

Politecnico di Milano

Research on
interactive
design of
children's
digital games
based on emotional
experience



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A thesis by: Huiting Xiu 872835

Design Della Comunicazione
Final thesis
A.A. 2018 / 2019

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Abstract

Interactive games have been widely experienced by children from all over the world, and the researchers and educators as well as parents are concerned about how would the interactive game affect children's emotional skill and development. The present study aims at solving this problem from both children's personal perspective as well as parents' observations. The main goal of the study is to investigate the types of emotions children encounter in the

game playing and how they regulate their emotions, whether the emotions experienced in the game playing could exert influence in their social interaction in real life. The questionnaires have been collected from 168 parents and children from all over China. We could conclude from the results that children are able to distinguish the basic emotions such as happiness, sadness, anger, contempt, etc. Children play various types of games for different reasons such as to regulate their mood, to have common language with peers, etc. Engagement with interactive game would enable children's to encounter and experience different emotions and most of emotions they have experienced are positive. Furthermore, children believe that their emotions experienced in the game play would not linger and thus affect their social interaction with family or peers in real-life.

Based on the conclusion of this study I designed an app that aim at solving these issues for such target Chinese families, helping the parents and children to play mobile phone games together and share the common interests. This solution, to my best knowledge, is unique by far.

Acknowledgements

I would like to express my sincere thanks to my supervisor Luca Fois for the patience, guidance and all practical and helpful suggestions that significantly improved my design of the study as well as the

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My sincere gratefulness is also expressed for my dear classmates and friends. They have never failed to inspire and encourage, support me, either in academics or in personal life. Thank you for your time, honesty, and dedication.

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01

INTRODUCTION

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LITERATURE REVIEW

Introduction

The new computer technologies offer exciting new chances for entertainment developments for young children, this has been proved with evidence in recent research field throughout the world. As the

researchers develop interactive play environments, interactive activities as well as the interactive games continue to grow quickly. The development of the interactive games for children has nowadays outperformed the film industry as well as the book industry in terms of revenues in a lot of regions. Although technology is believed to be able to support the compelling interactive games experiences and enhance interaction and communication between the young game players, there is still uncertainty in evaluating the interactive games from the perspective of children's emotional development and the difference approaches of the interactive games.

Human-computer interaction (HCI) research could be traced back in the cognitive sciences of psychology as well as the human factors, and could also be found in computer science. Even though early researchers have conducted a lot of studies from the perspective of human cognitive development, the idea of children's emotion development lacks its supports and investigations. Although acknowledge-

–ment of emotional influence attributed by playing interactive games is important, it is still not well understood by researchers.

Some researchers have been attempting to use physiological data to identify children's emotional states. James expected that understanding children's physiological responses could be useful in recognizing children's emotions and emotional changes throughout the game play (Cacioppo et al., 2000), and other researchers have also provided additional results to support that physiological data sources can be used to distinguish children's emotional reactions and fluctuations (Ekman, Levenson, & Friesen, 1983).

The present study investigates children's emotion recognition and development as well as the influence of emotions towards their social behaviours outside the virtual game world. Data are collected from children's as well as their parents' survey about children's different emotional expressions and whether the negative and positive emotions linger

after their game involvement ends. In other words, whether children will behave aggressively towards their friends and families if their emotions are negative during game playing. Thus, the design aims at investigating whether children's emotions, both positive and negative would affect their social behaviors in real life.

The present study is divided as follows: Section 2 is an overview of relevant background literature review, which includes the connection of game play to brain development, and also the influence of children's association with interactive games on their emotional development and emotional regulations. Section 3 focuses on the research design, which explains how the data has been collected and analyzed. Section 4 provides all the results that have been extracted from the data analysis and then concludes that main findings and discussion follows as the Section 5.

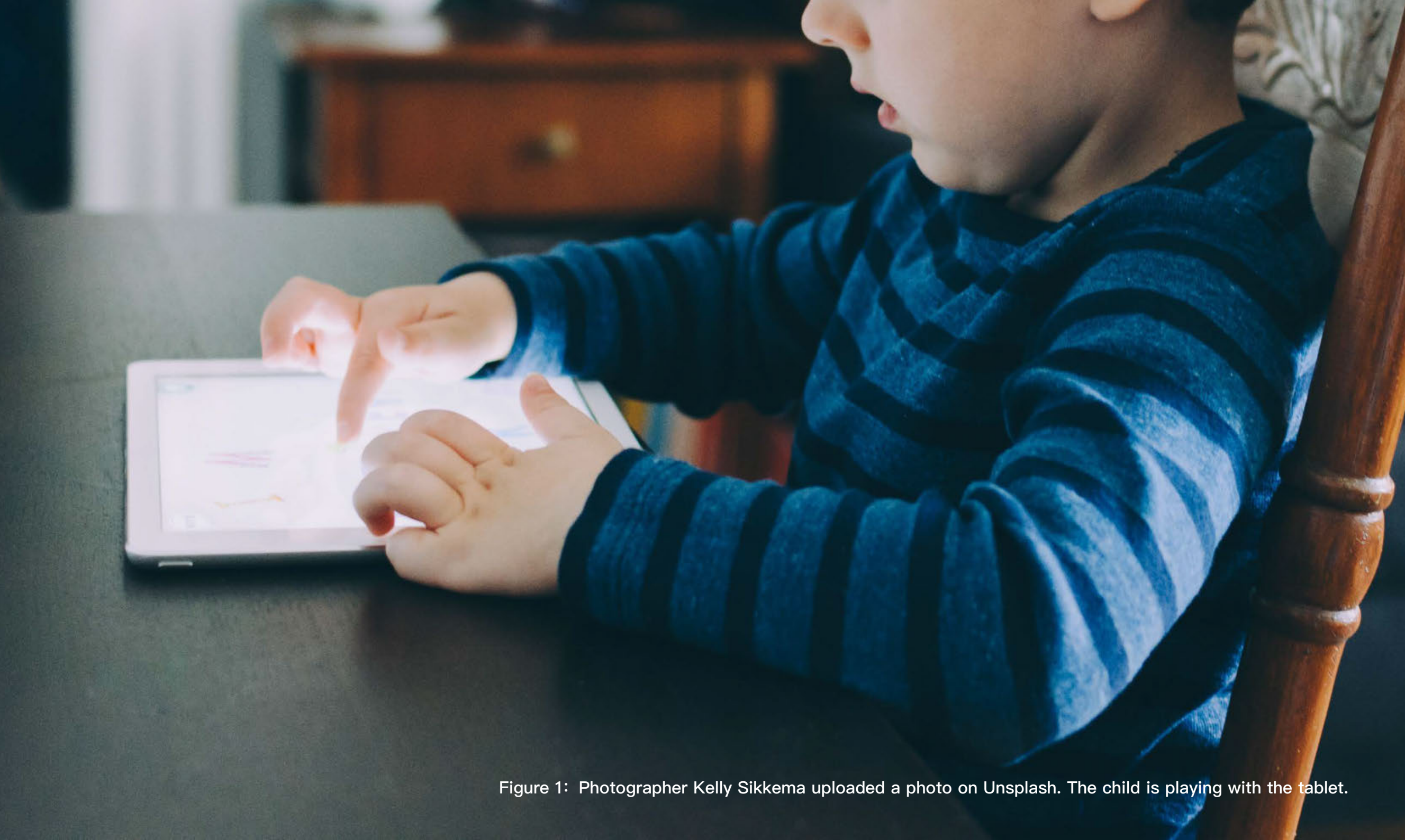


Figure 1: Photographer Kelly Sikkema uploaded a photo on Unsplash. The child is playing with the tablet.

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LITERATURE REVIEW

Brain development

Psychological evaluation

Emotion hierarchy

Emotional development

Negative emotions

Influence of television and game
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RESEARCH QUESTIONS

INTRODUCTION

Literature review

Nowadays, computers and video games consume large amount of children's free time and has thus raised topics of how the new technology affects children's lives. Some researchers support the

inclusion of computer and video games at school and home environment, arguing that with the stimuli of game-based tasks, children are highly motivated to complete the tasks that will result in the improvement of academic skills. Besides, they believe that having early access to computers and digital games enables children to easily adapt to digital world in the future. However, other researchers are skeptical of positive influence of game-based teaching and learning. They suggest that digital media is related to children's high rate of physical problems as obesity, hand injuries because it takes up time that could be invested in sports and outdoor activities (Subrahmanyam et al., 2000). Besides, it also deprives children's normal social life and is thus paired with negative impact on children's social skill development.

Being an indispensable part of children life, digital games can be used for pure entertainment, however, with a design that focuses on research and development, they can also be targeted as educational facilities to emphasize positive influence on

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children's learning (Blumberg et al., 2013). In addition, digital games are also an activity enables children to be involved in social and interactive aspects of life. Furthermore, it could also promote children's emotion awareness and development as well as emotion regulation.

Brain development

Researchers have proved that the process of perception of emotions requires active participations of different brain regions, such as the somatosensory cortices and the upper brainstem nuclei, that are

Being an indispensable part of children's life, digital games can be used for pure entertainment, however, with a design that focuses on research and development, they can also be targeted as educational facilities to emphasize positive influence on children's learning (Blumberg et al., 2013). In addition, digital games are also an activity that enables children to be involved in social and interactive aspects of life. Furthermore, it could also promote children's emotion awareness and development as well as emotion regulation.

The physiological program of emotion perceptions engages different brain regions in distinctive patterns. And early researches also indicate that different representational and regulation sites are related to emotions.

Since the right and the left brain of children are totally responsible for different areas in learning, therefore, the fulfillment of colorfully preparing children's learning strategies (playing interactive video games) do cause the good relationship between children's learning and future development

and growth in emotion perception (Judy, 2008). Therefore in order to fulfill the early childhood education in proper progress, it is necessary to appropriately cultivate the right and the left brain development of children (Gou, 2003).

The latest research in neuroscience suggests that the human being is pushed to pursue behaviors that activate the reward circuit of the brain. The moments of our life full of emotional valences and meaning linger longer in our memory and can be recalled with greater accuracy than neutral ones. It is now attested that the prefrontal cortex is the part of our brain designed to perform executive functions such as solving problems, maintaining the threshold of attention and inhibiting emotional impulses. If the prefrontal cortex can be considered the CEO of the human body, the front crawler is his personal secretary. Among his tasks is that of acting as a filter to the many stimulations and performing a fitting action in a continuous teleconference between the other parts of the brain, especially the amygdala. The latter is responsible for the onset

and maintenance of emotions by virtue of the presence of dopamine neurotransmitters. Whenever the brain sees an engaging moment in our lives, it asks the amygdala to release dopamine into the system just as a personal secretary leaves a post-it to remember an important appointment to the administrator. Scientists have shown that, in fact, dopamine plays a fundamental role in the long-term storage of information.

When children play games, these two parts of the brain will be activated and stimulated so that children could feel the emotional change and become happy and delighted, or disappointment and anger. On the other hand, children's emotional impulses could also be restricted such as temper tantrum and outburst of strong negative feelings, so that their interaction with their friends or peers could be maintained and stabilized. Thus, children's social interaction could be more successful with the help of these two parts of the brain functions and children's emotional mood and feelings could also be enhanced.

Psychological evaluation

One perspective for researchers is to consider the options to optimize the relationship between humans and the technologies they employ. It is not only important to evaluate how the technology has

affected user performances as regarding the productivity and efficiency, but also important to investigate how it has influenced the well-being of the children. Early researchers have designed a physiological metrics to evaluate the influence exerted on the well-being. In Mandryk, Atkins and Inkpen's research (2006), they have employed techniques to test the galvanic skin responses, electrocardiography, electromyography of the face as well as the heart rate.

Cardiovascular measures reflects also children's emotional activities as the figure temperature would differ children from positive and negative emotions (Winton et al., 1984); electromyography measures muscle activity and muscle tension and has also been considered as the prediction for positive emotion and negative emotion that children have experienced in game play (Stern et al., 2001); Physiological responses have been examined to differentiate children's emotional reactions in interactive play environments (Mandryk & Inkpen, 2004). Researchers also believe that physiological mea-

asures provide a rich, continuous information about the children's experience with interactive game playing.

Emotion hierarchy

Emotions could be divided into two categories as basic or discrete emotions that emphasize a biological base, such as emotions of anger, fear, sadness, joy and love (Ekman, 1973; Izard, 1977; Bretherton &

Waters, 1985; Sroufe, 1979). These basic emotions are universal and could be found in all human beings. Another category could be found on more complex socially constructed emotions, for instances, loneliness, resentment or other emotions that could only be observed in different cultures (Morsbah & Taylor, 1986; Harre, 1986).

Emotions hierarchy could be layered with three levels. The first layer could be divided into two opposite families as positive and negative emotions. In the middle layer, there are basic emotions that have been used in different cultures and different age groups, such as anger, sadness, fear, joy and love. Each of the five basic layers defines a subordinate category that is more complex, more socially constructed emotions. Love consists of fondness and intimidation. Joy is a combination of bliss, contentment, and pride. Anger includes annoyance, hostility, contempt and jealousy. Sadness includes agony, grief, loneliness. Fear is divided into honor and worry. This hierarchy of emotions is created by Shaver et al. (1987). The categories at the first

layer, positive and negative emotions, could be interpreted from the place in the hierarchy that they appear early in the development process. As referring to individual's social life, the early appearance of negative and positive emotions is related to children's application of positive and negative verbal claims. For example, with positive emotions, children can develop words such as like, favorite, good, and nice and so on. Comparatively, with negative emotion, children can develop words such as bad, mean, don't like, dislike and so on (Bretherton et al., 1986; Fischer et al., 1984). The application of different words in communication and interaction with others would affect their relationship formation as well as maintenance of social relationship.

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Emotional development

Emotional process has been widely believed to include aspects of motor-expression, sensory-perception, cognitive-attention, and affective-feeling. In neuro-conceptual terms (Panksepp, 1993), emo-

tion should include all these elements.

Emotion develops with the growth of a child. When children are small, they could distinguish different facial expressions and action patterns as joy, affection, anger, sadness, and fear. In the years that follow, when the children develop into adults, more specific and more complex emotions develop, such as compassion, humiliation resentment, and alienation. This is the emotion development from a simple and few basic emotions into a broad range of complex and more sensitive emotions.



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Figure 2: Still Face Experiment(<https://www.youtube.com/watch?v=apzXGEb-Zht0>): Ed Tronick (http://www.umb.edu/Why_UMass/Ed_Tronick), director of UMass Boston's Infant-Parent Mental Health Program and Distinguished Professor of Psychology, discusses the cognitive abilities of infants to read and react to their social surroundings. The video is an excerpt from Lovett Productions' HELPING BABIES FROM THE BENCH: USING THE SCIENCE OF EARLY CHILDHOOD IN COURT.

Children's recognition of emotions is also crucial in their development of emotions and regulation of emotion. Researchers believed that in the field of psychology, the ability to recognize the emotions and to also regulate their own emotions from different experiences would enable a child to develop their positive social skills, such as empathic social

skills as well as the casual thinking.

Experts value children's ability to acknowledge their own emotions throughout their life and also in all areas of life. The areas where children could learn to recognize their emotions could be found in early childhood centers as this environment serves as a complement to parents' education. Their skill of emotion recognition could also be developed in elementary schools, hospitals, etc., encouraging and helping children to name different types of emotions is significant to parents, teachers and other social parts.

Skill of emotion recognition could be obtained from many approaches such as books or toys that teach children to distinguish facial emotions such as happiness, angry, madness and so on. Usually parents and teachers are responsible for teaching children to learn the emotions. Nowadays, with the development of interactive games, children have one more approach to recognize their emotional changes and to develop their emotion regulation skills. In addition, movies, TV programs also help children to

develop their emotional knowledge. Moreover, parents' own expression of emotions will also affect the children's understandings about emotions. Emotionally expressive parents may enable children to observe and interpret information about emotional expression and situations. This indicates that parents give children chances to learn from the nature of happiness, sadness, anger, anxiety or fear, with more personalized experiences. However, if parents are not emotional expressive themselves, children have limited chances to learn the emotional expression or even have access to negative emotional experiences.

In the psychological field, there are different aspects concerning the significance of emotions (Shuman & Scherer, 2014; Russell, 2003). One of the important emotions found in game play is the achievement emotion. Achievement emotions could be divided into two dimensions as valence (which means the positive versus negative emotions) and activation (which means activating versus deactivating emotions) (Feldman, Barrett & Russell, 1998). And these dimensions could be then categorized into posi-

tive-activating emotions, for example enjoyment, and positive-deactivating emotions, for example relaxation, negative-activating emotions, for instance anxiety, and negative-deactivating emotions such as boredom (Perkrin & Perry, 2014). The positive-activating emotions have been related to the engagement behaviors, whereas the negative-activating and negative-deactivating emotions are negatively related to engagement behaviors (Kahu et al., 2014; Skinner et la., 2008). The relation between children's emotions and their social behaviors towards the real world needs more investigations. This empirical study aims at providing more evidence to support the relation between children's emotional demonstration and their outward social behaviors.

Emotion regulation is considered another important topic in psychology, referring as a cognitive ability (Miller, Rogriguez, Kim, & McClure, 2014) and social competence (Shaver & Mikulincer, 2014). It is also a topic included in education (Duckworth, Gendler, & Gross, 2014). Children's emotional recognition and emotional regulation skill development is one of the

most important targets in teaching and learning both at home and at school besides academic achievement. It is highly significant for children to conceptually acknowledge their emotions and feelings from very early age and learning from different contexts as interacting with various communicative agencies, such as peers, teaches and family members. Furthermore, emotion regulation is another aspect of social skills for children to develop and enhance, for example, how to express their feeling of disappointment, how to behave properly under anger, how to convey their gratitude towards others, etc. Therefore, a lot of research has been conducted to identify emotion competence, being the ability to act properly in emotion arousing situations (Suveg & Zeman, 2004).

Psychologists have considered emotion regulation as a critical developmental acquisition among young children (Lewis et al., 2006). Emotion regulation could be categorized as regulating negative emotion as well as positive emotion. Positive emotion regulation means that people try to up-regulate positive emotions such as love, interest and joy (Quoidback,

Berry, Hansenne, & Mikolajczak, 2010). In the present study, we focus only the negative emotion regulation. Negative emotion regulation is often described as the efforts made to down-regulate negative emotions and to decrease experimental and behavioral aspects of anger, sadness and anxiety (Gross, Richards, & John, 2006). Emotional competence is crucial for children to adapt to social functioning and psychological adjustment (Saarni, 1999). One of the most important tasks of children is to learn to regulate the intuitive behaviors that indicate negative emotions. Emotion regulation is the capacity to control the presence of negative emotions such as anxiety, anger, distress, and shame (Zeman, Shipman, & Suveg, 2002). Researcher have proved that the lack of ability to identify emotional states, the inhibition of anger, and the malfunction of expressing anger and sadness, or anger coping are highly predictive for children's internalizing behavior problems (Suveg, Zeman, & Stegall, 2001). Comparatively, dysregulated anger and sadness expression, anger coping are correlated with externalizing behavior problems.

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Social interaction plays an important role in children's development and enhancement of emotion regulation skills. Neither emotion recognition nor emotion regulation skill could be obtained through exclusive conceptual studying, but could be learned from interacting with peers, teacher and family members in different social contexts. Added to these types of associations, game-based interaction is a creative new interactive approach for children to recognize and control emotions, no matter in interactive or narrative contexts.

Researchers have assumed that narrative approach is a way for children to understand themselves, others, and the world around through the construction of a life experience (Fivush, 2001). Besides, researchers also proved that children's narrative skills and processes are developed through relational processes (Fivush et al., 2009). Children rely on narrative skills to construct a life story by finding connections between experience and self. Narrative skill is also considered to be positively related with children's well-being (McLean, 2010). Therefore, both narrative and interactive approaches should be

interpreted in the interpersonal contexts.

Therefore, during the process of children's digital game designing, it should be taken into consideration how to avoid being harmful to children's physical and social development. Instead, the design of the games should be reinforced for the benefit of children's emotional skill development. The interactive nature in association with games should also be investigated. The narrative design of digital game has been proved to be reliable in supporting children's problem solving skills (Dickey, 2006). Similarly, this article aims to study whether the interactive design of digital game would influence children's emotion recognition and emotion regulation skills.

Emotions are believed to influence people's social behaviors mostly positively and adaptively, as they lead people into behaviors that would meet people's needs and motivate them to develop towards effective actions and behaviors. Opposite

Negative emotions

Exposure to violent game is assumed to be involved with children's aggressive behaviors. Researchers have proved that playing violent games would increase children's attachment with aggressive

thoughts, hostile attitudes, and aggressive behaviors towards their peers and families, meanwhile, these effects are found to be continuous and would remain for long period of time in experimental, cross-sectional as well as longitudinal researches (Anderson et al., 2007).

It is assumed that violent games could be contagious. People are more likely to play violent games if there are people who play violent games in their social network connections. For example, people's rudeness would spread if their contacts are rude (Dishion & Tipsord, 2011). Moreover, other research has shown that participants who are more likely to be involved with violent behaviors if a friend had engaged in the same violent behaviors (Bond & Bushman, 2017).

Thus the researchers believed that playing violent video games is highly related with children's negative emotion expression as well their social behaviors towards the real world. This will also be examined in the present study as whether children and

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parents have observed that children's association with violent video games would result in their negative emotional expression towards their family members and their friends.

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Influence of television and game on emotion

Television presents experiences of others to the viewers vicariously. Especially for young children who do not understand fully the differences between real and appearance, television can arouse chil-

children's emotions directly. For example, preschool children could be easily frightened by threatening or horrible stimuli, or by physical change like transforming from human into monster. For most of the people, emotional reactions generated by televisions are vicarious reactions to the stimuli and the scene that people have portrayed. Television viewers respond by sharing the perceived emotions of others. Researchers have defined this type of emotional share is based on taking other people's feeling or concern, and others have simply called it empathy (Eisenberg & Strayer; Eisenberg, Fabes, Schaller, & Miller, 1989). Other literatures have also showed that even young children would respond emotionally when watching televisions that depicting other children in distress (Eisenberg, 1992). Vicarious emotion is an affective reaction that could be cognitively mediated. However, perspective-taking ability only indicates correct perception, but not situating oneself in the place of others in television. The perceived reality of what is presented in television varies in the effect of causing children's emotional responses. If a television is perceived as a

fact rather than fiction, children might be more likely to imagine themselves in the roles of the characters in the television. However, when children grow, or if they are reminded that the television is fictional, children would react less emotionally to the fictional programs, but still generate emotions to the factual programs.

The difference of the influence between gaming and television relies on the engagement characteristic of the gaming. As a television viewer, when a child grows or is pointed out the virtuality, a child could dispatch from the immediate emotional reaction, however, in game engagement, it is difficult sometimes to distinguish presence from the game immersion. Researchers have defined immersion as an objective description of the technology, whereas, presence is a subjective experience that could only be described by the users who are experiencing it. Kalawsky indicates that presence is essentially cognitive or perceptual, whilst immersion is related to the physical extent of the sensory information. In presence, the mediated information becomes the

object of perception, whilst the technological devices fade into the background. Researchers have proven that the engagement in gaming plays a significant role in influencing children's level of presence as well as emotional reaction (Kallinen, Salminen, Ravaja, Kedzior, & Sääksjärvi). Compared to watching television where children play the third person view, engagement to the gaming, where children play the first person view, would generate higher sense of special presence self location and high emotional involvement. This could also be explained by the fact that playing games as a first person view generates more presence than watching television as third person view, and the sense of presence is highly motivational in stimulating children emotional reactions and responses. Sense of presence from engagement in game playing here plays a significant role as generating and stimulating children's emotional reactions and responses. Being an indispensable part of children life, digital games can be used for pure entertainment, however, with a design that focuses on research and development, they can also be targeted as educa-

tional facilities to emphasize positive influence on children's learning (Blumberg et al., 2013). In addition, digital games are also an activity enables children to be involved in social and interactive aspects of life. Furthermore, it could also promote children's emotion awareness and development as well as emotion regulation.

