Children´s agency in the virtual reality
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ABSTRACT

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Nowadays, technology such as computers, tablets, 3D printing, augmented reality, and virtual reality are beginning to be included in primary and early childhood education settings. Needed equipment are becoming more affordable and reachable. However, there is not much research about the educational use of Virtual Reality. Particularly, how young children experience virtual reality and how they act remains under research.

This research aims to find out what children in the early childhood education setting think about Virtual Reality, how their agency is formed, and do they consider the VR experience a positive one. The data of this qualitative case study data were collected in Finland, in one of the early childhood education centers in Kauniainen. The participants, altogether, eight children from four to six years old, attended a virtual game playing session in two separate groups. The research data consisted of videotaped material of VR playing situations and children´s interviews. The data were analyzed carefully through data-driven content analysis.

Results show that playing in the virtual world was highly motivating, fun, and engaging for the children. Children learned quickly to use VR glasses and hand devices, although adult supervision and assistance was still needed. Children's agency in VR was manifested through active action, exploration and independency, but not through social interaction. Results suggest children's attitudes toward VR game playing were positive. The pedagogical possibilities of utilizing VR in early childhood education will need more opportunities and educational use of VR calls for more research.

Keywords: Virtual reality, Early Childhood Education, Play, Digital play,

TIIVISTELMÄ

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Tänä päivänä erilaiset teknologiset laitteet ja sovellukset, kuten tietokoneet, tabletit, 3D- tulostus, sekä lisätty- ja virtuaalitodellisuus alkavat olemaan osa varhaiskasvatuksen ja perusopetuksen oppimisympäristöä. Virtuaalitodellisuuden hyödyntämistä opetuskäytössä ei ole saatavilla paljon tutkimustietoa, vaikka erilaiset teknologiset laitteet ovat yhä enemmän lasten saatavilla. Etenkin virtuaalitodellisuudesta pienten lasten kanssa, keskittyen lasten kokemuksiin ja toimijuuteen, on tehty vain vähän tutkimuksia.

Tämän tutkimuksen tavoitteena on selvittää, mitä varhaiskasvatuksessa olevat lapset ajattelevat virtuaalitodellisuudesta ja miten heidän toimijuuteensa virtuaalitodellisuudessa ilmenee. Tutkimus on toteutettu laadullisena tapaustutkimuksen ja tutkimusaineisto on kerätty yhdestä päiväkodista, Kauniaisten kaupungista. Tutkimukseen osallistui kahdeksan, neljästä kuuteen vuotiasta lasta kahdessa eri tutkimusryhmässä. Tutkimusaineisto koostui videoiduista VR-pelitilanteista ja lasten haastatteluista. Tutkimusaineisto analysoitiin huolellisesti datalähtöisen sisällönanalyysin avulla.

Tutkimustulokset osoittavat, että virtuaalimaailmassa pelaaminen oli lapsista motivoivaa, hauskaa ja mukaansatempaavaa. Lapset oppivat toimimaan virtuaalimaailmassa nopeasti, vaikka aikuisen valvonta ja apu oli tarpeen. Toimijuus virtuaalitodellisuudessa ilmeni aktiivisena toimintana, ihmettelynä ja tutkimisena sekä omatoimisuutena, mutta ei sosiaalisena vuorovaikutuksena. Tulokset viittaavat siihen, että lasten asenteet virtuaalitodellisuuteen olivat positiivisia. Virtuaalitodellisuuden hyödyntäminen osana varhaiskasvatuksen pedagogista toimintaa vaatii silti lisää mahdollisuuksia, ja virtuaalitodellisuuden opetuskäyttö lisää tutkimusta.

Asiasanat: virtuaalitodellisuus, varhaiskasvatus, leikki, digitaalinen leikki,

CONTENT

1 INTRODUCTION

Now, the technology in our children's lives is more versatile than ever: devices, such as computers, smartphones, and tablets, are now quite everyday things, and innovations like virtual reality (VR) and augmented reality (AR), and wearable technologies, are becoming to something, that children encounter more and more regularly (Mertala & Koivula 2020). Children today have a more comprehensive range of technologies to use than their grandparents or even their parents (Marsh et al., 2016). The rapid growth of technology has also created the digital divide concept, which describes the differences between generations regarding access and know-how about digital technologies (Koivula & Mustola 2017, 38). The digital divide can also be problematic for adults as it may cause difficulties to understand children's current interests relating technology and digital play.

Technology affects almost every area of our lives and children's play, creating a new kind of play concept called digital play (Stephen & Plowman, 2014). Play has existed as an stable phenomenon for several centuries, and now, the use of technology has enabled the birth of digital play, an exceedingly novel form of play. Because digital play is so different from how we've described the play in the past, we need to pay special attention when considering its effects on a child's growth and development (Salonius et al., 2005).

 Digital play is a type of play where a child utilizes technology, such as computers, tablets, or smartphones, in playing or making and watching videos, taking pictures, or interacting playfully with a technology. This new way of play is becoming a more and more everyday activity for children and thus, it has already become part of the cultural context of childhood (Heider & Jalongo, 2015). Moreover, in early childhood education, digital play has become an integral part of pedagogical practises for children in many developed countries (Stephen & Plowman, 2014).

In recent years, day care centers have undergone a rapid technological change. Digital technologies, especially tablet computers, have become in a

relatively short time as part of early childhood education centre's daily life and pedagogy (Koivula & Mustola, 2017). Usually, when we talk about digital devices in early childhood education, we often refer them to as technology education instead of emphasising play with technologies. The Finnish National Core Curriculum for Early Childhood Education and Care (Finnish National Agency for Education [EDUFI], 2018) instructs that one of the tasks of early childhood education is to improve children's skills in information and communication technology (ICT). In the early childhood education centers, the role of information and communication technology in everyday life is studied and observed with children, and various ICT tools, applications, and games are introduced to children. (EDUFI, 2018).

As written in the Finnish National Core curriculum, technology, and digital devices are referred to as one of the transversal competencies and should be considered with children widely through natural ways to learn, by playing, exploring, movement, and expressing oneself (EDUFI, 2018).

This research aims to figure out, how children react to virtual reality (VR) and how they act in it. The research seeks to determine, how the children's agency is formed in VR and how children feel about the experience. We might think, that new technological devices are fascinating, and children would be curious around them. However, there has been lots of discussion about how passivating digital play can be for children. There is a considerable lack of empirical studies that include children and virtual reality, and there are even fewer studies in the field with children under the age of seven (Bailey & Bailenson, 2017).

1.1   Concept of the digital play

Before opening the term digital play, it´s essential to start by defining the play itself. By definition of the concept of play, it can be regarded an activity that is spontaneous, fun, rewarding, and voluntary (Burghardt 2011). According to Gray (2013) the five most agreed-upon characteristics of human play are: Play is self-chosen and self-directed, intrinsically motivated, guided by mental rules,

imaginative, and play is conducted in an alert, active but non-stressed state of mind (Gray, 2013). For a child, the meaning of play arises from play itself. Play brings joy and pleasure to children. When children play, they are active actors: they structure and explore the world around them, create social relationships, and form meanings to their experiences (EDUFI, 2018).

Understanding better the digital play and its complexity, it's noteworthy that children's play has remained a relatively permanent phenomenon for a long time. When we think about play and games that we have been playing in our childhood, we might find that they are relatively the same that games and plays in our parent's and grandparents' childhood. Mary Clare Martin believes that by tracing children's play patterns, anthropologists have provided many exciting insights into children's games in the past and have proved that playing has existed for centuries in our lives and cultures (Martin, 2016). According to our knowledge, observations, and anthropological studies, we can say that children's play is strongly related to the environment where children live, the social status of the children, and the toys and materials available. These materials, which are used for the purpose of play, have an essential role in a play for children.

