

Discovering children's player typologies with playtests

Lauri Nykänen

University of Tampere
School of Information Sciences
Computer Science
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Supervisor: Zheyang Zhang
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University of Tampere

School of Information Sciences

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Research on player typologies has been focused on games mainly targeted for mature audience. Player typologies are needed for game design and marketing purposes. In order to discover children's player typologies, two playtest sessions were organized. In the playtests, children from 4 to 6 year olds playing a children's safety game were observed. The data gathered was analyzed and results compared to previous research. Five children's player typologies were discovered, with two of those concluded to be unique player typologies of the game. Gleeful players enjoy seeing the negative reaction resulting of incorrect play. Rulers add their own rules to the play. In conclusion, the thesis analyzes and discovers children's player typologies while uncovering playability and usability problems of the game.

Key words and terms: player typology, children, video games, playtest, playability, usability, play style.

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1. Introduction

Digital media is rapidly changing the way we live. Ongoing development of interactive media has changed the way we go by our everyday life, but also the ways we learn. Interactive media is becoming one of the most powerful tools for teaching. Reaching children of a very young age about safety issues was an ongoing issue for Tukes [2013], the Finnish Safety Organization. To solve this, Tukes wanted to find new ways from interactive media to teach children about safety issues. They proposed a student-led project for Demola, which is an innovation project platform based in Tampere [New Factory, 2016]. In Demola, companies and organizations sponsor projects, which explore new ideas and solutions for existing problems. Students with multidisciplinary backgrounds complete the projects in 3-month cycles. Result of a project is a concept, a prototype or a demo.

The project was initiated in spring 2014. The project continued after the spring project season in autumn 2014, with new members joining the team. The result of this autumn leg was a published game in Yle's Pikku Kakkonen platform¹. In the spring of 2015, the project continued with two members in the project, aiming to add three more games. The success of spring's project made yet another continuation in the summer with two more games. Finally, the game was released on August of 2015. It consists of multiple smaller games, eight in total. According to Tukes [2015] the game is played by about 2000 Finnish children every day.

In *Pikin Huone* the player guides an alien called Piki through everyday life on Earth. Piki faces challenges like choosing which objects eatable, how to cross the road and how to use an elevator safely. The game is playable on both mobile devices and desktop computers.

During the development of the game, one of the most crucial parts was playtesting the game with players of the target audience. The target group for this game is from 4 to 6 years old. This kind of target group was quite challenging. As an adult it is almost impossible to guess how children of this age play the game. Therefore, the development process was iterative and the game went through multiple changes before reaching satisfactory quality. In the numerous playtest sessions there were observation done of very different play styles to play these games. This was the catalyst for an idea for this research.

This research aims to identify different player types of *Pikin Huone*. These player types will be identified from the game's target audience, which is from children from 4 to 6 years of age. This is achieved by observing the players in playtest sessions. Flaws in the game will also be discovered during the playtest sessions.

¹ Pikku Kakkonen. Accessed on 13.6.2016. <http://www.yle.fi/pikkukakkonen>

One missing piece in previous research is whether player typologies can be found in very young children. Previous research has mostly focused on games that are meant for mature audiences. No previous research focusing on player typologies of this young of an audience could be found. Therefore, the largest research question in this research will be whether player typologies can be identified in children from 4 to 6 year olds. Identifying different player typologies is important for providing great game experience equally for all the different players. Usually games targeted for this young audience are very simple in nature and do not really take into account a possibility for different player typologies.

The children's safety game *Pikin Huone* will be tested on a focus group in a playtest session, with a possibility for extended number of test sessions. The reason of this playtest session is to observe the children as they play the game. The goal is to discover what kind of different styles of play are being displayed by the players and whether there are any playability problems still present in the game. In the playtest one to two children will be observed at a same time. Due to practical issues regarding the test location, a constant number of test subjects taken at a time cannot be set. The players will take turns to play the game. The children will be coming in pairs or larger groups, preferring with their friends, to ease the children's pressure of being in a test session. While focusing on pairs and larger groups, single players will still be allowed if the child is comfortable with the situation and no other option is possible. Having children play together with friends complicates the observation a bit. It is inevitable to do it in this way; otherwise, the subjects might feel the situation being too awkward to play the game in a relaxed way, which is crucial for results. The test situation inevitably affects how the children play the game, but no other options can be used within the scope of this research.

Analysis of the playtest sessions will be done after the tests. Data collected will be notes and remarks made during the test sessions. Another option considered was taking raw data such as recording player's exact inputs within the game during playtests. Unfortunately, this could not be done due to technical limitations. Therefore, the player typologies will be based on rough estimates, but this is in line with previous research done. The research method in this research is practical and qualitative research. Technical limitations of *Pikin Huone* and the scope of research does not allow for quantitative research. The expected outcome of the research is that the player typologies discussed in Salen's and Zimmerman's research can be identified from the children of this age [Salen and Zimmerman, 2003]. It is also possible that the results point out that the different player typologies do not match with the previous research done. This might open an option to propose a new player typologies focusing on children based on this research. In that case, the amount of data gathered might not be enough for

comprehensive argument for the case. This might prompt for a base for more extensive research.

This paper begins on introduction to game industry and to the concept of play in general. On Chapter 3, a brief look into related research of player typologies within game research and the benefits of discovering player typologies will be presented. Short introductions to game development, game design, playability, usability and playtests will be given on Chapter 4. Then on Chapter 5, an overview of the game used in the playtest for the research will be introduced. The implementation and design of playtest with the results of it will be presented in Chapter 6. On Chapter 7, the usability and playability problems with proposed fixes will be presented. Player typologies of Pikin Huone and their relation to previous research on player typologies are presented on Chapter 8. A summarization of the research will be presented on Chapter 9.

2. Games and play

2.1. Play

Play is a term of wide range of meanings, but in the context of this research, it is an activity that is done for enjoyment and recreation [Hughes, 2009]. Play is intrinsically motivated and self-directed activity [Goldstein, 2012]. Playing can vary from playing with a doll, to running in a race to playing a video game. Playing is not always done just for pleasure, but also to overcome challenges and to compete with others. Many play activities may result also in negative feelings, if the outcome is not in the interest of the player [Vygotsky, 1980].

Playing should not be seen as a total waste of time, even though it is an activity of recreation. Some leading scholars of children's cognitive development psychology argue that play itself is an important part in development of a child [Granic et al., 2014]. For example, Vygotsky [1980] saw many different benefits of imaginative play for the development of a child. A child solving a problem with the help of more capable peer is beneficial for their development, as they move on to next level of development [Vygotsky, 1980]. Playing games is more or less usually some kind of problem solving in a one way or another. Even though the play Vygotsky [1980] observed was traditional play, the benefits of playing will probably carry over to playing video games.

2.2. Video games

Video games are an interactive media, which are used for digital play. Interaction is the key element in video games, which differs it from other forms of media.

In May of 1962, a couple students presented a program on MIT's annual Science Open House. They had programmed the program throughout the semester and they called it *Spacewar!* [Graetz, 1981]. This small piece of program is nowadays held as one of the first video games ever made. Video games have evolved since then from simple one-colour blocks of pixels to multibillion-dollar epics. Video game industry is now a multibillion industry, which generates over 23 billion dollars in sales as of 2015 just alone in United States [Entertainment Software Association, 2016]. Video game industry is currently on a path of growth, with digital entertainment revenues growing year-to-year in United States in 2015 by approximately 20% [Activision Blizzard, 2016].

Playing video games in particular, like play in general is also not done just for fun. Serious gaming has been on a rise in the past years. Playing video games is not just a joyful activity, but can be even done as a profession. Electronic sports have been on a rise in the past years. This rise of past years can be seen as beginning already in 1998 South Korea, where *StarCraft: Brood War* became a popular spectator sport in a nation struggling with economic downturn [Rossignol, 2008].

Video games in general are nowadays an increasingly important part of the whole media spectrum. Playing video games is done for means of education, competitiveness and entertainment.

2.3. Children's play and games

Traditional children's games are plays that are without written formal rules. Rules of these games are passed on as a heritage from generation to generation. Children learn these games by visually seeing other children playing the game [Kaminski, 1995].

Children's video games are usually simple, positive games that do not tend to tackle into serious issues. In video games aimed for children, losing is not as severe as in more mature games. Often losing in the game has even been made impossible. The game experience of children's games is often catered to make them feel good, important and capable. Punishing a player for failing is thus counter-intuitive for these kinds of games. This is in contrary to video games targeted to adults, in which making the player feel good often is not the singular aim.

Gender segregation is a largely used segmentation basis when looking at children's play in more traditional settings. Children choose to participate in play activities more with peers from same gender rather than the opposite [Corsaro and Molinari, 2005]. In traditional outdoor games, children demonstrate playing styles heavily influenced by their gender. In general, boys tend to play games that are competitive and physical while girls are into games that require socializing and that are sedentary, non-vigorous [Meire, 2007]. The types of play activities also do vary based on gender. Boys are more likely to get involved into fantasy role-playing compared to girls [Blatchford et al., 2003]

Adults can positively affect children's play. In a study on children's block play, it was concluded that adult's scaffolding affected positively on complexity of block structures constructed by children [Gregory et al., 2003]. Adult's presence was not enough, but active scaffolding did make a difference. In context of this study, these results will be kept in mind when conducting the playtest sessions.

2.4. Play style

Play style is the approach player takes into playing the game. Interaction between the game and the player is always different from player to player. The differences on how these interactions are chosen to be played out can be seen as players' unique play style. Everything surrounding the play affects the play style. For example, players' motivation for playing, willingness to win, willingness to jump into the magic circle of play and the context of playing the game affect the play style. Culture has also large impact on how players play games [Bialas et al., 2014]. Combination of all variables that affect players'

actions in game results in certain play style. Player typologies are therefore generalisations of play styles.

3. Player typologies in games

3.1. Need for player type segmentation

The need for segmentation arises from business side of game industry. Segmentation is especially helpful for marketing purposes. Marketing literature divides market segmentation into following four categories:

1. Geographic segmentation.
2. Demographic segmentation.
3. Psychographic segmentation.
4. Behavioural segmentation [Hamari and Tuunanen, 2014].

In geographic segmentation, consumers are divided into groups based on their physical location. Cultural differences and language play a large role in this type of segmentation. In demographic segmentation, the consumers are divided based on descriptive attributes, such as gender, age, or marital status. Psychographic segmentation is done based on customer's sharing same values, attitudes and lifestyles. Behavioural segmentation is division based on consumer's relationship to the product, such as consumer's motivation behind using the product, the benefit a user seeks from using the product, etc. Behavioural segmentation also includes density of usage and consumer's brand loyalty [Boone and Kurtz, 2013].

In context of marketing, it is vital to understand the inner of a player in order to make games targeted towards a certain types of players. Understanding how players' play the game is the key to understand what they enjoy in the games. Creating an enjoyable experience is the overall goal in game development. Therefore, understanding the player typologies better will enable more sophisticatedly targeted game experiences.

Besides marketing and business side of game industry, player type segmentation is also helpful for game design. Especially free-to-play -games are seen to greatly profit of deeper understanding of player typologies, as understanding player behaviour is in-line with capital gains. The differences in behaviour are for example differences in willing to spend real money in the game, how often and how seriously a player plays the game and what kind of style of play does the player use. Knowing these differences are helpful in aiming the correct marketing to players.

In software development, understanding users is a vital part in designing the software throughout the lifecycle of it. Traditionally, user analysis in software development has been focused on personal traits such as sex, gender, computing expertise and education [Dillon and Watson, 1996]. In requirement engineering part of software development, understanding the needs and behaviour of the end-user allows for discovery of important user requirements in the requirements elicitation process and

is essential for satisfactory result [Sommerville and Kotonya, 1998]. Also, in user-centric design understanding user's motivations, needs and behaviour is the corner stone in designing the software as defines by the standard ISO 9241-210 [ISO, 2010]. The benefits of understanding the users vary from increased user experience to tailoring the software for specific group of users, for example for users with autism [Mejía-Figueroa et al., 2016]. Similarly, understanding different types of players allows for understanding player behaviour in other aspects of game besides play, for example player's behaviour in consuming services and goods in virtual economies [Drennan and Keeffe, 2007].

3.2. Jean Piaget's four stages of relationship between the player and the rules

One of the first researches done related to children's player typologies is not from the field of game research, but rather from the field of psychology. Different player typologies arise from how players react to other players and how they react to the rules of the game. Relationship between the players and the rules were researched already in 1930s by cognitive psychologist Jean Piaget. In his book *The Moral Judgment of the Child* Piaget explains how children's relation to the rules of Marbles changes with age [Piaget, 1932].

According to Piaget, children from ages 4 to 6 do not understand that Marbles have fixed rules in place. Children of this age fall to Piaget's first and second stages of development. On the first stage, children only play the game based on desires and motor habits without any rules in place. Children reach the second stage once they have been given an example of codified rules for Marbles. The third stage is reached at the age of 7-8. At this stage, every children tries to win and their interest in formal rules increase in general. In the last stage at the ages of 11-12, children play Marbles with fixed and unified rules.

In the context of this research, Piaget's research is interesting. Those children without prior experience with the game will be starting on Piaget's first stage, but as soon as they are presented with the rules of the game, they should be on the second stage. Every child playing the game will be of ages from four to six, which means that according to Piaget's theory they should not understand the fixed rules within the game world.

