

Article

The Influence of Smartphone Games on Students' Self-Concept

Ya-Chuan Ko^{1,2}, Chi-Hung Lo^{3,*}  and Yung-Chih Chang⁴

¹ Department of Creative Product Design, Asia University, No. 500, Lioufeng Rd., Wufeng, Taichung 413, Taiwan; chrisko@asia.edu.tw

² Department of Medical Research, China Medical University Hospital, China Medical University, No. 2, Yude Rd., North District, Taichung 404, Taiwan

³ Department of Industrial Design, Tunghai University, No. 1727, Sec. 4, Taiwan Boulevard, Xitun District, Taichung 407, Taiwan

⁴ Master Program of Digital Innovation, Tunghai University, No. 1727, Sec. 4, Taiwan Boulevard, Xitun District, Taichung 407, Taiwan; cycoao911@thu.edu.tw

* Correspondence: chlo@thu.edu.tw; Tel.: +886-4-2359-0492

Abstract: Children begin to understand the world from birth, gradually recognizing their existence. On interaction with their surrounding environments, they begin to recognize themselves and gradually develop self-concepts. With the advancement in technology, smartphones have become an indispensable daily necessity. The age at which a child handles a smartphone is gradually decreasing. Many traditional toys are increasingly being replaced by smartphone games, which have become an essential part of children's lives. This study attempts to understand the impact of smartphone games on the development of children's self-concept. Using the Piers-Harris Children's Self-Concept Scale, a questionnaire survey was conducted among students of grades 3 and 4 in elementary school.

Keywords: smartphone games; elementary school students; self-concept; Piers-Harris Children's Self-Concept Scale



Citation: Ko, Y.-C.; Lo, C.-H.; Chang, Y.-C. The Influence of Smartphone Games on Students' Self-Concept. *Appl. Sci.* **2021**, *11*, 7408. <https://doi.org/10.3390/app11167408>

Academic Editors: Sheng-Joue Young, Shouu-Jinn Chang, Stephen D. Prior, Liang-Wen Ji and Hao-Ying Lu

Received: 8 July 2021

Accepted: 8 August 2021

Published: 12 August 2021

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2021 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

With continuous advancements in technology, practically everyone has a smartphone now, enabling seamless contact between people and easy access to the Internet at any time and from any location. It has also make the Internet accessible on mobile phones; people, thus, are no longer limited to using computers to surf the internet. Instead, it exposes people to diverse forms of entertainment and makes it convenient to take photographs, listen to music, and access software, making lives more convenient.

Nowadays, mobile surfing time is on the rise—from 92 min in 2011, 201 min in 2016, and 204 min in 2017, to 211 min in 2018 [1] In terms of age of use, according to a 2015 survey of children aged 11 and 12 by the Children's Welfare Alliance Cultural and Educational Foundation, 47.9% of the respondents had smartphones, and 81.7% of them used them for playing games. This data shows that children who grew up in the age of digital technology with experience of video and digital games showcase new and unique abilities, languages, and logics, gradually forming the so-called video game generation [2,3]. Now, due to their popularity and rapid spread, mobile phones and the Internet have become an important part of the lives of curious children, especially for leisure and entertainment. In addition to learning in class, elementary school children use digital media to collect information on the Internet to complete their homework after class or at home. In their spare time, children also engage in leisure and entertainment activities through the media (reading and listening) [4].

Children face anxiety in the process of growing up, as well as life pressures from schoolwork, family, and interpersonal relationships. In the process of playing games, they obtain emotional relief and spiritual comfort. However, there also are people who negatively indulge in playing games, leading to disorder in their lives and physical harm.

Children who play video games are just as keen on sports, comics, star chasing, and drama. They get emotional relief, get to know themselves, and make friends while participating in leisure activities. Because almost everyone has a smartphone now, online games are more easily accepted by most children, providing them with new options and experiences. We have also seen the positive impact of games on people. For example, in a 2014 CNN Finance Interview, “Why I put World of Warcraft on my resume”, an American person mentioned the World of Warcraft game in his resume, emphasizing his leadership in the virtual and real world, and was interviewed. It paid off and he went on to serve as the Chief Information Officer (CIO) of Starbucks, and later as the Chief Operating Officer (COO) of Symantec, a well-known information security company. It has, thus, been observed that playing games does not always have negative results in life.