Play materials help children concretize their imagination, promoting cognitive development, such as interaction skills, symbolic thinking, and problem-solving skills. Play materials also attract children to be physically active (Healey, 2019). Despite the rise of technology, looking into the early childhood education centers, we can see that there are still many similar toys that were there generations backward. These toys, such as balls, dolls, and blocks still have a place in many homes. However, traditional toys seem to gradually make room for more and more technology-augmented toys with flashing lights, beeping sounds, and other programmed interactions (Stephen & Plowman, 2014).

New toys and research around toys have challenged parents and educators in deciding, which toys are most appropriate for children (Healey et al., 2019). The toys, with which children are playing nowadays, have substantially changed play by blurring the boundaries between the material and digital worlds. (Berriman, 2018, 4). We also acknowledge that play and play materials are

continuously developing. Technical and digital play, and toys related to these areas, are a new phenomenon causing debate among educators, parents, and researchers. In digital play, the play environment is becoming more and more complex because technology creates synergies between child's reality to digital devices and toys (Marsh, 2017, 2).

Digital play is a complex phenomenon: it has been seen as positive, promoting creativity and developmentally important, but also as a threat to a child's average growth and development that passivates, isolates, and negatively affects a child's development. Therefore, children's digital play has become a controversial phenomenon (Mustola et al., 2018). Still, digital culture, digital play, and digital toys have become a crucial part of contemporary childhood culture, and there is a need to understand this constantly developing phenomenon better. Today's children's childhood is different from past generations, with various technology such as computers, tablets, and digital toys. Technology is an integral part of their life. They grow up in a digital world with almost universal internet access. Technology remains in children's lives and is guaranteed to play a vital role in their everyday lives (Zahra & Alanazi, 2019).

1.2   Child's agency in digital play

As a phenomenon, a child's agency is broad and multidimensional, and therefore defining it from one perspective is challenging. But it's important because a child's sense of agency, which refers to the feeling of being in charge of their actions, is crucial for children's growth and development (Hilppö et al,. 2016). The child's agency can be seen as a voluntary and independent activity in various situations that impact the problem the child is currently dealing with (Lipponen et al., 2013). A child's activity also plays a significant role when talking about the agency. Agency means humans action and behavior where the significance of an active activity is emphasized (Lipponen et al., 2013). Even though some scholars disagree, should the agency be seen only through active activity (Paju 2013).

In this research, the child's agency is defined as active activity where the child acts voluntarily and influences the things around him/her. Another critical part when defining child agency are a social relationships. Agency can be seen as a social phenomenon, and interaction with others is needed to build one's agency (Esser, 2016). Also, Emirbayer and Mische (1998) underline the social aspect of the agency: it is always a dialogical process in which people communicate with each other through everyday operational contexts.

Children's agency is an important concept when we discuss about the digital play, but there is also other wide-ranging topics around digital play. The digital play raises many emotions and opinions among parents and educators. Understandably, new and unknown phenomena raise concerns. According to recent studies, increasing screen time has been pointed out as one of Australia's biggest child health concerns (Rhodes, 2015). Also, children's prevalence of inactivity and motor deficiency is a global issue, which is more likely to increase worldwide. This is also linked to the prevalence of childhood obesity and its threats (Laukkanen et al., 2018). According to a media research study in the USA, one of the concerns about the increasing presence of technology and digital play in children's homes is the degree to which this may detract from face-to-face family time (Children media Use in America, 2013).

Parents and educators share their concerns about our children through generations. Do they work too little, listen to too much radio, eat unhealthily, or play too much? The target for concern may change, but the reasons are always the same. We want our children to be happy, prosperous, and healthy and sitting in front of the tv or playing with tablets for hours and hours is a risk for normal child development (Neumann,2015; Nikken & Schols, 2015.) When   talking about children and digital games, we might face the assumption that playing is associated with increased violence and antisocial manners, passivity, and decreased health (Ferguson, 2010; Suziedelyte, 2021).

To understand this side of the digital play debate, we must explore what kind of activity it has been seen. These concerns might come from the assumption that digital play and technological devices are used as unsupervised babysitting,

which denies children adult company. This assumption often leads to the scheme of thoughts where digital play is related to physical inactivity, passivity, lack of verbal and social development, and adults' fears about internet safety (Stephen & Plowman, 2014).

Even we might disagree about how developmentally productive and necessary digital play would be for a child, the child sees play everywhere, and any activity can be play for the child. In digital play, children bring together elements, toys, ideas, and imagination and enrich the play with the help of technology. Digital play is a new form of play which draws on both the digital and non-digital properties of toys and moves flexibly across boundaries of space and time in ways that were not possible in the pre-digital era. (Marsh, et al., 2016).

Many scholars and studies have already highlighted that children's digital play and technology should be seen as a new form of play rather than paying attention only to the possible adverse effects of technology on a child's growth and development. (Jenkins, 2006; McClure & Sweeny, 2015; Mantilla & Edwards, 2019). Digital play can provide new possibilities not only to entertain children but also for learning and educating. Any child's experience regarding technology will always depend on the child's motives, parents' or teachers' support, and a good design which supports the child's purpose in the play. (Stephen & Plowman, 2014).

As pointed out, whether the digital play is good or bad for children depends on the situation where, how, and with whom the child is enacting the digital play. Also, contrary to expectations raised on the other side of the debate, there has been evidence that digital play does not dominate as much the lives of children as parents might think. Also, there have been claims that digital play is just one part of the new socio-cultural environment of the children's childhood (Stephen & Plowman, 2014). Whether the digital play is seen as either active or passive activity is the sum of many factors, such as what kind of game is in question, where digital play is played with whom children play, and what skills and motivation guide the child in the digital play (Mustola et al., 2018). When playing, children are proactive, create content and build a play environment in

line with the play's theme, either concretely or in their imagination. In play, children's agency is a phenomenon where the feeling, both as an individual and as a group of children, matters. I am, or we are doing things. We affect them. Things just don't happen to me or us. (Virkki, 2015.)

Digital play supports the child's activity and agency. It does not bind the child but enables creative and functional action. In the digital play a child can act voluntarily and in his/her own way (Sintonen et al., 2015). Also, when we think about the child's agency and the digital play, computers, tablets, and digital toys can support a child's agency and motivation in several different ways. For example, they can provide a child-specific, competitively challenging education that supports the child's confidence in their skills (Ronimus, 2013). It is known and recognized that the most useful for learning and motivation is when the child can deal with tasks with a low level of difficulty above the child's level of competence (Lepper & Malone, 1987; Malone, 1980; Vygotsky,1978). Digital play, where the objects are built in a way that can support a child's own level of skills, feeds the motivation more comprehensively than just traditional toys and plays.

As mentioned in the earlier, the toys and children's play are developing continually. Digital play is a new phenomenon, and a lot of research is needed. In this research, we aim to find out how children react and how the child's agency is seen in a new kind of digital technology, which can immerse children in totally different environments, giving new ways to interact with the technology. Predicting the future is very difficult, so we cannot be sure that our visions will come true, but based on current trends, it appears that the use of virtual reality will increase in many fields such as research and product development, entertainment industry and the education and training (Randén, 2004).

1.3   Child in the Virtual Reality

As famous British science-fiction writer Douglas Adams states in his book Mostly Harmless, (1992, 69). "A computer terminal is not some clunky old television with a typewriter in front of it. It is an interface where the mind and

body can connect with the universe and move bits of it about". Many of us might think that Virtual Reality belongs to the future. It is noteworthy to understand that nowadays, it is quite an everyday thing. Virtual Reality (VR) can be defined as the utilization of personal computers to establish a new kind of environment, unlike traditional user interfaces. Virtual reality places the player inside a game, program, or application. Instead of looking at a screen, the player has a comprehensive and engaging experience, and the player can collaborate with 3D universes while experiencing it. (Wadhawan, 2021).