INTRODUCTION

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LITERATURE REVIEW

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RESEARCH QUESTIONS

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METHODS

Research questions

The present study aims at identifying firstly the various types as well as different categories of interactive digital games children are involved with in their spare time outside the school. In addition, the

study also targets at investigating children's (aged between 7–13) emotional recognition and the emotions that they have experiences in game playing. The influence of the digital game playing in their emotional perceive as well as the affect of emotions occurred during the play to their basic daily life. How the negative and positive emotions experienced in game play affects their social relationship with family members as well as the peers and friends would also be explored in order to understand the benefits or the side effects of children's involvement with new technology. In other words, in the present study, both negative and positive emotion perceived in game play would be learned with the aim of understanding how well children are able to recognize the seven emotions and how capable children to regulate their emotions and mood that would have respective influence on their associating and interacting with other peoples in real life.

Interactive design of children's digital games emotional experience

1. What kinds of emotion experience would children encounter in playing interactive digital games?

2. Whether interactive game-play would influence children's recognition of emotions and emotion regulation, and how?

- Would positive experience in children's game play generate positive emotions?
- Would negative experience in children's game playing generate negative emotions?

3. Whether the emotions experienced in game play would affect children's social behaviors and relationship outside the games?

- Whether the positive emotion would lead to prosocial behaviors and positive relationships beyond the game?
- Whether negative emotion would lead to problem behaviors and negative relationships beyond the game?

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METHODS

Participants

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Survey

Product exploration

Data analysis

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RESULTS

PRODUCTION

Methods

The present study employs both qualitative and quantitative research methods to analyze the data. Qualitative research investigates subjective existence through observing and analyzing the main

reasons for individuals' actions or words. The meaning can only be analyzed from pragmatic inferences instead of being determined semantically. It could be divided into several sub-types, such as interviews, diaries and focus groups. The advantages of qualitative research include that participants may provide answers or perspectives the researcher had not considered and it is also possible to collect abundant of rich data from small samples. Therefore, it is possible to obtain rich data with qualitative research frame. However, in qualitative research, the reliability or validity could be challenged easily, because of the subjectivity of the data analysis, the small sample size may result in the lack of objectivity and generalization (Ying and Zhou, 2004). These are the disadvantages of the qualitative research analysis. No matter how, the qualitative research is still relied on to analyze the content of the open-questions that have been exerted in the survey. In the current study, we have designed certain open-end questions for children to fill in, thus to collect more detailed information. For this part of the data, we have used qualitative analysis

to integrate the data to the qualitative ones. Qualitative data leads to the richness of the data as the answers provide by the children could not be predicted beforehand and thus researchers could analyze the data from different perspectives and thus generate various types of useful results. Therefore, it is impossible to define the data beforehand. Because with the qualitative data alone, the data would be biased and thus lacks the validity, however, with the additional quantitative data, the combination would enhance the validity and reliability of the data set.

Quantitative data, on the other hand, examines the numerical data that have been collected from a large database for comparison. It is not related to the content but dealing with numbers. The advantage of using quantitative data is that the analysis is always objective as no personal bias could be introduced. Different to qualitative data, quantitative data requires large database and the results extracted from the data would be tightly attached to the research question. No additional result could be achieved from the same set of data. For current

study, we have used survey to collect data for the reason that survey could be expended and covered a large number of participants and thus generate the generalizability and reliability of the data. Survey also helps researchers to avoid the bias and subjectivity that might be generated by each individual because survey leaves no room for participants to formulate answers that might serve for their benefits. In other words, survey in a way defines the possibility for participants to manipulate the data and provides more natural and authentic data. These data collected would be calculated and combined according to the different categories and later on analyzed and presented with numerical or statistical results. The general results would be defined by the results and the statistics or numbers could only be interpreted from a fixed perspective.

All method in scientific research has its advantages and disadvantages, however comparing the qualitative and quantitative research methods can enable researchers to select the suitable instrument for research in their own fields. Quantitative research

methods and qualitative research methods are totally different as regarding their research focus, study purpose, main objects, major methods and sample type, and they can be seen as being two contradictory research paradigms in social science, like education. Qualitative research requires the researchers to provide rich data, to design the research and analyze the data based on historical and life experience material, and the main purpose of qualitative research is to obtain an empirical understanding of the reasons and motivations behind social phenomenon; the result often provides the society with a preliminary understanding, however, it is normally consisted of small samples with no representative case. On contrary, quantitative research has its fundamental on numerical or statistical data obtained from surveys, questionnaires, such as responses to Likert-scale type questions, the objective is to quantify the data and to generalize the results from the sample to the general population; it usually relies on statistical methods for data analysis, then based on the result, researchers makes recommendations, from a large sample of

representative cases. The two methods are complementary and mutually reinforcing, so sometimes researchers use both methods simultaneously.

During research, the selection of subjects or participants or sample is important. One way to choose the sample is called convenience sampling. According to the researcher's real demands, they select the sample who meets the objective and purpose of the research in order to help the work, or simply select the easy-to-get participant; for example, choosing students from a certain class where he or she happens to teach. The basic theory for convenience sampling is that the respondent is homogeneous with each unit of the target group, therefore the survey results may be generalizable. Convenience samples are easy to be accessed, convenient and with efficiency, the required information can be easily obtained, hence saving time and expense. This method is suitable for probing surveys, or pilot studies. However, in practice, not all samples in the population are homogeneous, so the sampling result would lead to biases and the lack of reliability, and

thus the result is not representative of the target population. The method of sample selection was therefore considered as a combination of convenience and purposive sampling.

Another important element of the research is the quality of research, and the validity is often seen as one of the indicators of the quality of the research. Validity could be divided into two types, one of them is the internal validity and the other is the external validity. Internal validity is used to indicate the uniqueness of the results of the study. For example, if there is only one feasible explanation of the results, the internal validity is high. However, if there is more than one explanations, the internal validity is comparatively low. External validity refers to the premise that the research results are still valid after being disengaged from the research situation. Generally, it is considered to be as reliable and well-designed research if the same results are achieved with the same experiments taking place at different times and locations with different samples. However, there are some factors that can diminish

external validity, for example interrater reliability: the degree to which another researcher conducting the same experiment would achieve the same results. Some bias also can affect the reliability of the research, for instance: the experimenter of the research, sample of the research, each individual's response, and the researcher's selection. The internal validity establishes the foundation for the research, and the external validity expands the scope of the research, they mutually work with each other.

study also targets at investigating children's (aged between 7–13) emotional recognition and the emotions that they have experiences in game playing. The influence of the digital game playing in their emotional perceive as well as the affect of emotions occurred during the play to their basic daily life. How the negative and positive emotions experienced in game play affects their social relationship with family members as well as the peers and friends would also be explored in order to understand the benefits or the side effects of children's involvement with new technology. In other words, in the present

Interactive design of children's digital games: A new emotional experience

In this study, both negative and positive emotion perceived in game play would be learned with the aim of understanding how well children are able to recognize the seven emotions and how capable children to regulate their emotions and mood that would have respective influence on their associating and interacting with other peoples in real life.

Participants



基于情感经验的儿童数字游戏体验调研

如今，儿童花费大量的空闲时间在计算机和网络游戏上，因此提出了新技术如何影响儿童生活的话题。这个研究主要研究现代游戏对儿童情绪体验的影响和如何更好的通过游戏来影响儿童。

*1. 您是谁？

学生

学生家长

教师

*2. 您的性别？

男 女

*3. 您的（或您孩子/学生）年龄段？

6 7

Figure 3: Online questionnaire

Participants of this study includes altogether 168 children, parents and teachers from 13 cities across mainland China, and among these participants, 40 of them are students, 124 of them are parents, and

Interested children based on emotion

4 of them are teachers. Besides, regarding the gender allocation, 53 of them are girls and 115 of them are boys. One of the reasons for the big difference between the boys and girls' participation ratio could be explained by the fact that boys' parents pay more attention to children's involvement with games than girls' parents. The whole sample also covers an age difference from First Grades to the Sixth Grades, with 9 participants from first grade, 24 from second grade, 16 from third grade, 15 from fourth grade, 51 from fifth grade, 35 from sixth grade, 18 from seventh grade. With all the survey documents sent out, 168 people participated and all of them joined in with free will. As the research is dealing with participants from all around the whole China, the anonymous and confidential will be guaranteed. All the procedures are approved by university as well as school administration. In addition, all the participants' information is confidential and data are accessible by the author only.

Each participant is required to provide background information regarding their access to digital games.

Each participant is required to provide background information regarding their access to digital games. Among all participants, 130 children own a personal computer, iPad or smart phone, through which they could play digital games and all of them played digital games at home; and the rest of the 38 children have no access to digital games at home. Almost all the children can have access to the digital games in a certain way, and about half of the participants can play digital games once per week, some of them have longer access to the games and even 10% of the participant could play digital games everyday. Almost all the participants agreed that they have certain time limits to play digital games at home, only about 8% of them have no time limit at home. With the children who have the time limit, 87% of them could play about 1 hour per time and among them, half of the participants have 30 minutes time. 5% of the children could play for over 2 hours per time.

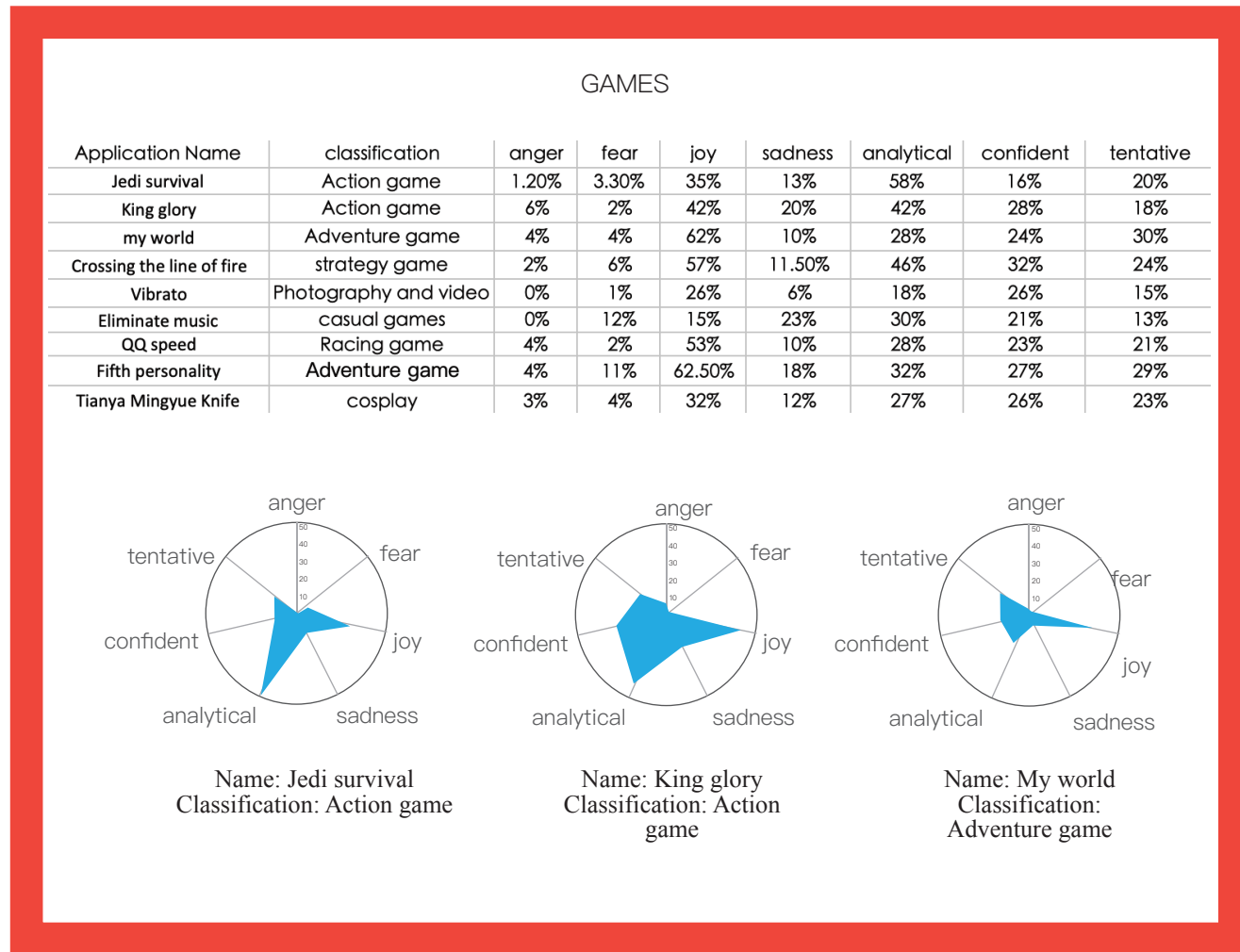
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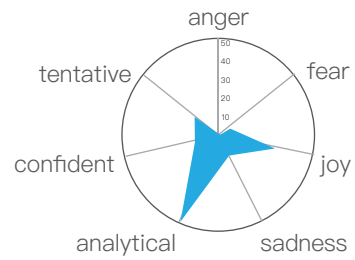
inter
 children
 based on emot

from the ratings of all these tools. The differences of previous data will be analyzed to provide a preliminary knowledge of whether children prefer to be engaged with programs that are calm, happy, aggressive, violent, etc.

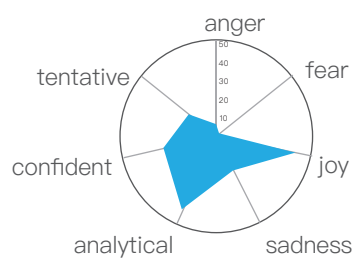
Product exploration

The exploration of what kinds of video games are mostly welcome by children is also conducted. In addition, information of what movies, toys and TV series children watch or use will also be collected

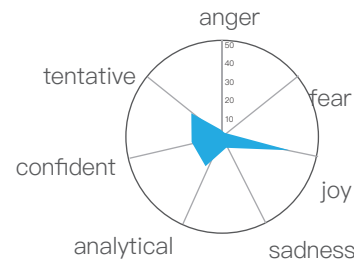




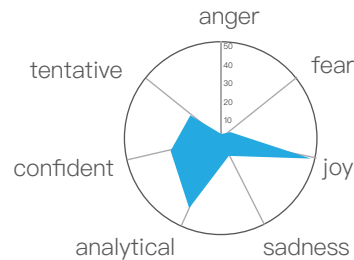
Name: Jedi survival
Classification: Action game



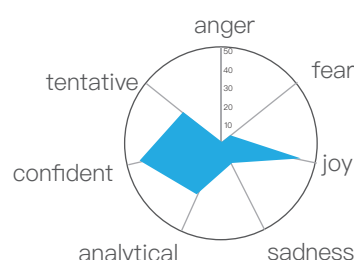
Name: King glory
Classification: Action game



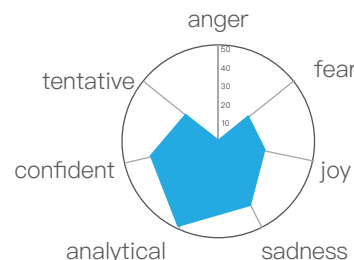
Name: My world
Classification: Adventure game



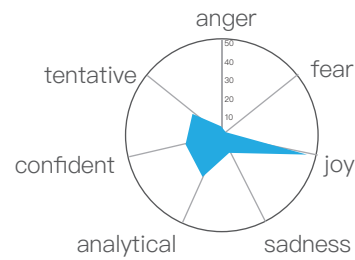
Name: Crossing the line of fire
Classification: strategy game



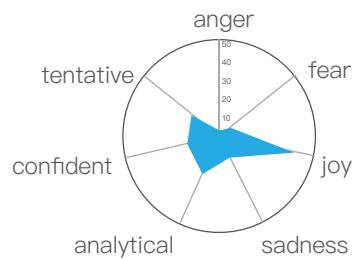
Name: Happy Elements
Classification: Casual games



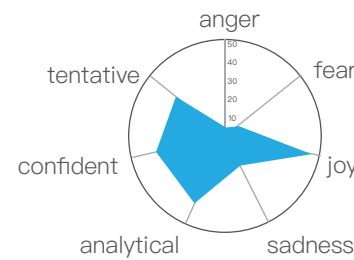
Name: QQ speed
Classification: Racing game



Name: Fifth personality
Classification: Adventure game



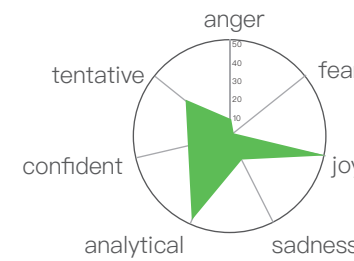
Name: Locke Kingdom
Classification: Casual games



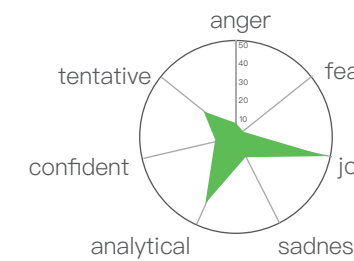
Name: Tianya Mingyue Knife
Classification: Racing game

TV SHOWS

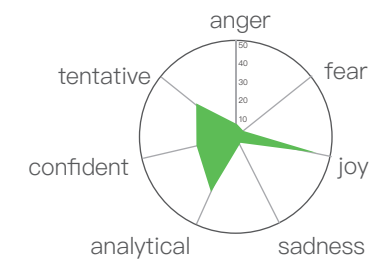
name	anger	fear	joy	sadness	analytical	confident	tentative
Little play bones: Dream	5%	1%	30%	8%	29%	14%	18%
Our boyhood	0%	1%	38%	9%	30%	8%	16%
Second season under or	1%	0%	46%	6%	27%	10%	12%
Zhenxing Street	6%	2%	42%	4%	32%	11%	17%
Assassin	1%	0%	47%	10%	34%	19%	9%
Full-time master	2%	0%	23%	5%	36%	15%	10%
Teenager is a bit cool	4%	0%	32%	6%	40%	7%	16%
Conform Heroes LEAF	1%	2%	30%	10%	34%	13%	7%
Small opera bone: Eight	3%	1%	39%	11%	28%	13%	14%
Breaking the sky	3%	2%	22%	12%	39%	9%	15%



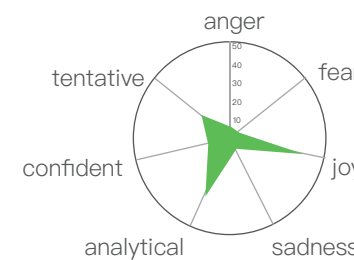
Name: Little play bones: Dream of Red Mansions



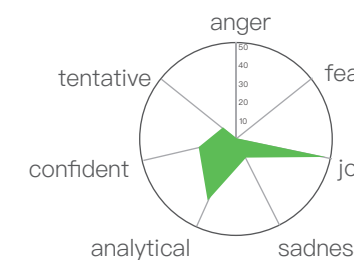
Name: Our boyhood



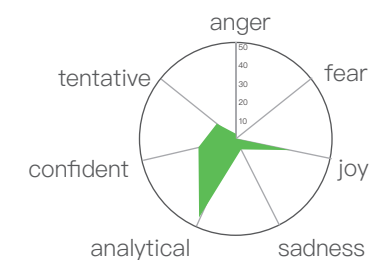
Name: Second season under one person



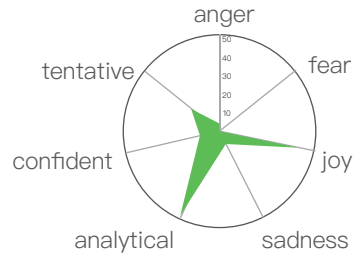
Name: Zhenxing Street



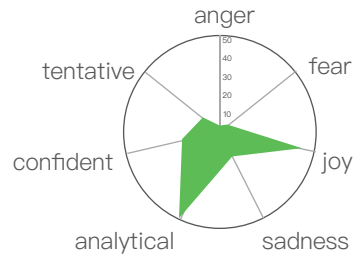
Name: Assassin



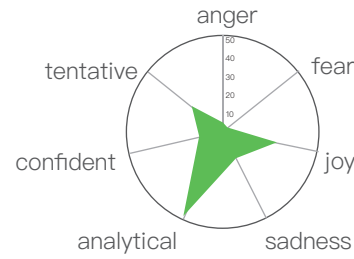
Name: Full-time master



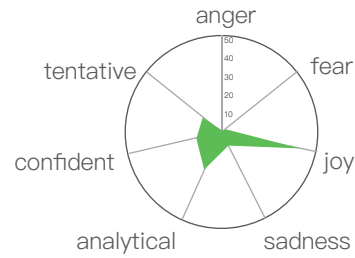
Name: Teenager is a bit cool



Name: Conform Heroes LEAF



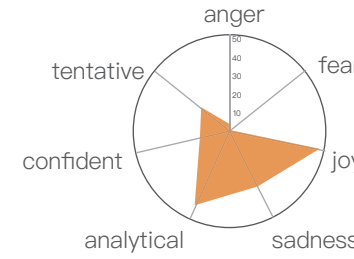
Name: Small opera bone: Eight Immortals crossing the sea



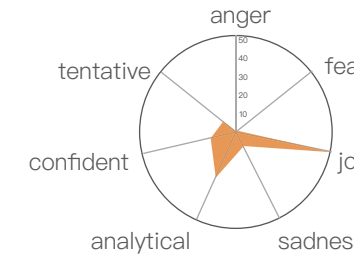
Name: Breaking the sky

MOVIES

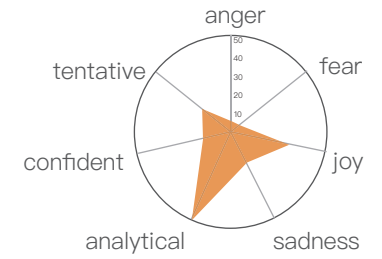
name	anger	fear	joy	sadness	analytical	confident	tentative
Coco	1%	0%	39%	27%	35%	12%	14%
Paddington 2	0%	1%	50%	8%	26%	14%	9%
Da Hu Fa	4%	4%	21%	12%	35%	11%	14%
Peter Rabbit	12%	3%	39%	10%	23%	14%	11%
Duck Duck Goose	3%	1%	40%	7%	29%	14%	15%
End of Summer	2%	2%	39%	14%	36%	15%	8%
Bear emergence	3%	2%	32%	8%	22%	13%	12%
TOFU	3%	7%	35%	9%	41%	12%	11%



