found the games easy to play, including some of the LingoDeer players who had encountered exercises that they described as unclear or confusing. The amount of those who experienced stress or anxiety was small,

but the causes are important to acknowledge, as excessive repetition of LingoDeer exercises caused by recurring mistakes was able to cause both stress and anxiety, as was playing against a timer in Influent. While the exercise with the timer was completely optional, LingoDeer will not allow the player to proceed to the next level or "lesson" until they pass the previous one by giving enough correct answers. Combined with the way how the game used repetition to teach the words the player seemed to have trouble with, this could potentially lead into a situation where the player would be unable to proceed to the next lessons, and therefore, get stuck. While this wasn't outright mentioned by any of the participants, it is no wonder that one person who had trouble forming a difficult, recurring sentence correctly would have liked to see an option to skip the exercise. In short, the majority of the answers supported the idea that educational games offer a way for adults to learn without pressure, stress, or anxiety, but the causes of stress that few participants mentioned should not be ignored.

The games were also able to improve self-efficacy of the participants. Players of both Influent and LingoDeer got sense a of accomplishment from several things, out of which making correct choices was the most significant one. Improved self-efficacy is related to the persons beliefs and capabilities, so it is not surprising to see that succeeding in the given exercises has a positive impact on the player. Decrease in confidence to try new applications or learn new languages was not reported by any of the participants, and instead, majority felt that playing the games had increased their confidence. While some people felt that this increase was caused simply by the interesting content the games offered and how games can make one realize that the subject - a language, in this case - is not as difficult to learn as they originally thought it would be, one participant made an important observation regarding why games can increase one's confidence when it comes to learning: Game doesn't judge. The player can make mistakes without worrying about what other people might think, and therefore, an educational game could be used as a safe learning environment for all those who are capable of using one, including people who suffer from low self-esteem, anxiety or other conditions that may hinder their willingness to participate in more social learning situations.

In summary, all effects that had been found on adults in the previous studies showed up in the survey results, which means that even though the amount of survey participants was rather low, it could be confirmed that increased engagement, increased motivation, and improved performance are indeed effects that can be found on adult learners. As for pressure-free learning and improved self-efficacy, the survey results show that even though they were previously studied on children, they can apply to adults as well. The following table visualizes what effects the survey confirmed and which ones were new findings in the context of adult learners.

TABLE 5 *How the survey results relate to the previous studies*

<i>Effect</i>	<i>Previous studies on adults</i>	<i>Effect in the survey</i>
<i>Increased engagement</i>	<i>Dobrescu et al. (2015) Tang &amp; Taguchi (2021)</i>	<i>Confirmed</i>
<i>Increased motivation</i>	<i>de Marcos et al. (2016) Tang &amp; Taguchi (2021)</i>	<i>Confirmed</i>
<i>Improved performance</i>	<i>Dobrescu et al. (2015) Tang &amp; Taguchi (2021)</i>	<i>Confirmed</i>
<i>Pressure-free learning</i>		<i>New finding</i>
<i>Improved self-efficacy</i>		<i>New finding</i>

In the survey, some background information regarding the participants was collected, but generally speaking, only one part of this information seemed to have a significant effect on the results: The age of the participant. While the game that was chosen, the gender of the participant and familiarity with educational games may have caused slight variation in the results – such as how *Influent* and *LingoDeer* offered different kinds of game modes – the differences were either very small, the sample sizes too limited (for example, there was only one male participant who was under 30 years old) or the result included factors that implied other reasons for the variations than the background information. However, when questions about engagement were asked, nearly all participants who were over 50 years either implied or outright stated that they didn't think that the game they selected was fun. Instead, they valued the game for its interesting educational content, whereas the majority of younger participants agreed that the game was fun and engaging. As even the previous studies where the increase of engagement was noticed were conducted on students, namely those by Dobrescu et al. (2015) and Tang & Taguchi (2021), it seems like there would be an opportunity for researchers to study what exactly would make educational games more appealing to individuals who are middle-aged or older.