Virtual reality offers people experiences and experiences in a new way. In virtual reality, a person can experience and do things that would not be possible in the real world or would be very difficult to implement by traditional means (Randén, 2004). The main target of Virtual reality is to give players a virtual environment where they can connect with technology similar to in the real world. (Wadhawan, 2021).

As with any other technological device, Virtual Reality technology has been evolving gradually, and it has started to become even more alike to the actual world. Virtual reality has developed at a tremendous pace, and its computing power has increased, making virtual reality realistic and more adaptable (Freina & Ott, 2015). The equipment needed for a virtual reality experience have recently been increasingly affordable. Virtual Reality devices and apps have made virtual reality more accessible to everyone. One can easily find good-quality VR glasses for the same price as other game devices such as PlayStation or Xbox. Virtual reality technology has been created to make a comprehensive experience that can help players immerse themselves in virtual experiences while allowing them to learn and entertain themselves at the same time. While Virtual Reality is already used widely in the gaming industry, it is utilized in other sectors as well, such as architecture, and the military (Liu et al., 2018; Portman et al., 2015).

According to many studies, it has been showed that the human body and the mind respond to virtual reality in the same way as if it is a real-life situation (Reeves, 1989). When adults use virtual reality glasses, they tend to understand

that they are safely located in their home wearing the virtual glasses, even that they might see a view where they are looking over the edge of a virtual plank (Blascovich & Bailenson, 2011). But there might be a risk when children are the users. The children might get too carried away and forget where they are. Also, Virtual Reality can be too realistic and scary for children. Children's tendency to see virtual reality as more real has been found in a survey by Sharar et al. (2007), using virtual reality with children of 6–18 years and comparing their experience with 19–65 years of aged adults. Differences between adults and children in virtual reality have also been studied; for example, in 2016, the research found that virtual reality affects a child's coordination differently than an adult's (Miehlbradt et al., 2021).

Moving in a virtual world always happens in a concrete space, in-home, in schools, and day care centers. Immersive Virtual Reality technology offers very high-quality features and may reduce children's ability to follow the rules of the physical world. A VR headset blocks out the location of objects in the physical world. Playing in Virtual Reality might be dangerous for children when they fall or walk into a wall while being immersed in play or a video while using Virtual Reality glasses (Bailey & Bailenson, 2017). Bumping to a head or falling when forgetting the actual world barriers is not only one concern for children experiencing the virtual world. There are also findings that VR gameplay may potentially have harmful emotional consequences for users, depending on the nature of the content (Lavoie et al., 2021).

For example, in Virtual reality, users can fly, climb on a high mountain, or even face dangerous animals, which might be stressful for children. In addition, given Virtual Reality's ability to produce such powerful effects, there is a risk that such effects may become even stronger in response to stressful Virtual Reality playing experiences. (Lavoie et al., 2021). Virtual reality equipment is already available in supermarkets, and even more, children can test them in homes, schools, or early childhood education centers. In addition, there are a few studies of children utilizing Virtual Reality experiences environments without specially

designed Virtual Reality glasses, using low immersive technology, such as using computers or mobile phones (Muldres et al., 2020).

Also, Virtual reality and early childhood education are quite sparsely studied area. Typically, virtual reality is strongly connected to entertainment use rather than education. Still, there have been a few studies on how young children react to virtual reality. For example, the benefits of virtual reality have appeared in a study where they have been studied children's pain management and virtual reality. There was evidence that virtual reality can reduce pain and anxiety during medical procedures even more effectively than painkillers (Li et al., 2011).

The use of digital play, computers, games, and tablets in early childhood education has been studied quite a lot in Finland (Koivula & Mustola, 2017). and also internationally (Mâță & Clipa, 2020.) Technological devices are already an integral part of today's learning in early childhood education centers. However, there is not yet much research data on virtual reality in teaching and education. In addition, the younger the children are, the less research has been done on the subject, even internationally. Virtual reality is a world that makes the player forget about the physical world, providing a rich and immersive experience wherein the child feels and responds to the virtual world as if it were real. Still, too little is known about how the Virtual world relates to child development. (Bailey & Bailenson, 2017). The opportunities of the virtual world can be limitless, and we might think that children are eager to discover virtual worlds like explorers. Also, according to the 2020 EDUCAUSE Horizon report, the use of Virtual Reality is overgrowing in education due to several factors: it is immersive, more accessible, and lowered cost (Brown et al., 2020).

1.3 Research Questions

This research aims to find out what children in the early childhood education setting think about Virtual Reality, how their agency is formed, and do they consider the VR experience a positive one. Virtual reality is expected to have widespread adoption within education in the upcoming years (Araiza-Alba et al.,

2021). However, there is not much research about the educational use of Virtual Reality. Particularly, how young children experience virtual reality and how they act remains under research.

In this research the child agency and the experiences are under closer review because, the child's sense of agency, is crucial for children's growth and development (Hilppö et al,. 2016). And the positive emotional experiences can promote learning children´s learning (Crouch et al,. 2021); (Schlesinger et al,. 2020).

The research questions in this study are:

1. How a child agency looks while experiencing the Virtual Reality

The first research question explores children's activities in the virtual world. Interest is, what is the level of a child's independence, activity, and interaction is while playing in the Virtual Reality. Also, analysis focuses on does the child acts curiously, open-mindedly, or cautiously. And how the child uses hand controls and how comfortable a child is with virtual technology devices. As a presumption, there might be variation between children, but are the child's age, gender, or previous experience from the virtual reality relevant, and do they shape children's experience.

2. What kind of experience Virtual Reality is for children?

Digital play and technology usually arouse interest in children. This research explores children's experiences of Virtual Reality. Is Virtual Reality the experience interesting for the children, or do they find it boring or useless? What kind of feelings does virtual reality awake in children? Do they have fun while playing?

2 RESEARCH METHODS

This research aims to understand child´s agency and how they react to and feel about virtual reality. Thus, the focus is on the child's own experiences. Therefore, this study has been conducted using qualitative research methods. This research method is often chosen as an approach, when one is interested in the experiences, feelings, and thoughts of the people involved in the research (Juuti & Puusa, 2020).

Qualitative research allows the researcher to get a good insight into the research context and the participants who attend the study. This research approach collects the material from people's stories, words, and observations, so this approach gives a deep understanding of the whole phenomenon (Patton, 2015). This qualitative approach also means understanding and supplying a theoretical interpretation of the studied phenomenon (Tuomi & Sarajärvi, 2018). In general, the qualitative research examines the connections between theory, empiricism, and practise (Juuti & Puusa, 2020). Qualitative research is an upper concept for several different research methods (Kananen, 2013). This case study research used some aspects of phenomenological research method.

2.1   Research Approach

This research was conducted as a case-study. Yin (2003) defines a case study as an empirical study that it aims to explore in depth certain topical phenomenon in its context. The chosen phenomenon, which is carefully studied, and the aim is to get a good overview of the phenomenon (Kananen, 2013). When designing a case study, it is essential to consider what we can learn from the case and what new perspectives the case produces about the phenomenon being studied. (Stake, 1995). In the present study, the child agency and the experiences in virtual reality were subject to closer investigation.

Case studies often have triangulation features (Kananen, 2017), which means that different approaches have been used as the data collection methods to understand the phenomenon. The case study requirements are that the studied phenomenon is current, the research is carried out in a natural environment, the research material consists of many different materials, a deep and rich description of the phenomenon is desired, and there is usually one research subject. (Kananen, 2013). In this research, the studied phenomenon, VR from the perspective of young children is topical, and the research is conducted in one early childhood education setting.