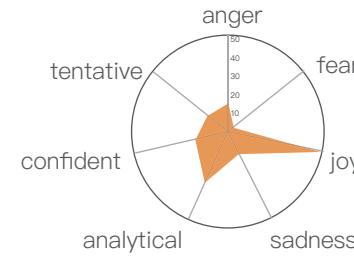
Name: Coco



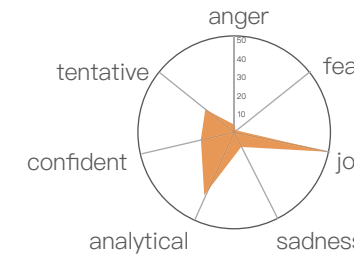
Name: Paddington 2



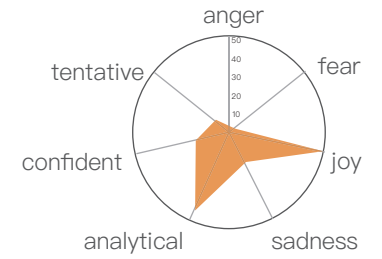
Name: Da Hu Fa



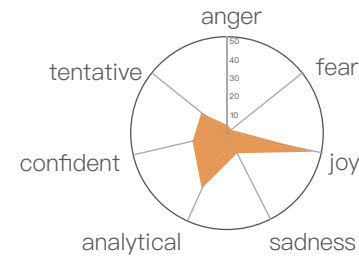
Name: Peter Rabbit



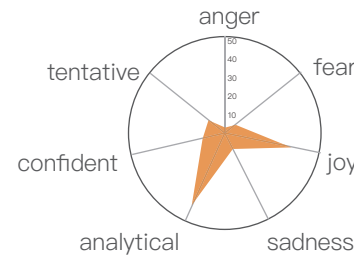
Name: Duck Duck Goose



Name: End of Summer



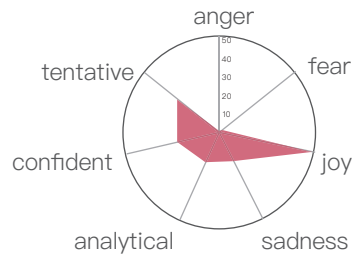
Name: Bear emergence



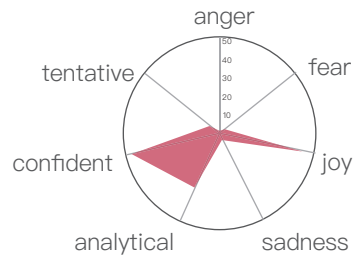
Name: TOFU

TOYS

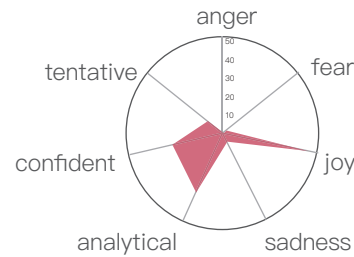
name	anger	fear	joy	sadness	analytical	confident	tentative
Tangram	0%	2%	40%	13%	13%	17%	21%
Experimental toy	0%	2%	35%	2%	21%	32%	4%
Kong Mingsuo	0%	1%	45%	5%	34%	27%	10%
Warship building blocks	1%	3%	41%	2%	21%	31%	8%
Jumping ball	0%	0%	37%	3%	11%	16%	7%
Paste painting	0%	0%	39%	2%	18%	30%	9%
table soccer	0%	1%	46%	1%	21%	39%	10%
microscope	0%	0%	27%	4%	13%	40%	9%
Map puzzle	0%	3%	37%	3%	14%	28%	6%
Aircraft carrier model	0%	1%	42%	14%	23%	19%	11%



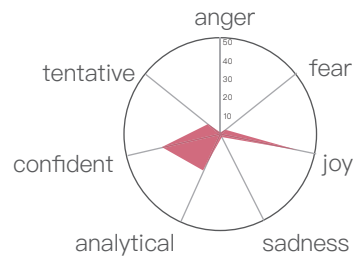
Name: Tangram



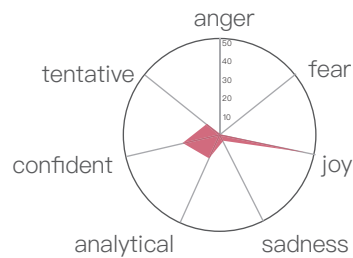
Name: Experimental toy



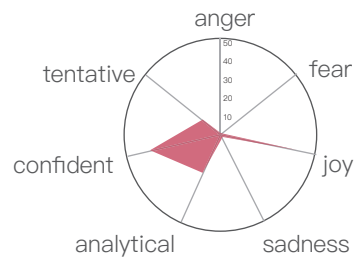
Name: Kong Mingsuo



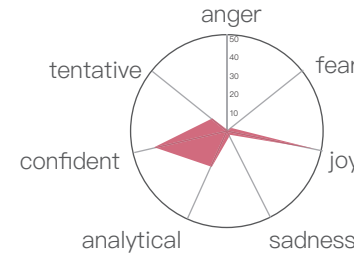
Name: Warship building blocks



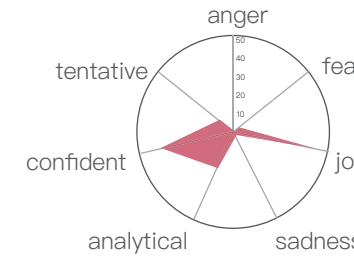
Name: Jumping ball



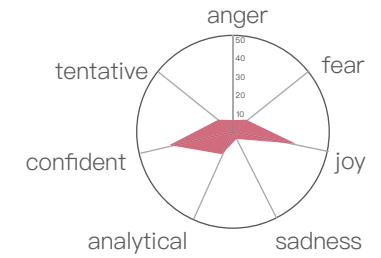
Name: Paste painting



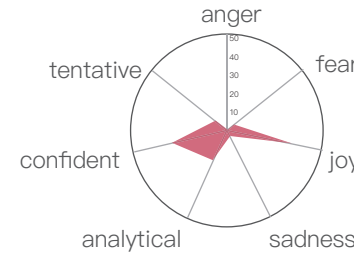
Name: Table soccer



Name: Microscope



Name: Map puzzle



Name: Aircraft carrier model

Table 1–4 and Figure4–7: Digital games, children's TV shows, movies and toys online comment analysis.

Active design of children's digital games Optional experience

The first picture shows the digital games, the second picture shows the TV shows, the third picture shows the movies, and the third picture shows the toys. In Figure 1, eight children's movies were broadcast from July 2017 to July 2018; ten children's TV shows; and ten of the most online-selling toys, and the ten most downloaded video games. And use the top 100 comments on each game, movie, TV show, toy review network, and analyze it at <https://voyant-tools.org/>. Divide the comments into seven emotions: anger, fear, joy, sadness, analytical, confidence, and tentative.

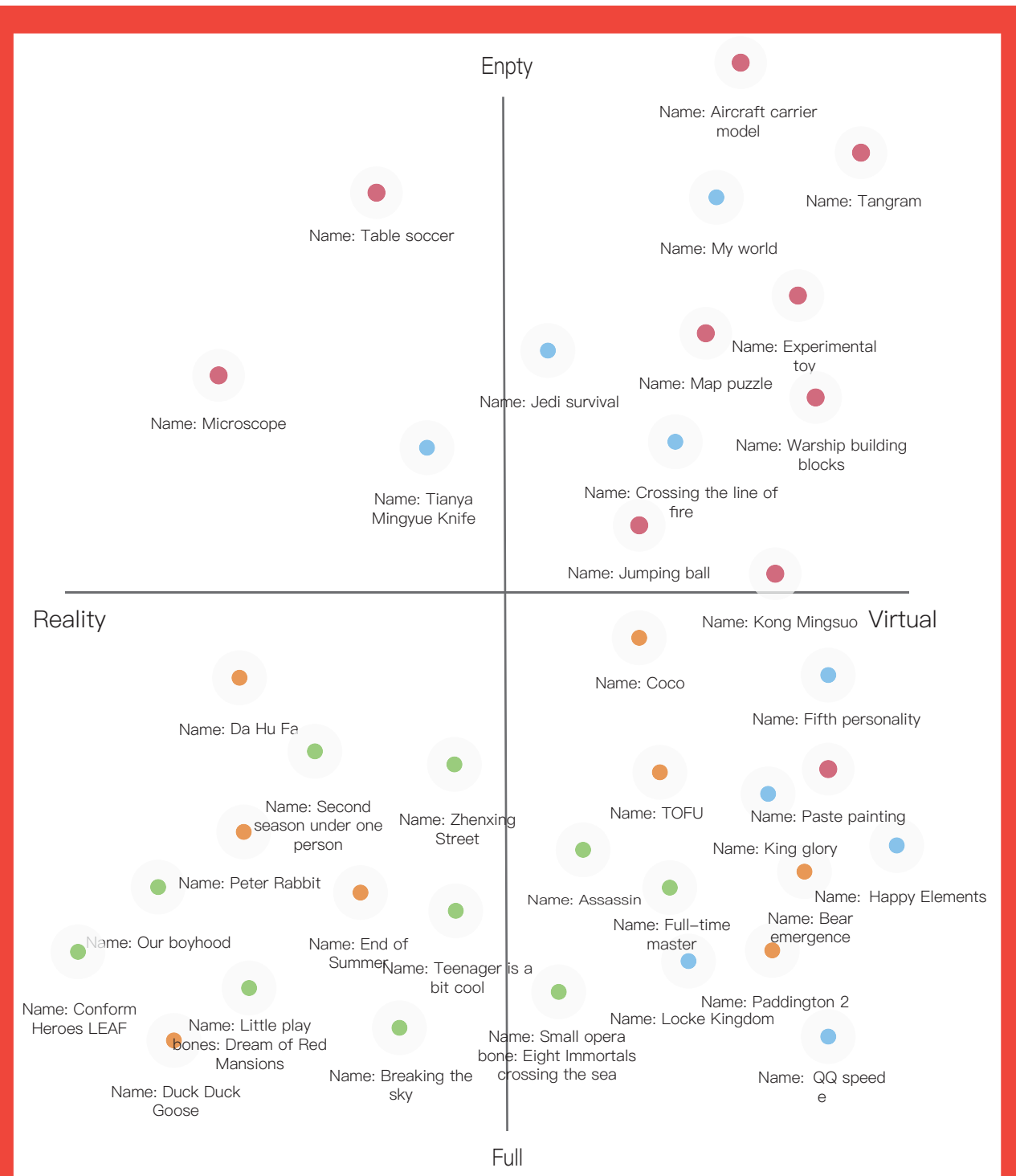


Figure 5: Operational freedom and background reality

Data analysis

Quantitative data approach is applied for data analysis. Frequency of each item is coded into the matrix of SPSS. Two independent samples t-test is conducted to test whether the mean at baseline for

each item of prosocial behavior as well as problem behavior is the same for boys and girls. One-way ANOVA is used to test if the girls and boys as well as the age differences differ in prosocial skill and problem behavior. Correlation among different variables is also measured to predict the connection among all variables, such as gender and age to the social and emotional skills. Concerning the fact that the data is obtained from students of separate classes and grades, there is a need for multilevel approach. However, the small data setting limits the possibility to conduct a multilevel perspective analysis (Kreft, 1996). Therefore, an intraclass correlation coefficients (ICC) is demanded to find out how much of the variation is interpreted within the class. This statistical data of participants provide information on their emotional recognition skill as well as emotion regulation skill during interactive digital game playing.

Qualitative data approach is applied for analyzing the open questions in the survey.

The categorization of the emotional data will be following the guidance of these definitions:

ANGER: Likelihood of writer being perceived as angry. Low value indicates unlikely to be perceived as angry. High value indicates very likely to be perceived as angry.

FEAR: Likelihood of writer being perceived as scared. Low value indicates unlikely to be perceived as fearful. High value, very likely to be perceived as scared.

JOY: Joy or happiness has shades of enjoyment, satisfaction and pleasure. There is a sense of well-being, inner peace, love, safety and contentment.

SADNESS: Likelihood of writer being perceived as sad. Low value, unlikely to be perceived as sad. High value very likely to be perceived as sad.

ANALYTICAL: A writer's reasoning and analytical attitude about things. Higher value, more likely to be perceived as intellectual, rational, systematic, emotionless, or impersonal.

CONFIDENT: A writer's degree of certainty. Higher value, more likely to be perceived as assured, collected, hopeful, or egotistical.

TENTATIVE: A writer's degree of inhibition. Higher value, more likely to be perceived as questionable, doubtful, limited, or debatable.

04

METHODS

inter
children
based on emot

— 05

RESULTS

Type of digital games

Motivations to play digital games

Emotions recognized

Frequencies of emotions sensed

Consequence and influence of
the emotions

Emotion regulation and social
relationship

06

DISCUSSION

INTRODUCTION

active design of
en's digital games
otional experience

inter
children
based on emot

interactive digital games, what emotions they have
in playing games, how their emotion in playing
games would affect their social interaction in real
life with parents and family and friends.

Results

The paper examines the emotion experiences chil-
dren encounter from their involvement with the
interactive digital games. The result will be present-
ed as the reasons that motivate children to play

Type of digital games

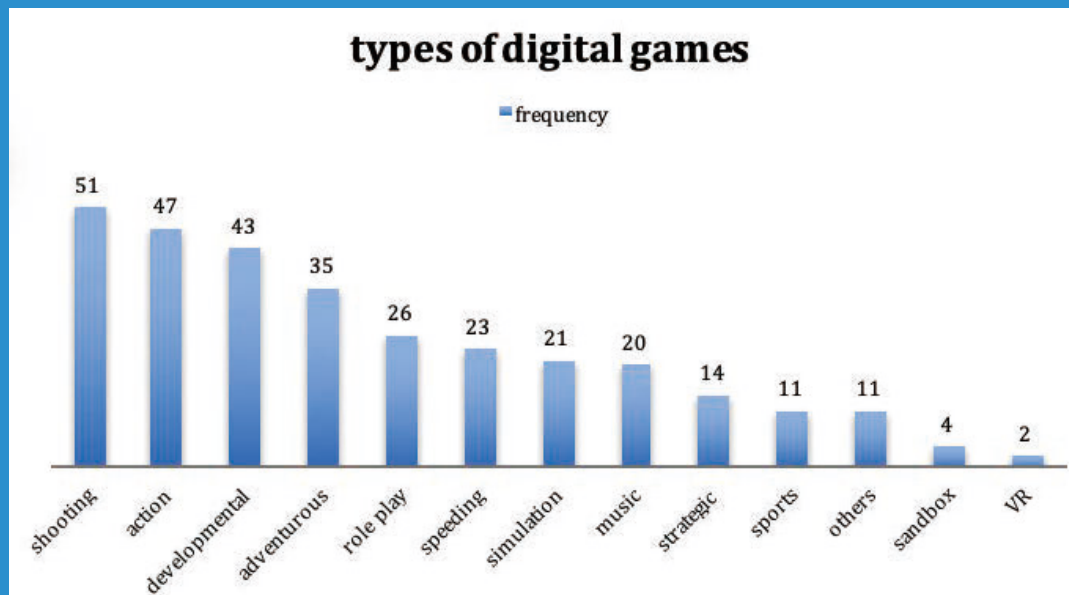


Figure 8: Frequency of various digital games children play

According to the Figure 3, there are more than 13 different types of digital games from which children could select and are most popular among the young children at present for their entertainment in their free times. Shooting games ranked first among all the games with a number of 51 nominations among all participants and it takes up about 40% of all the games. Second most popular one was the action games as 47 children preferred to play the game, and it occupied about 36% among all the games. The next one was the developmental games, which was about 33% with the 43 nominations among all. Adventurous games were about 27% among all games when 35 children have been joined in this type of games. Adventurous games were followed with role play games at about 20%, and then the games that require the speed and full attention, such as car racing games, were at about 18% among all game types. Simulation games and music games were more or less similar as both of them were rated at about 16% compared to other games. Sports games like football games were about 8.5% among all the game types. The more recent games

active design of
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otional experience

that required real high technics as VR games and sandbox games were lowest at about 1.5% and 3% respectively. The rest of the 8.5% of the games were defined as others when the participants could not find the proper categories for the games that children have played.

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children
based on emot

Motivations to play digital games

The present study also aimed at investigating the reasons behind children's desire to play interactive digital games, or in other words, what have motivated children to be involved with the interactive digital games instead of being associated with other

Interactive design of children's digital games: emotional experience

digital games instead of being associated with other types of entertainment, or example, playing outdoors with their peers, reading at home or in library, etc. Altogether 130 participants answered the question and provided their answers to this specific question.

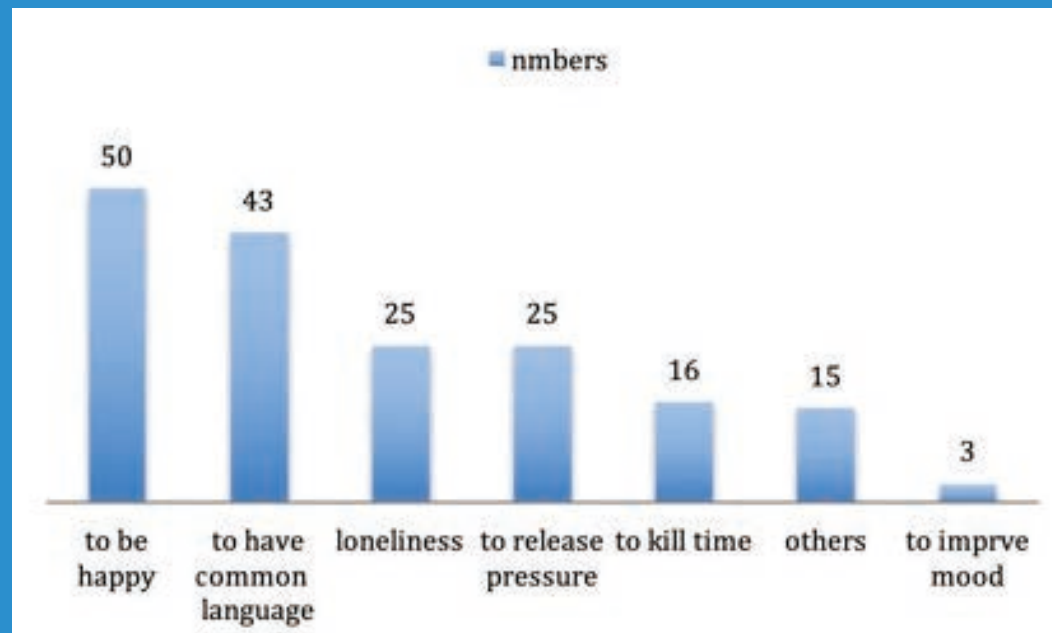


Figure 8: various motivational reasons behind playing interactive digital games

Interactive design of children's digital games: based on emotion

Based on the Figure 4, we can conclude that children play interactive digital games for various reasons and the most popular one was because of their fondness of digital games and their preferences to play the interactive games as playing digital games could make them happy. 50 participants out of 130 have played games out of the reason to seek happiness during game play. Another large number of group of children played interactive digital games for the reason that because their friends or peer also participated with the same games and thus playing same version of the digital games will enable them to gain the common language to be associated with peers. This type of reason has occupied 33% of all the reasons listed. Next was the reason of being lonely at home and when they feel bored, playing digital games would be a pleasant tool to improve their mood, the same amount of 25 participants have voted for the reason that playing interactive digital games helped them to release the pressure. 12.3% of the participants have confessed that playing digital games was only a way of killing times and with no other specific reasons. Meanwhile, there

There were also 3 participants indicated that playing interactive digital games would literally improve their mood when they had negative emotions.

participants could choose as many emotions as possible as long as they are able to determine the emotions. Altogether 168 participants have voted for the emotion recognitions.

Emotions recognized

Another fact that the present study has explored was which emotions children can recognize among the seven following emotions as happiness, disgust, contempt, sadness, anger, fear and surprise. All the

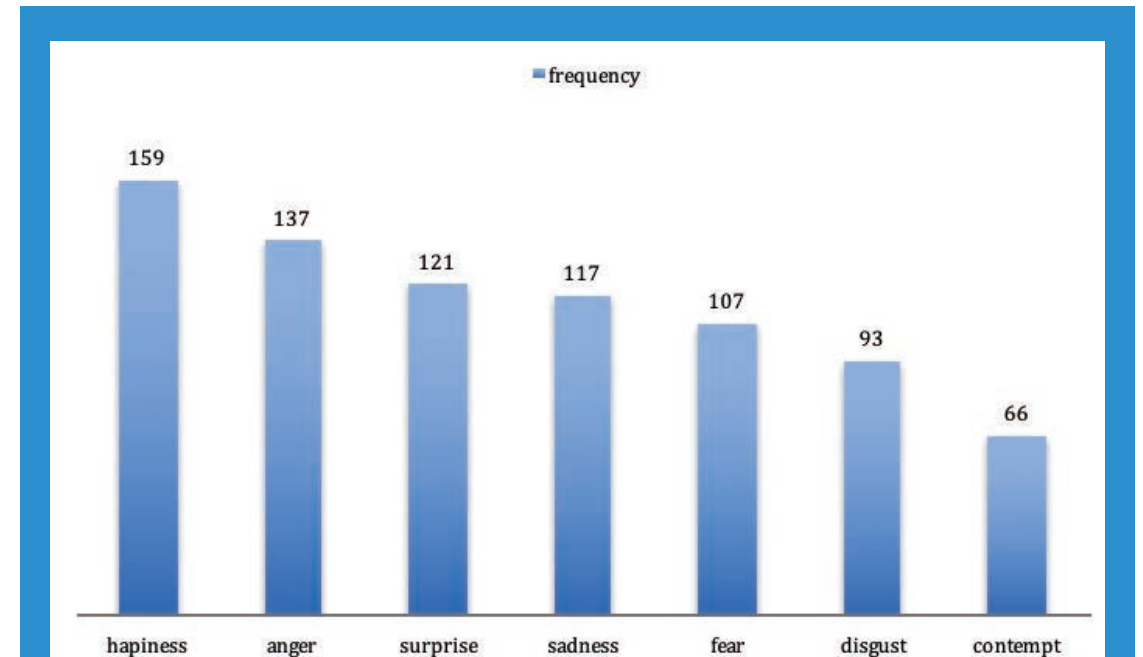


Figure 8: the number of the emotions that are recognized by the children

According to the Figure 5, happiness is the easiest emotion for children to be recognized as among 168 participants, 159 of them could easily notice the emotion of being happy. 137 children could recognize the emotion of anger in social interaction or in playing digital games. And 121 children are believed to be able to tell the emotion of surprise among the rest of the emotion recognitions. Most of the children, about 117, could also distinguish the emotion of sadness from the rest of the emotions. 107 children could tell when they feel afraid or frightened in their daily life. About half of the children, with the number of 93, could recognize their emotion of feeling disgust and even less children, only about 66, recognize the emotion of feeling contempt.

Motivations to play digital games

After the participants have provided the information about the recognitions and understandings of all seven emotions, the present study also asked the participant to vote for the frequencies of each emotion they have sensed in the game playing. All

the 168 participants were required to distinguish each emotional experience among four regulars as never felt, sometime felt, frequently felt and all the time felt.

emotions	never	sometimes	frequently	all the time
happiness	17(10.12%)	54(32.14%)	74(44.05%)	23(13.69%)
anger	68(40.48%)	80(47.62%)	16(9.52%)	4(2.38%)
disgust	99(58.93%)	56(33.33%)	9(5.36%)	4(2.38%)
fear	106(63.1%)	53(31.55%)	7(4.17%)	2(1.19%)
sadness	105(62.5%)	52(30.95%)	10(5.95%)	1(0.6%)
surprise	57(33.93%)	84(50%)	26(15.48%)	1(0.6%)
contempt	105(62.5%)	48(28.57%)	13(7.74%)	2(1.19%)

Table 5: Frequency of all emotions sensed in game playing

As regarding the emotional experience of happiness, about 10% of participants selected the item as they have never experienced happiness in game playing, and about 32% of the participants have experienced happiness from time to time, and almost half the participants have the positive emotion experience frequently in game playing, besides, there are also at proximately14% of children felt happy during the whole process of game playing each time. Opposite to the happiness, about 40% of children have never felt angry in playing digital games, whereas quite low rate of children, about 2.4% sense anger almost all the time. Almost 50% of the children have recognized anger from time to time in the process of game playing and 10% of them sensed anger quite frequently compared to others. Quite similar to the frequencies of anger experienced by children, 59% of them have never felt disgust, and the number of the children who selected this item is over half of the all participants. In contrast, only 4 children have experienced the disgust emotion all the time. There is also large number of children, about 39% altogether, who have sensed disgust at a certain point

in their experience of game playing. For the emotional experience of fear, sadness and contempt, the majority of the children have never had encountered these types of emotional experiences in their involvement with game playing, and comparatively, only one or two children have felt fear, or sadness or contempt throughout the game playing. For fear, about 31% of children have encountered this emotion in game play and about 5% of them have more frequent experience with fear. Similar result could be found in the emotional experience of sadness and contempt. For emotional experience of surprise, relatively lower frequency could be found in never experience surprise, and even less in all the time felt surprise with only one child's selection. Half of the children have identified that they have experienced surprise from time to time in game playing for different reasons and about 15% of children have experience surprise with higher frequencies than others.