3.3. Bartle's Killers, Achievers, Socializers and Explorers

Player typologies have been discussed largely within the game research field. The largely used and one of the first researches for player typologies is Bartle's *Hearts, Clubs, Diamonds, Spades: Players Who Suit MUDs* [Bartle, 1996]. In this paper, Bartle identified four different player types from the players of Multi-User Dungeons or

MUDs. These four types identified by Bartle were Killers, Achievers, Socializers and Explorers.

Killers enjoy affecting other player's game experience. This is usually done by causing harm and distress, but it is also possible for these players to gain their enjoyment by helping others. According to Bartle, these players usually choose the harm-causing attitude, as the rewards of helping others are not often good enough. Achievers focus on gaining experience to level up in the game world and all other aspects of game are merely regarded as means to progress further in the game.

Socializers are mostly interested in other people and the social interactions happening in the game. The game world is looked as a setup for social interaction. Explorers enjoy discovery over anything else. Rather than taking the shortest route to beat the game, these players look behind the scenes and try to find how things in the game world work. These four main categories form the primary player types.

Bartle's four player types are based on player style varies on two-dimensional axis: Action versus interaction axis and world-orientated vs. player-oriented axis. Killers' interest lies in acting on other players. Achievers on the other hand act on the game world. Like Killers, Socializers are focused on other players, but they are into interacting with them, rather than acting on them. Explorers share the same interest as Achievers: game world, but like Socializers, they are into interaction. The interests of the player types are shown in Figure 1.

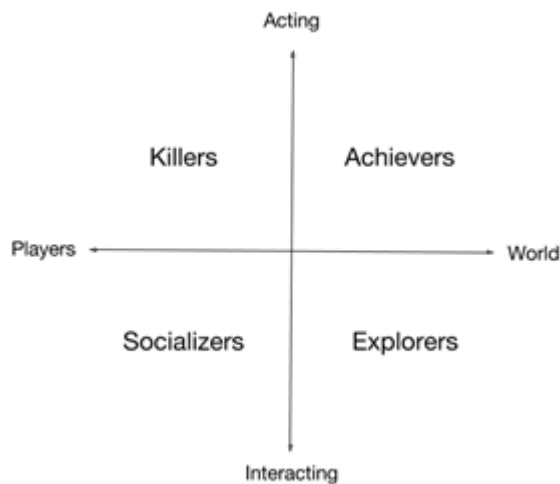


Figure 1. Bartle's four player types and their interests [Bartle, 1996].

Players do not always play as if their primary player type suggests, but rather varies between the four depending on player's mood. Bartle suggests that players most often play as their primary player type suggests and usually only stumble into play style of other types to achieve the goals set by the primary player type.

Bartle's division into four player typologies has been criticized for being overly simplified and too clear-cutting [Hamari and Tuunanen, 2014]. According to Hamari and Tuunanen [2014], most critique is centralized over that Bartle does not take into account that players' do not play as one single player type constantly, but rather change their play behaviour based on various variables. Bartle presents player typologies as humongous archetypes, while critics suggest that players in reality have multiple motivations for their actions. Rather than being labelled strictly into single category, their typologies should be seen as a combination of many archetypes, with varying scale of magnitude.

3.4. Mulligan and Patrovsky's Barbarians, Tribesmen and Citizens

Mulligan and Patrovsky break the player types into four categories in their book *Developing Online Games: An Insider's Guide* [Mulligan and Patrovsky, 2003]. These three player categories are barbarians, tribesmen, citizens and general players.

Barbarians are described as players, who do not care what other players think. They cheat and do not care to play within the magic circle of the game. They enjoy seeing other players suffering and in general bring havoc to the game. Tribesmen in the other hand are players who identify themselves strongly within a micro-community and focus on enjoying the game together within this group. Citizens are players who are the good guys of the online community. They help new players, play game in character and overall try their best to play the game as it should be played [Sotamaa, 2007]. They are the pillars of the game. Players who are left out of these other three categories are categorised as general players. They obey the rules and follow neutral play style.

3.5. Salen and Zimmerman's five types of players

In their book *Rules of Play: Game Design Fundamentals* Katie Salen and Eric Zimmerman categorise players into five different play styles: standard players, dedicated players, unsportsmanlike players, cheaters and spoil-sports [Salen and Zimmerman, 2003]. According to Salen and Zimmerman, the differences between the player types come from three variables: Player's relationship to lusory attitude in the game, their respect and relation to the formal and implicit rules of the game and their interest in reaching the objective of the game. Lusory attitude refers to players' willingness to jump into the magic circle of the game, adhere to rules and play the game as it should be played.

The differences between the five player typologies introduced by Salen and Zimmerman's are shown in the Table 1.

Player typology	Degree of lusory attitude	Relationship to rules	Interest in winning
Standard Player	Possess lusory attitude	Acknowledges authority of rules	Typical interest in winning
Dedicated Player	Extra-zealous lusory attitude	Special interest in mastering rules	Intense interest in winning
Unsportsmanlike Player	Sometimes resembles the Dedicated player, sometime resembles the Cheat	Adherence to operational rules, but violates implicit rules	Intense interest in winning
Cheat	Pretends to possess lusory attitude	Violates operational rules in secret	Intense interest in winning
Spoil-sport	No pretense about lack of lusory attitude	No interest in adhering to rules	No interest in winning

Table 1. The five player types' relationship to lusory attitude, rules, and interest in winning. [Salen and Zimmerman, 2003].

Standard players are those who follow the rules and play the game how it is meant to be played [Salen and Zimmerman, 2003]. They possess lusory attitude and follow the formal and implicit rules. Dedicated players are similar to standard players, except that they take the seriousness of how they play to the next level. Dedicated players try to practice different strategies to optimize their play. They take lusory attitude seriously. Salen and Zimmerman give an example of the difference between these two types: Standard player might play Blackjack a few times on their Las Vegas visit, while dedicated player will study the system of the game and spend hours and hours in the Blackjack table.

Unsportsmanlike players are players, who do anything within the rules of the game to achieve the victory, even if this means breaking the spirit of the game. They violate the implicit rules of the game, but do this within the allowance of the formal rules. For example, in the classic game of Tic-Tac-Toe these players might simply avoid losing by taking forever to make their turn, as the formal rules do not point out how much time the player has to make a move. Dedicated and unsportsmanlike players both abuse the flaws of game design to win the game. Unsportsmanlike players do not care if abusing flaws breaks the implicit, unwritten rules of the game and therefore they

do not let themselves fall completely into lusory attitude [Salen and Zimmerman, 2003].

Cheaters violate the formal rules of the game to win. For example, in Monopoly cheaters might take the other players' money while they are not looking. Cheaters play as if they possess a lusory attitude towards the game, but in fact, they do not have lusory attitude. They have a drive to win, even if it means breaking the rules. In contrast to this, spoil-sports do not have any interest in winning the game. They gain their enjoyment from ruining other players' fun. They have no interest in following the rules of the game and actively try to break the magic circle of the game world. They do not possess lusory attitude at all, nor do they pretend to have one [Salen and Zimmerman, 2003].

3.6. Five dimensions of player types

Hamari and Tuunanen did a meta-synthesis of player types on their paper Player types: A meta-synthesis [Hamari and Tuunanen, 2014]. They analyzed 12 previous publications of player typologies. In conclusion, five dimensions were noted to be present in most of earlier publications: Achievement, Exploration, Sociability, Domination, and Immersion.

This synthesis of player typologies is strikingly similar with the four player typologies proposed by Bartle already in 1996. The one true difference is the concept of immersion, which was not included in Bartle's work. Players who seek immersion are playing to escape from reality [Yee, 2006]. They value sense of discovery by finding rare items in dungeons, being part of the larger story by role-playing as their character and the option to customize their in-game characters.

3.7. Player typologies are merely archetypes

On many researches that propose some kind of player typologies one topic is repeated often: The proposed divisions between players are merely only generalisations. No player fits a type and the players change their player type based on mood, context or even on which game is played.

Mulligan and Patrovsky talk about this issue in this way.

“It's important to note that there is gray area between these types. The categories that follow are generalizations. Please don't expect all your players to neatly line up into the areas we've listed. It won't happen that neatly, we promise.”

Hamari and Tuunanen also discuss the issue on their paper:

“Typologies, such as Bartle’s, should be understood as an archetypal categorization, where the types represent a player type whose certain motivations and behaviors are stronger than in other player types.”

The player typology categorization should be seen as generalizations, not be taken as dichotomous label. Players do not fit into single category in actual real life situations, but rather their actions should be seen as a result of multiple archetype categories, which’ balance of magnitude of scale changes based on various reasons. Different styles of play are very much dependent on context and situation [Kallio et al., 2010]. Therefore, Kallio et al. even suggests that categorization of players based on behavioural play style is questionable and it trivializes the meanings attached to gaming as whole.

4. Game development

4.1. Game development process

There is no standard process for game development. This is because game industry is still relatively young industry, products are different across the border and openness for innovation is high in the industry. However, even though there is no standard process, there are standard stages of development [Fullerton et al., 2004]. These milestones are used for communication on development process between the publisher and the developer. The development phases are as follows: Concept phase, Pre-production phase, Production phase, Quality Assurance (QA) Phase and Maintenance.

In concept phase, the budget and plan for development will be done and presented to the publisher. If the publisher agrees to the presented project plan development process moves on to pre-production phase and a contract is done. At this point, the idea for the game is still unsettled and it might still go through major changes. A working prototype or a playable level is made in pre-production phase. In minimum, working prototype include core elements of game's gameplay in it. The prototype has to be playable, as it will be evaluated by playtesting. Graphics used in the prototype are only temporal. In this phase, only a small-sized team is working on the prototype of a game. The size of the team will be kept small to reduce costs. The aim is to test feasibility of the idea, if the features are differentiating enough and the technical endures included are plausible to overcome. The prototype will work as proof of concept for the publisher. If succeed, a full-sized team will start working on the game and the development enters production phase.

The goal of the production phase is to get to the point where all planned features are complete and no more features will be added to the game until release of the game. This is usually the most long and costly phase in development. As production, moves forward, making changes to game design become more costly. Making major changes to the broader game design is not possible anymore in a cost-effective way after entering the production phase. In the QA Phase, the game will be polished for the release. Emphasis is put on the quality of the game, most of bugs hindering game are fixed, and user experience is tweaked. When all severe bugs have been fixed, a game is ready for launch. After launch, the process enters final phase, maintenance. In this phase, game is patched for bugs hindering experience. Low-level bugs are not usually fixed at this point, only those bugs that are severing affecting negatively to the user experience.

4.2. Game design

Game design is in the central part of game development. It is part of the game development process throughout the process from concept to finalized product. Game

designers take charge of the creative vision of the game. Schell defines game design in a one powerful sentence as follows [Schell, 2014]:

“Game design is the act of designing what a game should be.”

It is all the decisions that is needed to answer the question of what is the game and what does it consist of. For example game designer has to make decisions on which are the rules, how does the gameplay work and what the player should feel when he or she plays the game. Game designer’s role in a game development company is to make these decisions. Game designing is therefore the active act of designing what the game will be in the end.

4.3. Playability and usability

One goal of this thesis is to find playability and usability problems in Pikin Huone. Therefore, definition for these terms is needed. The line between playability and usability in games is a blurred line, with a few overlapping elements. Playability is in itself a vague term that has not yet been given a standard definition in the research community. Many researchers have proposed their own definition for the word. One of the recent definitions comes from Korhonen et al., [2009], below:

“Playability is related to intuitiveness, unobtrusiveness, fun, and challenge. In addition, it is a combination of user interface and the gameplay, i.e. game content aspects of the game.”

Intuitiveness is important in many aspects of game. Controlling the game should feel natural and come intuitively. User interface should be unobtrusive; not get in the way of play, but rather support it. Gameplay has to be easy to understand and therefore easy to get into. Difficulty should be set to where playing is challenging, yet not too difficult or too easy. Overall, a game has to be a balanced experience for good playability. Gameplay elements of the game create the fun and challenge in playability [Korhonen et al., 2009].

Järvinen et al. [2002] provide a more complex definition. They divide playability into four categories: functional, structural, audiovisual and social playability. Functional playability is the gap between the player and the game: controls. It does not only include the physical mean of interacting but also intuitiveness of the controls and what kind of feedback the game gives for player’s action. Structural playability consists of gameplay patterns and overall flow of the game dictated by the rules of the game. Audiovisual playability includes sounds, music and level of photorealism in the game.

Social playability is the support for communities in- and off-game and overall sociability surrounding the game.

Playability is combination of many elements that make game enjoyable and it cannot be easily and unambiguously explained. The most important aspect of playability in this thesis will be whether the gameplay of the game is understandable or not. The target group of the game is not familiar with game mechanic standards; therefore, intuition plays a large role how the gameplay is understood. Understanding the gameplay easily and fast is crucial for enjoyable play experience.

For game usability analysis, a popular method is heuristic evaluation. Nielsen and Molich [1990] originally developed the method for user interface problem mapping, but it can also be used for video game usability evaluation.