The research was conducted by using also some features from phenomenological approach. Phenomenological approach to studying human experiences. The idea, then, is that there is only knowledge in people, their experience, and thus the meaning they create for things (Patton, 2015). The studies that have been using phenomenology as a tool are investigations of how humans perceive, experience, and understand the social and material world (Ram & Houston, 2015). According to the phenomenological approach, it is essential to remember that every one of us feels the surrounding reality in our way. There is not precisely the same experience (Laine 2018, 25). Therefore, the phenomenological approach is justified for this study, as there may not be a single answer to the research questions. Still, the research findings are firmly based on a child's personal views and experiences.

The research data were collected using videotaped sessions, and interviews. The research aims to get a deep understanding of the child's agency and virtual reality experiences.

2.2 Research Context and participants

The data for this study was collected in Kauniainen -Finland. Kauniainen has a Digital education program funded by the Finnish National Agency of Education called the Digipuu program. This program aims to provide high-

quality digital education materials to early childhood education centers and schools and strengthen the digital skills of children and teachers in many ways. Kauniainen has an extensive range of digital devices, which enable children to test and use, for example, 3d-printers, Augmented reality programs, and Virtual reality devices. The Virtual Reality equipment used in this research were part of the Kauniainen Digipuu-program.

Participants in this study were children from one of the early childhood education centers in Kauniainen. Children who attended the research were from the one early childhood education group. In the study, altogether eight children participated, and they were divided in two different groups. Both study groups had four children aged four to six. Four of the children were boys, and four were girls.

2.4 Data collection

The research data collection was conducted from May to June 2021 by observing the children. Observation is a reasoned method of data collection, when the researcher wants to perceive the phenomenon under study as a whole, or there is only little knowledge about it yet (Törrönen 1999). Also, the daily life in early childhood education is so diverse that it is difficult to define it otherwise than by observing it (Grönfors 2015). Both research groups (four children in each) attended the study on two consecutive days. On the first day, the children had a two-hour game playing session with virtual glasses. There were virtual reality devices, a video camera, a beanbag chair, and a television in the research setting. Children were experiencing the virtual reality one by one but staying still as a one group. Children who were waiting their turn or had already played could watch the game situation streamed in real-time from the virtual reality glasses.Research was conducted in in groups for two reasons. Group observations are important because it provided an opportunity to find out things that children might not want to discuss with the researcher alone (Patton, 2015).

and also, because, when defining the terms of child agency, children's social interaction was also under observation.

In the second part of the study, the researcher gathered the same children attending the study the previous day for interviews. Then, children could discuss experiences in virtual reality. The basis of the children's research interview is the confidence that the child himself is the best expert to tell about his own life (Roos & Rutanen, 2014). This part was organized in a small group room where a researcher met the children around a large round table. There were also drawing paper and coloured pens on the table to allow children to draw their experiences while discussing their memories. Giving children the opportunity to draw during the interview has been proven to be a workable solution, as it is easier to connect with children through drawings (Roos & Rutanen, 2014). Children's drawings also gave interesting information about children's experiences in virtual reality. To reach an understanding of the child's world and get to know the child, it is good to use a variety of means and research methods of (Olli, 2014). Interviews with children was conducted in a children's own group space, and the researcher aimed to create a safe and positive atmosphere for children. Interviewing the children requires the researcher to have the ability to work with children and the sensitivity required by situations (Patton, 2015).

In this research, the researcher used a semi-structured thematic interview. The thematic interview method is characterized as that part of the interview has been limited and locked, but not everything (Hirsjärvi & Hurme, 2000). A thematic interview is a suitable approach when children attend the study. The thematic interview gave the possibility to receive similar information about both groups, in the same way, still showing the children the freedom to tell what they had to say. In the thematic interview, where the topics and themes are predetermined, but the exact formulation and order of the questions is a free form (Eskola et al. 2018). the researchers learn about children's feelings and thoughts after the Virtual Reality experience. The discussion with both research groups follows the same formula and questions but lets space for children open discussions. The researcher had selected a small number of questions to be asked

from both research groups during the discussion. There were, for example, these questions; did the children have fun yesterday when they tested the virtual glasses? What do they remember about it? Was there something that they did not like, and would they want to try it again in the future?

Both research situations, the VR game session and the children's interviews were videotaped. Recorded videos enabled the researcher to look closer at the child's reactions and actions after the research from different perspectives (Derry et al., 2019). The role of the researcher was quite active during the research, so videotaped sessions gave a lot of helpful information which was in danger of going unnoticed during the research. Videotaping is well suited for exploring social situations and interactions because videos offer the possibility to observe, for example, eye contact, gestures, and body language. From the videos, researcher can also notice the possible effects of the environment on behavior and detect common interests between research participants (Derry et al., 2019).

This study used data collected from approximately six hours of video material transcribed into study notes. The transcription is important part of the research project, and it is crucial to transcribe all actions and speech from the videos as it has happened and said. The researcher also has to pay special attention to identifying different voices and nonverbal communication (Lloyd-Evans, 2006).

2.4 Hardware and software used in this study

The hardware used in this research was the Virtual Reality glasses that enabled the children's Virtual Reality experience. Kauniainen had already purchased Oculus Quest 2 glasses as a part of the Digipuu Program. Therefore, these specific products were selected for this research. Oculus Quest 2 is a virtual reality headset developed by Oculus, a brand of Facebook. The headset is capable of running a standalone headset without an external computer. The Oculus Quest 2 virtual reality headset is a refreshed version of the original Quest with a lighter weight and a display with a higher refresh rate and per-eye resolution, making it

easier and better to use (https://www.oculus.com/quest-2). Notably, Oculus sets the minimum age for using the Oculus Classes at thirteen years. To create a player profile on the Oculus, one needs an active Facebook profile. The minimum age for creating a Facebook profile is thirteen years. The study used virtual glasses set with a Facebook profile opened for this study. No information were collected into the glasses or for the Facebook profile about players or research settings.

The software used in this study was a virtual game designed and developed by Color the Minds. The game, My Treehouse was designed explicitly for 6-to 9 old children. In the game, the player sees himself in a treehouse with many different functional elements. The game was not publicly available for download, and it was still under development, but the virtual world already offered many aspects for children to experience. In the virtual treehouse, players could, for example, build a train track, make food with a play kitchen, throw paper airplanes, draw on paper, or go to the balcony to see views (see pictures 1-3).
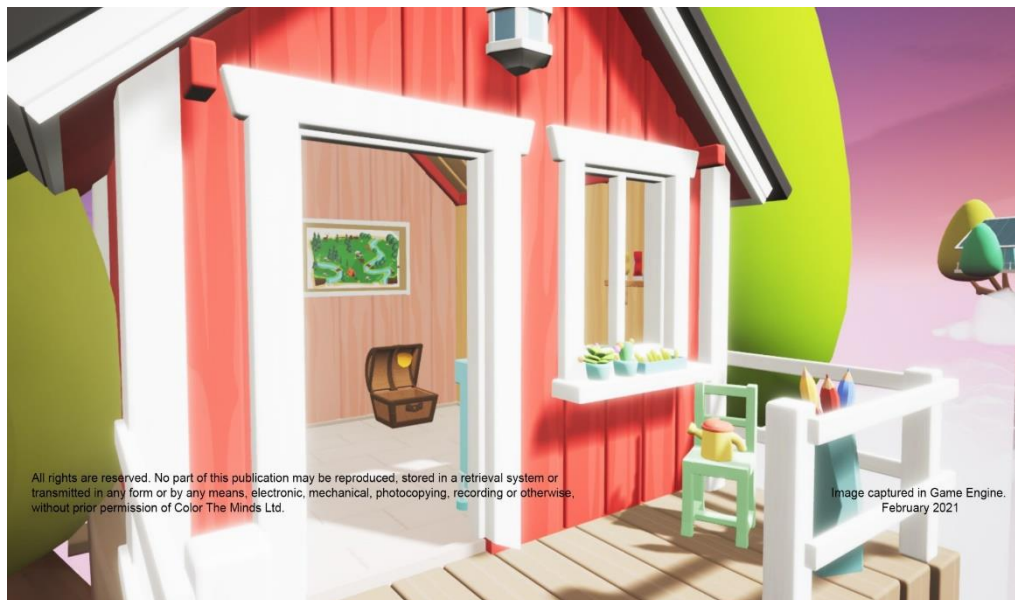
Picture 1. The Actual gameplay view from the balcony of the treehouse.