Consequence and influence of the emotions

With a deeper understanding of the frequencies of seven emotions experienced in children's game playing, more was investigated in order to gain the understanding of how children's emotions encountered in game play would affect the life situation

after the game. In other words, how children distinguish the emotional reaction within and without the game playing and whether the emotion would affect the real life interaction and association with others. The present study therefore designed to ask children if they have expressed their emotions openly when they have positive or negative emotions in game playing. For example, whether they would jump and celebrate when they are extremely excited and oppositely scream and being aggressive when they are angry, or if they maintain mostly calm no matter in what kind of emotional experiences. The result indicated that about 18 participants (11%) selected that they would always express their feelings with outburst behaviors. 60 children (about 36% among all) stated that they express their emotions open at sometimes and more or less the same amount of children (46% of all) believed that they prefer to express their emotions frequently. Only a really small number of children have no experience of expressing their emotions freely to others, which has occupied about 7% of all children.

In addition to the understanding of whether children would prefer to express their emotions openly or to contain their emotions, the present study also aims at exploring whether children these emotions experienced in the process of game playing would linger after the end of the game and whether children are capable of regulate their positive emotion and negative emotion when interacting with real life. First of all, the results could be divided as whether children's emotions would maintain in their real life from two perspectives as positive emotions and negative emotions.

	positive	negative
all the time	13	3
frequently	27	8
sometimes	58	42
never	70	115

Table 6: the frequencies of remained positive and negative emotions

For positive emotions, 13 of the children confessed that their positive emotions remained even though the game has ended whereas only 3 children have their negative emotions lingered after the game. 27 children selected that their positive emotions lingered quite frequently after the game and comparatively only 8 of them have negative emotions lingered frequently. Relatively, 58 children have experienced the positive emotions from time to time after the end of the game, and 42 of the children have the negative experience with the emotion linger. There were also high rate of positive emotion experiences that were categorized as never lingered and even higher rate was observed in negative emotions among 115 children.

Emotion regulation and social relationship

It was also investigated about people's opinion on the influence of negative emotions from the game playing to the improvement of social relationship with family and friends in real life. 9 participants have agreed on the positive influence on their social

relationship in real life, among them, 9 believed that they are highly and positively related, and 17 thought they were somewhat related, and 29 believed that they were slight related to the improvement of social relationship, however, the majority of the participants, with the number of 113, did not consider the negative emotion would affect their social relationships with friends and family.

Similar results could be found in the correlation between positive emotions and their social relationships. Altogether 90 children did not believe that their positive emotion lingered from game play would have positive influence on their social relationship establishment in real life. Whereas 78 children believed that the positive emotion would also affect positively on their social relationship, among them, 9 participants even regard them as highly related.

Furthermore, how the people around the participants would conceive their emotion change was also explored with the question that whether others

would behave negative or feel agitated when the participants have negative emotions after game playing. 11 participants have sensed that the other would mirror their emotion and felt negatively if they themselves were in a bad emotional status. More than 100 participants have similar experience to sense the relatively low mood from friends and family when they themselves were in a negative emotion. However, there were also 50 participants who had not recognized any emotional change from others even though they were in a negative status.

With all these done, the researchers also asked if the participant believe that the digital game playing are related to their emotional experiences. Only 53 participants thought the relations were negative, and the rest of all believed that there were certain degree of correlation between the action of playing interactive digital games and their change of emotional status. Among them 26 consider them to be highly related and 89 thought they were somehow related, no matter the correlation was strong or weak.

When asked about whether the emotion recognition would be beneficial in regulating children's emotions, 6 participants indicated that through recognizing the different kind of emotions, children are also able to regulate their emotion status in real life. 23% of the participants believed that learning the emotion differences would enable children to regulate and control their emotion experiences. 33% of them regard the emotion recognition as profitable in children's emotional regulation. However, the rest of 41% of participant denied the function of emotion recognition in emotion regulation.

These results are relatively similar in participants' nomination of whether the game playing would improve children's emotion regulation skills.

Emotion regulation and social relationship

It was also investigated about people's opinion on the influence of negative emotions from the game playing to the improvement of social relationship with family and friends in real life. 9 participants have agreed on the positive influence on their social

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RESULTS

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DISCUSSION

Children's involvement with
common language

Dominance of emotions

Emotion patterns

Influence of interactive game on
emotions

The benefits of playing games

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CONCLUSION

INTRODUCTION



Figure 9: Children were to be happy and to have common language with friends and peer.

Discussion

Children showed various of different reasons to play computer games, and the most highly rated reasons in our study were to be happy and to have common language with friends and peers. With which, they can have easy access to a certain social group and

to be easily accepted and welcomed by that target group. According to Fabio's research result, this also explains the people's preference to be involved and engaged with certain social group or social community. Fabio believes that involvement is a contagious fact, however, people can be positively infected by this virus. Even with a small number of carriers in a narrow social circle can also be enough to spread an interest or a passion in a community or a group. All the spreading and populisation could be completed without any forcing or obligations, people are just motivated and interested in taking part in the same activities. At the same time, this kind of involvement or engagement can be developed and enhanced within a certain social group or community to create social relationships. All individuals have, at least once, felt the desire and the need to share their passion with friends and relatives, or to be involved or engaged with people who show the same interest or passion.

All these interest or passion will spreads to people who are close to us and they could also be trans-

mitted from us to others in a continuous manner: when children are players of a same game, this enthusiasm will be spread to their peers and friends. Peers and friends who want to be involved or engaged with other players, will start to play the same game in order to have the common language to share the interest and passion. Children who are around these groups, even not involved with the games, could benefit from other children when they witness that they are happy and are enthusiastic about the game, because getting closer and breathing the overwhelming positivity could make their social connection more stronger and their emotion shared and spread.

This spreading of the positivity or the desire to master a common language among children is also defined in Fabio's advocate as social influence: the perceptions, judgements and even the actions of every individual tend to change according to the social sphere of which it belongs to as a part. Friends or peers use the same platform or play the same games tend to exchange experiences and

share their emotions such as anger, happiness, despair, or disappointment with mutual understandings. This also shortens the distance between friends as it links not only the closest friends but also seemingly unpredictable relationships to feel close and be bound to each other. With this common language or common interest within a certain group or community, we feel more involved or engaged with each other and, especially children, will not feel isolated if they are otherwise too shy to interact with their peers. It is a feeling strongly linked to sharing, socializing and knowing they are not alone.

This is one effective way to adjust children's emotional presentations and expressions when engaged with others, be it happy or sad or angry, etc. A person involved in any type of activity or product has the physical and psychological changes.

Our behavior changes spontaneously, even without the need for any pre-existing motivation or interest, in a state of positive propensity and active participation. The hours fly away quickly without realizing

it: in these moments we become more focused, serene, creative and happy, we tend to think for goals, to give our best and to develop creative solutions. For these moments, like our result shows that children's another reason to play game is to find the happiness in playing, children's intention and the purpose of having common activities and interest is to enjoy the moment of game playing and extracting the happiness from the games.

Dominance of emotions

Children of early age are believed to be able to recognize different types of emotions that they have experienced in game plays. Especially the emotions of the first layer in the emotion hierarchy as positive emotion and negative emotion. The result of the

present study also showed that children are able to distinguish the basic emotions such as joy, sad, love, fear and anger.

Emotions are assumed to shape the individual's personal development. When the emotions are recognized and activated, they help to shift a person's goals from previous state to a complete new period that is defined by the emotions. For example, when a small child is mad at other people's interference with his ongoing activities, no matter watching TV series or playing a game, he or she will halt the activity and start to complain, or become mad and try to push the person away from her, or even start to cry or to behave aggressively. This series of behaviors from early years would change and develop throughout the life. For example, when children become adults, they start to control and regulate their emotional expressions, they might rely more on verbal approach to solve the problems and more organized and controlled in responding to others.

One of the developing effects of emotions is

engaged with the dominance of one emotion experienced by an individual. It is claimed that when an individual experience one certain emotion repeatedly, it will define their development by shaping both their facial expressions as well as their personality. Malatesta (1988) has proved that for adults have demonstrations of dominant emotions. For example, when they try to express other emotions, they show themselves in their facial expressions, meanwhile, they show their personal characteristics as well. Different type of personality development is closely related to specific emotions such as depression to sadness, anxiety to fear, security to happiness and so on. Malatesta's (1988) research also indicated the connection between characteristic expression and personality assessments. What appears on the face is a reliable hint of emotional experiences and expressions. The present study tests this claim by relating children's emotional experiences within the game play to the behaviors and expressions outside the virtual game world. In the present study, when asked about the influence of one dominant emotion in game play, for example, the repetition of emotion

of happiness would be expected to be connected with the positive behaviors towards their friends and families after the game play. In the long run, according to Malatesta's theory, this repetition of dominant emotion would enhance individuals' personality to be with secured feeling in their social relationships. From another perspective, the association between dominant emotion and social behavior or personality could be used to regulate children's social emotion and behavioral skills. For example, if the interactive games could be designed to mainly satisfy children's desire to win as to promote the emotion as achievement purpose, with the repetition of happiness they experienced in game playing, children's happiness level will be improved and also the maintenance of positive emotion could be enhanced in the long run. This would also lead to the discussion of the influence of negative emotions as anger and disappointment children might experience in their involvement with interactive games, as the negative emotion is associated with the aggressive behaviors. Thus in designing the interactive games, people need to take into consideration to

avoid the negative emotions that children might encounter.

Children's emotional patterns are also related to their social relationship with others because of their social nature. For example, young children will establish different types of emotion-based social relationship with adults (Bretherton & Waters, 1985; Bowlby, 1980). Each type of relations is shaped by the distinctive emotions, such as joy, anger, fear, love or care, etc.

Emotion patterns

Researchers have claimed that there are three major patterns of social attachment among people, no matter in young children or adults. These three types are categorized as following: secure attachment, anxious/ ambivalent attachment, and avoidant

attachment. Hazan and Shaver (1987) explained these attachment styles mainly from the perspective of emotion appraisals and self-control procedures. Secured individuals express their feelings and emotions comparatively freely and they are also easy to be soothed when the individual of the attached relationship react to their negative emotions. Whereas anxious and ambivalent individuals have the tendency to convey their negative emotion with protest. For this group of people, protest is an effective way to attract attention and support from the individual of the attached relationships. Avoidant individuals prefer to behave with deny, suppress or so called deactivate the emotions because their expressions have not caused any satisfactory or proper responses from the attached person from earlier experience.

Even though all three different attachment styles are differentiated with different individuals, because people normally have a dominant attachment style based on their personal characteristics, it is still significant to know that these styles could co-exist

in a single individual. Many people also present different attachment styles towards different individuals.

In our study, we investigated how parents and friends react to the children when they behave negatively or positively with the emotions that they have experienced with the game playing. For example, children might feel negative and behave aggressively or passively towards family and peers. The result of the present study showed that most of the family members or friends around the game players are able to sense their emotional change, either negative or positive even though the survey reported that only less than half of the emotional reactions remained after they have ended the game. Based on the attachment theory, first of all, as children will develop the avoidance relationship because of the neglect of parents reactions, it is thus suggested that parents should pay attention to children's emotional status after their game play in order to let children release the arousal or pressure encountered from the games. Thus, with the aim of

establishing secure relationship with others under the happiness emotion, parents are encouraged to be involved with understanding children's psychological reactions and conceptual development. As children of this age group are all able to identify and recognize their emotional experiences, it would be easy target to sooth children's negative emotion and to enhance their positive emotion.

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Influence of interactive game on emotions

As we can see from our result that interactive games such as shooting games and action games are much more popular among young children and these games are easily supposed to be danger and violent video games. These types of games are also

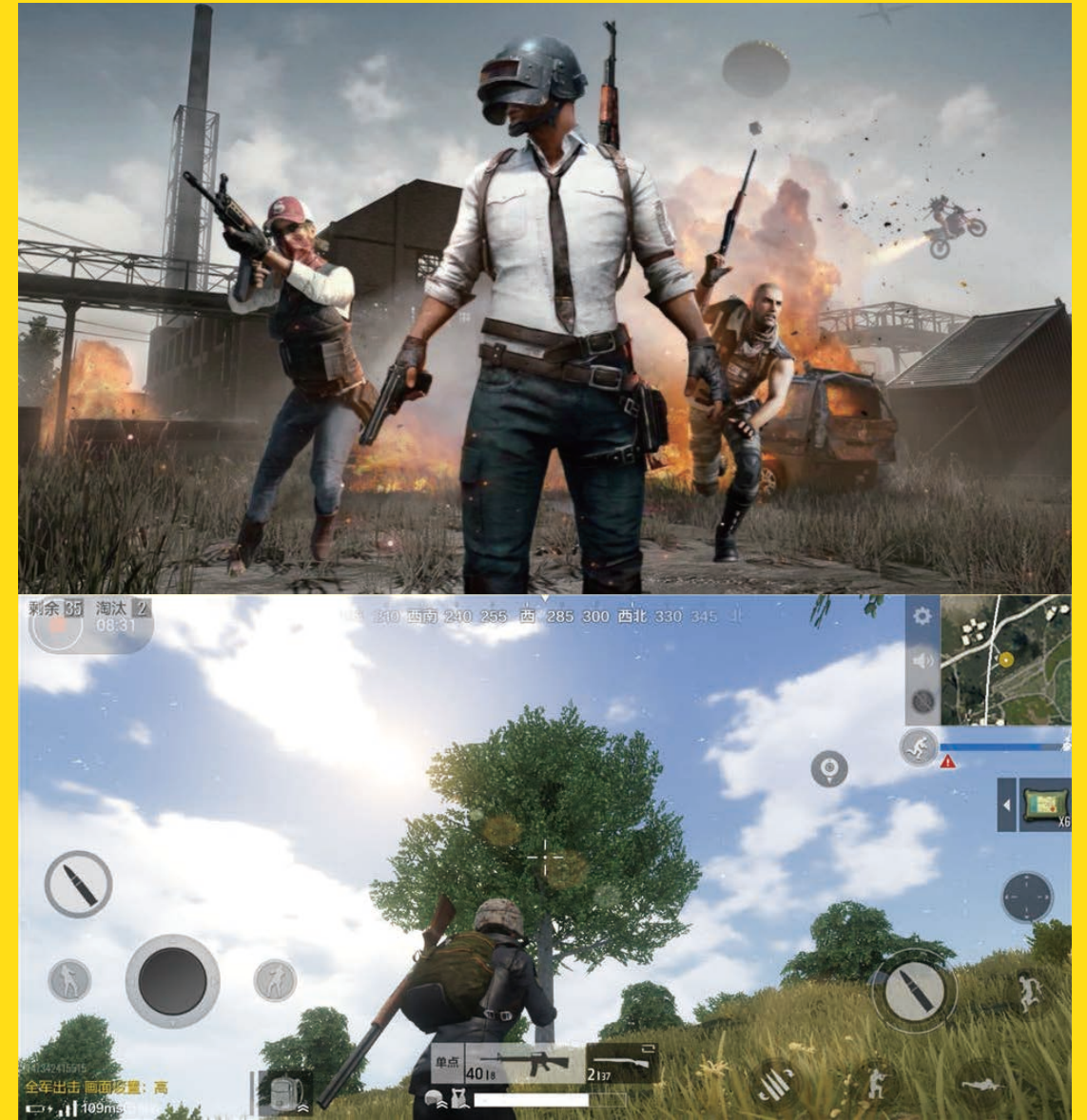


Figure 10: Jedi survival, China's most downloaded shooting game.

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believed to serve a part of cognitive and emotional learning processes. Researchers also analyzed the correlation between children's experiences of playing and being stimulated by strong emotional interactive games to cognitive and physical interaction with the virtual game world as well as the development of the emotional skills. Previous researchers also compared the influences between watching a film and playing an interactive video game on children's emotion reactions (Grodal, 1997). In order to induce strong emotional reactions, there is a need to have treat towards their lives or health to break their secured feelings. An physiological reaction, arousal is then elicited, which will lead to emotions if analyzed cognitively. Early researcher Frijda (1986) once mentioned that emotions could be regarded as the modes of relational readiness of actions, no matter in a condition of showing a tendency to establish, maintain or disrupt a relationship with the surrounding environment or presented in the type of relational readiness or as such.

The most convincing example would be that in

children's playing shooting games, when they are faced with a gun pointing directly to the center of their face, this would immediately create their physiological arousal. However, how your arousal would be transformed into an emotion is determined by the context of the game at hand. If the child are armed at the moment of encountering life threat, he or she might feel anger or aggression and start to fire back before the enemy, whereas if he or she is unarmed, they might feel horrible and fear for their lives and thus react as searching for ways to avoid being shot or escape quickly, or if they are cowarded by the situation and unable to cope with that and feel despair and defeated. In contrast, if you are safely situated behind the screen as the one who is watching the game instead of playing the game, there is no interaction occurring and the sudden arousal might be transformed into delight or relaxed feeling. Researchers consider these emotions as phasic. Which means that there is always an inducing cause of arousal, resulted in the comprehension of what to do with the faced situation, which will consequently give guidance to the actions that will

eventually transform the emotion by removing or transforming the original causes of the emotions. According to the series of phases, the emotional experiences could be divided into several different steps as having a cause, an arousal, a cognitive comprehension and a labeling of the arousal, and then followed by relational actions to remove the original arousal.

There is large difference between the film viewer or TV watcher and the interactive game player. For a film viewer, they have no control over the direction of their perceptions and consequently no control over their reactions to the arousing events. However, as a reviewer, they can also bridge the combine the perceptions and actions by different cognitive and affective strategies. Films and TV series shown are usually input-driven that ensures a strong input of events to stimulate reviewers' arousals. These events and plots are designed with the aim of overwhelming viewers' and as a result to, to cause viewers' passive emotional responses like crying or fearing. For these reactions and emotional arousals,

reviewers actually experience them as a third person or a witness to events and plots (Carrol, 1990). These kinds of third-person perspective are often provided with close link between the way of presenting the events as well as the emotional-inducing elements and the protagonist's close concerns and actions. If the events or plots could stimulate viewers to connect the perceptions, concerns and actions as if they were the protagonists, the emotional arousal would be more stronger and more active.

Compared with events in films and TV series, the emotional input from video games is less than watching TV or film. However, video games makes up for this by providing devices that would be connected to output. Video games usually give access to the interactive interface, so that the player could have control over the consequent actions and also the perceptions with the possibility to control the point of view, the result, the direction and the actions of how the game world would be proceeded. This is the reason to the differences

between the TV or film watchers, that are basically listed as follows: 1) the interactive game player needs to use attentive focus on the game in order to control the perception, the action and the consequence of the game playing; 2) the player needs to make mental maps of the game space from a three-dimensional perspective, just the same as the real world. For example in the shooting games, children need to pay close attention to the landmarks, the corners, the turns, and so on; 3) with the advanced devices, children also need to coordinate their visual attention and the motor actions perfectly to give order to react immediately if needed. The feedback from the activation of this coordination system will also stimulate additional physiological arousal; 4) this emotional significance and the labeling of a certain event-related arousal requires children's high level of ability to cope with a given problem. This capability varies over time and vary from child to child. Mostly it requires children's high level of emotional control over the reactions and actions; 5) young players will get a continuous or short-term satisfaction and happiness from his

performances, such as winning the games or conducting a satisfactory action. However, they could also face continuous or brief frustration and anger from failure of an action or defeated by other players; 6) we should all be aware that whether children experience happiness, satisfaction or frustration, and depends on the children's motivation for performing, and being successful or fail is partly determined by the players' emotional status as well as the ability to handling the emotions instead of games themselves. In addition, the length of the video gaming depends also on the player's own motivation as well as their ability to distinguish the virtual world from the real world and the capability to detach their emotional feelings from the virtual world. All these elements have emphasized that video games are more focused on the relations between emotional input and output, as well as the relation between perception, attention, emotion, and motor control, actions and so on than barely watching TV or movies. Thus, arousal could also be experienced from output. The interactive game players are usually participating in a way that he or she

becomes the part of the given world.

The benefits of playing games

A lot of researches have been conducted to investigate the function of the playing the video games. Many researchers from different fields have confirmed the positive benefits children can obtain from playing video games, such as the evolutionary

psychologist has emphasized the adaptive functions of play (Bjorklund & Pellegrini, 2010) and also the developmental psychologist has confirmed the positive function of playing (Erikson, 1977). It has been widely accepted that playing games could provide children an early access to experiment with social experiences and simulate alternative emotional reactions, which could also be implicated in the context outside the game context. Other virtual real-life games could provide children chances to reproduce real-life situations and experiences where they can work out solutions for their own pleasure and positive emotions and to reduce their negative emotions. Also, through playing games, children can also experience other elements such as power, dominance, aggression, anxiety, pain, loss, growth, and joy and so on which might not be able to experience in their real life and they can also learn to handle with all these feelings in gaming and exemplify their control over it in real life. In addition, neuroscientific research has revealed that play fighting or shooting games would stimulate the release of chemical growth factors in the certain part of the brain, the orbital frontal cortex, that

controls the social activities and as a consequence, enhances the growth and development of the areas that have been stimulated.

With a combination of our results, we could divide the benefits of video gaming into four main categories as cognitive benefits, motivational benefits, emotional benefits and social benefits.

For cognitive benefits, researchers have proven that especially in the shooting games, where children need to take a lot of actions based on the environment, even though they are violent in nature, it helps to activate a wide range of children's cognitive skills. The experiment conducted by researchers have shown that children who play shooting games show faster and more accurate attention placing, as well as higher spatial concepts in visual processing, and active mental rotation ability (Green & Bavelier, 2012). Other researchers have also concluded that the cognitive advantages are also manifested in neural processing and efficiency. Bavelier, Achtman, Main and Focker (2012) have conducted a magnetic resonance imaging study where they found out that

the brain part, the fronto-parietal network, that controls attention allocation is less active in children who are tested during a challenging task, such as shooting, than in non-gamers. Therefore, researchers believe that challenging games, like shooting and killing, help the players to allocate their attentions more effectively than others and to filter out irrelevant sources and information more efficiently. In conclusion, specific kinds of video games enables children to enhance their cognitive functions, and some of the games also helps to generalize and reproduce a real-world contexts.

Regarding the motivational benefits of gaming, we can summarize that certain types of games would promote children's effective motivational styles both inside the game context and in real life situations. Previous researchers believe that motivational styles described with persistence and continuous efforts are major elements that lead to final success and achievements (Dweck & Molden, 2005). The researchers also stated that children learn to develop their beliefs and confidence about their intelligence and capabilities, beliefs that requires certain

motivational styles and that will consequently affect their achievements. It is advocated that video game is a ground to encourage children's efforts and to enhance the idea that intelligence is something that could be cultivated through effort and time. Therefore, it requires teachers and parents to give concrete and immediate feedback based on children's efforts and contributions they have made as game players. Immediate and concrete feedback in video games, not just from adults, but also from the game itself, like the points, coins, etc serves to reward children. These rewards would also function to balance children's emotions, especially in times when children have frustration and disappointment, with these kinds of rewards and feedbacks, children could experience certain level of success and accomplishments (Sweetser & Wyeth, 2005). Furthermore, in face of failure, the video games also motivate children to be persistent to gain benefits from their persistence in the last (Ventura, Shute, & Zhao, 2013).

In addition, researchers have also found that failures is not necessarily connected with negative feelings such as anger, frustration, sadness, instead, failures

motivates children to feel excitement, interest and joy (Salminen & Ravaja, 2008). Because if failed, children are highly motivated to restart the game with the aim of winning the game and are thus relentlessly optimistic about being the winner of the games (McGonigal, 2011). These characteristics of being persistent and positive will result in an educational success in real life when they are confronted with challenges (Ventura et al., 2013). In summary, video games could cultivate children's persistence, optimistic motivation and thus lead to success in school and real-life contexts.