For heuristic evaluation, a list of heuristic to be evaluated is needed. Pinelle et al. [2008] suggests ten usability heuristics for video games. These ten heuristics are as follows:

1. Provide consistent responses to the user's actions.
2. Allow users to customize video and audio settings, difficulty and game speed.
3. Provide predictable and reasonable behaviour for computer controlled units.
4. Provide unobstructed views that are appropriate for the user's current actions.
5. Allow users to skip non-playable and frequently repeated content.
6. Provide intuitive and customizable input mappings.
7. Provide controls that are easy to manage, and that have an appropriate level of sensitivity and responsiveness.
8. Provide users with information on game status.
9. Provide instructions, training and help.
10. Provide visual representations that are easy to interpret and that minimize the need for micromanagement [Pinelle et al., 2008].

To limit the scope of the thesis, expert heuristic evaluation will not be done. However, the ten heuristics for video games will be kept in mind in playtest analysis to help spot the usability problems from the data gathered during the playtest sessions.

4.4. Playtesting

Playtesting is a fundamental part of game development and game design process, which is an essential process in finding game design problems and keeping the vision of game on track during the long development process [Fullerton et al., 2004]. Playtesting is an iterative process, which moves from playtesting to evaluation and finally revising the game accordingly. Playtests are initiated as soon as a playable prototype is available and the testing can be continued long after the game is released. After shipping the

testing switches from direct observation to watching the stats, reading the forums and listening to direct feedback from the players. Playable prototype of a game is needed for playtesting. Instead of playtesting, heuristic evaluation methods could be used for game analysis before playable prototype of the game is available [Pinelle, Wong, Stach 2008].

Traditional playtest methodologies include direct observation of the testers, verbal reports and questions & answers -session. In direct observation, players are observed as they play the game. The actions of the players are observed [Ambinder, 2009]. It is important to observe how players' react to situation in game. Negative side to this is that players' behaviour might change as they are being observed. A natural situation is tried to achieve, but being observed is never the same as playing on your own.

In verbal reporting testers talk aloud as they play [Ambinder, 2009]. They describe what they do in the game, why they do it and how they do it. This is helpful especially in understanding why certain players take certain actions in the game; it is a way for designers to get inside the mind of the player. Downside to this is that talking aloud interferences with players' play and might affect how they play the game. Questions & Answers are used to get feedback on very specific design questions. Q&A's include group phases and individual interviews. Problem with Q&A's is that people usually do not know why they do certain things in the game and interview situation include social pressure in group situations.

In this thesis, playtesting is done mostly in direct observation method. Players are guided to play each of the games, but after they start to play, they are observed passively, only interfering with the play if needed. For example, this might be a situation in which the player does not understand how to continue in the game or does not understand some concept at all. Players are also asked questions to confirm whether interpreting of the tester matches with the players' true intentions. For example, in the Eating game players might feed an alien with harmful items if they do not understand which items they are.

Out of the reach of this thesis are the technical approaches for playtesting. These include stats collecting, design experiments, surveys and physiological measurements [Ambinder, 2009]. Surveys did not fit into the research as in playing action speak louder than words and the children of this age group were not seen as reliable to answer questionnaire in an unbiased way. However, questions were part of playtest in an informal vocal way, not in a form of questionnaires. Children were asked questions for clarification for their actions when such information was seen needed.

Stat collecting was considered to be used in this research, but such technical approach requires large amount of resources to implement, therefore it was not chosen to be used. Stat collecting can include for example statistics of where players have died on the map, how long players play the game and how long they does it take for them to

progress in the game. Such data can reveal game design problems and help the designers to understand what kind of design works for future development. In multiplayer games, such data can give important information for on-going development and changes can be for not just future development, but also for existing content. Data collecting can be used for tweaking the difficulty of game, which is a crucial part in holding players' interest in a game [Cowling et al., 2015].

5. Children's safety game

5.1. Development of Pikin Huone

The initial idea for children's safety game was by Tukes [2013] and the initial project started in spring of 2015. In fall of 2015, the project continued with new members joining the team. Two original members remained to work in the project and 3 new members joined the team. The new team consisted of a programmer, a game designer, a safety expert and two graphical designers. All members took part in the game design decisions. My own role was to be the lead programmer of the project, as well as being the project manager. My task was to keep the project on track while achieving a result, which would please all stakeholders of the project.

The fall project started by analysing what kind of safety issues are there related to children. Then after pinning down the issues, the focus changed to come up how these issues could be educated through interactive game and which problems are plausible to make a game out of. The first idea that came to life was the Eating game, which focuses on educating which items are not good to put into mouth. The three more ideas that made it to the first version of Pikin Huone were cycling safety, reflector usage and choosing the correct sized life jackets. The initial first version of Pikin Huone was release on February 2015.

The project continued in the spring of 2015 with more partners joining in, but with shrinking team size with only two members of the team left to develop the game. The rest of the games were developed with only programmer and graphic designer but both of which used more of their time to the project. The new partners that joined the project were Finnish Fire Protection Fund, Finnish Association of Electrical Safety and Finnish Road Safety Council. New games covered safety issues about traffic, electronic and fire safety each made for each of the new partner. These games were successfully developed during spring of 2015. Two more games were developed during the summer of 2015. These games were focused on playground and lift safety. The development of all new games continued throughout the summer, until all new games were released in one completely new version of Pikin Huone in August 2015.

The game was developed on Phaser [Photon Storm, 2016], which is a game framework for creating HTML5 games. Phaser framework was chosen as it is open source software and it provides simplistic arcade physics matching the complexity needed for the planned game of Pikin Huone. Using HTML5 was a constraint demanded by the target platform, Pikku Kakkonen. The platform is a collection of games targeted towards Finnish children.

5.2. Overview of Pikin Huone

Pikin Huone is a children's safety game, which is playable on Pikku Kakkonen. It is originally made for Finnish children in mind, but later, an international version of the game was also made. The game consists of eight smaller games, each of which aims to educate about a specific safety issue, as seen on Figure 2. The following are the character and scenes found in Pikin Huone.

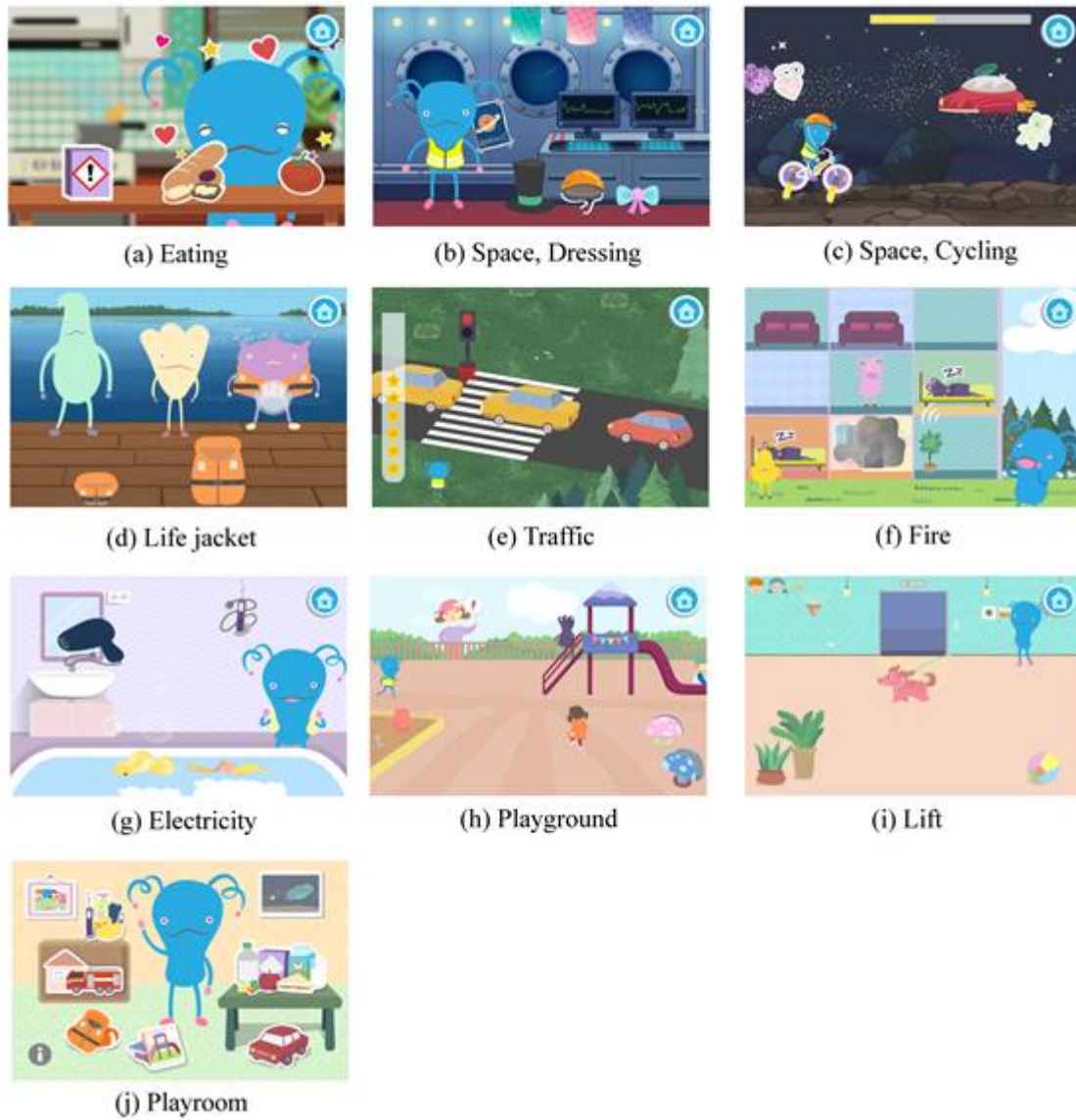


Figure 2. Screenshots of safety games in Pikin Huone.

5.2.1. Piki

Piki is the main character of Pikin Huone. The idea behind this character was to have a character who is clueless about everything on planet Earth. This puts the player in the position, in which they are the wise ones, not the ones to who are clueless and need to be guided. They feel like they are the ones in control. This is balance of powers

between the player and the main character is emphasized in the opening dialogue said by the voice narrator in the game:

“Hello, nice to see you here! This is Piki, an alien who needs your help. Piki has just moved here to Planet Earth and does not yet know how to live safely here. Help Piki and his friends by guiding them safely through their activities. Play safely!”

The game begins at the Playroom, which is the main screen of Pikin Huone. In this scene, the player can choose which game they want to play by choosing the game from a game referencing object as seen on Figure 2. Pikin Huone was designed to be a nonlinear game, therefore this scene works as a platform to open any other game the player might want to play. The Playroom works as a bridge between different games, as every game ends with the game state returning to the Playroom.

5.2.2. Eating

Eating game was the first game developed for Pikin Huone. The goal of the Eating game is to feed Piki with objects that can be eaten and to avoid those objects that should not be eaten. Voice narration explain the goal in this way: *“Piki is hungry, but he does not know what he can safely eat on this planet. Help Piki choose what he can eat. Stay away from things that cannot be eaten”*. Feeding Piki with the correct food will make Piki eat them and corresponding sounds will be played. Piki will also make movements after finishing eating to signify happiness resulting of player’s actions.

Feeding Piki with enough food makes him full, and the game is thus won. In contrast to this, feeding Piki with the inedible objects makes him first feel a bit of sick. Feeding him a second time in a row with inedible object will make him feel sicker and if the player continues this for the third time, he will puke. After this, every inedible object will result in Piki puking, until the continuum is broken with feeding Piki with edible food. Puking and feeling sick is the only penalty given for the player for playing the game in the wrong way. The wrong play is not penalized in hidden scores that count towards winning the game.

In this game, the player is given two clear choices. Feed Piki either with the wrong objects or with the correct food. Therefore, it is important for the objects themselves to be recognizable, so no wrong play can accidentally happen. The objects in the game range from spaghetti to poison. There is also one special object in the game. The special object is a worm, which will result in Piki feeling sick, even though eating worms is not actually dangerous for health.

5.2.3. Space

Space game is divided into two parts. In the first part Piki dresses up for cycling. Goal of this part is to dress Piki accordingly to cycling. Educational goal of this is to show what items should be worn when cycling. Voice narrator explains the game in the following way: *“Piki is going on a space bicycle ride. Choose safe equipment for cycling and put them on Piki”*. Noteworthy about this is that the narrator only explains the first part of the game. There is no explicit goal said what to do when Piki is cycling. In the dressing part three objects fall at a time, and the correct item must be dragged on top of Piki. Only one of the three objects is the correct one. The choice is made for example between cycling helmet, crown and a bow. This loop happens three times, until Piki is fully suitably dressed of cycling.

Trying to dress the incorrect item to Piki results in Piki showing unwillingness towards that item. Dressing correct item results in Piki agreeing to it by voice and the next three objects falling down. The game will continue to cycling part after Piki is dressed with safety vest, cycling helmet and a reflector.

Completing the dressing part starts the cycling part of the Space game. The goal of cycling part is to collect reflectors, even though the goal is not explicitly said. Player must themselves figure out how to win the game by noticing the correlation between collecting reflectors and the filling progress bar on the top. The game starts as player presses anywhere on screen. Piki will start to cycle continuously forward. Player controls Piki by pressing anywhere on screen. This will make cycle’s thrusts activate and the cycle to move upwards.

There are also asteroids and space cars flying towards Piki. Hitting these will result in a negative reaction, but hitting them is not penalized in any other way. Upon impact, Piki will shout in pain. In addition to this, the transparency of Piki will fluctuate for a few seconds, similar to Super Mario in the classic platform game *Super Mario Bros 3*. Piki is also able to jump upon asteroids and cars, and push them downwards. Jumping on them is not rewarded in any way, though. Collecting a reflector will make the reflector disappear, a score sound is given and the yellow progress bar will fill a bit. The game is won upon filling up the progress bar completely. Educational goal of the cycling part is to promote reflector usage in society.