As can be seen from the picture 1, there are rockets, a watering can, and small plants on a windowsill on the right-hand side. On the balcony, the player can look at views, water the flowers, or fire rockets

Image captured in Game Engine.
February 2021

Picture 2. In the kitchen (picture 2) players can use and play with a food closet, kitchen sink, oven, and stove. The kitchen in the game offers lots of playable features. The kitchen stove could be turned on, as well the faucet. There are a lot of different foods in the cupboard.

Picture 3. As picture 3 shows, on the left-hand side are colouring paper and a table where you can build a train. The player can either raise or lower the level of different items to a height suitable for the player by using the red handle.

2.5 Data analysis

The Data analysis describes, interprets, and tries to understand the phenomenon under investigation (Juuti & Puusa 2020, 143). The data analysis is influenced by the choices made by the researchers at the beginning of the research process. The research problem posed and the research questions guide the data analysis. (Kylmä & Juvakka, 2007; Ruusuvuori et al., 2010). Data for the first research question about children agency were found on the videos recorded on the first research day from VR gameplay situation, and data for the second question about children experience were found on both research day videos. The research material were analyzed using inductive content analysis.

The qualitatively collected data are systematically described in inductive content analysis by coding significant factors into their categories (Schreier, 2013, Chapter 13). The aim is to organize the material in a concise and clear form, analyze the material systematically and objectively, and obtain a brief description of the phenomenon under study (Puusa, 2020; Tuomi & Sarajärvi, 2018).

The observations from the video material were first transcribed into study notes. The length of the transcribed study notes was 69 pages using the font Book Antiqua, size 11, and spacing 1,15. The researcher wrote all transcriptions in Finnish. Content analysis organizes and condenses the material into an unmistakable whole, without losing the information it contains (Nowell et al., 2017; Tuomi & Sarajärvi, 2009). In data-driven analysis, the steps for content analysis are the delimitation of the material, the review, the deletion of additional material, classification, and summary writing (Puusa, 2020). After transcribing all the material, the irrelevant issues from the research material were excluded from the analysis. Video transcriptions held a lot of information, but all the

information was not relevant for this study. The goal of the data analysis is to find the data that corresponded to the research problems posed.

The first research question was to explore child agency in the Virtual world, and so the data collection from the video transcriptions aimed to determine how the child´s agency is seen in the Virtual play session. The child agency is seen in this research through the various definitions set out in Chapter 1.1. Theoretically, it can be summarized that child's agency consists of

the *degree of independence* of the child

the degree of activity of the child, and

the degree of interaction of the child.

I utilized these definitions to analyze the data by classifying children's agency. (see table 1.)

TABLE 1. Scale of Child Agency

scale	Degree of independence	Degree of activity	Degree of interaction
1	very dependent	very passive	very low interaction
2	dependent	passive	low interaction
3	little bit dependent and relatively independent	little bit passive and relatively active	some interaction
4	independent	active	rich interaction
5	very indepented	very active	very rich interaction

The next step was to analyze what kind of descriptive types could be categorised from the data that had similar characteristics in terms of agency. From these similar properties formed the type examples. The typology aims to describe the research data closely but still comprehensively. The intent is to condense and characterize what is not present in a single answer (Eskola & Suoranta, 2000). The researcher has the autonomy to choose the type examples, and there is no possibility to select types in advance, but the research data must communicate to the researcher. The researcher needs to be aware of their position and the

presuppositions that may affect the interpretation of the research data (Ruusuvuori et al., 2010).

Data analysis for the second research question aimed to determine what kind of experience the virtual reality was for children. When exploring the child's experience is essential to note that the child's cognitive characteristics, resources, and personality affect the experiences. For example, regarding emotional experiences, joy of the child can be a momentary, heart-breaking, overwhelming feeling or calm and steady (Rantala 2006). There has also been much research that underlines that expressions such as smiles and laughter develop early in children, and these expressions are similar to adults smiling and laughing (Messinger & Fogel, 2007). In this research, first, it was analyzed what kind of emotions the child felt while using VR glasses. This was analyzed from child's gestures, e.g., smiling and laughing, as well as from verbal expressions. Next, child's experience was analyzed by examining whether the child wanted to continue playing after their turn. In addition, children were be asked in the next day's interview about their experiences from playing and would like to try again sometime in the future.

The following table 2 describes how the child´s experiences were analyzed in this research.

TABLE 2. Determining child´s Virtual Reality experience

scale	Positive emotions	whether the child wanted to continue playing	whether the child wanted to try again on the next day	whether the child described the experience as positive
yes, no	yes, no	yes, no	yes, no	yes, no

The following step was to analyze children's experiences more in-depth. This analysis was done by qualitatively describing children's behavior and activities. From the videos were also picked several quotes from the children. The direct quotations aim to describe the style of the material and highlight the

richness of the material (Puusa, 2020). The results found in the video material's data analysis are presented in the next chapter.

2.6 Trustworthiness of the study and research ethics

In this research, the researcher followed practices recognized by the scientific community, such as honesty, diligence, and accuracy in recording and presenting results and evaluating the results (see HTK Guidelines 2018). The criteria of scientific research are the prerequisite of reliability (Heikkilä, 2014) and is one of the key topics for ethically acceptable research. Research can only be morally acceptable and dependable, if carried out as required by good scientific practice (Juuti & Puusa 2020).

This research investigates children under school age in a municipal early childhood education setting. In the research, only relevant information on child is collected. This personal data includes e.g. the gender and age of the child. However, in a videotaped study, individuals can be seen and heard, and thus, these are personal data. Therefore, the research requires a privacy statement filled in the University of Jyväskylä's template and this was sent to child's parents alongside with the research consent. The research consent questionnaire sent to parents explained what the research covers and what personal data is collected, who process it, and how and when the material is destroyed.

Particularly in researching children, the anonymity of the participants is crucial. In the present study, the participants are referred to, for example, a girl six years old or a boy seven years old. It is carefully considered that no information is revealed about which child, which early childhood education group, or even which early childhood education center children are from.

Research consents are collected in accordance with the instructions of the University of Jyväskylä and the City of Kauniainen. The research consents have also been asked from the children.

The research data consists mainly of videotaped situations. In video analysis, the aim is to observe what kind of speech children use when they describe what they see and experience in the virtual world, what kind of emotions is visible, and how the children act in the virtual environment. Also, a group interview was recorded so that the children have possibility to reflect upon their experiences. The reliability of observation is increased by videotaping the research situation because it is possible to check the course of events afterward. Situations can be viewed repeatedly, even at different speeds, by choosing different observation strategies or methods and using other evaluators. The video can also show small details and quickly pass situations unnoticed in the research situation (Powell 2005; Vienola 2004).

Notably, this researcher has carried out using a phenomenological approach, and in the qualitative research, the researcher's interpretations reduce the objectivity and reliability of the study (Aaltonen & Högbacka 2015). To avoid the researcher's irrelevant interpretations, I try to write the study notes as accurately as possible without writing additional interpretations.