Another benefits of children's playing video games is that they could learn to regulate their moods and to promote their emotional states (Ruggiero, 2000). Gaming is considered to be one of the most efficient and effective way to generate positive emotions among children. Early studies have shown a causal relation between playing certain video games and children's increased positive emotions (Russoniello, O' Brien, & Parks, 2009; Ryan, Rigby, & Przybylski, 2006). Russoniello and his colleagues (2009) have proven that through playing Angry

Birds, children's emotional moods will be enhanced and their relaxation increase whereas anxiety diminished. McGonigal (2011) has also proposed the idea that the most intense positive emotions could be experienced in playing video games. Flow or transportation is another positive emotions experienced by video game players, especially when the children are immersed in an activity that simultaneously evokes a loss of less-consciousness (Sherry, 2004).

Experiencing positive emotions helps to establish positive social relationships and enables children to pursue their goals, as well as handle their negative feelings such as failures or disappointment more positively (Fredrickson, 2001). When playing games could basically enlighten children's mood and make them happier, it could be concluded that video game playing brings a positive emotional benefits to player.

Different to other games, video games also provide an additional benefits as social benefits, where children are not isolated socially, instead, over 70% of children play their games with a friend or peer, no

matter in a competitive context or cooperative way (Entertainment Software Association, 2012). In many video games, children need to decide whom to cooperate and whom to reject, and with whom they should form a group or as viral, therefore, it is easy to understand that children could learn sufficient social skills and prosocial behaviors during gaming, which could also be applied in real life situation with their friends and peers, as well as family members (Gentile & Gentile, 2008). Ewoldsen, Eno, Okdie, Velez, Guadagno and DeCoster (2012) also summarized that game players learn the prosocial skills when they play games specially designed to reward effective cooperation, support, and helping behaviors. In addition, playing video games also reduces negative social behaviors, especially when children are involved with violent video games, they are required to work as a team and cooperate positively, which reduces children's access to aggressive cognitions and hostility (Eastin, 2007; Velez, Mhood, Ewoldsen, & Moyer-Guse, 2012). Recent researchers also showed that playing violent video games cooperatively instead of competitively will increase children's prosocial skills and cooperative behaviors

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in real life situations (Ewoldsen, et al., 2012).

Benefits of social skills in playing video games could be concluded that it could enhance children's social ability as to organize groups and having civic behaviors in their real life.

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DISCUSSION

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CONCLISION

Conclusion

For the present study, we have carried out research to investigate the different types of emotion experience and the types of games that could influence children's emotional experience. Furthermore, we

also explored how engagement with digital games would influence children's social interaction in real life.

We could conclude from the results that children are able to distinguish the basic emotions such as happiness, sadness, anger, contempt, etc. Children play various types of games for different reasons such as to regulate their mood, to have common language with peers, etc. Engagement with interactive game would enable children's to encounter and experience different emotions and most of emotions they have experienced are positive. Furthermore, children believe that their emotions experienced in the game play would not linger and thus affect their social interaction with family or peers in real-life.

All components of emotional behaviors are believed to be involved with development throughout the time, for example, the appraisal, responses and self-control procedures. Game play in the present study is an agent that enables children to recognize as well as develop their third layer of emotion skills.

In more complex situations, and with the guidance of parents in acknowledging the emotions, children's skills in distinguishing specific and complex emotions will be improved. Thus, adults' assistant and remind is also recommended to be positioned after children have played the games, no matter what type of emotional experience they have encountered in the gaming. In addition, the design of the interactive game is vital in supporting the development of children's emotional skills, because children experience a sense of presence in gaming and the presence is highly related with children's emotions. For example, if the context of children's presence is violent and aggressive, children have high possibility to be aggrieved and violent, whilst if the context is peace and happy, children's emotion would be calm and pleasant. Under this guidance, designers need to take into consideration the children's emotional experiences and development in designing the interactive games.

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WePlay

Design of a mobile phone application, WePlay: Understand your children via playing mobile phone games together, even you are far away

Problem Description

INTRODUCTION

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DESIGN OF APPLICATION

Problem Description

Mobile phone games are gaining increasing popularity all over the world. My interviews strongly indicated that the young children (5–12-year-old) are obsessed on them. It has been well studied that

their emotions of can be positively affected during playing the games. Such emotions can further influence their psychological development, if these emotions can be well interpreted by themselves and/or correctly intervened by the adults, mainly the parents. (Malatesta and Thompson, 1990) However, emotions can also result in negative behaviors of children. In the past decade, the increasing social media have also shown both positive and negative effects on children and teenagers (Reid Chassiakos, et.al, 2016). Therefore, it is important for parents to pay more attention on mobile phone-based games and social media. My interviews and surveys (see Appendix) have shown that the parents were aware of this issue and their children's emotional and behavioral changes during and after playing games. However, most of them did not know how to join their children, nor how to discuss their emotions. Recent studies have investigated such issue and given a critical insight: children would only like to share their interests on one object (e.g. a game) and their emotions with those who have the same interests (Viola and Idone Cassone, 2017). More

Importantly, when children share their emotions with others who have the same interests, either positive or negative emotions, their expression and interpretation about their emotions can be positively regulated. Such regulation is independent on what products or activities that the children are interested. Therefore, playing mobile phone games together with their children can be the most effective way to understand their emotions and proceed invention if necessary.

I have investigated on children's different types of emotion experiences, how different games could influence children's emotional experiences, and how mobile phone games could affect children's social interaction in real life. We could conclude from the literature that children are able to distinguish the basic emotions such as happiness, sadness, anger, contempt, etc. They play various types of games for different reasons such as to regulate their mood, to have common language with peers, etc. Engagement with interactive game would enable children to encounter and experience different emotions and

most of emotions they have experienced are positive. Furthermore, children believe that their emotions experienced in the game play would not last after playing, thus would not affect their social interaction with family or peers in real-life either.

However, there are hundreds of thousands of parents in China cannot live together with their children because they work remotely, thousands of miles away from homes. The children are being raised by the grandparents. This is not only a critical problem to the development of children, but also a potential social problem to this generation. Besides the families in which the parents live apart with the children, another case may be more common in China: as the economy grows fast so many parents have been spending too much time on work, so they have no time to be with their children, even they will come home late at night. Their children need their accompanying, at least their attention and communication during play. Therefore, I designed an app that aims at solving these issues for such target Chinese families, helping the parents and children to

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DESIGN OF APPLICATION

Design concept

Main Functions

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ANALYSIS OF DESIGN

play mobile phone games together and share the common interests. This solution, to my best knowledge, is unique by far.

Design concept

Weplay is a mobile app that is designed for primary school students (ages from 7 to 12) who play mobile phone games, and for parents who are unable to be with their children regularly for a variety of reasons.

It can provide solutions to communicate under different moods. Children can make parents more aware of their own emotional changes by uploading photos of themselves when play games and marking their emotions when take photos. Parents can better understand their children's emotional changes on the software, and timely help and guide their children to deal with their children's emotions.

Furthermore, they could have a control of their children's dedication in playing interactive games with the apps as it records how long and how intensive children have been playing interactive games.



Figure 11: A concept image showing that users can solve some critical issues while playing mobile phone games that no other approaches can effectively solve. Thus, users can have a totally new experience of playing games and socializing by using WePlay. Courtesy to NICOLAS ASFOURI/AFP/GETTY IMAGES; REUTERS/Ibraheem Abu Mustafa. In Beijing on February 17, 2018.

The essential concept of the design of this application is represented by its name “WePlay”. The whole idea is based on combination of three aspects that are discussed afore and in the following sections: 1) the research conclusion that parents should play games with their children together to understand their emotional developments and help to understand them, 2) my interview conclusion that Chinese parents want to play phone games with their children but have no effective approaches (see Chapter 6 and appendix), and 3) the conclusion from my market research that there is no similar applications and the Persona models.

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Main Functions

This product is designed as a game platform and social application for children and their parents. The design of this application is mainly comprised of the following aspects:

A. Provides a platform for the most popular on-line mobile phone games with real time face-to-face communication.

Children and parents can play and discuss the games in real time via video chat, so that the children can express their emotions and the parent can understand the effects of games and intervene if necessary.



Figure 12: The process of playing mobile phone games while video chatting and an example of a child playing a game while video chatting with his mother (Moore Manor, a html-based game developed by the Mole company) and video-chatting with his parent. Picture courtesy to a show, Dad! Where Are We Going? MBC Inc. Korea.

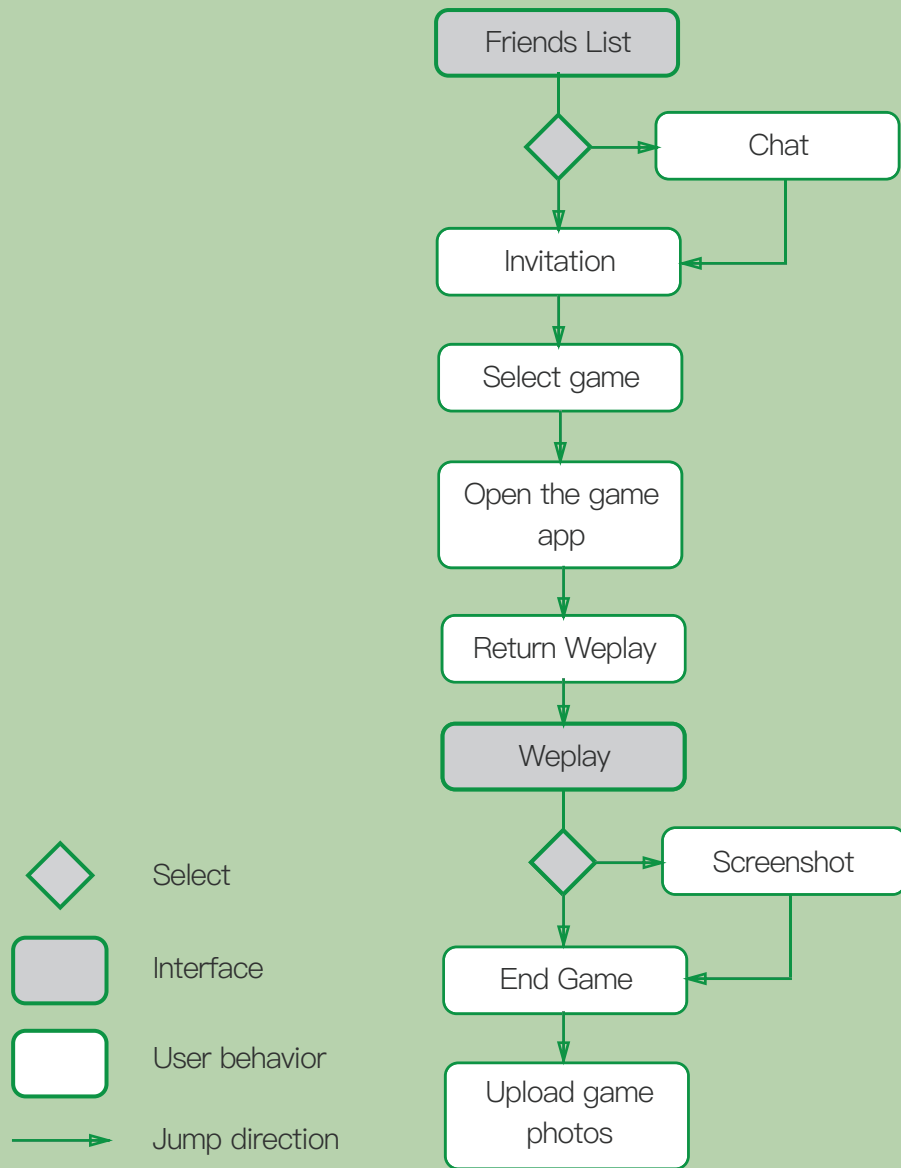


Figure 13: Product journey of WePlay.

B. Encourages children and parents to record their real-time emotions and share with each other.

The moments and the emotions during playing games can be strong, very happy when succeeding to win or very sad when losing. However, they will fade over time. Hence, recording the precious game moments and share them with friends (children and/or parents) is important, especially for the children to understand how they have been reacting to different situations. The shared moments can also be good topics for the children and parents afterwards.

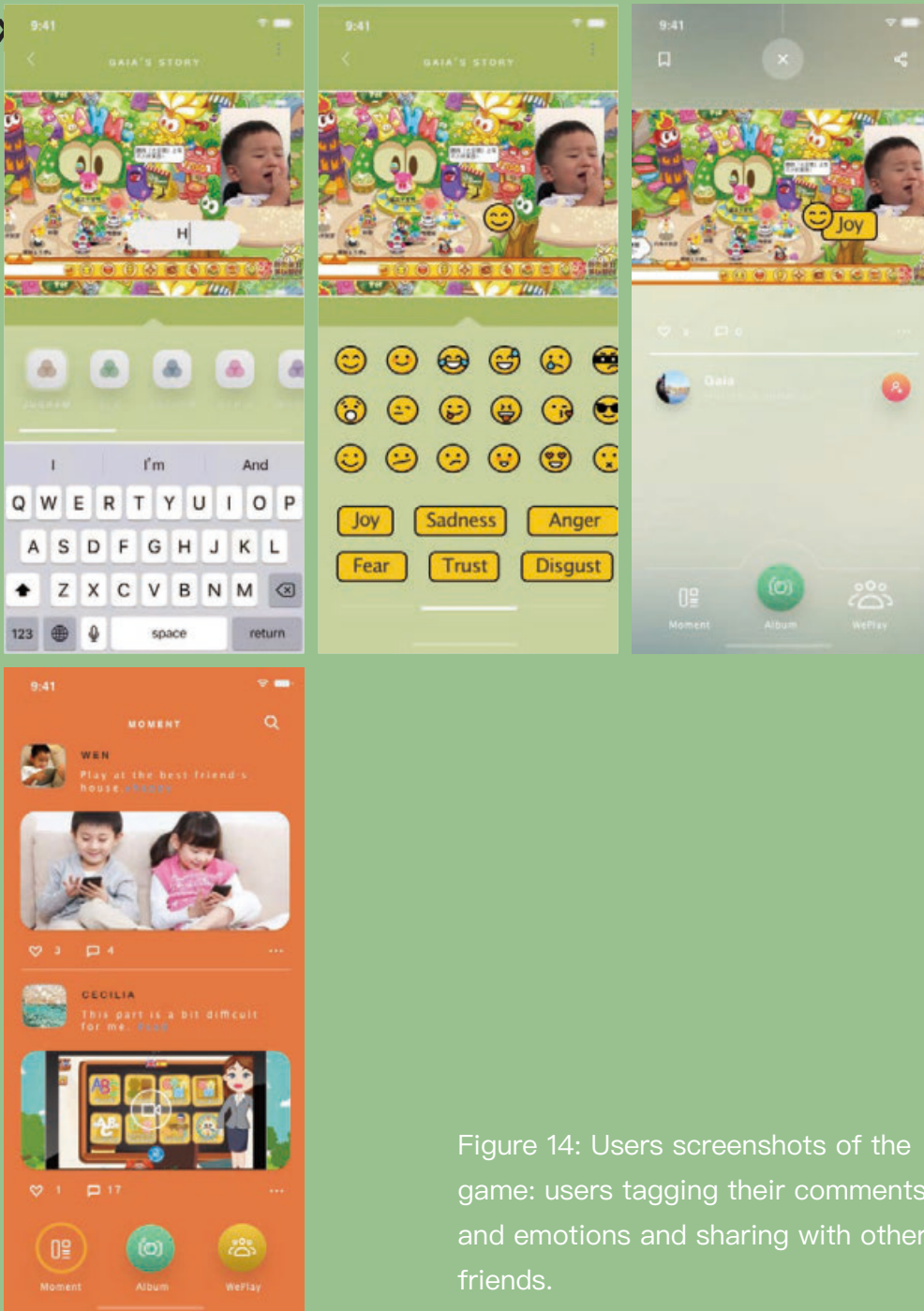


Figure 14: Users screenshots of the game: users tagging their comments and emotions and sharing with other friends.

C. Automatically records the children's emotional changes by the tagged emojis and analyzes their emotion development.

WePlay provide many vivid emojis for the children to choose to tag on the screenshots of game and video chat when they are too young to express or type in words (and the parents can do too). It also allows the users to tag their wording to record whatever they want. The parents can also save their favourite photos into their own mobile devices and share amongst family members or sharing with other parents. By reviewing the saved screenshots, the system can filter and summarise these key moments, and then generate an emotion report for both children and parents based on emotional tags. All emotion-related emojis will be classified into the basic emotions according to literature: happiness, sadness, liking, disliking, anger, fear, surprise and contempt, according to the codes of emojis. The emotion report will mainly focus on analysing the children's gameplay duration, preference of game, emotion types and their posting frequencies, change of mood, and etc. The results will be graphically

shown for easy understanding the status and growth of children. Parents, therefore, are able to have a better understanding of their children's emotion development by referring to both photos and report provided by the system.

D. Allows parents to remotely and virtually accompany their children when they are playing a game by sharing their real-time playing display.

Here, the parents are not playing (may be working), but the children can see what their parents doing by the video chat and can be aware of this companion.



Figure 15: Emotions of children during playing different games can be easily chosen by the users, classified and recorded and displayed to analyze the emotional changes over time automatically by WePlay.



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Figure 16: Children can play games in WePlay to let their parents watch and record game moments.

The application's social function stands for communication between children, communication between parents, and communication between parents and their child, communication between game designer

and children, and communication between game designer and parents. These communications are mainly conducted through online chatting, picture sharing, and messages leaving.

E. At the parent's login end, helps parents to monitor their children's game playing duration, frequency, and emotions, with their permissions of course.

WePlay has two login options and two individual systems for children and parents. There are some additional monitoring functions at the parents' end:

- Parents can see more complicated data and results of children's emotions
- Parents can control the duration of children's game playing
- Parents can observe children's playing (after informing children first)

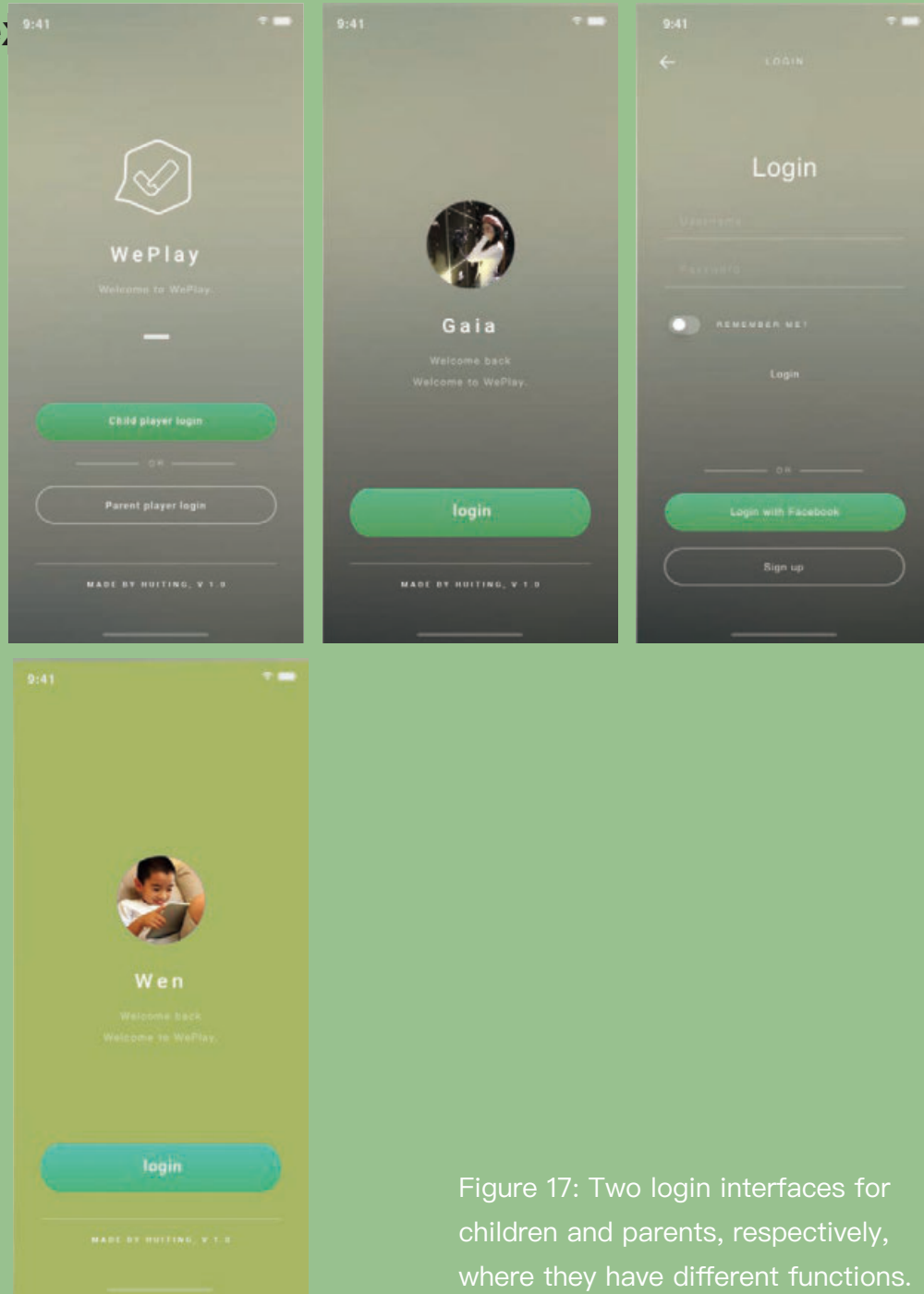


Figure 17: Two login interfaces for children and parents, respectively, where they have different functions.

C. Automatically records the children's emotional changes by the tagged emojis and analyzes their emotion development.

WePlay provide many vivid emojis for the children to choose to tag on the screenshots of game and video chat when they are too young to express or type in words (and the parents can do too). It also allows the users to tag their wording to record whatever they want. The parents can also save their favourite photos into their own mobile devices and share amongst family members or sharing with other parents. By reviewing the saved screenshots, the system can filter and summarise these key moments, and then generate an emotion report for both children and parents based on emotional tags. All emotion-related emojis will be classified into the basic emotions according to literature: happiness, sadness, liking, disliking, anger, fear, surprise and contempt, according to the codes of emojis. The emotion report will mainly focus on analysing the children's gameplay duration, preference of game, emotion types and their posting frequencies, change of mood, and etc. The results will be graphically

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Analysis of needs of potential users

Persona

Journey map

Low fidelity prototype

Storyboard

Design of theme, color and font

Analysis of needs of potential users

debating between control, limitation, and joining. However, there are 30,000,000 children in China who do not live with their parents, which is a tenth of the children's population. For these families, it is very challenging for the parents to understanding how their children's game time. According to my interviews with 5 families, it is very common that the parents would like to know how their children react during playing mobile games and would like to joint them. In conclusion, I think there is a huge market in China for WePlay.

It was reported that 91% of kids aged 2–17 play digital games (Coldewey, 2011). It has become a critical issue all over the world that how parents should deal with their children's game time, i.e.

Persona

In this section, I employed “personas” models to simulate and analyze the needs of potential users. Personas, according to Alan Cooper’s (2004) definition in his book “ ‘The Inmates Are Running The

In this section, I employed “personas” models to simulate and analyze the needs of potential users. Personas, according to Alan Cooper’s (2004) definition in his book “ ‘The Inmates Are Running The Asylum’ , are not real people, but fictional characters who have been created and studied during the process of product design. As the hypothetical archetypes of actual users, they need to be defined by their goals (Cooper, 2004). Focusing on needs is exactly what the personas are created for.

Based on personas design, the essential need of my potential users, parents and children who do not have enough time to stay together in person, is to spend time online to understand mutually and have more common interests by playing mobile phone games and video chatting simultaneously. Even though there is not a significant amount of user research in the investigation part, I can still conclude that the target users of this product can be confined to (1) the Chinese children in the age range from 7 years old to 12 years old, who have interests and are able to play mobile phone games independently; and (2) these children’s parents who are

under heavy personal daily pressure so unable to spend enough time to communicate with their children.