5.2.4. Life jacket

Life jacket is the simplest game in Piki Huone. In this game there three different sized aliens alongside three different sized life jacket vests. Voice narration of the game is *“Piki is going on a boat ride with his friends. Help each of them choose the right life jacket”*. The player’s goal is to dress aliens to accordingly sized vests. This is done by dragging the life jackets on top of the aliens. Once the life jacket is on the alien, it must be then tightened up. After this is completed, the alien will move out of the screen.

Once all three aliens are dressed up, the game is won and the three aliens are seen sailing away, safely dressed with the life jackets.

5.2.5. Traffic

In Traffic game, the goal is to cross the road in a safe way. Voice narration gives the context for the game “*Piki is on his way to the playground. Help Piki cross the road safely*”. This means crossing the road at a zebra crossing and waiting for green light on traffic light. Player controls Piki by pressing anywhere on screen. Piki will move according to angle between the touch and Piki. Randomly positioned trees alongside Piki will create a path for player to move forward.

Piki will eventually come across a road, which he must cross. If he tries to cross the road on other places than at the zebra crossing, a police officer will appear at screen, mumbling with a negative tone. Piki is pushed backwards. The same effect happens if player tries to cross the road while the red light is on the traffic light or if player moves to the road while crossing the zebra crossing.

The game is won after enough roads are crossed. On left side of screen, a star drops down every time a road is crossed. This forms a progress bar, which indicates progress in the game. Educational goal of this game is to educate that roads should be crossed at zebra crossing and if there is a traffic light, wait for the green light.

5.2.6. Fire

In Fire game, the goal is to warn aliens of danger or as the voice narration puts it “*Something has caught fire. Help Piki warn others of the danger*”. An animated intro is shown before game is started. This shows Piki noticing the fire and making a call to general emergency number 112. Then an instruction screen is shown to indicate how the game should be played. In the game Piki is seen on the lower right corner of the screen and transparent view of apartment house is on the left side of the view. Other aliens are still inside the house, even though there is a fire outbreak. Few of them are sleeping, some are scared and hiding behind couches, some are just standing, frozen with fear. Piki’s goal is to warn those aliens of danger by shouting at them.

Aliens' positions, rooms, interiors and walls are generated randomly for every playtime. This way a player always has to approach the game with fresh eyes and cannot rely on memorizing the locations of the aliens.

Shouting can be done in two different ways. Firstly, player can do a swipe gesture from Piki towards the aliens he wants to warn of danger. This option is educated by instruction screen shown before the game starts. Second option for player is that he or she can just press on the rooms, and Piki will shout towards that room. During development, multiple options and varieties of gestures were tested. Players show different approaches especially for this game. Children’s view differs on how they think

the game will work. Therefore, multiple approaches were taken into consideration when designing the game. It is important to cater for different control approaches for satisfactory game experience.

Once a shout hits a room an alien is in, the alien will teleport out of the building to safety. The game is won once every single one of the aliens is outside in safety. Fire fighters arrive in the end. The most important educational goal of this game is that whenever there is fire, you have to get out of the building, do not hide. Secondary educational goal is that if you see fire, you should call for help from the general emergency number 112.

5.2.7. Electricity

Narration for the Electricity game says “*Piki is going to take a bath. Keep unwanted items away from the bathtub*”. The main educational aim of this game is to teach that electricity and water are a dangerous combination. Therefore, the scenery of this game is set to bathroom. A bath is full of water and Piki observes as different objects start to fall from ceiling towards the bath. Player's goal is to let only those objects to bath that are safe to use with water. This is done by touching on or near the objects as they fall. Objects will fly away from the bath once touched. There are two kinds of objects falling. Those that work with electricity: electric razors, lamps and electric toothbrushes. Then there are typical objects used in bath: ducks, shampoo and brushes.

A non-electric object will cause bubbles to form in the bath and Piki to react with positive reactions. Letting these objects fall into bath will increase the happiness of Piki. In the other hand, letting electric objects will make Piki scared and sad. On top of this, a electric shock sound is given and the screen gets dark for a few seconds. Letting these objects fall in a row will make Piki increasingly sad and screen even darker and darker. After second time in a row of electric objects Piki's face is seen pop up on the screen, shaking his head with a sadness on his face. There are no other penalties for letting electric objects fall into the bath. The game is won once enough non-electric objects have fallen to bath.

5.2.8. Playground

In the Playground game there are children walking towards a slide. Player's' objective is to let only one child to the slide at a time. Voice narration explains the situation as follows: “*Piki's friends are playing in the playground. Do not let more than one person at a time on the slide*”. The flood of children can be controlled by interacting with children by tapping at them, which makes them walk backwards. If a child tries to enter the slide while it is already occupied, he or she will fly backwards and a woman will appear behind bushes and convey. This is the only punishment given for failing in this game. The game is won after sufficient number of children has slid the slide down.

The educational goal of this game was to underline the fact that only one user should be sliding down in slide at a time.

5.2.9. Lift

In the Lift game Piki is visiting his friends on an apartment building with his dog. Voice narration explains the context as follows “*Piki is on his way to meet his friends. Help Piki and his dog get to the elevator safely*”. Once Piki walks near the lift, the dog will start running away. The player must shorten the leash by clicking with mouse or tapping with fingers at the screen. Once leash is shortened, Piki can enter the lift. Inside the lift, the player will have to click on a floor to move Piki as far away from the door as possible. The lift will go one floor upwards and Piki will go to visit his friend on this floor. This loop continues until Piki has met three of his friends.

The dog running away is a pulling contest between the dog and the player. Player must tap fast enough to overcome the force of the dog’s pull. If the dog wins the contest, he will get away and Piki is pulled with him, flying behind the dog in a comical way. Eventually the dog will stop running away and Piki can once again approach the lift with him and try again.

On the first floor will try to run away, but on this floor in particular he cannot pull Piki with him. If the dog is about to win in the first floor a finger will be shown tapping on screen as an instruction. This design choice was done as it was noted in playtest sessions that the player’s took some time to understand the game mechanic. With too harsh of a punishment they would have always lost in the first floor, as the game was not easy to pick up on.

The educational goal of the game is to keep dog leash short when using the lift. In addition to this once inside a lift you should not be close to the door.

6. Playtest and data analysis

6.1. Background

The hypothesis of this research is that children's player typologies can be found. The chosen research method was qualitative and practical research. The approach to playtest was chosen to be a traditional one, in which the subjects are observed as they play and questions are only asked whenever clarification on motivations behind observed play is needed. The main goal of the playtest was to record as much of observed play as possible in order to make generalisations on play styles observed. Later these generalisations can be concluded into children's player typologies. In addition to player typologies, also playability and usability problems were a focus of this research. Therefore, problems with controls, understanding of instructions and interactions with user interface were recorded.

6.2. Playtest design

Throughout the development of Pikin Huone, different approaches to playtesting were tried. Children played alone, together, three at a time or even eight at a time. Even with eight children simultaneously taking part in the playtest, only one child was always playing at a time. The problem with too many children at a room was that they were carried away, and there was too much waiting for the children until it was their turn to play.

Only having one at a time had other problems. It was time consuming and some children felt uncomfortable alone in a room with a few strangers. Being alone in a playtest was successful on children who exhibited extrovert behaviour. For more introvert types this was simply not working, as they were too scared to play in a natural way. Introverts were having also troubles to play when the group size were larger. They clearly felt pressure as being watched. This could have been overcome with having a playtest being done in passively observing way. However, this option was not feasible considering the limitations of kindergarten as the place for the tests.

The sweet spot for playtesting was found to be group sizes of two to three. In addition, it was determined that some of the children could be taken to playtest alone, if they felt comfortable with the idea. They were not pressured to take participate alone if they did not agree to it.

It was also noted to be important that the group of children participating at a same time were comfortable with each other. Friends playing together were carried away with playing the game, and clearly did not feel like they were being observed in a playtest scenario. The kindergarten nurse thus did preselection of which pair combination took part in the playtest. Even with this being the case, some pairs did feel a bit uncomfortable playing the game under observation.

For this research, the playtest was done for groups of two children and with single players. The focus was on two players in the playtest at a time, but because of the circumstances in kindergarten, some children could not play with a pair with them in the playtest. This was only allowed if the child felt comfortable with the situation.

Children will not be forced to participate in the playtest if they are uninterested in participating. Reason for this is that the gap between play and work is a narrow one. Children may not regard playing a game as a playful activity, but rather as work, if they are forced into it [Hughes, 2009]. Therefore, voluntary participation in playtest is vital for research.

For additional anonymity for the children, the names of the children are not revealed in the research paper. The test sessions are played on iPad Air 2, thus playing with only touch screen display is tested, even though the game could be played on a computer with controlling via mouse.

The playtests data gathered were all done by purely making notes on a notebook. The best option would have been to take video recording of the playtests, but the allowance parents had signed did not include allowance to such extent. Thus asking for video recording allowance was seen as taking too many resources and doing so would have limited the amount of subjects taking part in the playtest.

The type of data was notes on observed play. Noteworthy behaviour was written down within the boundaries of reason. The most important behaviour was how they approached the game; what was the overall play style. This also include how they did control the game, how much effort did they put into it and the social interaction between the subjects were also noted.

The most challenging resource to come by for this study was the actual test subjects. They had to be children within the target age group of 4 to 6 and had to have parent's allowance. Children were not forced to participate in the playtest if they displayed to be uninterested in participating. Quantity over quality was therefore the chosen style for the recording of the playtest. In total, 16 children took part in the playtest. 12 of those took part as pairs and 4 were playing all alone in the test.

It is important to keep in mind as reading this research paper that the playtest situation itself affects the behaviour of children and therefore it is not advised to jump into conclusion and put a player into one slot of player typology. Player typologies should be merely seen as categorizations [Hamari and Tuunanen, 2014].

Every play shown in the playtest has to be seen as result of multiple variables affecting the play of child, not as an unambiguous truth of child's personal character. It is merely the notable play style demonstrated in the playtest session and it is not a singular truth of how the participant plays games in general.

6.3. Implementation

Playtests were done in December 2015 at the kindergarten Itätuulen Päiväkoti. Throughout the development of Pikin Huone, the playtests were done in this kindergarten. Therefore, connections were already established and parent's allowance had already been asked for such playtest sessions. Such allowance allowed for anonymous playtesting only, recording video and voice was not thus possible. The tests were not filmed as getting permissions for filming would limit the number of subjects and be too much of a hurdle within the scope of the project. Testing was done with children whose parents have given permission for such playtests with the kindergarten.

The aim was to have children play in pairs, as this allowed for interaction between the players, even though they were effectively told to play alone, taking turns. Pikin Huone is single player game, but having the children play side-by-side allowed for a bit of interaction between them. This allowed for more detailed look into players' possible player typology. Many children took advantage of the situation and tried to influence others' children play, especially if their play styles for the game did not match, causing a conflict.

The children were guided to play every single game at least once. They were allowed to choose which game they wanted to play freely. Some children needed direct guidance with this, though. Behaviour in this regard varied a lot from child to child. Children were allowed to play games multiple times, if they wanted to do so. The playtest was thus seemingly free and relaxed in nature. Apart from guiding which game to play, children's play was not interfered in any other way. As concluded in a study on a children's block play [Gregory et al., 2003], interfering with play might result in play that is more complex. No matter how unimaginatively children chose to play the games, there were no encouragements done in hopes of gathering data that might have resulted in more interesting results.

6.4. Playtest data

The data gathered during playtests were written notes. Therefore, not everything that children did while playing the game could be recorded, but all noteworthy play and behaviour noticed were written down. Writing the notes affected observation, as the nature of play did not allow for interruption. Therefore, it is possible, that some key elements of play were not noted. However, the data gathered allows for generalization of player typologies, even if minor nuances of play might have been missed in observation.

Name	Age	Gender	Has previous experience with the game
India	4	Female	No
Mike	4	Male	No
Oscar	5	Male	Yes
Kilo	5	Male	Yes
Lima	5	Male	No
Alfa	5	Male	No
Sierra	5	Female	Yes
Juliatt	4	Female	Yes
November	6	Female	Yes
Papa	5	Male	No
Charlie	6	Male	Yes
Romeo	6	Male	Yes
Zulu	5	Male	Yes
Tango	5	Male	No
Echo	5	Male	Yes
Delta	5	Male	Yes

Table 2. Subjects, their age, gender and previous experience with Pikin Huone.

After the playtest sessions, the data gathered was looked through and analysis of the data begun. First, all the data of demonstrated styles of play of every subject was viewed as a whole to resolve what are the general play styles that are present in Pikin Huone. Then, every player was analyzed as an individual; what are his or hers play styles, experience and how other participant affected his or hers play. Considering all this available data, it was settled what his or her unique play style are for each of Pikin Huone games.

In the analysis phase every subject was assigned an alternative name for privacy protection, no real names are therefore used in this research. At the start of the playtest the subjects were asked their age, gender and if they had played any of the Pikin Huone games before. There were 4 girls and 12 boys, as seen on Table 2. Ten of the playtest participants did have previous experience of Pikin Huone. This was foreseeable, as the same kindergarten was previously used for the playtest sessions throughout the development of Pikin Huone. Three of the participants were 4 year olds, 10 were 5 year olds and three were 6 year olds.