Children entering the elementary school stage slowly get out of the subjective period. The living environment at this stage allows children to interact with teachers and friends, and enter a period of self-objectification [5]. Such changes are significant in the development of elementary school age children, especially the self-concept. If a child’s self-concept development is positive, it helps their physical and mental development. On the contrary, it may have a negative impact on the development of their mental health and other aspects [6]. Most of the topics among elementary and middle school children are around games. With the advancement of science and technology, the content of games has gradually increased from traditional toys and sport games to computer and mobile games. In recent years, due to the declining age of owning smartphones, elementary schoolchildren in many countries are now focusing on smartphone games, which have become a part of their lives. Smartphone games add a lot of fun, but at the same time have an invisible impact on lives. Therefore, owing to its popularity and many elementary school students owning their own smartphones, this research intends to understand the impact of smartphone games on the self-awareness of these children—the self-concept.

The aims of the research are as follows:

- (1) Understand the situation of smartphone gaming experience of middle-grade students in elementary school,
- (2) Understand the current situation and differences in the self-concept of middle-grade students in elementary school,
- (3) Understand the relationship between smartphone gaming experience and self-concept of middle-grade students in elementary school.

The following research hypotheses are proposed as the basis for the statistical test:

Hypothesis 1 (H1). *Different genders show significant differences in the self-concept of middle-grade students in elementary school.*

Hypothesis 2 (H2). *Different grades show significant differences in the self-concept of middle-grade students in elementary school.*

Hypothesis 3 (H3). *Different smartphone gaming experiences show significant differences in the self-concept of middle-grade students in elementary school.*

2. Literature Review

This research explores the impact of smartphone gaming experience on primary school students’ self-concept. The literature discusses two parts: (1) the definition and constituent elements of self-concept, (2) the influence of smartphone games on children.

2.1. Definition of Self-Concept

Cooley used “The Looking-Glass Self” to illustrate the concept of self. After interacting with others, people visualize their own picture in the minds of others, as well as the perspectives of others on this image [7]. Self-perception, based on the performance and reaction of others to oneself, is to understand what kind of person you are, such as

whether you are welcomed by others, and whether the interpersonal relationship is good. Therefore, Cooley's "self in the mirror" is based on the individual's imagination through the interaction with others, what kind of image they have in the hearts of others, and thinking about other people's possible thoughts about this image from the perspective of others. It is based on "How other people perceive me". Mead explained it based on Cooley's point of view, and believed that self-concept is the gradual development of a kind of interaction and relationship between individuals and others in various aspects [8]. People's cognition of themselves often comes from their interactions with others or their expectations of themselves. It believes that self is gradually formed through various interactions between individuals and the environment. In different environments, the different groups involved and different reactions of others will cause different self-concepts. Therefore, people's cognition of self is often formed by interaction with others. Rogers believes that self-concept is an individual's overall view of oneself, including one's own perceptions of one's own abilities, personality, the relationship between individuals and others, and various evaluations obtained by individuals in the process of pursuing goals [9,10].

Shi Xiuqing believes that self-concept can change in different situations [11]. A scholar once designed an experiment in which subjects would get feedback from others about their self-description, and this feedback would confirm or refute the subject's claims. The subjects were divided into two groups, one group could interact with others, the other group could not. Subjects who can interact with others will actively verify their self-description by responding to their rebuttals. But on the other hand, subjects who are unable to interact with others have no opportunity to interact with others, and are affected by feedback from others, and have considerable changes. Some researchers have also found that people will selectively interact with people who have the same view of themselves, actively choose roles that are consistent with their self-concept, and selectively pay attention to the feedback that confirms their self-description. In this way, the self will protect them from changes; even those caused during the experiment will disappear in a short time [12]. It can be seen that self-concept is affected by feedback from others.

Self-concept is the knowledge and evaluation of oneself, and it is a very important part of individual development [13]. It is also an interpretation of oneself through subjective understanding in the objective experience of an individual's interaction with others and feedback in the environment. It is the core of the personality structure. When this experience continues to accumulate, it forms a personal pairing. Self-integrity understanding and self-evaluation are a set of subjective thoughts [14]. With age, experience will continue to increase, and self-concept will also continue to grow. Therefore, the self-concept is a dynamic change in a person's life [15]. Gong Yuwen believes that self-concept is a conceptual indicator of the overall understanding of an individual. From active perception of oneself to a collection of experiences to evaluate oneself from a more objective angle, the individual gradually develops through the process of environmental interaction and socialization—to form a concept and evaluation of one's own image, behavior, ability, values, and emotions; to understand oneself from a comprehensive view of oneself; and to form a cognitive model of oneself [16]. Research by Renske Van der et al. showed that the ideas of others are very important in constructing a self-concept—the opinions of others are internalized into a part of the self-concept. This occurs at the behavioral and neurological level throughout adolescence. This may contribute to the development of a stable self [17].