At the early stage, the main users are the parents and children who are have limited time together. However, any others who are willing to know their children's emotional data and intend to create more opportunities to have a better understanding of their children can also be regarded as the users of this app. Services will also be provided to the kid's family members by recording children's performance, providing their child's mobile phone game photos and emotion records for their further photo sharing and understanding of their children.

Regarding personas of this game, there are three main roles need to be emphasised, including the parents, the children, and the game designers of the games that can be played in WePlay. The designers will have access to all children's emotional data. The common goal of them is to find a solution to help parents understand their children's emotional development via the process of mobile phone game

playing and to promote the understanding between parents and children.

Based on the findings and conclusions from the interviews (Chapter 6 and 7) in terms of the target users' characteristics, behaviours, needs, and background stories, the following personas have been created to represent different user types. Ideally, these personas can serve as a communication tool to provide a general description and critical insights in further understandings, goals, and behaviour patterns of product users.

Xiao Ya



A. Personal background

Xiao Ya is a Chinese girl and just turned nine. For now, she is studying in a primary school at her hometown, Tianjin. She lives with her grandmother in Tianjin, China, and her mother works in Shenzhen, China, 1400 miles away.

B. Entertainment in her life

Due to her parents' absence, Xiao Ya's favourite way of entertainment is relatively simple, playing with her mobile phone. Her parents do not restrict on the duration of her mobile phone playing. On the contrary, they feel relieved when Xiao Ya is using the mobile phone because they can know where she is by tracking her location. Xiao Ya is keen on playing video games, especially those interactive mobile phone games which are popular amongst her classmates. They have established a virtual community through these games. However, Xiao Ya cannot use her

mobile phone whenever she wants. Because the school forbids the electronic devices, she mainly plays games at home after school and on the weekends.

C. Communication between Xiao Ya and her mother

Xiao Ya can only see her mother no more than twice a year due to her mother's work arrangement. Meanwhile, Xiao Ya does not have much opportunity to make phone calls or video calls with her mother. The frequency of chatting through the phone is normally three times a week. She has spent more than six years of her life living apart from her mother. In her case, ever since Xiao Ya can remember, her mother has left. The situation is the same correspondent to Xiao Ya's mother, that she also barely knows anything about Xiao Ya's life.

D. Problem and challenges

The separation between the mother and daughter makes Xiao Ya introverted and bashful. And she prefers to play

her mobile phone rather than communicate with others. The special family background caused Xiao Ya not be able to control her emotions and temper well, and sometimes she rejects to chatting with others.

E. Needs and goals of the persona

- Needs to know more about her emotion recognition ability
- Needs to know strategies used for dealing with basic emotions
- Needs to learn how to express her emotions
- Needs to establish a close relationship between her mother and herself
- Needs parents' guidance on her emotion development

Xiao Ya



A. Personal background

An'an is a thirty-one years old Chinese mother who has a six years old son. Her son is studying in a primary school in Beijing, China. Her husband takes the job to raise their child while An'an works in Singapore.

B. Entertainment in her life

An'an is relatively a technology enthusiast and keens on using different mobile devices. She buried her life in work and rarely has any free time. Playing video games is almost her only hobby in her dull life but she does not play frequently. She could only learn her child's growth and his life through the photos and videos shared by her husband and other family members.

C. Communication between Xiao Ya and her mother

Despite An'an is busy at work, she makes phone calls to her child and other family members every day. She can only go back to China no more than five times a year. As An'an grows older, she realized the importance of family and willing to spend more time with her child. She attaches great importance to her child's education, and she believes that family education is as important as school education. However, she does not put a strict limit on her child's game play time. She trusts that her son could balance the time distribution between study and entertainment.

D. Problem and challenges

As a successful woman at work, An'an also has her own troubles. She does not have enough information about the growth of her child, and she can only share feelings and emotions online. Even though she believes that her husband will try his best to raise their child properly, she is still worried about the family education. In order to dispel her own doubts, she seeks more opportunities to communicate with her child.

E. Needs and goals of the persona

- Needs to know more about children's emotions, such as happiness, sadness, and fear
- Needs to make records of her child's growth, especially her child's emotional development
- Needs to socialise with other parents to learn more about family education
- Needs to guide her child's emotion development remotely
- Needs to establish a closer relationship between her child and herself

Xiao Ya



A. Personal background

Zhuang Shan is a thirty-nine years old Chinese woman. Her main occupation is a teacher, while she is also an amateur game designer. She has a twelve years old daughter, who is currently in her sixth grade. For now, Zhuang Shan is living with her family in Beijing. She is also a game enthusiast.

B. Entertainment in her life

Zhuang Shan lives a colorful life with many hobbies. She keeps on playing, designing, and making mobile phone games. She even used to design two video games with her friends. In her spare time, she wants to design a new video game for family education and aims at helping both parents and children to know each other. Through this application, the family will have more opportunities to bond together.

C. Communication between Xiao Ya and her mother

As a teacher, Zhuang Shan has the advantage to spending the vacation with her family. So, she spends a long time to accompany her child, including going out, playing mobile phone games, and communicate with her child frequently. She also greatly values family education. The occupation also gives Zhuang Shan the advantage of understanding her child's feelings and emotion development at a deep level.

D. Problem and challenges

Zhuang Shan's problem and challenges are that her work follows a fixed timetable and she does not have enough data for her mobile phonegame design. Despite her abundance experience of education, she does not have enough experience of guiding and educating children online.

E. Needs and goals of the persona

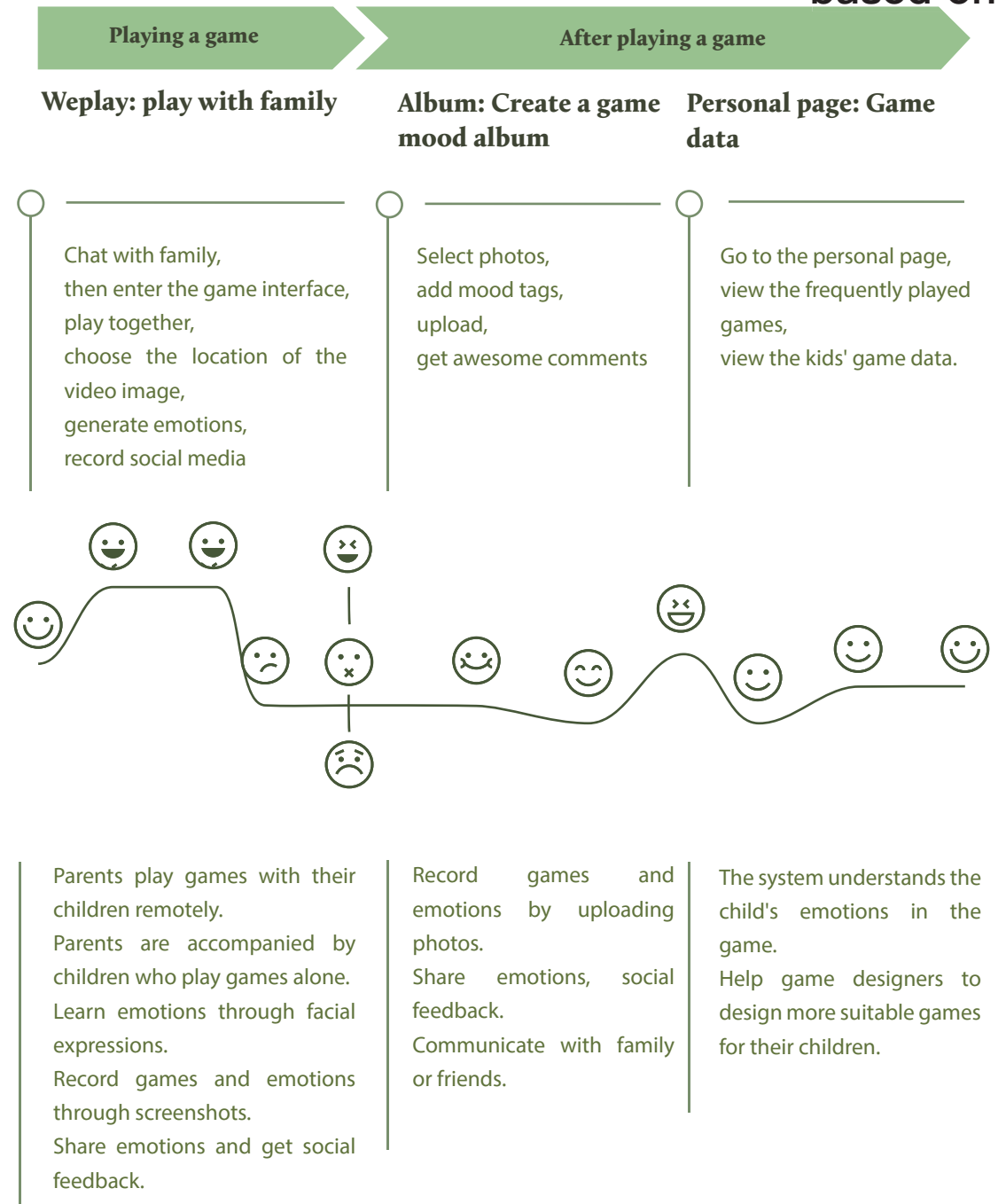
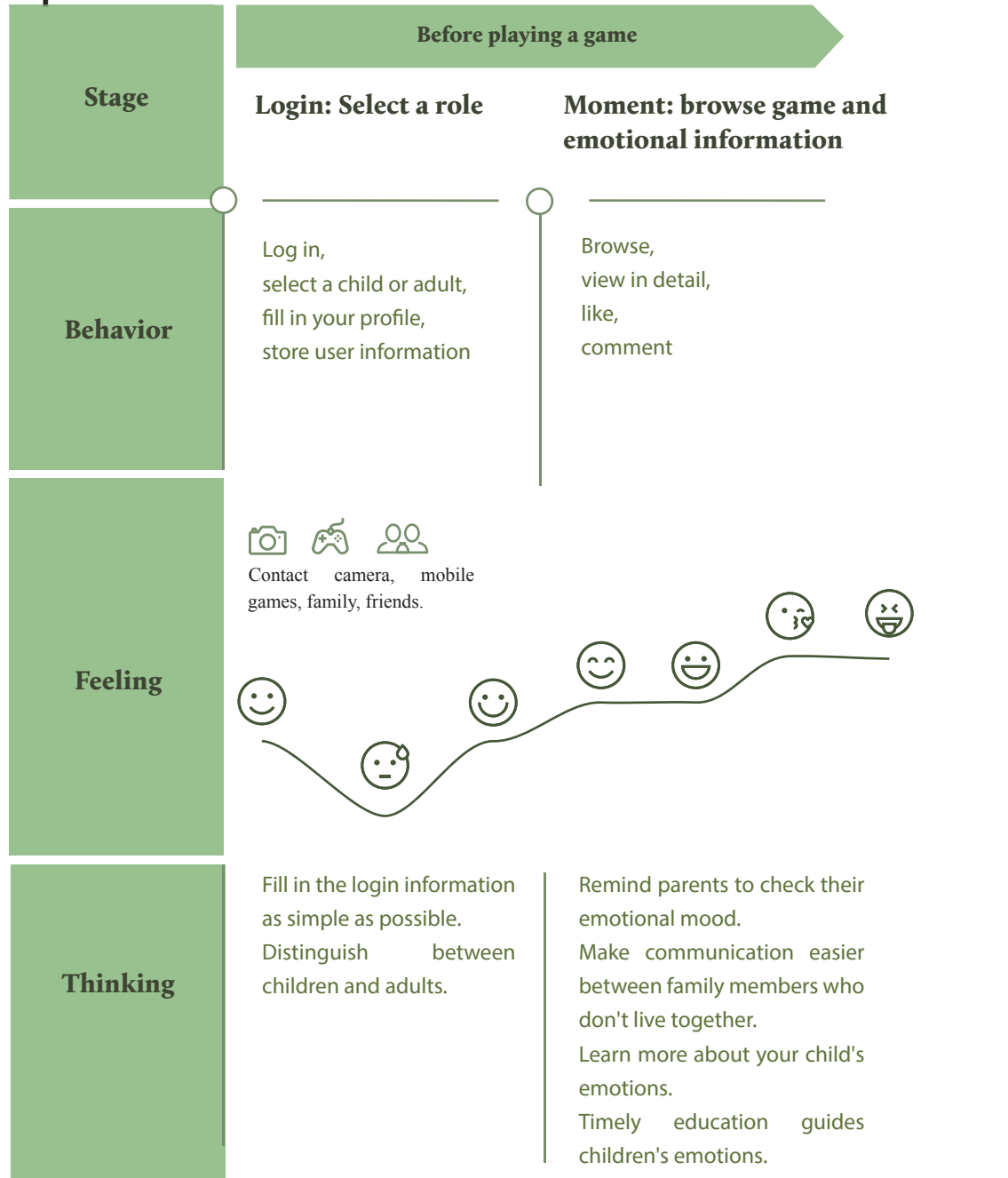
- Needs to get more knowledge on emotions, especially children's emotions, emotion recognition, and emotion development
- Needs to get more data about children's experience of playing mobile phone games
- Needs to know children's and parents' feedback of playing mobile phone games for education

Journey map

A journey map has been created (Figure 10) for people's understanding of the experience flow across these different touchpoints. By this visual support, it is obvious to find out elements which can be improved further. In this case, current users are parents, children, and cell phone game designers. Their behaviours and possible experience during the process of game play, interactions and connections between themselves, as well as a whole picture of this product, has been detailed visually. By detailing each current users' behaviour onto each touchpoint, it is clearer to see whether this product design is able to meet different needs of different types of people.

A journey map is an easy way to describe the assumption of a design or map customer's/users' experience throughout an existing service. According to the specific context of this application, a

Figure 18: Journey map of WePlay.



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Low fidelity prototype

This part analyses the current market picture sharing app to understand the current situation of users using products. Two apps with the most downloads in February 2019 are selected as the research

objects. Mainly through the analysis of the existing product registration, upload, sharing, social, viewing, tagging functions, to compare the advantages and disadvantages of its user experience, so as to help me choose a more appropriate functional arrangement.

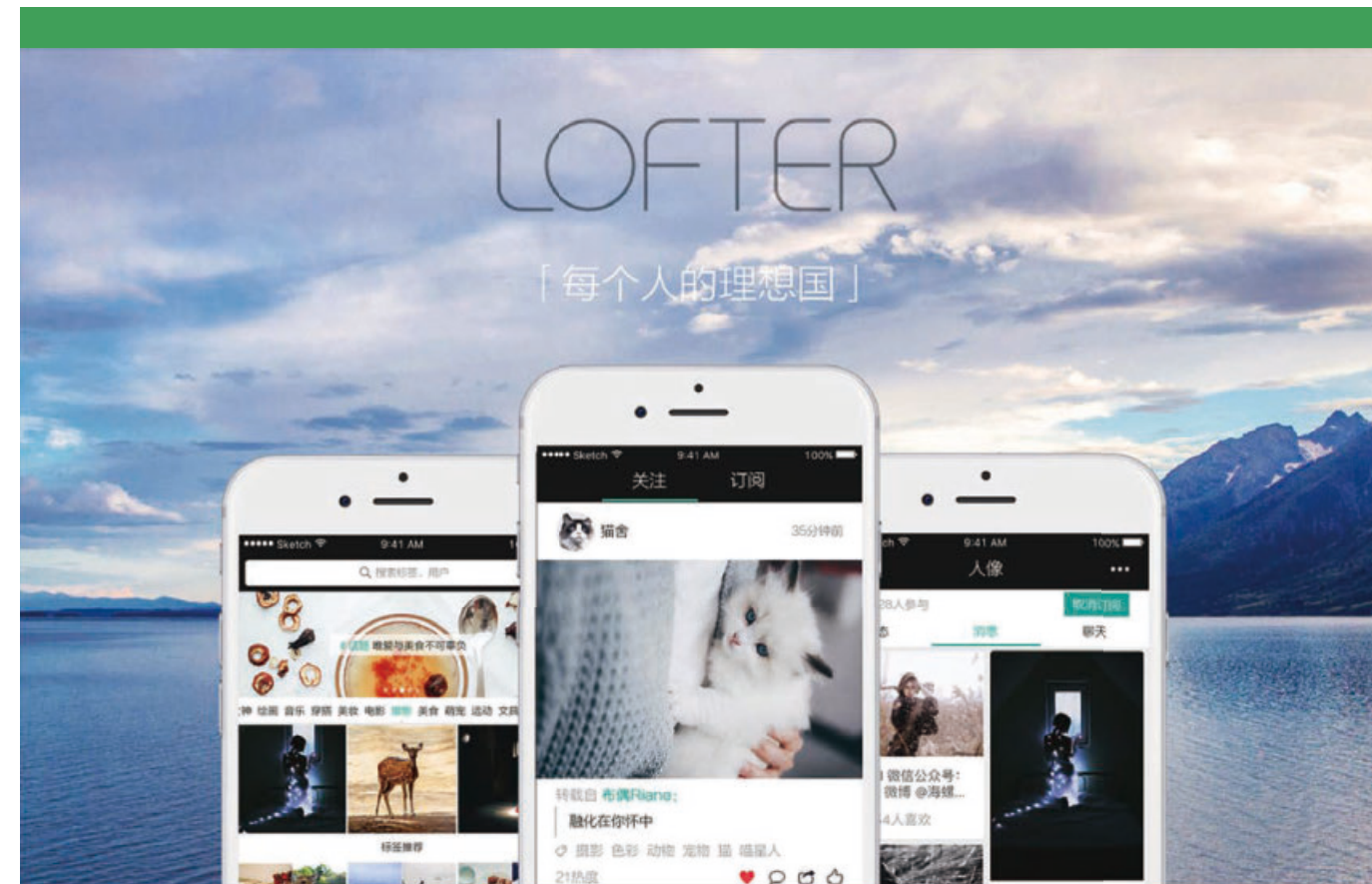


Figure 19: Interface of Lofter.

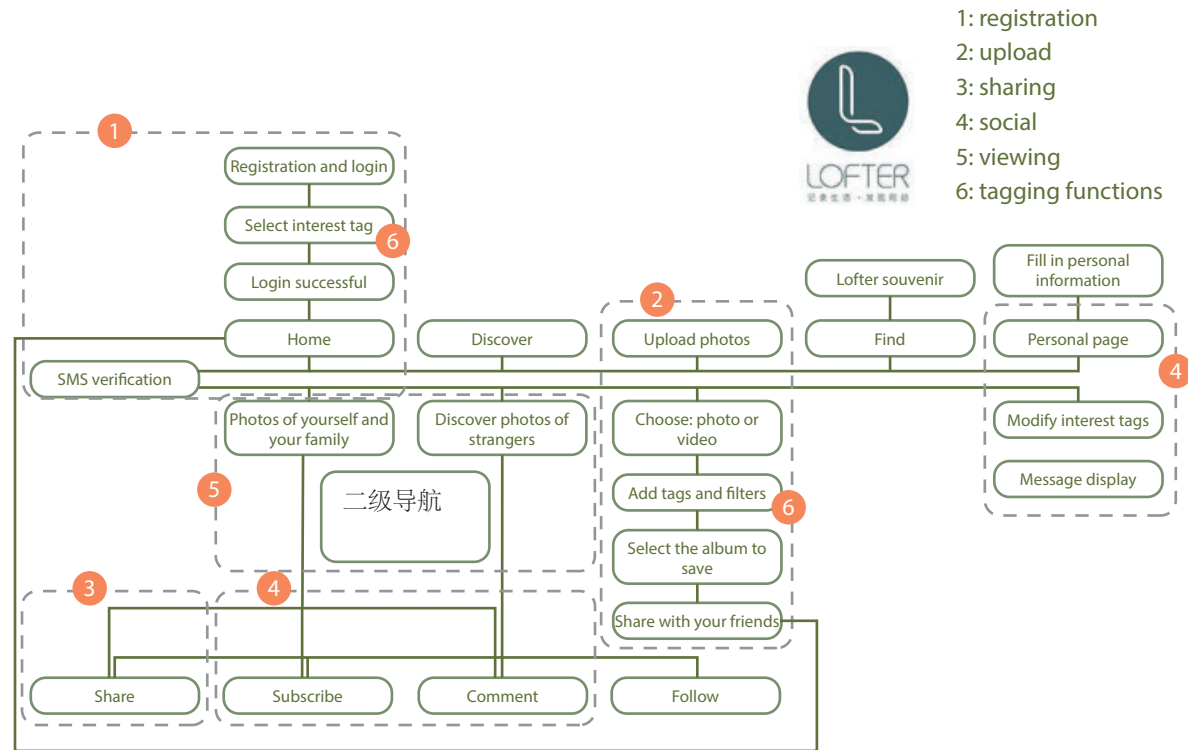


Figure 20: Page structure of Lofter.

Figure 11 is the page structure of Lofter and Figure 12 is for Nice. The two shares similar page structures and are both made up of “Home”, “Discover”, “Upload photos”, “Find” and “Personal page” parts. Light blogging is what Lofter strives for. With more

shared pictures and less social contacts, its channel pushes out interest communities that we pay attention to according to users’ personal preference and thus reflects differentiated photo-based social contacts among them quite humanely.

Lofter enjoys functions of labels and short videos, enriching forms of contents. The second level navigation displays followers and subscribed channels in sections, convenient for users to look through. The contents focus on ‘following’ with page structure includes “add friends”, “ads images”, and recommend interested users “friends timeline list stream” to increase page friendliness. As new users of Lofter log in, default official accounts will recommend some pictures and information to enrich pages’ contents. Users are given too many choices because of easy procedure, while Lofter is off-targeted because of complex operation.

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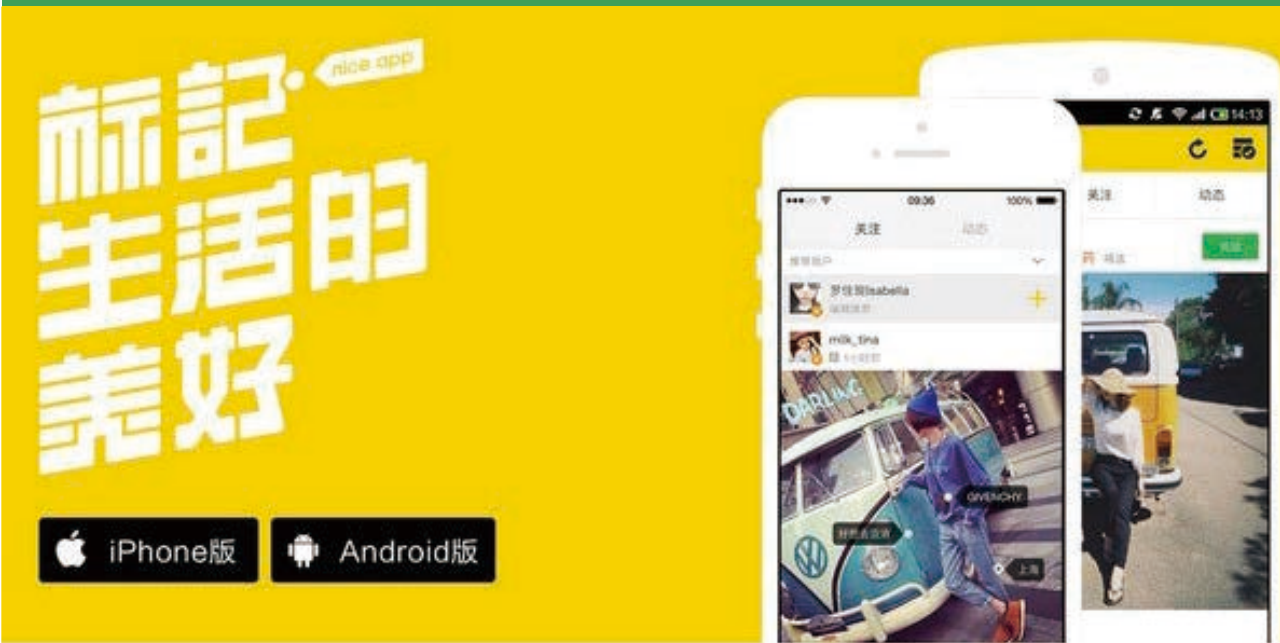


Figure 21: Interface of Nice.