In addition to the five effects that have been examined in this study, one benefit of educational games is that they are not tied to a specific time or a place. Therefore, it would be interesting to study how they fare against other learning methods. While this study already included brief comparisons between games and books, classroom education and even a specific case of online lessons (a study conducted by Tang & Taguchi, 2021), there was no deep analysis. While games are more flexible than formal language courses that rely on classroom education and they allow the player to listen to the words and sentences they wish to learn unlike physical textbooks, both of these traditional methods might have advantages that were not recognized in this study. More importantly, it would be beneficial to compare the educational games with other self-learning or remote learning methods, because these methods seem to share certain traits with educational games. For example, none of them would require the learner to go to a specific place to learn, which is beneficial as there are people who are unable to attend lessons in person because of, for example, time, location or health related issues.

## 8 CONCLUSION

The purpose of this study was to answer the research question: *What effects do educational video games have on adult foreign language learners?* The study consisted on two parts, the literature review and the empirical research. In the first part, five effect categories were formed based on previous studies regarding educational games, while in the second part, the goal was to verify effects that had been found on both adults and children before, and to see if the effects that had been previously studied only on minors can apply to adults as well.

In the literature review, the effects that were found on both adults and children were increased engagement, increased motivation and increased performance (Tang & Taguchi, 2021; Dobrescu et al., 2015; de Marcos et al., 2016), but there was a lack of studies regarding pressure-free learning and improved self-efficacy on adult individuals. The reason why it was important to verify the previous studies instead of simply studying the effects that had not been identified on adults before was because while there were already studies that had recognized increased engagement and improved performance, namely Dobrescu et al. (2015) and Tang & Taguchi (2021), the study by Tang & Taguchi (2021) had shown rather mixed results regarding increased motivation.

To verify the effects that had been found on adults earlier and to gather data about the other two effects, an empirical study was conducted in the form of a qualitative survey that consisted of open ended questions. The transcribed answers went under thematic analysis, and were therefore collected under five themes, all named after the effects found in previous studies about educational games that were conducted on children. The data collected under each theme was then classified based on whether the effect in question had been positive, neutral or negative according to the participants' answers.

## 8.1 Findings

Based on the survey results, all of the effects found previously on children can be applied to adult learners when they are learning foreign languages with the help of an educational video game.

Increased engagement, increased motivation and improved performance – the effects that had been found earlier on adults – were verified. However, increased engagement and increased motivation both had limitations regarding how well they can be generalized. The results regarding increased engagement can only be safely applied to young adults, as participants over 50 years old were hesitant to find the game entertaining. Even though some of them described the game as interesting, which could imply a level of engagement, the focus in their answers seemed to be more on what the game can offer in terms of learning rather than how engaging or entertaining it is.

The results about motivation were also slightly different from those that had been found on earlier studies. While long-term effects were not studied, it was noticed that the games did not increase the level of motivation even on short term on people who already held negative attitudes towards language learning. However, game features such as easiness, variety, and the combination of sound and text increased motivation on participants who did not mention having a clear aversion towards language learning.

Compared to increased engagement and increased motivation, improved performance seems to be less situational effect as long as it is examined from the point of view of what the games can teach instead of comparing games with other methods. In the survey, all participants were able to list things that they learned from the games they played, but as all the participants used games to learn, the effectiveness of games was not compared to anything else in practice as a part of this study, even though there were participants who certainly compared their new gaming experience to previous learning experiences. While the survey results show that the games can teach people foreign language skills, they alone cannot be used to determine if the games would have performance-related benefits or disadvantages when they are compared to other learning tools or methods. However, when the survey results are combined with the results of the previous studies by Dobrescu et al. (2015) and Tang & Taguchi (2021), it can be determined that educational games have the potential to teach the learners as effectively as text books and online lessons can.

The new effects that were found on adults in this study were pressure-free learning and improved self-efficacy. Even though some participants reported experiencing stress during specific parts of their chosen game, the vast majority of the participants reported no stress or anxiety during gameplay, which shows that educational games can be used as a mostly pressure-free language learning method. They could also be used as a safe learning environment for those who experience social anxiety in learning situations, as one of the participants pointed out that the game doesn't judge the player when they make a mistake.