In Table 3 there is every player's noted play style listed by every single game of Pikin Huone. The following are the explanations of different play styles noted. These are the archetypes of different play styles that can be seen in children whom play Pikin

Huone. The archetypes play styles are the result of extensive analysis done on data gathered from play tests.

	Eating	Playground	Electric	Traffic	Space	Lift	Fire	Life jacket	Play styles
India	S	R	S, H-	I	S	S	S	S	S, R
Mike	S	S, (R)	G	I	I	S	S	S	S, G
Oscar	S	S	S, G	S, G	S	S, G, /G	S	S	S, G
Kilo	S	S, H	S	S	S	S, (G)	S	S	S, H
Lima	S, /G, H	S, H	S, G+, H	S, (G)	S, H	S, /G	S	S	S, G, H
Alfa	S	S, G-	S	S, /G	S	S, (G)	S	S	S, G
Sierra	I	S	S, R+	S, H	S	S, H	S	S	S, R, H
Juliett	I	R	S, R+	S	S	S	S	S	S, R
November	S	S	S	S	(I)	S	S	S	S
Papa	S, E-	S	I-, S	S, I	I	S	S	S	S
Charlie	G	S	G, R	S	S	G, /G	S, H	S	S, G, R, H
Romeo	G	S, H	G-, S	S	S	S	S	S	S, G, H
Zulu	S	S	S	S	S	S	S	S	S
Tango	S, G, I-	S, G	S	S, G	S	S	S	S	S, G
Echo	S	S	S+	S+	S+	S	S	S	S
Delta	G	G, R	G, R	G	G	E	R	E	G, R, E

Table 3. Subjects and their style of play for every game. Abbreviations: E: Explorer. G: Gleeful. H: Helpful. I: Incorrect play. R: Ruler. S : Standard. +: Especially strongly shown play style. -: Slightly shown play style. /: Player actively tries to influence other player to play with the play style. (): Player playing with play style, influenced by other player.

At first, player typologies from previous research were tried to fit into those play behaviours observed in play tests. All four player types of Bartle [1996] were not expected to be identified in this research. This research was done in a simple single player game while Bartle's four player typologies were identified in a complex Multi-User Dungeon game. Therefore, interaction with other players was limited. In the playtest, some players participated together with their friend, which allowed for at least a bit of interaction between the players. With the limited possible interaction to other players, Bartle's Killers and Socializers do not fit for this research, except in a broader

sense. Simplistic nature of the game ruled out differentiating Achievers from Standard players. Games in *Pikin Huone* do allow players explore hidden features and reactions; therefore, this player typology of Bartle was adapted for this research.

For this research the Mulligan and Patrovsky's defined four player typologies do not really fit. They are based all too much on player-to-player interaction and thus cannot be used in a case of single-player game. The only player type that could be seen in the setting of this research could be the Citizen type. When experienced player meet with an experienced player, the experienced player has opportunity to help. In the playtest with multiple children at the same time, one player has always before the other one. This allows his or her to help the other player, if the current player is having troubles with the game.

Salen and Zimmerman's player typologies are somewhat fitting for this research, as these player types do not only rely on players' interaction with each other, but are more focused on players' relations to the rules of the game. The only player type that focuses on interaction with other players of these five is the Spoil-sport player. The setting of the research does not prohibit interaction between the players, even though they play individually, so Spoil-sports have a chance to affect other players' game experience. However, this kind of play was not observed.

Cheating in *Pikin Huone* is not feasible; therefore, Unsportsmanlike and the Cheat player typology cannot be discovered in this research. Simplistic nature of game and the setting of playtest does not allow for differentiating between the Standard and Dedicated type. Standard player typology was therefore adapted for this research, which in this research will also include the Dedicated players.

The existing player typologies were not precise enough to explain all behaviour and play styles noted. Therefore, a mix of unique player typologies and those based on previous research were done based on generalisations of play styles noted in play tests. The following is a brief explanation of said archetypes with more in detail explanation available in Chapter 8.

Standard players play the game as in a way the game designer intended the game to be played. They try to win the game by following the formal rules of the game [Salen and Zimmerman, 2003].

Gleeful players' gain enjoyment by purposely harming the main character Piki. They feed the inedible objects in the Eating game to see Piki puke. They let the electric objects fall to the bath, and laugh as Piki moans in pain.

Rulers want to alter the game by adding their own rules. For example, in the Playground game they suddenly decide that one of the characters cannot go to the slide, or only one character gets to go there. In the Electric game this behaviour was shown by deciding that only one type of items are given the permission to go to the bath. These

players understand that they have limitless power to play the game as they want. They see formal rules are seen as a guide, not to be taken literally.

Helpful players give help to their playtest partner. They guide the other player if they have any troubles and do not just passively watch the other player fail. Players were guided to play alone, but these players could not help but intervene with others players play when they saw them in trouble.

Incorrect play is playing the game in a wrong way. This behaviour is seen if rules are not understood. Unlike Gleeful players, they do not gain visible enjoyment for such behaviour. For example, they walk Piki towards the road without trying to cross it at the zebra crossing. In the Eating game, these players might feed Piki all the wrong foods, without any apparent reason.

6.5. Data analysis

On this section the play and behaviour of every subject that participated in playtest session is analyzed. Especially abnormal play, in which the play is not in line with the object of the game, is carefully explained. For example, feeding Piki with uneatable objects in the Eating game is deemed as play that is not in line with the objective of the game. Standard play is also noted in play style analysis, but further explanation of this is not usually necessary, except if the players shows exceptional skill, or in the other hand poor skill in handling the game.

The following data breakdown focuses on play styles of the players. Playability and usability problems were also noted in analysis, which is presented in Chapter 8.

6.5.1. India & Mike

	Eating	Playground	Electric	Traffic	Space	Lift	Fire	Life jacket	Play styles
India	S	R, /R	S, H-	I	S	S	S	S	S, R
Mike	S	S, (R), /R	G	I	I	S	S	S	S, G

Table 4. Play styles of subjects India & Mike.

Subjects India, a 4-year-old girl and Mike, a 4-year-old boy were the first pair to take part in the research. Both of them had not play Piki Huone before, which is optimal for the playtest. The first game they choose to play was the Traffic game. In this game, they both showed incorrect play. India played first and held her finger at the screen for the whole duration of game, not even raising it up when getting the police officer warning. Mike followed the same wrong play style, probably thinking this was the correct way to play.

Mike continued with the Playground game, in which he had a few problems at first, but realized the rules eventually. India encouraged Mike at one point to let no one slide, which Mike agreed with. India continued this Ruler behaviour on her own turn. She decided that only one type of children was allowed to access the slide. At this point Mike encouraged India let nobody slide, which she declined. She clearly wanted to decide on the rules of the game by herself.

In the Electric game, Mike played first. At first, he had troubles in understanding the game and let every single object fall to the bath. India helped him by telling what the correct thing to do in the game was. However, after correcting his play for a moment he went back to letting everything fall to the bath. Mike clearly gained some enjoyment from letting the electric objects fall to the water. India on the other played the game correctly, she even pointed out by saying aloud which objects ‘*belong*’ to water and which do not. However, later India wanted to play this game again. This time she let every single object fall to water without touching anything. This was deemed as borderline gleeful behaviour, but as there was no any enjoyment to be seen from her, this was taken to be experimental play of standard play, rather than gleeful play. On rest of the games both showed standard play style.

6.5.2. Oscar & Kilo

	Eating	Playground	Electric	Traffic	Space	Lift	Fire	Life jacket	Play styles
Oscar	S	S	S, G	S, G	S	S, G, /G	S	S	S, G
Kilo	S	S, H	S	S	S	S, (G)	S	S	S, H

Table 5. Play styles of subjects Oscar and Kilo.

Subjects Oscar and Kilo both are 5-year-olds boys and both had previous experience with Piki Huone. Oscar displayed gleeful behaviour in the Electric, Traffic and Lift games. In the Electricity game, Oscar started by playing correctly, but then slowly started to play the game in an incorrect way, enjoying hurting Piki. Kilo then convinced him to play according to rules. In the Lift game Oscar failed on purpose and tried to get Kilo to do the same, to which Kilo agreed. In the Traffic game, Oscar also played purposely in an incorrect way, by walking towards the red lights. In other games both of the players showed standard play style.

6.5.3. Lima & Alfa

	Eating	Playground	Electric	Traffic	Space	Lift	Fire	Life jacket	Play styles
Lima	S, /G, H	S, H	S, G+, H	S, (G)	S, H	S, /G	S	S	S, G, H
Alfa	S	S, G-	S	S, /G	S	S, (G)	S	S	S, G

Table 6. Play styles of subjects Lima and Alfa.

Lima and Alfa are both playing Piki Huone for the first time and they are 5 year olds boys. In the Eating game Lima tried to get Ara to feed Piki with the hurtful foods. Later, he helped Alfa by pointing out which of the food is edible. On many later games, Lima also got interactive with Alfa and helped Alfa to play correctly. However, Lima did not only enjoy helping Alfa, but also seemingly enjoyed see Alfa fail in the Electric game. This was the only case in the playtest session in which the other player seemingly laughed at other player’s misery. Lima showed that he cared about Alfa winning his play, even if he helped him. However, he panicked in the Playground game in which Alfa failed on purpose. It seemed to be important for him that the formal rules were followed and Alfa implicitly not following them caused him to panic.

They both showed gleeful play on several of the games, and tried to encourage each other to play in an incorrect, gleeful way. The difference between the two was that Lima did care much more about following the implicit rules of the game. Lima wanted Alfa to follow them and cared about succeeding better in the games than Alfa.

6.5.4. Sierra & Juliatt

	Eating	Playground	Electric	Traffic	Space	Lift	Fire	Life jacket	Play styles
Sierra	I	S	S, R+	S, H	S	S, H	S	S	S, R, H
Juliatt	I	R	S, R+	S	S	S	S	S	S, R

Table 7. Play styles of Sierra and Juliatt.

Sierra and Juliatt are girls, 5 and 4 years old respectively. Both had played Piki Huone before. They started with the Eating game, in which both fed Piki with every single object that came along the conveyor belt. In the end of the playtest, they came back to the game and demonstrated same kind of play again. This behaviour was seen to be caused by not understanding the object of the game, rather than being motivated by gaining enjoyment from seeing Piki get hurt. They continued on to the Playground game, in which Juliatt showed Ruler behaviour by wanting to decide who gets to go to the slide and who does not.

In the Electric game, they both showed Ruler characteristics, in which they both decided to let only certain objects fall to the bath, not being in line with the objects of the game. In this game, Sierra might have been encouraged to this style of play by seeing Juliatt play in this manner in the Playground game. For example at one point Sierra didn’t let any more soaps in, saying “*I have enough soap already*” and Juliatt also mimicked the behaviour saying “*I do not want this item anymore*”.

Sierra helped Juliatt in the Traffic and the Lift games, as Juliatt had problems with understanding how these games’ mechanics work. However, in the Lift game

Sierra gave wrong advice to Julieta. They thought it is necessary to touch the lift, when in reality no such mechanic exists in game. Overall, they both had some problems with understanding how some of the Piki Huone games work with Sierra trying her best to help Julieta to play. Ruler play style was obviously shown in the Electric game.

6.5.5. November & Papa

	Eating	Playground	Electric	Traffic	Space	Lift	Fire	Life jacket	Play styles
November	S	S	S	S	(I)	S	S	S	S
Papa	S, E-	S	I-, S	S, I	I	S	S	S	S

Table 8. Play styles of November and Papa.

November is a 6-year-old girl and Papa is a 5-year-old boy. November had previous experience with the game and Papa was playing for the first time. They both played all the games in a standard play style. In the Eating game, Papa did show a bit of Exploration play style by trying what happens when feeding the wrong food. This however was obviously just done to see what happens, out of curiosity. In the Space game, Papa did not avoid the cars and asteroids coming at him. When was confronted as for the reason for this he explained: “*It doesn’t hurt as I have the safety equipment on*”. In the Traffic game, he also played incorrectly for some time, but in the end tried to play correctly, even though he seemingly enjoyed the police officer reaction coming from failing. Overall, these two played as really normally, showing only standard play style.

6.5.6. Charlie & Romeo

	Eating	Playground	Electric	Traffic	Space	Lift	Fire	Life jacket	Play styles
Charlie	G	S	G, R	S	S	G, /G	S, H	S	S, G, R, H
Romeo	G	S, H	G-, S	S	S	S	S	S	S, G, H

Table 9. Play styles of Charlie and Romeo.

Subjects Charlie and Romeo were one of the more complex subjects in the playtest. Both are 6-year-old boys with previous experience with the game. They started the test with the Eating game. In this game, Charlie played first, feeding Piki with only the objects he should not be eating. Charlie audible wanted “*to make Piki puke*”. Romeo tried to get Charlie to feed the eatable food to Piki, but he would not budge. Romeo himself fed every single object to Piki. Surprisingly when continuing to Traffic game, both players played with standard play style. In the Playground game, they also played

in the standard play style, with Romeo helping Charlie a bit. In the Fire game, Charlie helped Romeo, instead the other way around.