The quality and consistency of the material are affected by the fact that all children have the same experience of the game itself. Every child starts the game from the same point, and everyone has the same opportunities to play the game. During the study, the researcher limited the gameplay time for an individual child to a maximum of 15 minutes to avoid possible side effects such as dizziness caused by virtual glasses.

Video recordings also contribute to the opportunity to observe and look at the similarity of experiences. If there are unforeseen changes or interruptions at the research time, the researcher can decide to exclude some of the results from the research results. According to McNutt (2014) reproducing an experiment is one critical approach that scientists use to gain confidence in their conclusions.

The research methods have been opened as much as possible in this research. The problem with reproducing the experiment comes from the research target, the children, and also from the game development.

Because the game is still in the testing phase and constantly evolving, it is impossible to repeat the study precisely the same way. Also, when it comes to children, it is hard or almost impossible to repeat the test with the different or even the same children in the same way for a second time. However, the study focuses not on the game My Treehouse but on the child's virtual world experiences. Thus, this study and its results may be repeated even if the game being played is something else.

To ensure quality, the researcher kept the original raw data, i.e., the video materials, intact and stored until the end of the research. Writing notes from the raw data is a time-consuming project throughout the research process. Also, the same security considerations go along with the raw data for the backup data. There will be no copies of the raw data for security reasons (Ruusuvuori & Tiittula 2009).

The research diary also plays an essential role in quality assurance. Using the research diary, the researcher can return to the days when he worked with the research material, and written notes help the researchers work with the research. The research diary is personal and does not include identifying factors related to the research subjects. This diary records information on when and what has been done and other information relevant to the study. The research diary has two essential purposes for research. The first purpose serves the researcher himself and contributes to the disadvantages caused by possible breaks in the research data analysis. The second purpose serves to utilize further the information obtained from the research.

The video material, study diaries, and other study files used in this research are for use only and will not be retained or used after the analysis. All research material is the property of the researcher. A Finnish company owns the game used in the research, and it is used with the company's permission. All the screenshots used in this research have permission asked from the company. The completed study is freely available and can be translated by the subscriber, the City of Kauniainen. Once approved, the research itself is also freely readable and usable, following the University's rules and practices. The city of Kauniainen will

not use video materials or other materials used in the research. It is agreed with the city of Kauniainen that they have the right to mention and refer to the completed research in their marketing and events. However, they will not have rights to the research material, research diary, raw data, or other written material. Only the researcher is entitled to these. In addition, the raw data will be appropriately disposed of once the research has been returned and reviewed.

Virtual glasses may be a new experience for the child, and there are potential disadvantages to using them, which are carefully considered in this research. Studies show that virtual glasses can cause short-term harm to some users, such as dizziness and nausea (Martirosov et al., 2022). In addition, virtual glasses may be too scary for some children. In this research, it is crucial that when applying for a research permit from parents, they have received sufficient information about the potential harm that virtual glasses may cause to children. The decision to participate voluntarily in a study requires that the subjects have enough information about the research and the collection of material (Kuula, 2011.)

In the research situation itself, the safety of children will be taken into account with special care. Children's well-being and experiences are observed the whole time. The child may choose to suspend the study at any time. It is also essential that the child feels that they are not alone in the room but is always accompanied by a friend and, if necessary, a familiar and safe adult from the early childhood education group. The research situation is also organized to minimize the chances of tripping or hitting an arm or leg with a physical obstacle. After trying out the virtual glasses, the child sits on the floor for a while to ease any dizziness caused by the virtual glasses before moving back to the group room. Before a child tries out virtual glasses, it is essential to go through the functionality of the controls with them and tell them what kind of virtual environment the virtual glasses can access. In this way, the aim is to avoid the new experience being too scary at first.

Upon completing this study, all the video material has been appropriately disposed of to maintain anonymity and confidentiality (Ruusuvuori & Tiittula

2009, 17). In addition to deleting material, overwriting the files is taken into account. The research material is stored securely at the University's U-station via a secure VPN connection.

3 RESULTS

The main aim was to find out how the children's agency could be seen in the Virtual Reality and what kind of experiences the children had. Virtual Reality experience offered a new way to act, play and learn for the children, which they felt interesting, motivating, and fun. The quotations are marked with alphanumeric codes where B stands for Boy and G stands for the girl. The number after the letter indicates the age of the child. So B5 means a five-year-old boy and G4 a four-year-old girl. When there are two children of the same age and same gender child, the number after age indicates the serial number.

3.1 How did child´s agency look like while experiencing a Virtual Reality

The first research question was to observe children's agency and activities in the virtual world. Before starting to use devices, the researcher gave a small introduction to what children could do and experience in Virtual Reality. A small introduction for using the hand controllers was also given to the children. After this, one child at a time could begin a VR experiment. There was a variation between the first five minutes between the children's reactions, when they experienced the virtual world for the first time. There was no evidence that the first players would be those who were more careful or that boys or girls had or child ages make the variation. The children agency in this research has been classified in the table 4.

Table 3. Children´s agency in VR

Child	Code	Degree of Independence	Degree of Activity	Degree of Interaction
1	B5.1	5	5	2
2	G4.1	4	4	1
3	G4.2	5	5	1
4	G5.1	4	4	1
5	B5.2	3	3	2
6	B6	5	5	4
7	G5.2	2	3	2
8	B4	3	3	1

The degree of the children's independence while experiencing virtual reality varied in this research. The variation between the children started from 2, depended to 5; very independent. Five of the children took a more independent approach, while three experienced Virtual Reality a bit more dependent on the researcher. The sex or age of the child did not appear to have a significant effect on the independence the child experiences in this research.

Next examples illustrate children's degree of dependence.

Example 1. Child G5.2 starts the virtual reality experience by standing still and watching the virtual treehouse. The child looks at her hand one by one and rotates her head slowly. The researcher asks her to tell what she sees, and the child answers by saying a kitchen. The researcher asks does the child wants to make food, but the child does not respond. The child keeps rotating her head without making any steps or attempts to reach for objects. The research asks whether the child wants to taste apple and the child says yes. The researcher helps the child take two steps forward to reach for the apples and help the child raise her hand. The child tries to use a virtual hand, but the apple falls on the floor. The child laughs cautiously at this mistake.

Example 2. Child G4.2 starts immediately walking around in the virtual treehouse. The researcher asks the child to stop and look around at first. The girl stops for two seconds and starts to spin around. After a few rounds, the girl sees the treasure chest on the floor, and the child squats on the floor and uses her hands to try open the chest. Children have difficulties using hand controls and cannot open the chest. The child stands up quickly

and starts walking towards the kitchen. The researcher asks the child to slow down and lift the child to the middle of the play area. The researcher explains to the child how the teleport button works, but she is too eager to continue playing and says she wants to go to the kitchen. Children continue to walk fastly towards the kitchen.

These two different approaches show the child's dependency in the first three minutes of their VR experience. The child in example 1. was very dependent on the adult's help and support, while the child in example 2. was very independent and did not care much about the researcher's instructions or help.

One thing that might affect the child's level of autonomy is the earlier experiments in Virtual Reality. It was notable that only one child in the research group had tested the virtual glasses before the research. This child was **B6**, and according to him, "*I´m an excellent gamer*".

Many of the children carried a high level of autonomy during their play sessions. The researcher asked the children if they wanted to build a train, but in many cases, children were motivated to do things on their own. "*I want to make a mess,*" said **G4.2** and continued to drop virtual items on the floor. This messing-up activity was fun for seven out of eight children, and it also caused laughter among other children. One of the child **B5.1** asked the help from the researcher by asking "*can you lift me, I want to taste the ketchup*"

While playing, children learned to use hand controls better and better, leading to increased independence. Children started to feel that they could control the game without the researcher's help. For example, when the child **B5.1** had played for ten minutes and was struggling with opening the treasure chest, the researcher asked does the child needed help with the hand controllers child answered, "*No, I can do this on my own*". In the Virtual Treehouse, one shelf was so high that none of the children who took part in the experiment could reach for it, and besides the child **B5.1** also, three other children asked for help from the researcher.