Improved self-efficacy was also shown in the results, as the participants were able to tell examples of things that gave them a sense of accomplishment while playing, and none of them reported decrease in confidence in either learning new languages or trying new applications. Instead, majority of the participants experienced increase in their confidence in both cases, and the rest reported no significant effect one way or another.

## 8.2 Limitations of this study and topics for future research

The limitations of this study can be split into two different categories: The limitations of the literature review and the limitations of the empirical research. When it comes to the literature sources, one limitation became clear during the source collection phase. Like a scoping review by Xu et al. (2019) indicates, most studies regarding the use of digital games in language learning seem to focus on children who are learning English (Xu et al., 2019). The amount of studies regarding any other languages taught with the help of educational games turned out to be surprisingly limited, almost nonexistent. While the situation seems to have changed slightly during the last few years, the change has been from children to college students, and the main language that's being studied is still English, if the subject being taught is even a language in the first place. Because of this, the literature review relied strongly on more generic studies about adult learning and learning theories, not specifically language learning.

While the lack of relevant earlier research was certainly a significant challenge, it was also as a strength, because it highlighted the need for further research of the subject. Therefore, the empirical study focused on languages other than English and aimed to gain participants from a wide variety of adult age groups, not just college students.

While both *Influent* and the two versions of *LingoDeer* taught languages other than English, the majority of those who participated in this study were young adults between ages 21 and 29, which means that the effects of this study best apply to them. Luckily, some older individuals were able to participate, but the amount was still lower than what had been originally hoped for. The amount of female participants was also significantly higher than those who identified as male or other, which is why it would be difficult to determine if the differences in the answers would have something to do with the player's gender identity or if they were simply caused by other individual differences.

The use of two games – three if we count the different versions of *LingoDeer* as separate games – was a decision that could have caused issues because the gameplay and game modes were quite different. However, with the exception of results that focused on the exploration possibilities *Influent* offered, the differences did not have a significant effect on other results. What can be considered a significant limitation however, is the low amount of participants. Even though the participants were from different backgrounds as they were gathered from two Discord servers unrelated to education or video games and personal contacts,

the overall amount of those who finished taking the survey was 12. Despite the differences in age, gender or even previous experience regarding educational games, it has to be kept in mind that the results only apply to a small amount of individuals and should not be applied to larger populations without further studies or careful consideration. Also, as long-term effects were not studied, the results only apply to short-term learning from educational games.

Despite the limited amount of participants, the results of this study still suggest that the age of the player can have a significant effect on how engaging they find the game to be. As even the previous studies by Dobrescu et al. (2015) and Tang & Taguchi (2021) both noticed the increase of engagement as one of the effects that affected adult players, there would be an opportunity for researchers to study what would make educational games more appealing to middle-aged or older audiences.

Another interesting research subject would be is the effectiveness of educational games when they are compared to other learning tools and methods. In both Dobrescu et al. (2015) and Tang & Taguchi (2021), educational games were shown to be more engaging than books or online lessons, but in terms of effectiveness, they seemed to be on the same level. However, an issue with these studies was that they focused strictly on proving if the games can reach the same effectiveness as the methods they were compared to. The possibility of games surpassing the other methods in effectiveness was not considered. Also, both of these studies only compared educational games with one other method. In the future, comparing games with a wider range of educational tools and methods would be an interesting subject that would provide information that could benefit those who wish to provide people with better remote learning options.

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## APPENDIX 1 SURVEY FORM IN ENGLISH

### Background questions

- Age
- Gender
- Have you tried educational games before participating in this study?
- Which game did you play as a part of this study?

### Engagement

1. For how long did you play the selected game?
2. Did you find the game fun to play? If so, what aspects of the game were fun and/or interesting?
3. Did you find the game boring? If so, what aspects of the game were boring?
4. How likely will you keep playing this game in the future? Why / why not?