In the Electricity game, the gleeful play continued with Charlie deciding to let only those objects to bath which hurt Piki. Romeo got a bit frustrated with Charlie at this point, and convinced Charlie to play in the correct way. Charlie did not continue to play in standard play style, though. He decided to let only soaps to the bath. Romeo let every object fall to bath at first, but then continued to play in a standard way.

In the Lift game, Charlie continued with the gleeful play style, letting Piki to be drag by the dog on every single floor where this was possible to do. On Romeo's turn, Charlie tried to convince him to do the same play, but Romeo did not agree to this.

Out of these two subjects Charlie demonstrated very typical Gleeful play style, where he did not care much for the object of the game but rather wanted to play the game the opposite way in many cases. Romeo showed same kind of behaviour, but not to the same kind of extent. Romeo clearly did also enjoy playing in the wrong way, but also at the same time, he did show interest in achieving the object of the game.

6.5.7. Zulu

	Eating	Playground	Electric	Traffic	Space	Lift	Fire	Life jacket	Play styles
Zulu	S	S	S	S	S	S	S	S	S

Table 10. Play styles of Zulu.

Zulu was the first player in the playtest session participating as a single player. He is a 5-year-old boy and he had played Piki Huone before. Zulu played in a very standard way, always aiming to achieve the objective of the game. He played in skilled manner, obviously having spent quite some time with the game before participating in this playtest session. In the Electric and the Playground games he even wanted to demonstrate what happens if you fail in these games. The only time he failed in these games in one way or another was when he just wanted to demonstrate what the reaction of the game for failing is.

6.5.8. Tango

	Eating	Playground	Electric	Traffic	Space	Lift	Fire	Life jacket	Play styles
Tango	S, G, I-	S, G	S	S, G	S	S	S	S	S, G

Table 11. Play styles of Tango.

Subject Tango is a 5-year-old boy who had not played Piki Huone before participating in the playtest. First, he began by playing in a standard way on the Eating game. Later he played this again and fed Piki with all the incorrect, inedible objects. When asked why he did so he could not explain his actions.

In the Traffic game, he did this same combination of action in reverse order: First, he played by going against red lights, but later came back to this game and played in correct way. In the Playground game, it seemed as if he did not care for the little punishment given for failing in this game. He did not show any care for letting the characters walk towards the slide, even though it was already occupied. He did not only fail in this game, but also played correctly at times. On all the other games, Tango did play in a standard way.

6.5.9. Echo

	Eating	Playground	Electric	Traffic	Space	Lift	Fire	Life jacket	Play styles
Echo	S	S	S+	S+	S+	S	S	S	S

Table 12. Play styles of Echo.

Echo is a 5-year-old boy who had previous experience with Piki Huone before participating in the playtest. Echo played all the games in a standard way, but in unusually highly skilled manner. He played in skill level not seen in any other subjects on this playtest session.

For example, in the Space game's dressing part he already grabbed the items as they were falling down from the ceiling. In this game, he also tried the incorrect ones before proceeding to the correct ones. In the cycling part, he jumped on top of the asteroids, unlike any other player on the playtest. He also wanted to share his knowledge; on the Traffic, Lift, Life jacket and Space games he wanted to show what happens if you play incorrectly. He made little to no mistakes in any of the games, except for the Traffic game, in which he failed a couple of times. This was probably due to the poor control scheme in the game. In the Fire game, he was one of the few who controlled the game in the way the game was originally designed to be controlled.

6.5.10. Delta

	Eating	Playground	Electric	Traffic	Space	Lift	Fire	Life jacket	Play styles
Delta	G	G, R	G, R	G	G	E	R	E	G, R, E

Table 13. Play styles of Delta.

Delta was the most interesting test subject to take part to the playtest session. He is a 5-year-old boy and he has played the game before. He was the only player to play not in the standard play style at all. In the Electric game, first he let every object fall to the bath. After doing this for a while, he did not let any object fall to the water. After this, he continued to let only the electric objects fall to the bath. In the end, he played this game in three different ways, but none of the three was the so-called correct way to play.

In the Playground game he had a bit problems with the mechanic at first, he tried to swipe children away, but only direct touch works on this game. At times when playing this game he did not let anyone to slide. Later decided let only the main character Piki to the slide. While Piki was on the slide, he let other characters hit the slide, which makes them to bounce backwards. This behaviour clearly indicates that he understood the game mechanics exceptionally.

In the Eating game, he only fed Piki with the inedible objects at first, later proceeding to feed him with the eatable food. He played this game again later and fed Piki with every single object that came along the conveyor belt. In the Life jacket game, he clearly tried to put the wrong sized vests on aliens on purpose. This was probably done to explore the punishment given for playing this game in an incorrect way. Again, in the Space game's dressing part he continued this same pattern of play. He tried to dress Piki with every single incorrect object until selecting the correct one. In the Fire game, he pressed on all the empty rooms, until continuing to press on the rooms with the aliens in it.

In the Lift game, he had problems with understanding how the game mechanics work, despite demonstrating knowledge and understanding in previous games. Inside the lift, he tried to drag Piki forward. There is a blinking circle, which player has to press to continue in this scene. He was also confused what the progression bar means. He asked why Piki does not go forward, while he pressed on the icons on the top-left corner, that present progress.

Later he wondered why Piki is thinking of only one of his friends, and tried to change the one he is thinking by touching on the progression bar icons. In this game, there is a thought bubble over Piki, which appears if the player touches on Piki while he is walking. The bubble always has the next friend Piki is going to visit next.

In the end of the playtest Delta went back to play the Traffic game. He went against the red lights all the time and left Piki in the middle of the road. He explained this action by saying that he wants the cars to run over Piki. He failed in doing so as the game logic does not allow for this kind of result to happen.

7. Playability and usability problems

7.1. Benefits of discovering the problems

After looking into play styles demonstrated by each of the subjects, it is necessary to differentiate the actions resulting from playability and usability problems from play coming from inner inclination of the player.

Playability is closely related to play and player typologies, as good playability enables enjoyable gaming experience [Korhonen et al., 2009], and therefore encourages player to play the game in an imaginative way. On the contrary, poor playability hinders the experience and therefore discourages player from playing the game in a complex manner. The actions that are caused by problems in usability and playability must be therefore discovered.

Understanding the playability and usability problems is an important factor on understanding how and why players take certain actions. Discovering usability and playability problems therefore allows for better identification of the play that has actual value in the context of discovering player typologies. For example, in Eating player might feed every object that comes along the conveyor belt. This could be wrongly identified to be Gleeful play style, if the players' motivations and problems in playability and usability are ignored.

7.2. Problems found

The ten heuristics presented in Chapter 5 [Pinelle et al., 2008] were used a guideline for discovering the usability problems in the game. There were 27 problems found in total. Out of all the found problems that could be related to these heuristics all were within six of the ten heuristic categories. Therefore, most of the problems in the game are related to problems with giving the player understandable instructions, manageable controls and consistent response to user's actions.

In addition to usability problems, there were also quite a few playability problems discovered. The problems found during the playtest sessions were the following, broken down by game.

7.2.1. Eating

Some players, including subjects Sierra and Juliett, fed Piki with every single object that came along the conveyor belt. This may suggest that there is fundamental problem in game design of the game: the player is not given enough options. This might lead some players to choose the wrong option as it is the only option presented at a screen. Players who do this kind of play might lack self-discipline to wait for the correct objects.

The Eating game is a simple game; there was not any usability problems noted that affected negatively to the play. However, lack of progress bar is in violation of the usability heuristics [Pinelle et al., 2008].

In the Eating game, many players chose to feed Piki with the harmful objects, which might be because the reaction of that behaviour is funny rather than too negative. In original release of the game Piki did not puke at all. The puking was added later as to discourage players from playing the game in incorrect manner. However, as this playtest shows the negative reactions are not enough for the players who prefer the incorrect, gleeful play. The correct play is rewarded by showing Piki to be happier for feeding him with eatable food, but this reward is not obviously enough.

7.2.2. Space - Dressing

In one occurrence, safety equipment dropped through the floor. This made the game situation to enter an unwinnable situation, which forced the player to restart the game. The loading icon between the dressing and cycling part of the game confused many players. It is a green check mark, which some players seemingly supposed to be touchable. They touched it to continue, even though any place of the screen can be touched to continue. A few players accidentally pressed the home screen button on the dressing part, probably because the items always appear on top-right corner of the screen and therefore most of the action happens on that side of the screen.

7.2.3. Space - Cycling

There is no any indication on how to control Piki in this game. This confuses some players to a certain degree. Some players naturally touch directly on top of the main character. This does work, but the player could also press anywhere on the screen for the same effect, with less obstructive placement of their hand.

Some players tried to swipe Piki to move him. It is not clear for some players what the progression bar on top of the screen is for.

Falling down might not be fast enough. A player tried to avoid obstacle by falling down, but the fall was not fast enough, even though he started this action in relatively early compared to the approaching space car.

Some players just held their finger on the screen all the time, which made the character thrust upwards all the time. It is not uncommon for players to not avoid cars and asteroids in this game, therefore penalty for hitting those might not be noticeable enough.

7.2.4. Traffic

Some players do not lift their finger at all in this game. They keep it down, and go against the red lights, until it switches to green. Playing like this removes all the interaction that should be happening in the game, effectively making playing the game

not really playing at all. There are obviously some problems in instructions as players decide to play in this way. The problems with the instruction are probably caused by having the instruction being just a finger that appears on screen. The finger disappears if player moves Piki forward. Players at this age are eager to play and not really follow instructions or think what message they are trying to tell the player. They probably therefore ignore the finger or just misunderstand what is the message of the instruction.

Players' had problems with understanding how to move the character horizontally. The amount of movement caused by touching might be too severe for some players to handle. The movement is calculated by the angle between the touch and Piki, a logic that might be a bit hard for some players to understand.

On top of this, some players control the game by inserting their finger too far away from Piki, in a way that limits the visibility. The controls in general are working poorly in this game, as almost all the players had some sort of problems with it, some even tried to drag Piki forward. The problematic controls caused many players crossing the zebra crossing accidentally to walk a bit too far to the left of the road and therefore triggering the police officer warning for walking on the road.

7.2.5. Fire

On this game, the most confusing part was the instruction scene, as seen on Figure 3. Many players did stare at the instruction scene and did not understand what they should do. There is no indication what the player should press to continue. The player could press anywhere, but lack of clear button for the action leads players to do nothing.

A wide range of different ways to control the game was shown in this game in particular. For example, subject Romeo played the game by dragging their finger all the way from Piki to aliens. Some players did not understand what the instructions said or they did not care to look at it, as they started the game by trying to press directly on Piki.

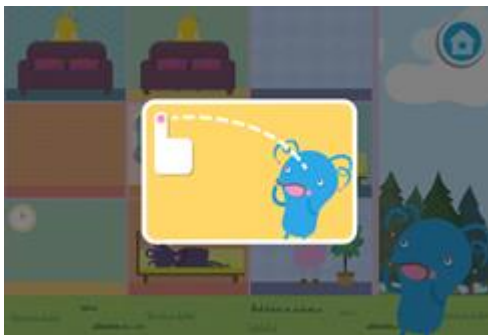


Figure 3. The instruction image of the Fire game that caused confusion among subjects.

Most of players who played by directly clicking on aliens, pressed on top of aliens multiple times, even though once is enough. Only one of the subjects played in a

slow, calm way, in which he waited for every single shout to finish before beginning a new one.

7.2.6. Electric

There were only a few playability and usability problems noted for the Electric game. Screen turning black after electric object hitting the water caused a bit of harm. In one case, the player could not see clearly and therefore could not deny the electric objects from falling to the bath in one case. This might lead to loop of fails, which is hard to stop if every single failure is punished by turning the screen black.

A few times in this playtest session, items were visibly falling beside the bath, but they still hit the trigger, which counts the hits. Some players had troubles with bouncing the items away, as they tried to swipe them. In original concept version, the game was controlled by swiping, but it was later changed to work with direct touches. This works in most cases, but sometimes players do a little swipe gesture, which sometimes do not seem to register.

7.2.7. Playground

This game had similar problem to the Electric game, in which some players tried to swipe, but the swipes did not register. The game is looking for direct touches near the characters, therefore swiping gestures are not sometimes registering.

There is a possibility for a dog to walk behind the slide. Many players tried to touch the dog and expected some kind of interaction to happen. However, the dog cannot be interacted with, leaving those who tried disappointed.

The punishment for failing in this game is a woman that appears behind bushes and the character that tried to enter the occupied slide is pushed backwards. Some players did not care for this punishment, and just let the character bounce backwards. Therefore, the punishment for failing is not effective enough.

7.2.8. Lift

The lift buttons seem touchable, which in fact they are not. Many players had problems inside the lift; they did not understand you have to touch the blinking circle. They probably misunderstood that they had to move the character to that location, not that they had to click the circle in order to move there.

Some players never touched Piki while he was walking, which would have triggered a thought bubble. This is not a major problem, as it is not affecting gameplay directly. Still, this can be seen as a problem as it is a feature that some players never discover.

In the *in front of the lift* -part of the game one subject tried to hold his finger down, rather than tapping it shorter. The player could touch anywhere on the screen to

shorten the leash, but many players thought that they had to touch on either Piki, dog or the door.

In the same part of the game some players thought that you have to tap on the lift in order to move Piki there. In addition to this swiping Piki forward was a common misunderstanding for how the game mechanic works. In this game Piki moves forward automatically continuously until reaching a game state which requires player interaction. This might be confusing as other games in Pikin Huone such as Traffic and Space are games in which the main character's movement is controlled directly by the player. Consistency within the game is thus broken.