People-to-people interaction is strengthened by Nice which focuses on social contacts that show one's personality. It has pretty average contents and forms, both of which are shown obviously and switched freely. It is quite complicated for new users to register and it always takes them plenty of time

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to see the contents before finishing registration. Sorely setting one layer of the first level navigation makes structures and contents easy and it is composed of a friend recommendation follow on the top and friend timeline list stream. However, people feel a kind of confusion if images, videos and live

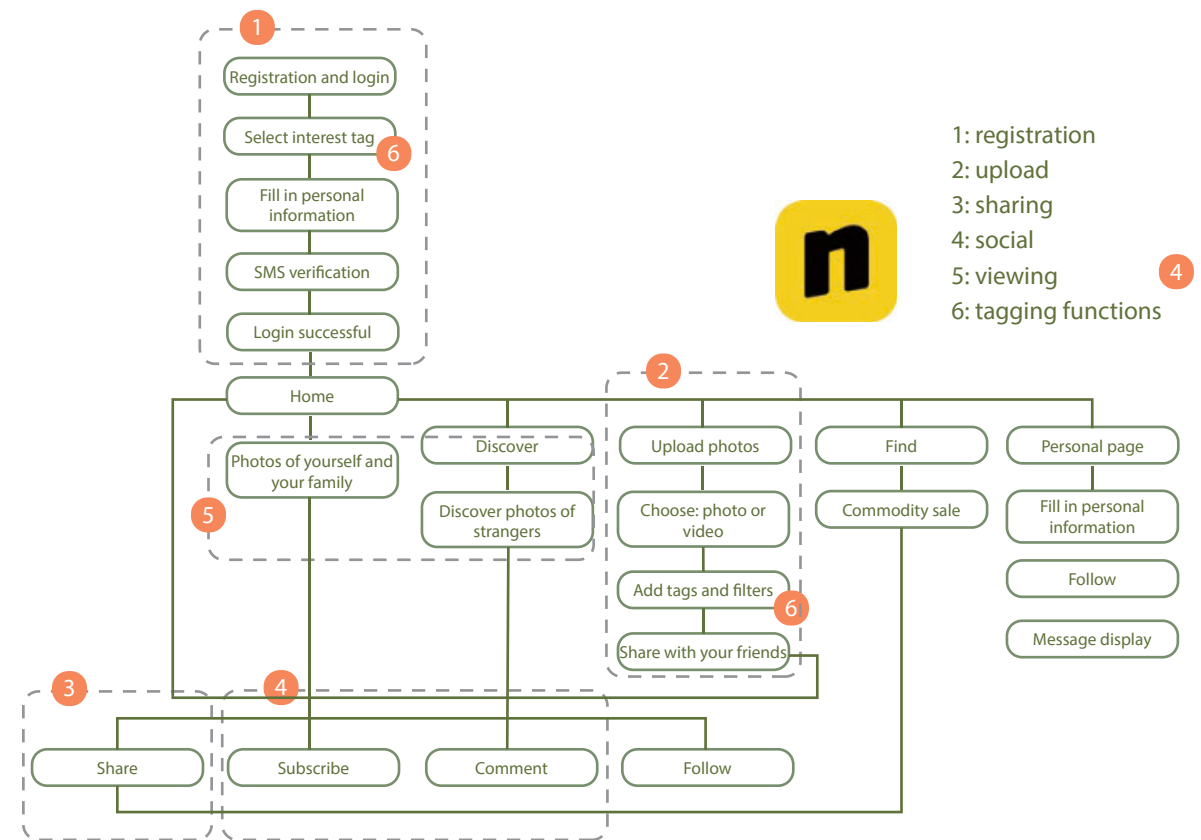


Figure 22: Page structure of Nice.

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broadcast of their followers are displayed in a mixture. If one does not follow anyone, his home page will be blank, which leaves very unfriendly impression on new users.

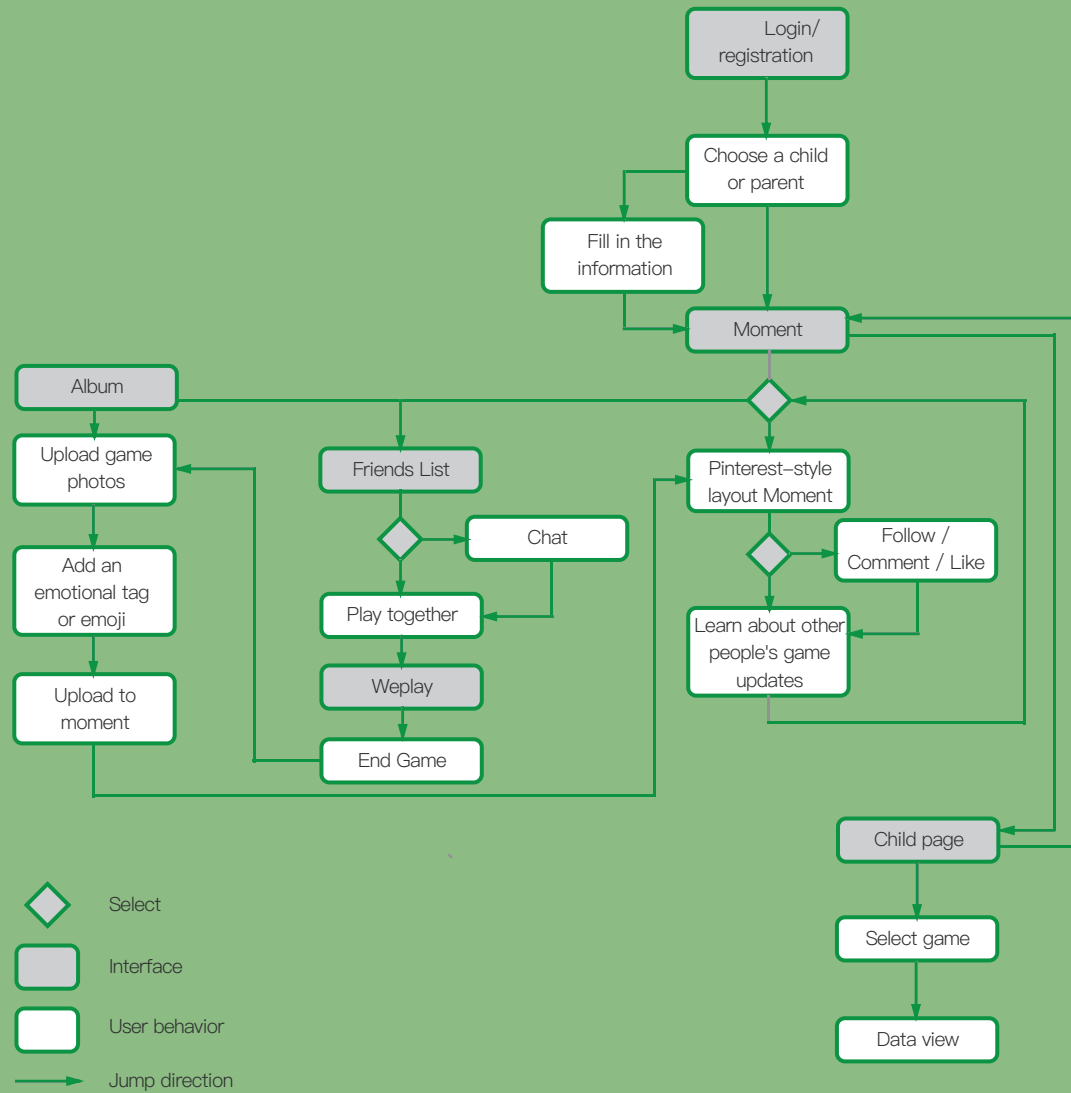


Figure 22: Product journey of WePlay.

Interactive design of children's digital games: emotional experience based on emotion

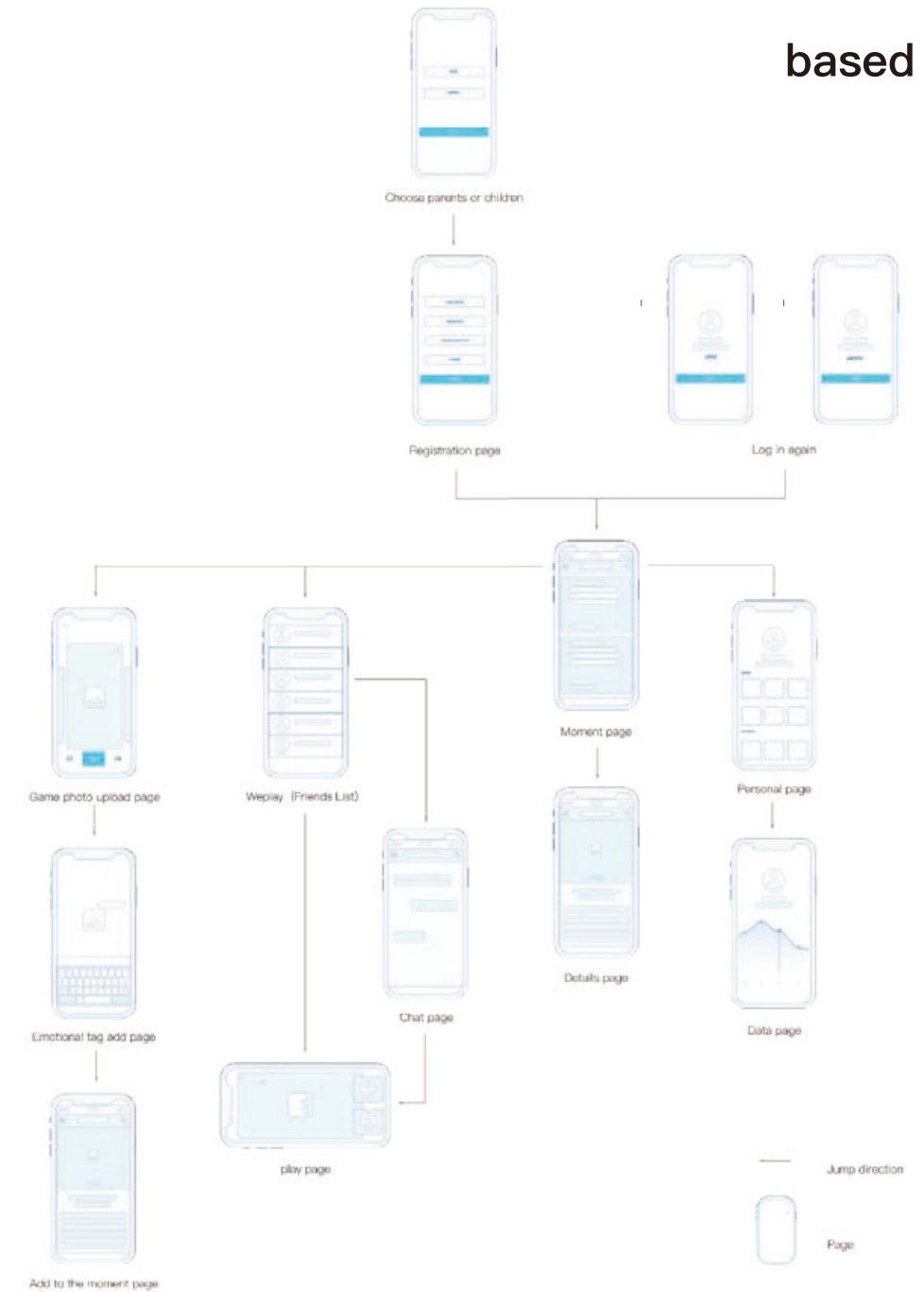


Figure 22: Low fidelity prototype and jump relationship with the page.

Storyboard

Ideally, this mobile application would be able to provide an opportunity for the parent users to know more about their children's expression of emotions, change of emotions, and emotion development.

During the kid's gameplay, the system will filter these photos and link chosen photos with the screenshot at that specific moment in the game. Parents therefore can review their children's reaction to certain circumstances through their parent account and categorise photos based on their understanding of their own children. For example, when a mother selects "Happiness" in the online album, she will be able to see both her child's happy face during gameplay and screenshot of the kid has win the game.

After a period of accumulation, parents would be more familiar with their child's mood change, expression of their emotion, their character building, and emotion development.

In addition, if parents make a request for their children's emotion development report, the system will generate a report based on the children's performance during their gameplay time.

For example, if photos with "anger" occupy a large proportion of the children album, it would be report-

ed as “the kid is not good at emotional control and easy to be angry”; If photos with “happiness” are more than others, it would be reported as “the kid is optimistic.”

Parents, therefore, can guide or educate their own child based on their feeling of the photos or report provided by the system.

Photos can be shared between children and their parents, children between children, and parents between parents. Therefore, other children's performance in gameplay and other parent's feedback can be adopted as a reference for improvement of family education.

By using this application as a support for family education, the process of categorising photos into different emotion tags, in a certain degree, enforces parents to spend more time in observing and understanding children's facial expression and basic emotion. Overtime, for parents whose child is introvert and not good at expressing their negative emotions such as sadness and fear, they can thus

be more sensitive to children's mood changing and deal with such change immediately. Moreover, it can be found that some children behave differently when they are with parents and when they are playing alone. They might show more “happiness” in game-play then going out with their parents. Reports like this would require parents to pay more attention to child's growth and warn them the necessity to establish a closer relationship between them. In addition, based on previous research, children's expression of basic emotions usually varies from person to person. Long-time observation and deeper thinking on children's mood are able to enhance parents' ability in children's emotion recognition and emotion development.

Ideally, in response to different emotions and different family backgrounds, this application can help children's emotion development in the various ways. Taking “anger” and “confident” as examples, this application will deal with such emotions in the following ways.

Anger: During children's gameplay, there are differ-

Interactive design of children's digital games for emotional experience

ent expression of “anger”, such as raise their eyes, being silence, swearing, and a sudden quit from the game they are playing. When parents have categorised children's photos into “anger”, they would be informed that, under what kind of circumstances, the kid has expressed his/her anger. If parents felt that their children is easily to be angry, they can learn from courses/instructions in the system or referring other people's parenting way to find a solution to guide their children. For instance, they would be recommended to have a weekend trip to help children mentally and physically be relaxed.

Confident: If most pictures have been categorised as “confident”, and based on children' game history, their performance has been defined as independent, optimistic, and with leadership potential. Parents would be advised to encourage their children's self-direction, promote their creativity, and adopt innovative approaches to education activities.

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Design of theme, color and font

Literature has found that children and adults have different motional and interpretational abilities, so the interfaces of children's and parent's versions are different. It has been found that children are

sensitive to bright colors. Such colors can promote the children to interact. (Cardello, 2004) Many studies have demonstrated that 6 and older children can understand and use touching screen. Their control on multi-touch actions can be improved over time (M. Lorna and F. Daniel, 2010). Some study specifically suggested designing bright buttons, larger spaces between them, and visual feedback for children for their practice. (M. Lorna and C. Brendan, 2010).

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11

PROTOTYPE TEST

Objectives

Methods

Results and findings

Feedback



12

GAME EXAMPLOS

PRODUCTION

13

PRELIMINARY

Objectives

functions of this application can be achieved. Second, this test will identify whether the users follow the processes according to our design. Third, it will demonstrate whether the application's targets are achieved: to improve the communication/understanding between the children and parents via playing games together. Another objective is to collect general feedback regarding the application.

The project test aims at analysing how effective and convenient the proposed application can affect the users' experience playing mobile phone games. Specifically, first, it will identify whether the main

Methods

The app test was completed by using a prototype. The trial involved the mothers and their children from two families as the user test groups. A two-hour test records the mother's feedback after

using WePlay.

This section requires careful observation and recording of the users' behaviors by the application designer. What is recorded is not only users' opinions and ideas, but more importantly, the users' actual behaviors. In the recording process, the user's behavior and verbal expression are recorded according to different modules in the test scheme.

- Test subjects: two pairs of children and their families from different cities.
- Test tools: Sketch, Invision, and Principle.
- Test background: the background of the subjects and their commonly used mobile phone APPs .

The following questions will be answered to score the proposed application: User expectations:

1. To what degree (1 to 5, 5 being the most similar with what is expected) did the subjects expect to happen before and after clicking the key function buttons?

“Start play with your parent/child”,
“Tag”,

“Upload your picture”,
“Share your picture”,
“See the emotion analysis of your child”,
“How were you feeling when you played this game before”

2. Interactive rating table: To what degree were the subjects satisfied after using the main functions? What are the reasons? (1 to 5, 5 being very satisfied)

3. Usability: To what degree did the subjects evaluate the usability of the main functions of the prototype? (1 to 5, 5 being very straightforward)

4. Availability rating table: Can users easily find the main function buttons when trying out the prototype themselves? (1 to 5, 5 being very easy)

5. Emotion rating: To what degree did the users would like to play mobile phone games with each other than before? (1 to 5, 5 being much more willing to) to using other approaches (such as using Skype)

6. Can children easily express their emotions during game by the emojis and tags? (1 to 5, 5 being very easily)

7. Can parents understand better about their children's emotional change than before? (1 to 5, 5 being much better)

8. Did the children and parents talk about the game naturally (without being asked)?

9. Were the users more willing to talk about the game after play?

10. Will the subjects download the software for future reference?

11. Price: How much is the subjects willing to pay for the software?

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Figure 23: Test process and pictures taken during tests.

Results and findings

The quantitative results are as below Table 1. The number of prototype users who chose the according answer (1 to 5) were summarized.

Interactive design of children's digital games: emotional experience

Interactive design of children's digital games: based on emotion

	1 Most negative	2	3	4	5 Most positive
Q1. Expectation of results of main functions					
“Start play with your parent/child”,	0	2	5	11	2
“Tag”,	0	1	3	10	6
“Upload your picture”,	0	0	3	13	4
“Share your picture”,	0	1	2	16	1
“See the emotion analysis of your child”,	1	0	5	12	2
“How were you feeling when you played this game before”	0	5	5	9	1
Q2. Satisfaction about main functions	0	1	2	14	3
Q3. Usability of main functions	0	0	2	11	7
Q4. Availability of function buttons	0	1	1	13	4
Q5. Change of willingness to play games with parents/children than before	0	2	1	12	5
Q6. Easiness of understanding emojis (for children)	0	0	1	5	14
Q7. Easiness of understanding children's emotional changes than before.	0	0	2	8	10
Q8. Increased interests in game by observation (for both children and parents)	1	4	3	7	5
Q9. Increased interests in game by question (for both children and parents)	0	0	0	8	13
Q10. Willingness to download WePlay	1	0	4	9	6
Q11. Suggested price of WePlay	1 accepted < \$30, rest preferred free.				

Table 6: Results of prototype tests.

The prototype tests demonstrated: 1) the main functions worked as the users expected; 2) Their interactional designs were easy for both adults and children to find and use; 3) The children users can easily understand how to use this app to describe and record their emotional changes and share with their parents; 4) Both the children and parents users were satisfied with improving their mutual understanding, communications, common interests on playing games; and 5) the tested users were willing to download the app when it is available in market. To sum up, the prototype test demonstrated that the design of WePlay is valid, its targets are achieved, and it is promising to be further developed and commercialized.

The following are some specific observations to support the above results and conclusions. All participants could create and log into their account easily. SMS verification has been required during the process of registration. However, users felt that it would be simpler if they can link this account directly with their WeChat account or QQ account, two major Chinese social mobile phone apps. By

doing so, they would be able to add other family members in their WeChat/QQ contact list. In the sharing section, both of the two mothers tend to share their child's pictures not only within the context of family, but also send them to more people such as friends and colleagues. As a solution, I intend to establish a connection between this application and other social media accounts which are popularised by Chinese.

In the discovery page, parents looked through photos of other children, but have paid more attention to parents' feedbacks on their photo. For example, when looking at one of the "happiness" tagged photo, one mother read out the text under the picture,

(In Chinese) “真不明白为什么 现在的小朋友为什么那么喜欢玩游戏! 难道真的那么有意思么? (I really cannot understand the reason why all children are enjoying playing online games! Is it really that attractive?)”

The mother smiled and unconsciously, “当然

啦! (Of course!)”.

Although sometimes the users of this application might not actually share pictures with others or make comments under others post, information regarding family education in other families still attract their attention and prompt them to think more about their own kid. During the process of viewing other kid's picture, it is interesting to see that parents are more likely to pay attention to children who are in the same age range as their own child. Therefore, it is necessary to make recommendations to parents based on children' age.

By observing children' behaviour and response to this application, it can be found that both of the children are more interested in the gameplay section rather than discovery section. They used a long time to read descriptions of different games clicked their links and try to play them. Indeed, pictures with different facial expressions can be recorded and saved to the online album. However, children tend to ignore the album, but have paid all their attention to the games. When parents reviewing these photos

from their own devices, both of them felt that it is hard to identify their emotion based on their facial expression. For example, one kid had raised his eyes for twice, the mother cannot distinguish the difference between “thinking” and “anxious”. One of effective strategy used by the mother is to look at the screenshot of the game happening at the same time. By knowing the game is puzzle game, she successfully tagged the emotion as “deep thinking”.

The social function of this application has been highlighted by only part of the users. One kid was having fun in posting pictures with exaggerated facial expression to others. Even though there was no response to this post, he still spent around 10 minutes in looking through his photos again and again. Parents intend to post their children photos with their own comments such as the description of this picture, attitude towards child's gameplay, and thoughts on family education. One of the mother even said she prefer to share these pictures with strangers rather than her own child, since it may be embarrassed to let the child know that she is monitoring his face.

Generally speaking, all users were having fun in using this application. Although attention has been put on different sections, they all enjoy looking at these gameplay photos. One of the mother even said,

“我之前不喜欢孩子玩游戏，但是这个软件使我知道他在游戏的过程中也是动脑思考的。所以它也是促使我去更了解孩子的生活。(I did not like games before, but this application was telling me that my child was in “deep-thinking” during his playtime. This application can really promote me to learn more about my child).”

Design of this application can visually be more interesting. Brighter and bolder texts and images can be used to make “click” be easier. However, simplicity and ease of use still need to be taken into consideration.

Parents enjoy reviewing photos of their child's gameplay, but at the same time, they want to control children's gameplay time. It has been suggested that notifications of children' online time can be sent to parents and children themselves to make sure that gameplay time is not more 2 hours a day.

In terms of the game section, parents suggest that more types of games can be added to the system and puzzle game is their favourite game type. They also have interests in playing these games together with their child during free time, so that a closer relationship can be established between them.

Regarding the price of this application and in-app purchase, parents are reluctant to pay for the application, but they are willing to pay for a more detailed emotion report and courses which can help them to understand and educate their children in a better way.

Generally, both parents and children are having fun in using this application, and parents all believe that it would be helpful for their children's emotional development and family education in the future. They will definitely download this application once it has been published.

Feedback

Apart from feeling this application help them to learn more about their children emotions, have more interesting photos of their children, have more opportunities to communicate with other parents,

users also suggest that kid can present a different himself/herself which they have never found before. For example, particularly, one kid is quite shy and introverted, but by looking through his game history and report, his mother has found that the kid's favourite game type is gunshot and he is extremely brave in his game. Photos have shown that the boy enjoys his victory in diminishing his enemies and seems to be more optimistic than in real-life.

The mother said that, due to her high pressure work, she does not go out with her son quite often. When they are in amusement park or other theme parks, she always forbid her son to play all dangerous game such as roller coasters and haunted house. This application has provided an opportunity to her to learn more about her son, and motivate her to learn how to be a good mother again.

Game Examples

The following games will be the first adapted games on WePlay, not only because they have been popular and successful (easy to convert consumers), but also because they are good games for family mem-

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GAME EXAMPLES

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Children play online games with other players to play together. Some of them focus on competition, others help to build up collaborations. Both needs complex communication and involve various emotional reactions. Hence, different types of online games were chose (e.g. gunshot, puzzle game, role-playing games, and strategy game).