### Motivation

5. What aspects of the game increased your motivation towards language learning?
6. Did playing the game encourage you to study the selected language outside of the game? Why / why not?
7. How relatable or relevant did you find the examples that the game was using to support your language learning?

### Performance

8. What did you learn from the game?
9. What aspects or features of the game improved your performance?
10. What aspects or features of the game decreased your performance?

### Pressure-free learning

11. Did you find the game easy to play? If not, why?
12. Did you feel stressed while playing the game? During what parts of the game did you feel stress or pressure?
13. Did you experience feelings of anxiety during the gameplay?

### Self-efficacy

14. What parts of the game gave you a sense of accomplishment?
15. Did your confidence in using a new application increase or decrease during the gameplay?

16. Did your confidence in learning a new language increase or decrease during the gameplay?

Other

17. If you have any other thoughts about playing the educational game that you wish to share, you can write them here:

## APPENDIX 2 SURVEY FORM IN FINNISH

### Taustakysymykset

- Ikä
- Sukupuoli
- Olitko pelannut digitaalisia oppimispelejä ennen tähän tutkimukseen osallistumista?
- Mitä oppimispeliä pelasit?

### Mukaansatempaavuus

1. Kuinka kauan pelasit valitsemaasi oppimispeliä?
2. Oliko pelin pelaaminen mielestäsi hauskaa? Mitkä asiat pelissä olivat hauskoja ja / tai mielenkiintoisia?
3. Oliko pelin pelaaminen mielestäsi tylsää? Mitkä asiat pelissä olivat tylsiä?
4. Kuinka todennäköisesti tulet pelaamaan valitsemaasi peliä jatkossa? Miksi / miksi et?

### Motivaatio

5. Mitkä asiat pelissä kasvattivat motivaatiasi kielenoppimista kohtaan?
6. Kannustiko peli sinua opiskelemaan pelissä valitsemaasi kieltä pelin ulkopuolella? Miksi / miksi ei?
7. Kuinka samaistuttaviksi tai relevanteiksi koit pelissä käytetyt esimerkit, joilla kieltä pyrittiin opettamaan?

### Oppimissuoritus

8. Mitä opit pelistä?
9. Mitkä asiat pelissä edistivät oppimistasi?
10. Mitkä asiat pelissä häikäivät oppimistasi?

### Stressitön oppiminen

11. Oliko peliä helppo käyttää? Jos vastasit ei, kerro miksi.
12. Koitko pelaamisen stressaavaksi? Mitkä kohdat pelissä aiheuttivat stressiä tai painetta?
13. Koitko ahdistusta pelaamisen aikana?

### Minäpystyvyys

14. Mitkä asiat pelissä toivat sinulle saavutuksen tunteen?

15. Lisäsikö / vähensikö pelin pelaaminen itsevarmuuttasi kokeilla uusia sovelluksia?
16. Lisäsikö / vähensikö pelin pelaaminen kohdallasi itsevarmuutta tai mielenkiintoa uuden kielen oppimista kohtaan?

#### Muuta

17. Mikäli pelin pelaaminen herätti ajatuksia, jotka eivät sopineet aikaisempiin kohtiin, voit halutessasi kertoa niistä tässä:

### APPENDIX 3 THE ORIGINAL FINNISH QUOTES

Mielenkiintoinen peli, mutta hauskuudesta en oikein tiedä. \*T1

Peli oli ihan mielenkiintoinen jos halusi oppia, mutta en kyllä hauskuuden vuoksi pelaisi. Jos jotain uutta kieltä haluaisin opetella niin sitten voisin uudestaan vilkaista. \*T2

Pelin pelaaminen oli helppoa ja mukavaa, hyviä juttuja olivat tehtävien helppous ja toisto. \*T3

Pelaaminen oli helppoa ja vaati tarkkuutta sopivasti mielenkiintoa ylläpitämään. \*T4

Joidenkin sanojen osalta kirjainten kerääminen ja lauseiden osalta en aluksi ymmärtänyt, että sellainen tyhjä välikin pitää löytää palikkoista. \*T5