7.2.9. Life jacket

The Life jacket game is the simplest of game in Pikin Huone, but there is still one problem that was noted in the playtest session. In this game, the player must first dress the life jacket to aliens and then tighten them. Some players do not understand that they are supposed to tighten the life jackets afterwards.

A blinking circle appears if the life jacket is not tightened. For some players this is not strong enough clue to make them touch it. The confusion of not tightening the life jackets is probably caused by the lack of instructions given for the player. The voice narrative only instructs the player to dress the aliens with correct sized vests, not to tighten them afterwards.

Besides the problem with the tightening, one player had troubles with dragging the life jacket all the way to alien.

7.3. Proposed changes

In this chapter, possible changes are presented to the game that would fix the playability and usability problems that were found in the playtest sessions.

7.3.1. Eating

The Eating game is one of the best working games of Pikin Huone. It lets the player decide on how they play the game by also allowing the incorrect play. Playing in the incorrect way will not earn the player victory, but doing so is not punished too harshly either.

One problem that was noted was that some players fed every single object to Piki. They did not let any objects travel away from the game area. This behaviour might be caused by simple lack of choices. If there is only handful of objects shown at a time, not touching any of them might be challenging for some players, who lack enough self-discipline. This lack of self-control might be the cause for the player to choose the incorrect objects, as the time waiting for the correct objects feels too long.

In a famous Stanford marshmallow experiment, it was concluded that thought of nonconsummatory features of marshmallows leads to larger delay of gratification

[Mischel and Baker, 1975]. Using the same principles used in the Eating game players coping with lack of self-control could delay the need for gratification by seeing some kind of visual reminders of the reward for waiting for the correct, eatable objects. Therefore, one option to fix the problem could be adding a graphical reminder about the eatable objects. This problem could also be overcome by adding another tray line for example, but that might make the game too confusing by having too many objects shown to the player at once.

7.3.2. Space - Dressing

The dressing part of the Space game is also one of the best working games of Piki Huone, with only a few problems noted in playtest. Identifying objects is crucial for this game, as the players should understand which is which to choose the best fit for cycling. Although recognizing the objects was overall plausible, this could be always improved on by making the objects' silhouettes more corresponding to the physical characteristics of the object.

There is no instruction for the game, and this caused one subject to take some time before understanding how the game works. An instructional finger could pop up to encourage the player to act, if the player does not understand what to do at the beginning.

The cheek mark between the dressing part and cycling part has to be removed and a button for continue should be added, so players have something to touch. If there is not any button for continue, most do not understand that you can press anywhere to continue. Having a button for continue is a standard in video games, and therefore adding it is in line with usability heuristics by Nielsen and Molich [1990].

7.3.3. Space - Cycling

There is a confusion of where to press on screen for thrusting the cycle upwards. The player can press anywhere, but some choose to press directly Piki, which is advisable option as doing so limits the game view, as hand is partly covering the screen. This leads to breaking of usability heuristic of providing player with unobstructed views [Pinelle et al., 2008]. This confusion could be neglected by adding a button for controlling thrust.

Many subjects used the thrust almost all the time. They tend to stay at upper side of the game area, which results in an uneventful game experience. They could be forced to come down by making a limit on how much the thrust can be used at once. This might make the game too complex for the target demographic, though.

7.3.4. Life jacket

There should be vocal instruction for the tightening part. Currently, the narration does not say anything about tightening the vests. Other than this, there were not any other problems found that could be fixed.

7.3.5. Fire

The most problematic part is the instruction overlay at the beginning of the game. Many players just stare at it and do not understand what message it is trying to tell. Voice narration saying aloud how the game mechanic works would probably make enlighten to the instruction picture.

A button to continue is needed for the instruction overlay, as some players did not understand that the player could press anywhere to continue. The lack of button made many players end up being stuck in this screen.

7.3.6. Traffic

The in-game instruction finger that pops up is not effective enough. Some players just touch on the screen immediately and do not wait for the finger to appear. This could be fixed by adding an overlay instruction scene, which requires interaction to continue, just like the one in the Fire game.

The controls of the Traffic game are problematic. The game could be changed to be controlled by a joystick like virtual controller in the lower right or left corner of the screen, depending which is the dominant hand of the player. This would give the player a clear option where to place his or her finger in a manner that is not obstructive for gameplay.

7.3.7. Electric

In the Electric game, the most problematic feature is the screen turning black after electric object hits the water. This was originally done to act as a punishment for playing the game in an incorrect manner, but it leads to chain-like reaction of more electric objects hitting the water, as the player cannot see them.

The lengthening time of darkness for punishment must be removed. The darkness of the screen should be lowered, or the whole effect even removed altogether. One option could be making the black screen's appearance freezing the objects from falling. A counter from three to zero could be added after the black screen fades away; to give player some time to think and see what is exactly happening on screen. After the countdown reaches zero the falling of the items could continue.

7.3.8. Lift

Quite a few players were confused with the blinking circle inside the lift. It is there to indicate that player should touch there, and therefore resulting in Piki moving away

from the closing doors. The blinking circle is not a standard notification for touching. The circle should be replaced with the finger just like in the Traffic game, which might be more in line with standard icons used for touch. This would give more consistency to the icons used within the game, in line with the usability heuristics by Pinelle et al. [2008].

In the first floor there could also be a finger demonstrating that Piki's character is touchable in this game. Interacting with Piki brings up a thought bubble, which shows whom of his friends Piki is going to meet next. Currently some players never discover this feature, but having an instruction showing this would fix the problem.

The problem with players tapping in with hand placed in obstructive place could be fixed by adding a button for the action.

7.3.9. Playground

The punishment for failing in this game is not severe enough, as some of the subjects did not care about failing. They simply could just watch as the children walked towards the slide and did not react to this at all. It is hard to say what kind of punishment would be enough, though. Making the punishments more severe is always a balance between the light heartedness and the seriousness of the game. One option would be to have the character not just bounce away from screen, but to be visibly frozen in place. It should be more visible that the character received some kind of punishment for player's actions. However, implementing this might be challenging in a way, which does not confuse players.

The dog walking by received many attempts for interaction, but nothing happens from it. Simply making a dog bark and change his speed of movement upon interaction could benefit the game experience easily and in a way, that actually has an impact on the experience.

7.4. Summary of problems and solutions

In Table 14 and 15 on next pages there is listed all problems noted, with corresponding playability, proposed solution for the problem and a corresponding usability heuristic number from Pinelle et al. [2008].

Game	Problems	Solutions	Heuristic
Eating	Players feed every single object.	Another conveyor belt could be added to the game. Remind player of correct play.	-
	No indication for progress	Add a progress bar to present progress.	8
Space, Dressing	Confusion over loading scene icon.	Remove cheque mark and add a button to continue.	10
	Item dropped through the floor.	Fix the code that handles collision.	-
	Accidental presses on home button.	-	-
Space, Cycling	No instructions on how to control Piki.	Add audial and visual instructions	9
	Players do not avoid the asteroids and cars.	Add audial and visual instructions	-
	Players push the thrust all the time, thus not really playing the game.	Add audial and visual instructions	-
	Confusion over what the progress bar presents.	Add a limit on how much the thrust can be used at a time.	10
Life jacket	Players do not understand to tighten the life jackets.	Audial instructions	9
Traffic	Players keep their finger down all the time.	Instructions are not strong enough. Change the instruction for an overlay.	7
	Horizontal control of Piki is hard.	Control scheme could be changed to virtual joystic.	7
	Accidentally going to the road from zebra crossing.	Control related issue that could be fixed by reworking the control scheme.	7
	Players control Piki by using their hand in obstructive way	The virtual joystic could be located in lower right corner of the screen.	4

Table 14. Problems found, proposed solution and corresponding usability heuristic part 1.

Game	Problem	Solution	Heuristic
Fire	Players did not understand to click on instruction scene to continue.	Add a button to continue.	-
	Instruction scene was not understood.	Voice narration should explain the instruction scene.	9
Electric	Scene turning black as punishment led to more electric objects fall to water.	The lengthening blackness should be removed. One option could be to add a pause when electric object hits the water and a counter that tells the player when the game continues.	4
	Swiping objects do not work.	Fix the code for input.	1
Playground	Dog cannot be interacted with.	Add a simple interaction for clicking the dog.	1
	Swiping on children and aliens does not work.	Fix the code for input.	1
	Punishment for failing is not strong enough.	Alternative punishment could be freezing the game for a moment.	-
Lift	Buttons inside a lift appear clickable.	-	-
	Blinking circle is not strong enough clue for clicking.	The circle could be replaced with a finger.	9
	The feature of Piki thinking of next friend he is visiting is not discovered by some players.	Add visual instructions for this feature.	9
	Lack of button for shortening leash leads to players clicking on objects.	Add a clickable button for controlling this mechanic.	4
	Instruction for tapping was not understood. Players hold their finger down.	Audible instructions could be added.	9
	Confusion over controls. Players thought you have to tap on objects or swipe to move Piki.	Better instructions needed.	1
	Players tap in a way that puts their hand on a obstructive position.	Add a button for the action.	-

Table 15. Problems found, proposed solution and corresponding usability heuristic part 2.

8. Player typologies of Pikin Huone

In this chapter, the styles of play shown in the playtest sessions are analysed further. The play styles of each game are presented and the archetype player typologies of Pikin Huone are presented in more detail.

8.1. Play styles by game

As Pikin Huone consists of eight games, every game has its own unique features and therefore unique styles of play. The play styles shown in each of Pikin Huone games are presented in this chapter.

8.1.1. Eating

The subjects approached the game in three different ways. The most popular choice was to play the game in the correct way, which in this case is to feed Piki with only edible food while letting the uneatable objects pass by. Eleven of the sixteen subjects played in this correct style of play at least once.

Only two subjects, Charlie and Delta, played in the opposite wrong way. They fed Piki only with the inedible objects. Later Delta proceeded to continue with feeding Piki with every object that came along the conveyor belt. Five others played also with this play style. Subjects Juliett and Sierra did this same style of play, but the reason for their play was obviously difficult in understanding the objective of the game. The play style in this game is not in line with their play style in other games.

On this game, the gleeful style of play was clearly an option, and was demonstrated by those who liked to play in this way. Surprisingly the Ruler player typology was not shown by anybody in this game, even though the game seems to be perfect for such a style. The absence of ruler behaviour could be caused by the number of limited options shown at the same time. With a large number of different possible options, choosing to feed Piki with only one kind of objects would have stagnated the game too much and therefore led to more uninteresting play.

Two of the subjects fed Piki with the inedible objects. They could be seen as playing by Ruler play style, but both of them showed that their motivation was not to create their own rules to the game, but to gain enjoyment from the negative reaction shown by Piki. Part of the reason for absence of ruler behaviour could be that the Eating game was a popular choice to be the first game the subjects played. Perhaps some of those who played in the Ruler play style did not yet feel comfortable with the playtest situation. Against this trend of playing the Eating game first, subject India played this game as her last game on the test. She did not show the Ruler play style in this game, although playing with that style in the Electric game.

8.1.2. Space

The dressing part of the Space game is simple, and therefore the play styles in this part were all almost indistinguishable from one another. Subjects Echo and Delta were exceptions, as both tried all the incorrect objects first before proceeding to the correct ones. Both did this style of play apparently on purpose.

The cycling part of the Space game is the one that needs the most skill out of all Piki Huone games. The skill gap between players is shown on how they manage to avoid the dangerous objects flying towards Piki. Some players chose not to try to avoid the objects, but to only collect the reflectors without paying attention to Piki being hit by the asteroids and space cars.

There were also differences between the subjects in where they positioned Piki in this game. Five subjects stayed at near the upper limit of the game area, even though there are no any benefits in doing so. One of these who did this held her hand down on the thrust all the time, thus not probably even understanding the objective of the game.

When asked what the objective of the game was the answer varied from avoiding asteroids to collecting reflectors. The meaning of the progression bar was understood in general.

Five subjects did not try to avoid asteroids most of the time. Four of these players were also the ones that stayed at near the upper limit of game area. The one that did not avoid the asteroids, but also used the game area completely was subject November, who played with standard play style throughout the playtest session. Her uncaring for the asteroids on this game is probably caused by mimicking her partner Papa, who played the same game before her.

8.1.3. Life jacket

In the Life jacket game, there were not almost any differences in play styles as the game is too simple for much variety in approaching the game. However, subject Delta did show a bit of a difference. He tried to insert the wrongly sized life jackets to incorrect aliens continuously. He apparently did this on purpose, finding a way to play even a simple game in a gleeful, destructive manner. All the other subjects played this game in the standard way.

8.1.4. Traffic

Play styles fell into two categories in this game, those who stopped at the red lights and those who did not. A few of those who tried to play correctly failed at time to time by accidentally walking towards the red lights, but this happened usually once or twice per game. Unlike gleeful players, these failures were clearly done on accident. Five players chose to walk towards the red lights on purpose, even though they did understand that it would cause the police officer warning to come up. The police officer warning was seen

as funny and it seemed to be irresistible for some players to walk towards them, even though it was against the objective of the game.

In the playtest pair Lima and Alfa, the subject Lima encouraged Alfa to walk towards the red lights, but Alfa did not agree to this at first. Later he accidentally walked to the road and later first waited for the red lights and then crossed towards them on purpose.