- Mole's World
- League of Legends
- Battlegrounds
- Minecraft
- Pokémon GO

Interactive design of
children's digital games
based on emotional experience

Background and literature review

Based on previous research, some general insights into children's emotional experience are gathered.

It can be concluded that children are with certain

emotion recognition ability to examine basic emotions such as happiness, sadness, liking, disliking, anger, fear, surprise and contempt. In addition, parental factors are also able to affect children's emotion development and emotion recognition in their early childhood. For instance, in some complicated situations, parental guidance can provide effective help for children to distinguish complex emotions from specific basic emotions, and interactions between parents and children, in a certain degree, are with great importance in enhancing children's ability in developing their emotion recognition, even their social behavior. Studies in recent year have placed an emphasis on the role of emotion-understanding ability in children's social emotional competence since it is closely related to children's expression of their feelings state in real life, their understanding of others' emotional reactions and expression. (Karstad, Wichstrøm, Reinfjell, Belsky, & Berg-Nielsen, 2015)

It has been found that children's self-understanding, brain development, and social behaviours are mainly learnt and shaped in preschool years (Ontai &

Thompson, 2002). In other words, children's emotion experience, their recognition of emotion, and social-emotional competence all start within their family, especially the influential role of parenting in children's development of emotion understanding ability.

The fundamental part of the design in this study is to have an insight into strategies parents adopted to help and guide their children to understand and express emotions in the real life.

Methods of interviews

In order to have a deeper understanding of parent's needs in guiding their children's development of emotion-related ability, a survey has been designed and conducted to get more up to date information

about interactions between parents and children, parents' attitudes towards children's emotion-understanding ability, and parents' emotion-related behaviours in guiding children's comprehension, expression, and regulation of emotions.

A survey, therefore, has been designed and conducted to gather data from different families for the purpose of exploring ways of building deeper comprehension of real needs in emotion-related issues in the scope of the facility.

As a small-scale study, five mothers have been selected as participants, whose children are in a different age, but all have shown strong interest in

In terms of participant selection, attention has been confined to Chinese mothers since it is not realistic to be in a position to make claims about families with different cultural background in a general way. The semi-structured interview is the primary method used for data collection in this field work.

This research is qualitative research designed to gain insights and feedbacks of Chinese mother's

experience and thoughts regarding children's play of mobile phone games and children's emotions.

Qualitative research, based on the statement made in "Qualitative research methods: when to use them and how to judge them", it aims at answering questions in relation to participants' own experience, meaning, and perspectives from the standpoint of participants themselves (Hammarberg, Kirkman, and de Lacey, 2015).

The starting point of confining data collection into small scale is to make this research be more feasible, manageable, and keep coming data with validity for further in-depth analysis. Data is collected through the phone interview of the five mothers mentioned above. They are all representative and convenient to access. Details of findings from them have concluded and listed as the followings. Five mothers were interviewed. They came from different regions of mainland China, had different occupations, characteristics, and held different attitudes towards the understanding of children's emotions.

Interactive design of
children's digital games
Optional experience

Who
5 mothers

Age of mothers
29~41

Living places
4 different cities

Age of children
7~12



Figure 24: Background of interviewees.

Findings: interviewees' understanding of key components of WePlay

A. The role of photo

According to data collected above, four of the mothers consider children's photos as their favorite way of recording. Three of the five mothers will

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share the photos with their families. That is to say, in terms of strategies adopted to record the growth of their children, taking, sharing, collecting, and saving children's photos can be an effective solution for mothers to have a better understanding their children. Indeed, photos are able to stride over the restrict of time and space and give mothers an opportunity to establish a connection between children and themselves almost at all times and places. Even though Xiaohua has mentioned that, due to her busy work, she is unable to record her child frequently, it is still believed that photo of the child can be a suitable medium for her to narrow the gap between parents and children.

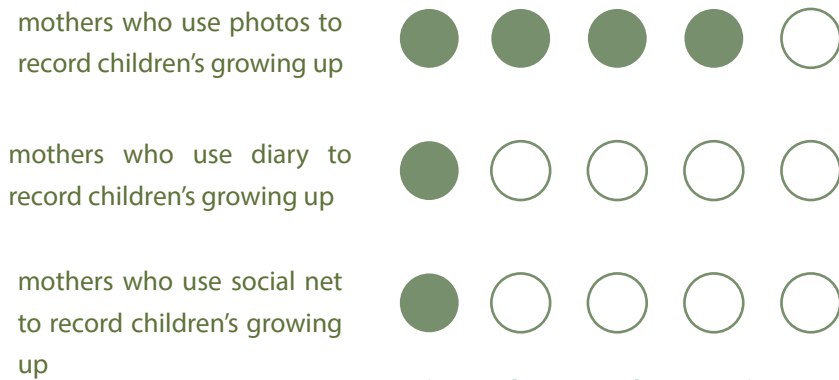


Figure 25: Needs of reviewees.

B. Interactive mobile phone games as an entertainment

Three of the five mothers have mentioned that playing with their child/children is an important part of their family activities. One of the mothers even is involved in her child's mobile phone gameplay by putting a family game machine at home for all family members to have access to interactive mobile phone games. It can thus be observed that parents generally hold an open attitude towards children's mobile phone gameplay. Even though issues on eye health have been mentioned above, for children, playing mobile phone games as entertainment is an inevitable trend in contemporary societies.

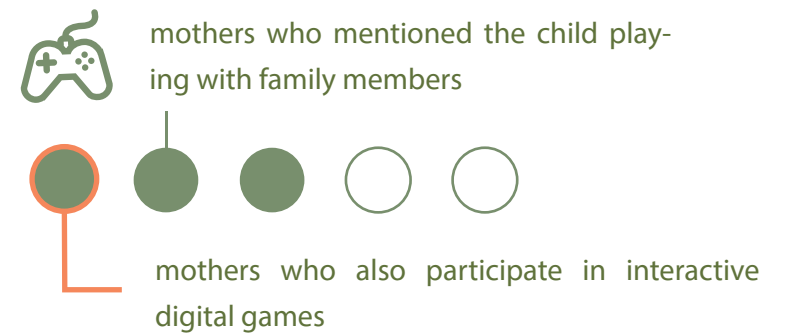


Figure 26: Distribution of game involvement of reviewees.

C. Emotion and communication

Three of the mothers seek to understand their children's emotions through their daily communication. They explain and perceive the connection between communication and emotion at different levels and from different perspectives. Findings can basically be summarised as the followings:

Parents are with the responsibility to judge children's emotion through their observation and communication; Parents' guidance on children's emotion is necessary, and exchange of communicative experience between parents is necessary and helpful in understanding children's emotions; Children's emotion recognition and emotion control can be learnt naturally without parents' guidance.

In addition, these five mothers are all looking for a good way to get along with and educate their children. Consequently, due to their different practice and attitudes towards parenting mode, their understanding of children are various from each

other. Some of them are with confidence in saying that they know enough about their child/children, while some have confronted many difficulties during the process of communication.

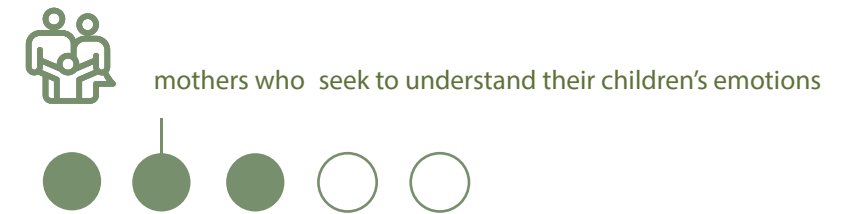


Figure 27: Background of reviewed parents on understanding/communicating with children.

D. Time spent on company and understanding of children's emotion

Four of them will spend 2 to 6 days a week to accompany their children, while one can only accompany her child during the Spring Festival. For those who are able to spend more time in communicating and playing with their child, it seems that they pay more attention to understanding children's

emotion and intend to create more opportunities to educate and guide their children.

By looking at time spent for the company, it can be observed that nearly all parents are being in a situation that they do not have enough spare time to communicate with their children. Xiaohua, who is living away from her child, can even only be with her child only once or twice a year. Such objective factors have resulted in her poor understanding of her child and relatively poor knowledge in guiding the child's emotion.

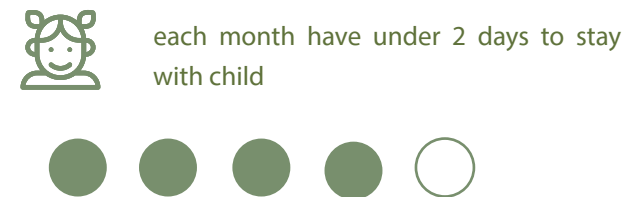


Figure 28: Time spent of reviewees with children.

Users' needs

Based on the findings above, it is obvious to see that parents need to find a solution to meet parents' needs in enhancing communication, promoting understanding, and building consensus between

children and themselves. As far as we know, parenting is hard, and some parents are even struggling their way through parenting. Many factors such as work, and distance may affect interaction and communication. Keeping up with how their children have been feeling during a period of time could be a solution to strengthen communication; however, it is also an exhausting full-time job which is extremely hard to be realized. As parents, indeed, it is difficult to handle both their children's emotion and their personal daily pressure. However, one important perspective to change this situation is to find as many as possible ways to stay connected with their children.

Regarding solutions to this realistic predicament, communicating with children should be beyond narrow-minded face-to-face interactions, and be realized in various ways. Design of a software which can help parents to record and understand children's emotional development seems to be necessary and has thus been explored. Start with paying more attention to children's growth, this software needs to keep the communication channels between

parents and children be open, realistic, engaged, and attractive. It should bring more information and reflection on parents' understanding of their children. In the meantime, this software needs to be fascinating in order to attract children's attention.

As part of this product design, in the phone interview section, these five mothers have also been asked whether they would use a software which is with the function of recording and helping them to have a deeper understanding of their children. Interestingly, they all have a strong interest in this software and say with certainty that they would use it for children's growth.

The five mothers said that if this software can easily record and help them understand the child's emotional development, they will use it. Four of the five think that sharing photos amongst family members can be an effective way to get a better understanding of their children. In other words, mobile phones and photos are playing a significant role in contemporary family life and family education.

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According to thoughts provided by these five mothers, other issues on this software include: parents are more willing to use a software which is completely free; Software with social fictions can be more interesting and functional; Other users' comments on this software as well as the popularity and rating of this software will affect their choice of downloading application; performance and effectiveness of this software in the early stage will determine whether they will keep on using it.

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Conclusions

standing between parents and children via playing mobile games together. In my literature review, it has been demonstrated that this the focused problem of this application, i.e. children's emotions during playing games, is critical to children's development and relationship with others. My pre-design interviews have demonstrated the needs of such an application was needed. My persona models and post-design survey by real people both indicated that the main functions were realized effectively, and the main targets were achieved. To sum up, all the data have shown that WePlay is a promising design that can be further developed and commercialized.

This paper presents a mobile phone application, WePlay, for the target users, parents and children who are live apart (especially for Chinese users), to solve one critical issue— how to promote under-

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Interview samples

Interviewee 1: Aiwen

A mother of a 7-year-old boy

Aiwen is a mother of a 7-year-old child. She works in a bank and lives with her husband and her young-

er sister in Shanghai. She is happy to spend time with her child after work. She has a clear time limit for the child to play interactive mobile phone games, but if the child is playing with friends or some other siblings, the limit will be slightly extended. There are 5 days a week for Aiwen to spend with her child. The other two days Aiwen needs to be on the night shift, which makes her impossible to spend time with her son. Due to the limited valuable free time, Aiwen put a high premium on her family time. Even though she has spent every last second of her free time on her child, she is still worried about her absence of her son's life, especially the emotional fluctuation. She has no clue to understand the sophisticated meaning under the simple facial expression.

When it comes to the record of the child's emotions, she said that she never does that on purpose, but she often takes pictures of her child. These photos would also be sent to her husband and her mother. The photos could save the happy hours from the passing of time and make Aiwen easier to understand her child. She believes reviewing the photos

could give her a better comprehension of the growth of her boy. And they could also make Aiwen easier to interpret the emotion expressed in the past. These photos are essential tools to make her feel connected with her child.

In Aiwen's mind, "Adults need to give their children space to adjust and control their emotions so that they can exercise. I don't pay much attention to the child's emotions, but only help when the child's emotions are out of control." She believes that when children cannot accurately express their emotions, it's parents' duty to guide their children to properly voice their emotions. The excessive attention could bring more harm than good to children. Parents are always overreacted to their children's mood swings and that could reduce their time to seek out the best reaction against that situation. However, in the forms of emotion records, parents could avoid act on impulse and make a better choice on the method to channel with their children.

Interviewee 2: Haili

A mother of a 11-year-old girl

Haili is the mother of an 11-year-old child living in Shanghai. Because her job is to run an online store with her husband, her time is relatively free, she often takes the child out with her husband to play. She sets the limits for her child to play games, but she feels that playing with children should not be too restrictive. The number of days a week to play with her child is 6 days. She needs to replenish her stock on the other day of the week. As Haili spent lots of time playing with her daughter, they are closer than normal mother and daughter. Haili has a better capability of understanding her child's emotion among the parents of the same age. Her unique job gives her the advantage to know better and lean closer to the inner world of her daughter.

Sometimes she also plays interactive mobile phone games with her child. When it comes to the record of the child's emotions, she says that the child already has a mobile phone, so that the child will upload her own photos and updates on her own social network. This is a record. Sometimes family members will talk about these photos and updates together. The photos are useful intermediates for

her family to communicate.

When being asked about “How to help children to understand and guide their own emotions”, she believes that it is important to keep a happy and peaceful attitude when dealing with children's emotions, so as to better guide and educate children. Also, let the children be willing to express their emotions and communicate in time. But as the child grows up, she doesn't quite understand the child's emotions for many times. She hopes there are ways to help her to know her child better.

Interviewee 3: Wenwen

A mother of two children

Wenwen is a mother of two children, 10 and 2 years old respectively, She lives in Shijiazhuang and is a full-time wife, once was a manicurist before marriage, now also provide some guests with door-to-door service. Having a lot of time to stay with children and family makes her happy. There are strict restrictions on the time table when children play games. The number of days a week to keep company with her child is 6 days. There is a family

game machine at home for family members to play game together. Games brought lots of joy and kept the family closer. For her, this is a way to increase the cohesion of the family.

She has a crafted family photo album and will add photos from some game consoles. She will also watch these albums with her family during the Chinese New Year. These albums will be very interesting when her children grow up. The process of making family albums is also enjoyable and keeps the family surrounded in a happy memory. In Wenwen's situation, no matter how much photos have her taken, the amount of the photos is not enough.

As for how to understand the child's emotions and guide the emotions, she feels that spending more time with the children is the key to understanding the children. It is very important to accompany each step of the child's growth. It is important to explain to your child the source of your emotions, and to encourage your child to learn and explore. If there is an opportunity, she hopes to have more exchanges with other parents about the education of children.

In other words, she needs a platform to communicate with other parents due to her absence of social life.

Interviewee 4: Juan

A mother of a 9-year-old child

Juan is the mother of a 9-year-old child living in Xiamen. She works in a communications company. The work is busy, her mother and her husband's mothers often take turns to take care of her child. She loves her child very much and likes to buy various gifts for her child. She is worried that her child will have high myopia as much as she does, and it is very strict to limit her child's time to play the game and use electronic products. She has only time to spend time with your child every weekend two days to play with child. Due to her absence of her kid's daily life, Juan is aware of the incapable of understanding her child's emotion. And their relationship is relatively alienated, which the gifts cannot offset.

Recording the child's emotions: She said that she used to write a diary to record the child's growth

online, but when the child was three years old, she had no time to do that because she was too busy at work, but she took a photo with her mobile phone to record every moment of growth of the child. She believes that these records can help her better understand and educate her children. Even though she realized that photos will be useful in the future, she does not have the opportunity to take enough pictures for her child.

As for how to understand the child's understanding of emotions, she believes that emotional awareness is the ability that everyone can learn naturally in the process of growing up even without parents' too much attention. She put all her faith in human nature, and for now, that is the only way to set her mind at rest. Because she does not have enough time to change the situation and she has no way to guide her child's emotional development.

Interviewee 5: Xiaohua

A mother of a 7-year-old boy

Xiaohua is a mother living in Shunde of a 7-year-old

boy. She works in a clothes factory. The child is taken care of by the grandparents in his hometown Guangxi. She hopes to make more money and give her children and parents a better life in the future. She can only stay with her child during the New Year. The boy barely knows her mother and she is not that different from a stranger. There is no way that Xiaohua could understand her boy's emotional fluctuation and she even could not recognize his face after one year's departure.

About record of the child's emotions: she says, there is no record on purpose, but every photo of the child is saved and often taken out for a look. Since she can only see the child once or twice a year, it is a happy thing to see the photos of her son. Each and every one of the photos is the most precious treasure to Xiaohua. They are the reminder of her lovely son and the best support for her struggle in the strange city. She would be much happier if the photos could be sent to her every day.

When asked "How to understand the child's understanding of emotions", She said that she does not

understand this very well, but if it is a good thing for the child, she is willing to understand and learn it. Despite the distance between her and her son, she is still concerned with his emotions. And if there is a way to improve the current situation, I believe Xiaohua will have no doubt to take it.

Questionnaire

BASIC INFORMATION:

AGE: GENDER:

Q1: DO YOU (DOES YOUR CHILD) PLAY INTERACTIVE VIDEO GAMES AT HOME?

YES NO

Q2: HOW OFTEN DO YOU (DOES YOUR CHILD) PLAY VIDEO GAMES PER WEEK?

1 DAY 2 DAYS 3 DAYS 4 DAYS 5 DAYS 6 DAYS EVERYDAY

Q3: DOES YOUR PARENTS GIVE YOU A TIME LIMIT IN PLAYING VIDEO GAMES?

YES NO

Q4: HOW LONG DO YOU (DOES YOUR CHILD) PLAY VIDEO GAMES EACH TIME?

LESS THAN 30 MINS 30-60 MINS 1-2 HOURS MORE THAN 2 HOURS

Q5: WHAT VIDEO GAMES DO YOU (DOES YOUR CHILD) PLAY?

Q6: WHAT PROMOTES YOU TO PLAY VIDEO GAMES?

BECAUSE I AM LONELY OR BORED AND VIDEO GAMES IMPROVE MY EMOTION

BECAUSE I LOVE VIDEO GAMES AND THEY MAKE ME HAPPY

BECAUSE I AM IN A BAD MOOD AND VIDEO GAMES IMPROVES MY MOOD

BECAUSE MY FRIENDS ARE PLAYING AND I'D LIKE TO HAVE THE COMMON LANGUAGE WITH THEM

IT'S JUST A WAY TO KILL TIME

IT RELEASES MY PRESSURE

OTHER REASON: (DESCRIBE)

Q7: HOW MANY OF THE FOLLOWING SEVEN EMOTIONS DO YOU RECOGNIZE?

ANGER

FEAR

DISGUST

HAPPINESS

SADNESS

SURPRISE

CONTEMPT

Q8: DO YOU FEEL THE EMOTION OCCURS IN GAME PLAYING?

NEVER SOME TIMES FREQUENTLY ALL THE TIME

Q9: HOW OFTEN DO YOU SENSE THAT YOU ARE HAPPY IN PLAYING THE

VIDEO GAMES?
NEVER SOME TIMES FREQUENTLY ALL THE TIME

Q10: HOW OFTEN DO YOU SENSE THAT YOU ARE ANGRY IN PLAYING THE VIDEO GAMES?
NEVER SOME TIMES FREQUENTLY ALL THE TIME

Q11: HOW OFTEN DO YOU SENSE THAT YOU ARE AFRAID IN PLAYING THE VIDEO GAMES?
NEVER SOME TIMES FREQUENTLY ALL THE TIME

Q12: HOW OFTEN DO YOU SENSE THAT YOU ARE UPSET IN PLAYING THE VIDEO GAMES?
NEVER SOME TIMES FREQUENTLY ALL THE TIME

Q13: HOW OFTEN DO YOU SENSE THAT YOU FEEL DISGUST IN PLAYING THE VIDEO GAMES?
NEVER SOME TIMES FREQUENTLY ALL THE TIME

Q14: HOW OFTEN DO YOU SENSE THAT YOU ARE SURPRISED IN PLAYING THE VIDEO GAMES?
NEVER SOME TIMES FREQUENTLY ALL THE TIME

Q15: HOW OFTEN DO YOU SENSE THAT YOU FEEL CONTEMPT IN PLAYING THE VIDEO GAMES?
NEVER SOME TIMES FREQUENTLY ALL THE TIME

Q16: HOW DO YOU REACT TO YOUR EMOTIONS? DO YOU REGULATE THEM OR NOT?
I TRY TO REGULATE I DON'T REGULATE

Q17: DO YOU EXPRESS YOUR EMOTIONS OPENLY OR NOT? (FOR EXAMPLE: YOU EXPRESS THEM OPENLY IF YOU SHOUT AND JUMP WHEN YOU FEEL RACED OR EXCITED. IF YOU CONTAIN THE FEELING AND BEHAVE CALMLY, YOU DON'T EXPRESS EMOTIONS OPENLY.)
I EXPRESS OPENLY I DON'T EXPRESS OPENLY

Q18: DOES THE POSITIVE EMOTION LIKE HAPPINESS MAINTAIN AFTER

THE GAME PLAY? (E.G. DO YOU STILL FEEL HAPPY AFTER THE GAME ENDED?)
NEVER SOME TIMES FREQUENTLY ALL THE TIME

Q19: DOES THE POSITIVE EMOTION FROM THE GAME PLAY IMPROVE YOUR RELATION WITH YOUR PARENTS AND SIBLINGS AT HOME OR WITH PEERS AND FRIENDS?
NEVER SOME TIMES FREQUENTLY ALL THE TIME

Q20: DOES THE NEGATIVE EMOTION LIKE ANGER LINGER AFTER THE GAME PLAY? (DO YOU STILL FEEL ANGRY AFTER YOU HAVE ENDED THE GAME?)
NEVER SOME TIMES FREQUENTLY ALL THE TIME

Q21: DOES THE NEGATIVE EMOTION FROM THE GAME PLAY IMPROVE YOUR RELATION WITH YOUR PARENTS AND SIBLINGS AT HOME OR WITH PEERS AND FRIENDS?
NEVER SOME TIMES FREQUENTLY ALL THE TIME

Q22: DOES THE NEGATIVE EMOTION DETERIORATE YOUR RELATIONSHIP WITH OTHERS?
NEVER SOME TIMES FREQUENTLY ALL THE TIME

Q23: DO PEOPLE AROUND YOU SENSE YOUR EMOTION FLUCTUATION AFTER GAME PLAYING?
NEVER SOME TIMES FREQUENTLY ALL THE TIME

Q24: DO THEY FEEL ANNOYED OR BEHAVE AGGRESSIVELY TOWARDS YOU WHEN YOU ARE IN NEGATIVE EMOTION?
NEVER SOME TIMES FREQUENTLY ALL THE TIME

Q25: DO YOU BELIEVE THAT THERE IS CONNECTION BETWEEN VIDEO GAME PLAY AND EMOTION?
NEVER SOME TIMES FREQUENTLY ALL THE TIME

Q26: DO YOU THINK THAT VIDEO GAME PLAYING BENEFICIAL IN EMOTION RECOGNITION AND REGULATION?
NEVER SOME TIMES FREQUENTLY ALL THE TIME

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Q27: DOES GAME PLAYING IMPROVE YOUR EMOTION CONTROL SKILLS?
NEVER SOME TIMES FREQUENTLY ALL THE TIME

Q28: DOES GAME PLAYING DETERIORATE YOUR EMOTION CONTROL
SKILLS?
NEVER SOME TIMES FREQUENTLY ALL THE TIME

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