Oli hieman hankala navigoida ja ymmärtää mitä tehdä. \*T6

Pelimuotoja olisi voinut olla enemmän, mutta ei ollut tylsä. Joitakin samoja tavaroita oli aika paljon, joiden tilalla olisi voinut olla muutakin. \*T7

Pelaaminen oli erikoista ja mielenkiintoista. Kaappien avaaminen paljasti uusia tavaroita, joten tutkiminen oli hyvin mielenkiintoista. \*T8

Pelissä hauskaa oli asunnon tutkiminen ja vieraan kielen sanojen oppiminen sitä kautta. \*T9

Eteneminen tuntui helpolta ja loogiselta. \*T10

Pelissä voi esimerkiksi huomata, etteivät jonkun vieraan kielen sanat olekaan niin vaikeita. \*T11

"Se kun sama kysymys alkoi toistua jos sen vastasi väärin, jolloin katsoi asian tarkemmin ettei tarvi samaa kysymystä toistaa liian montaa kertaa." \*T12

"...Kun asunnossa sai liikkua vapaasti, omaa oppimista oli helpompi kontrolloida. Sai keskittyä sanoihin, jotka kiinnostivat." \*T13

"Tietokoneella mukavampi oppia kuin kirjasta. Sillä voi kuunnella samalla miten sanat lausutaan." \*T14

"(Pelissä) pystyi hyvin toistamaan tiettyjä sanoja uudestaan, jotta saa kuultua tarpeeksi, miten joku sana lausutaan." \*T15

"Tavallaan kyllä. Koska peli opetti vain ja ainoastaan yksittäisiä sanoja eikä esimerkiksi lauseita tai kielioppia, jos haluaisin oppia kielen paremmin, pitäisi se tehdä muualla. Alkuun pääsee kuitenkin pelin avulla." \*T16

"Kielen opiskelu vähäiseenkin osaamiseen vaatii niin paljon, ettei sitä viitsi aloittaa ilman kovaa motivaatiota." \*T17

"Vapaus liikkua ympäristössä ja omaan tahtiin pelaaminen. Myös mahdollisuus toistaa hankalia sanoja, jotka näkyvät joka klikkauksella myös tekstinä, ei äänenä." \*T18

"Selkeä vaihtoehtojen esittäminen ja valintojen oikeellisuuden helppo tarkistaminen." \*T19

"En saanut ihan heti selvää, mitä piti tehdä. Ehkä en katsonut riittävän tarkasti." \*T20

"Sivusto oli hieman hankala hahmottaa." \*T21

"En ehkä sanoisi että "haittasivat", mutta rajoittivat. Pelin ympäristö oli hyvin pieni, ja siellä pystyi opettelemaan vain kodista löytyviin tavaroihin liittyviä sanoja, ei esimerkiksi ulkomaailmaan tai edes yksinkertaiseen keskusteluun liittyviä sanoja." \*T22

"Joo ja ei. Joissain kohdissa piti miettiä, mitä peli haluaa minun tarkalleen tekävän." \*T23

"Osittain, kelloa vastaan pelatessa tuntui stressaavalta." \*T24

"Kun rakensin palikoista lausetta. Se piti saada kokonaan oikein, mikä oli hankalaa. Kun meni väärin, oikea vastaus näkyi alakulmassa, mistä se piti kopioida muistiin ja yrittää uudestaan ja uudestaan. Olisin halunnut skipata välillä tehtävän, mutta en löytänyt siihen mahdollisuutta. Toisaalta skippaamalla ei opi." \*T25

"Olen aina ollut valmis kokeilemaan uusia sovelluksia, mikäli niissä on jotain mielenkiintoista opittavana." \*T26

"Pelissä kukaan ei pidä tyhmänä, jos tekee virheitä." \*T27

"No ei varsinaisesti ainakaan yleisellä tasolla, mutta ehkä valitun kielen kohdalla saattoi vähän lisätä itsevarmuutta, koska kieli ei vaikuttanutkaan niin hankalalta." \*T28