8.1.5. Fire

In the Fire game there is no much room for different play styles. All but one subject, Delta, played this game in standard way. The differences in this game are in how players choose to control the shouts of Piki.

The most popular option was to touch directly on the aliens. This was the control choice of ten out of the sixteen of the subjects. Only three of the subjects used swiping, which was the original way to control this game. An alarming observation was that five of the subjects tried to drag their finger from Piki to aliens, as this way of playing was not taken into consideration when designing the game. This technique works however, even though the game was not intended to be played in this way.

8.1.6. Electricity

In the Electricity game, the most used play style was the standard way of play. This game also seemed to bring up all the other play styles, being perhaps the most versatile game out of all in that sense.

Six of the subjects played in gleeful way; in which they allowed the electric objects to fall to the water. Four players made up their own rules within the game; they only allowed one type of objects to fall to water and changed the rules as the play went on. Rulers in this game wanted to make rules on which objects are allowed to water. This does not include those who wanted to let only the electric objects to fall to hurt Piki. The rulers made a rule in which for example, only shampoos were allowed to fall to the water, or that ducks could not enter the water. In the sense of completing the game, these rules do not make any sense, but the children seemed to enjoy the feeling of being in power. They could set the rules of the bath.

This game was the most diversified in terms of different styles of play shown by the players. The difference between the Electricity game and the Eating game is that in the Electricity game the multiple options are presented simultaneously, allowing for more diversified play by offering more options to improvise the play on.

8.1.7. Playground

Like in the Electricity game, the Playground game also gives multiple objects to interact with simultaneously. This again let players who preferred to play in Ruler and Gleeful play styles to blossom. However, gleeful play was not as popular in this game as in the

Electric game or in the Eating game. Only three children played this game in a gleeful way.

The reason for this could be that the punishment for failing is only that the woman appears and the children and the aliens bounce backwards upon hitting the occupied slide. They are not seemingly hurt by the bounce; the response is not strong at all. The gleeful players have to imagine the suffering caused by failing in their own head, as the game does not give enough clues for it. It seemed as if the gleeful players did let the children walk towards the slide on purpose, but as the negative reaction was not strong enough, they did not enjoy doing this style of play as much as in the other games.

The ruler play style was more popular in this game with four players, one of which was also playing in gleeful way. The rulers decided let only certain children or aliens to enter the slide, or disallowed one character from entering the slide at all.

The line between the ruler and gleeful play in this game is slim. It is hard to judge if the children do their decisions based on gleefulness or for the willingness to set the rules and being the judge of the game world. The divide was made based on the motivation being said aloud by the children in the playtest session. In addition, the general feeling of how child approached the game was noted and conclusion drawn from all this available data.

8.1.8. Lift

The ruler behaviour was absent in the Lift game, as the game does not have options for such play. The gleefulness was strongly shown in this game, shown by five players in total. The gleeful players did let Piki get drag away by the dog on purpose, usually multiple times. This was done typically on each of the floors that this is possible at least once. On the first floor the dog cannot drag Piki with him, as the first floor works as an introduction to the game mechanics and allowing player to fail already on this floor would have been too harsh.

On top of this, the Explorer type was shown by Delta in this game. The Lift game in particular is one of the more diversified games in terms of item interactions to find and explore. What is significant in Delta's play was that he managed to not play this game in a standard play style. He did not finish the game at all, as he got fed up with the game after only reaching the second floor. He started the game once over, when he got frustrated inside the lift for not understanding how to proceed with the blinking circle. In this game, he tried to figure out how the game mechanics work, and was overall confused and had wrong ideas how the game would work.

8.2. Typologies based on previous research

In the analysis phase, only a few player typologies were noted based on previous research. This was expected, as *Pikin Huone* is a single-player game. Previous research is mostly about multiplayer games and therefore emphasizes player-to-player interactions. Choosing a single-player game may be seen as a mistake, but in the other hand, this allows for a deeper look into interactions between the rules and the player.

8.2.1. Bartle's four archetypes

Bartle's player typology archetypes were not obviously noticeable. However, some similarities between the archetypes and styles of play in the playtest were clearly noticeable.

There was not anyone who wanted to directly harm other players' play, but many of the play test partners wanted to help the other one. Therefore, the Killers typology of Bartle could be seen as the Helpful players of *Pikin Huone*. Socializers also fall into the category of Helpful players, as these players did value the interaction and did not just observe the other player as he failed, but did intervene when necessary. Helping others was a rare in Bartle's situation [1996], but in the playtests arranged for this research, helping was one of the few ways players could have any effect on others.

Helpful players are keen to help the other player. Even though the guidance that players were expected to play alone were said, these players did not care about it but wanted to help the other player in trouble. Helpful style of play was seen on players who were also diverse in other unique play styles. Four subjects showed Helpful style of play, out of which three played also in Gleeful way and two played in the Ruler style.

Achievers can be seen as the standard players, who are playing to win the game, but Bartle's Achievers are a sort of extreme archetype, in which the player sees everything else just means of progression. Nobody on the playtest did perform such an extreme play.

Explorer typology was rare, but obvious for some players. Explorers value discover and exploration above anything. In *Pikin Huone*, they try items and see if they have any interactions hidden in them. They want to explore different game states, not always by playing correctly but also by playing incorrectly.

In the clear-cut games, in which player chooses from two types of objects the correct ones these players usually did let one wrong object to pass through to see the reaction of playing in wrong manner, out of curiosity. This type was only strongly seen in player Delta, but was also slightly seen in player Papa, and unworthily notable in many other players.

8.2.2. Salen and Zimmerman's five styles of play

Salen and Zimmerman's player typologies focused on interaction between the players and the rules [Salen and Zimmerman, 2003]. The standard player of their player typologies is a player who follows the formal rules and do let themselves go with the lusus attitude of game. This standard type of play was noted in this research. Everyone expect one of the subjects did play at least one of the eight games as within the realms of standard player typology. The exception was the subject Delta, who did not play any of the games in a standard way.

Salen and Zimmerman did separate the dedicated players from standard players. As many of the players were playing for the first time in this playtest, the dedication they had towards the game was hard to note. However, in case of subject Echo it was noted that the player showed skill on the level that could be counted as dedicated play.

Unsportsmanlike players by Salen and Zimmerman could not be discovered in this research. These players violate implicit rules to win the game. The games in Pikin Huone do not allow for much room for violating the rules to win the game, so these player typologies were not expected to be found.

Spoil-sports are players who want to ruin other player's fun [Salen and Zimmerman, 2003]. These types of play were not noted in the playtest sessions. There were a few borderline cases, though. For example in cases Oscar, Kilo, Lima, Alfa and Charlie, players tried to get the other player to play in a gleeful way. This was seen as their own motivation to gain enjoyment through seeing the negative reaction rather than motivation being ruining other players' play.

The cheater player typology by Salen and Zimmerman were not explicitly discovered. These are the players who blatantly violate formal rules in order to progress in the game [Salen and Zimmerman, 2003]. Like spoil-sports, the cheater typology was not expected to be found as the game logic does not allow for such behaviour and the playtest situation itself did not encourage for such behaviour.

8.3. Unique player typologies of Pikin Huone

These play styles shown in Pikin Huone are unique on their own with no direct counterpart found in previous research on play typologies. These player typologies are especially noticeable in this game in particular.

8.3.1. Ruler

In Pikin Huone games, there was clear tendency for some of the players to set their own rules. These players demonstrate a Ruler player typology. Rulers see rules of the game as not formal and constant, but as something that they do not have to take seriously. They see the game as a platform for their own games and play.

They usually do follow the formal rules usually at the beginning of play, until they want to change the rules as the play goes on. The change of rules can be influenced by ambiguous reasons. Sometimes the influence is clear, for example in the Electricity game the Rulers might see that there is enough of one object in the bath, so they do not let any more of those in, even though this is not in line with the object of the game.

The feeling of being in control seems to be of an importance for the Rulers. They want to be those who get to decide what happens in the game. They do not care about winning the game as much as the standard player does. They see the game as a blank slate for having fun and they do what is necessary to achieve it. Winning the game is seen as source of fun, but the result is not as important as the way to it.

Ruler play is remarkably close to play that children play on more traditional playground settings. The rules of the games are passed from one to another orally, therefore the rules are not formally written down. Being used to play these kinds of games, the children might not have so much respect for the formal rules, and therefore they have tendency to alter them.

8.3.2. Gleeful

Gleeful players in Piki Huone are those who gain enjoyment from hurting and causing harm to Piki or other characters in the game. They want to cause havoc in the game. The reactions that are given by playing the game in a negative way is the main source of fun for these players. Funny reactions are seen as the best, most enjoyable part of the game.

They let the electric object fall to get the electric shock. They see that Piki puking as fun and want to do it again. They want to leave Piki on the road so that the card would run over it. The more the characters get hurt the more fun, until the game feels like stagnating and they want to progress further.

In the Playground game, these players may decide to let nobody slide down in the slide. This is the important difference between the Ruler and the Gleeful player. The Ruler lets some types of characters to the slide while the Gleeful player sees that not letting anyone to slide down is more fun. Gleeful players let the electric objects fall when the Rulers decide to let only soaps in. Motivation behind these decisions is what differentiates these players. Rulers want to feel like they are in control, Gleeful players want to cause pain and see the reaction of negative play.

Motivation for gleeful play seems to be mostly about seeing the reaction for playing the game in an incorrect manner. It could be also caused by having a desire to do things you cannot do in real life within the game [Olson et al., 2008].

The motivation could also be caused by a need to display a *thug* image to the other player participating in the playtest. Playing in this kind of bad play could be

means for them to gain value in social hierarchy by presenting traits of masculinity in this manner [Ferguson, 2001].

These Gleeful types of players did show varying degree of lusory attitude. In some games, they were willingly to follow the formal rules and jump into the magic circle of play, but they were willingly to break the circle for the sake of funny reactions.

8.4. A Summary of children's player typologies

The children's player typologies were identified by carefully analysing each subject's play, looking at every game individually and making generalisations based on the play observed. At first, the player typologies of previous research were tried to fit to the play styles observed during the playtests. Since all play could not be explained by the existing player typologies, unique player typologies for Pikin Huone were created based on generalisations of play.

As expected, many of the player typologies in the field of game research were also seen in children aged from 4 to 6. Unlike previous researches, Pikin Huone is a single player game, which narrowed away player typologies focusing on multiplayer aspects. These player typologies were able to identify by throughout analysis of the data gathered during the play tests. Every game had to be analysed independently and every players' actions seen as individually to make larger generalisation of player typologies.

The Standard player is easily seen in many games. These players play the game as it is designed to be played. They try to win it by following the formal and implicit rules.

The Helpful typology is the only player typology found that is based on player-to-player interaction, unlike all other typologies that focus on relationship between the player and the rules. These players help the other player participating on the playtest session with them, even though they are not advised to interact with other player.

The Explorer type was hard to grasp, as the game itself does not include much room for exploring. However, such thrive to look beyond the curtain and to try everything possible was noted on a few children.

The Gleeful players did not care much for winning, but rather cared for fun reactions of the main character. They chose fun over the objective.

In children's player typologies, Ruler player typology is the most differentiating one comparing to previous research done. This player type is also most close to children playing tradition games, in which rules are not particularly formal, but can be altered at will and if all participants agree to new rules [Soute et al., 2010]. It seems like children do carry these aspects of traditional games to playing video games. As previous research did not include such remarks on players' altering rules, it could be expected that his kind of behaviour is unique for children. However, as this research did not include adults play the same game, such conclusions are left for future researches to tackle.

9. Summary

In this research, the goal was to discover player typologies of children from 4 to 6 years of age while uncovering playability and usability problems from the game. The approach was to do a qualitative research with two playtest sessions with a children's game that was developed to target children of this age.

Previous research on player typologies are mostly focused on games, which target demographic is usually from teenagers to adults. Children's games are largely absent in the previous research on the subject. The previous research is focused on multiplayer games, which allows for interaction between the players. Using *Pikin Huone* for this research was therefore a fresh approach to the subject, as it is a game targeted towards children from 4 to 6 years of age and it is a single-player game. Choosing this game meant sacrificing finding player-to-player typologies in order to find deeper single-player aspects in the possible player typologies found.

Children's play styles were analysed and based on this unique player typologies of the game were discovered. Player typologies in line with previous research done within the research field were also discovered. Playability problems of the game were analysed and possible solution for these proposed. The most of the problems found circulated around problems within having clear instructions, manageable controls and consistency in the game.

The children's player typologies found were standard, helpful, gleeful, ruler and explorer. The most interesting findings were the gleeful and ruler play styles. Gleeful players do not care about the goal of the game, but value the reaction caused by playing incorrectly above everything. Rulers do not settle for the formal rules in place, but rather want to add their own additional rules to the game.

The results of this research show that children even on very young age are capable of playing even simple games in different play styles, with various imaginative variances in play. The results of this research also indicate that there are unique player typologies for children. This information can be used when designing a game targeted to this demographic.

This research focused on a single player game, effectively leaving player typologies focusing on player-to-player interaction mostly out. Additional research could be done focusing on multiplayer aspects in order to find children's player typologies focusing on player-to-player interaction. Further research could also be done to see if the unique player typologies for *Pikin Huone* could also be found in other games as well to validate the results. The limited amount of data gathered on this research is not enough for comprehensive argument for the player typologies found, but these results can be used as a guideline for game design purposes.

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