Next feature regarding children's agency was the level of their activity, which was relatively high in this research. However, from the eight participants, six children started with a careful approach. These children took time only to

watch the virtual treehouse without moving or using their hands as following example shows.

Next examples illustrate children's degree of activity.

Example 3. G4.2 started the VR experience by spending two minutes only watching a ceiling fan rotating above her. When the researcher told the child that she could also take steps and walk in the virtual treehouse, the child immediately started walking around in the treehouse. The child teleported herself into the balcony and looked at the view for two seconds before noticing the watering can on the windowsill. The girl took the watering can, dropped it to the floor, and teleported herself back inside the treehouse. There she continued to walk toward the kitchen.

Example 4. B5.2 walked slowly in the virtual treehouse towards the kitchen. He tried to reach for the food in the food closet, and the researcher asked him to take two steps forward to reach for the food better. The child took one step and tried to get the food, and the researcher had to ask him to take one more step. After one more step, the child could reach for the food but struggled to grab the food, and the items were dropped to the floor. The researcher said that the child could also squad so he could take the food also from the floor, but the child kept standing.

These two different approaches show the child's degree of the activity in their VR experience. The child in example 3. was very active and used various physical movements to perform different tasks in the game. In contrast, the child in example 4. was cautious and did not want to complete all the activities which were required to do certain activities. The child's actions were also relatively slow.

Looking at virtual hands also seemed to be quite a strange feeling for many children. A quite few children started by rotating and looking at their hands but were careful about touching objects in the virtual world. After around five minutes of being in virtual reality, these passive children relaxed, forgot about nervousness and felt comfortable in virtual reality. All the children in the study experienced various numbers of different activities, although their attitudes, in

the beginning, were different. Besides moving and playing in a kitchen, children use their bodies. Children had to reach for the high objects, and they needed to crouch to pick things from the floor. A couple of children also tried to use their feet to stomp or kick the objects on the floor. Physical activity while playing in Virtual Reality was not heavy but varied.

Third feature regarding agency was interaction between children. The level of children's interaction was relatively low in this research. Only one child, the **B6** interaction, was on stage 4: rich interaction. Other children in this research experienced the virtual reality quietly, listening to the researchers' instructions and giving only one-word answers to the questions. Even though there was an opportunity to watch a live stream from the Virtual Reality glasses on a TV screen, it did not raise any conversations between the children. The only interaction to be observed came from **B6.** as seen in the following example**.**

Example 5. Child **B6** was talkative from the beginning and was willing to share his experiences with the researcher and the other children. For example, this boy looked at his virtual hands and asked, "*Who is this guy*?" *"Is this a robot or what?"* This boy also asked other children to join in the conversation by asking, "*Do you see me, do you see what I'm doing*?" When the child did not get any answers, he kept talking to himself while playing at the same time.

3.1.2 Different types of children's agency

Besides defining the child's agency using the scale, I was also interested in finding out what kind of activity types could be found from the VR experience. When looking into the research data, two different types of children's agencies were found. In this research, these types are named for **Autonomous researchers** and **careful reflectors.**

First type of children agency was consisting of high level of independency and activity. This Autonomous researcher's group were consist of five out of eight children**; G4.1, G5.1, B5.1**, **G4.2** and **B6**. These five children started relatively quickly investigating how things work in the virtual world. They began

to rotate, walk, touch, and grab on virtual objects. These three children seemed to be amazingly comfortable with the virtual world experience. This group's level of independence and activity also challenged the researcher's attention, as seen in the following example.

> **Example 6. G4.2**, walked the virtual world so fast that the boundaries of the play area came up many times, and the researcher had to lift her to the center of the play area so she wouldn't bump into the physical walls of the early childhood education center. The G4.2 played virtual reality for 15 minutes, and during that time, the researcher lifted her three times to the center of the play area.

These Autonomous researchers were carried a high level of autonomy during their play sessions. Children in this group performed a lot more of different activities during one game play session compared to the other group. Admittedly, the time spent on one activity was also significantly lower than the group that acted more cautiously and reflected their actions more. These children were also capable to do activities that consisted of several parts. The children **B5.1** and **B6** perform the activities, where they took the pot from the cupboard, removed the lid, opened the faucet, filled the pot with water, placed it on the stove, and put it on. These two children were satisfied with this success.

The second group founded from the research data were an opposite to this first group. In this group, the child's agency on virtual reality could be seen as an adult-depending cautious action, where the child explores virtual reality slowly and carefully and by making sure that the adult is close in case of need. Three out of eight participants can be considered to belong to this group **of Careful reflectors**; **G5.2, B4 and B5.2.** The children in this group acted independently but from time to time, ensuring that the researcher was close, as shown in the following example.

> **Example 7. B4** is in the kitchen and looks at the different foods in the food closet. He manages to get the donut in his virtual hands and look at it. The researcher says to the boy that he can taste it. The boy looks at the

donuts and turns his head towards the direction he heard the researcher´s voice. The researchers say again to the child that he can taste the donut. The child carefully brings the donut towards his mouth and opens it simultaneously as tasting the virtual donut. The child repeats this action a couple of times slowly.

The group of Careful reflectors also carried out some level of independence and activity but were much more cautiously and reflected their actions more than first group. These children in this group were also more dependent on the researcher's instructions and listened to the advice more carefully.

3.2 What kind of experience Virtual Reality is for children?

The second research question explored what children felt about the Virtual Reality experience. Of interest was how children think and act when playing and what they think about it after the play and the next day. On the first day, when children could try Virtual Reality, there was noticeable excitement, as the situation was new and exciting for the children. The researcher brought them new devices that gave children an unique experience. However, the familiar children in the group and the familiar space supplied safety for the children. Despite the initial tension described in the previous chapter, the children could relax quickly. The virtual glasses and hand controllers aroused a lot of interest, and the children excitedly tried what they felt and looked like before they were put on as following quotes describe.

 "I have never seen anything like this, and neither my mom nor dad," **B5.2.**
"I don't know what those are" **G4.2**
"Can I try first?" **B6**

Following table 5 describes the experiences of the children from virtual reality experiment from the first day and from the second day. The data for the first two questions; positive emotions and whether the child wanted to continue

playing were collected from the first day and the following two questions; whether the child wanted to try again on the next day and whether the child described the experience as positive was collected on the second day

Table 5. Identifying children´s experiences from the Virtual Reality session

Child	Code	Positive emotions	whether the child wanted to continue playing	whether the child wanted to try again on the next day	whether the child described the experience as positive
1	B5.1	yes	yes	yes	yes
2	G4.1	yes	yes	yes	yes
3	G4.2	yes	**no**	**no**	yes
4	G5.1	yes	yes	yes	yes
5	B5.2	yes	yes	yes	yes
6	B6	yes	yes	yes	yes
7	G5.2	yes	yes	yes	yes
8	B4	yes	yes	yes	yes

The filled table shows that the virtual reality experience was a positive experience for the children. As seen from the table, only one child did not want to continue playing or did not want to try the glasses again on the following day, even though the child had positive emotions and described the experience as positive. All the other children had positive emotions, wanted to continue playing, wanted to try again on the next day, and described the experience as positive. The positive emotions of the children could be seen as following example describe

Example 8. The first player in the first research group was **B5.1.** He was initially cautious about the virtual world. Following the researcher's instructions, he looked around and said aloud what he saw, an open door, a floor, a painting with a bunny picture. After looking, the researcher asked the child to direct his gaze toward the kitchen. The researcher asked if the child could open the cupboard door and taste the food in the cupboard? After careful experimentation, boy learned quickly, through a few mistakes, to use the hand controls. He took a variety of dishes and "tasted" them. This seemed to be especially fun. Boy smiled and laughed. A few dishes dropped to the floor accidentally while playing, but it seemed to move quickly for self-purpose. The boy laughed out loud as the

virtual items dropped to the floor. The laughter also caught on to the other children.

The children's positive emotions that the researcher paid attention to in this study were smiles and laughter. All eight participants had moments where they either laugh out loud or there were smile to be seen during their play session. Other emotion the researcher drew attention were the children's amazement, which could be seen from many participants. Although one of the children fell in the middle of the playing session, no negative emotions such as crying were noted in this study.

Seven out of eight children were willing to play more after the first try. This one child, **G4.2**, who did not want to continue playing had a minor accident when playing as presented in the following example

Example 9. Child **G4.2** was standing in the middle of the play area. She tried to reach out for the objects in the food closet but did not take steps closer. While reaching too far, she lost her balance and accidentally tumbled down. The researcher immediately took the glasses off and ask from the girl whether she had hurt herself, but the girl said no and wanted to continue the game. The girl seemed to be ok, and there were no signs of the injuries to be seen.

Even though child **G4.2** wanted to continue the first round of the game, the accident might affect how she did not want to play another round. When asking the children´s willingness to continue playing in the virtual reality from the other children after their first experience, all the other´s children were eager to continue playing.

On the second day for both research groups, children who were taken part in the study were gathered to the classroom. The aim was to discuss and interview the children to find out what they felt about the Virtual Reality experience. Children also could draw their memories on paper. The atmosphere in both research groups was positive. The children were much more talkative and shared their memories with each other as seen in the following example.

Example 10. *"You did nothing else but just mess,"* said **B6** to **G4.1**, and they both laughed. *"I wish that my mom could also have a possibility to try these,"* said **G5.2,** and **B5.1** said, *"I want to play again,"* to which all the children in the group agreed by saying *"mee too".* The children continued drew on paper things that they remembered from the game during the conversation. **G5.2** drew all the different foods found in the game and said, *"eating apples and donuts was the most fun."* One of the children, **G4.1,** drew a safety net on the paper. She had a problem staying inside the playing area while playing.

A conclusion can be drawn that playing in Virtual Reality is motivating, engaging, and fun for children aged four to six. The participants had positive emotions such as smiles and laughter during a play session. Seven out of eight children wanted to continue playing on the first research day, and the same children were eager to continue playing on the second day of the research. Every child who participated in this research described the positive virtual reality experience.

A Cheerful outlook toward Virtual Reality can be seen in a child's eagerness to play, laughter, smiles, and the excellent atmosphere that prevailed among the children who played. It should be noted that the interaction between the children was scarce during play, but the next day, when the research group reunited, the interaction between the children was rich.

4 DISCUSSION

There have been a lot of discussions that the rise of technology would lead to diminished children's play (Marsh et al. 2016). Technology affects our lives in many different ways, but it has also been pointed out that young children spending with different digital devices have not increased (Rideout 2013). However, the way children use technology and digital devices is constantly changing. Immersive virtual reality technology has demonstrated positive educational outcomes related to its use and is gaining traction in educational and training settings; Virtual reality is expected to have widespread adoption within education in the upcoming years (Araiza-Alba et al., 2021). What also has a significant impact on why virtual reality may become more and more popular is that it seems to be an exciting and fun activity for children

According to the present study, children under seven years old are pretty capable of playing and acting in a virtual world. Playing in Virtual Reality seems to support a child's agency by increasing the child's feeling of independence. Similar observation have also been presented in descriptions of digital play, for example Kaur (2021) wrote about that digital play develops the children sense of independence and autonomy. Increased independence also improves the opportunity to make children more engaged while children can better manage their actions and learning. This supports children for lifelong learning (Benson, 2011).

Still, while playing in Virtual Reality, children require a lot of adult guidance. Although safety limits are set in the virtual world, and games and programs remind the player of them, a young child may easily forget them and thus encounter physical obstacles. In addition, the role of the adult is essential to help a child in the physical world, and the adult's role is to act as a link between the real and the virtual world, and for example, ask, "Tell me what you see," or suggest "try to be able to lift that object." With adult guidance, children get more out of playing than without it.In the game used in this research, some objects in the play area were too high, so the child had to be lifted to reach them. This is not

necessarily bad and may even feed interaction when a player must ask for help outside of the virtual world. When utilizing the virtual reality in education setting, the teachers play role not only as instructor but also as a fellow-learner for children (Sharma, 2018).

As could be seen in this research, playing with virtual glasses is not, in general, an interactive activity. Although children were allowed to watch the same view as what the player saw on the television, it did not promote interaction. Also, the researcher's efforts to build interaction quickly ceased as the children did not participate in discussion. It seemed as if the tv was a passivating element that nailed the child to watch the action on the screen and made him forget that there were other children next to him. There are similar research findings on the passivating effect of television (Kirkorian et al., 2009; Khan et al., 2022). On the second day of the study, however, there seemed to be a need for joint discussion and dismantling. Together, the children had experienced something that only some could identify with. Laughter and good humor appeared on the second day of both research groups. Due to the lack of interaction in the gameplay session, we need to think more closely about the concept of child agency during virtual play. As Olli et al. (2021) underline that child's agency comes true in the interaction between individuals.

Playing in Virtual Reality seemed to be an active activity, in which the player moved and acted actively to make various game functions work. Children in this study, who controlled hand controls independently, could perform more autonomously. In Virtual Reality, children enjoyed performing activities that might not be possible in the real world. Throwing food, messing up, or cooking food on a stove was a motivating activity. Also, activities followed by some success, such as building a train track or firing a rocket and the resulting fireworks, were entertaining for children. Children appeared to be looking for activities that were either impossible in the real world or activities where their skills were measured and rewarded. Children's active role in virtual play might be necessary for the future because the increased use of technology has been linked to children's obesity in many research (Do et al., 2013). Also, research

shows that increased technology usage by children correlates with a reduction in physical exercise (Martin, 2011).

The child's positive experiences were clear. Every child who participated in this study described the experience as positive, and while observing the children, everyone showed some positive emotions such as smiles or laughter while experiencing the virtual play. Recent studies underline that inducing positive effects in children leads to observed improvements in the child's cognitive and socioemotional development (Stifter et al., 2020). Also, as the Curriculum for Early Childhood Education in Finland (EDUFI, 2018) points out, children's thinking and learning develop through diverse and meaningful experiences. There must be room for wonder, insight, and the joy of learning in early childhood education. (EDUFI 2018, 21).

In the end, one of the exciting things is when we have been discussing virtual reality, children's agency, and digital play. Can Virtual Reality offer a child an environment for a new way to play? There is no simple answer to this question. However, there are many conceptualizations of play, and they are pretty broad. For instance, one of the notions of play is that play is like any non-literal action done for enjoyment (Weisberg, 2015). Observing children's activities in the virtual world and focusing specifically on the activities that children described as messing up was based on the researcher's opinion, precisely, play. It had no purpose. It was an exploratory activity that was fun for children, and they did it voluntarily. According to results made for this research, children who observed the laws of Virtual Reality did it by using the same kind of methods as finding out how things work in reality- that was by playing. As many of our concerns regarding the technology in our children's lives are related to the amount of the screen time, we should focus more on understanding the digital play and include children's own views in this discussion (Cowan et al., 2021).

High-quality virtual content can enrich a children's world of experience. It can be used to orient children, deepen children's knowledge regarding some topics, motivate children, and entertain them. Maybe Virtual Reality is just one way to play, learn, and act, but for now and before this, a lot more research would

be needed to understand how Virtual Reality affects children. Utilizing virtual reality to educate young children would also be a valuable area for research.

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