In summary, self-concept is a person's experience of one's existence, including through personal experience, reflection, and feedback from others, to gradually deepen an understanding of oneself, integrate various habits, abilities, concepts, emotions, and behaviors shown by the individual, and become a universal and subjective idea of oneself as a whole.

Self-concept is composed of three parts: reflection evaluation, social comparison, and self-perception:

- (1) Reflection evaluation: one gets information about oneself from others. For example, when a child draws a picture and the parents say that it is very good, he or she will

- definitely become an excellent painter. After the child listens to it, he or she will draw more pictures or draw pictures more seriously in response; and vice versa.
- (2) Social comparison: it is a relative rather than absolute standard to confirm and measure oneself through comparison with others. For example, when test results are announced, students compare their scores with their classmates to understand their ranking in the class. In the case of a class average of 30 points, if a person scores 50 points, they consider it good.
 - (3) Self-feeling: see yourself in your own way, rather than judge yourself through others or in comparison with others. For example, after completing a task, you gain a sense of accomplishment, and subsequently increase in self-confidence and feel better about yourself.

2.2. Children's Self-Concept

The subject of this study are children in the third and fourth grades at elementary school. Therefore, this article focuses on the views of various scholars on the self-concept of this age group, in order to understand the characteristics and developmental focus of the self-concept of elementary school children.

Children aged six to twelve years are in the "incubation period" of sexual psychological development. Boys and girls are separated into single-sex groups. At school, children learn to improve their problem-solving skills and internalize social values [18]. At this stage, children begin to earnestly learn basic knowledge and skills and face the demands of society, and will compare and compete with others from time to time to establish self-efficacy. Successful learning experiences, the support and encouragement of teachers and parents, and sincere acceptance can promote children's sense of diligence; otherwise, they develop an inferiority complex and construct a negative self-concept [19]. For example, students who are interested in reading will devote more time to reading because of their interest, and because they devote more time, they will form the belief that they are better than others at reading, and students who have this belief are more likely to perform better in reading than those who lack self-confidence or do not have such beliefs [20]. Li Qiuying believes that painting can help children let go of their defensive attitudes, while also improving an individual self-concept. [21]. Self-concept is not inborn, but a result of socialization. It is generated after individuals interact with others and the environment, and can be changed and learned [22].

Schaffer pointed out that the development of children's self-concept changes over time; it can be divided into the following six points [23]:

- (1) From simplicity to differentiation: children form a holistic concept and gradually make showcase subtle differences as they grow up, taking into account contextual factors.
- (2) From inconsistency to consistency: younger children are more likely to change their self-evaluation; older children know their stability.
- (3) From concrete to abstract: children start focusing on the external level visible to the naked eye, and gradually develop to focus on the inner level invisible to the naked eye.
- (4) From absolute to relative: children tend to focus on themselves and do not refer to others. As they grow older, they gradually begin to compare themselves with others and understand themselves through comparison.
- (5) From optimism to reality: younger children portray themselves more glamorously, and as they grow older, they also mention their own strengths and weaknesses, and their viewpoints will be more balanced.
- (6) From public self to private self: children have never been able to distinguish between public behavior and private behavior, to distinguish between the two, and believe that the private self is the individual's true self.

The development of self-concept can have an impact on many aspects, such as diet, in daily life. Edurne Maiz and Nekane Balluerka found, in a study of the relationship between food neophobia and self-concept, that children with poor self-concept have a

lower acceptance of new foods. This may lead to picky eaters, which in turn affects physical development [24]. A study by Jaana et al. also mentioned that teachers should know more about a child's personality in order to give corresponding challenges and the possibility of success, and to cultivate and maintain a positive self-concept [25].

Based on the above points, the self-concept of elementary school children is a concept of continuous development, affected by the increase in age and experience, and gradually producing its own characteristics and development focus. In this stage, continuing to give positive feedback and experience will help children construct a positive self-concept.

2.3. Children's Self-Concept Scale

Children's self-concept is an important core of their psychological structure and has been measured in a large number of studies. The wide application of these measurement tools shows that they have perfect content validity and internal consistency [26]. Self-concept test tools have been established based on various theoretical backgrounds, theories, and measurement procedures, and because the content, meaning, and structure of the measurement tools varied, numerous tools have been developed [14]. At present, the self-concept testing tools commonly used are as follows. In 1979, Lu Qinming made reference to the Tennessee Self-Concept Scale compiled by Fitts and several Chinese translations of the Children's Self-Concept Test. The applicable objects are elementary and middle school students, measuring: (1) total self-concept, which refers to the attitude of an individual towards oneself; (2) self-identification, which refers to what kind of person the individual thinks of himself—it is the degree of personal satisfaction or acceptance of one's own current situation; (4) self-action is the personal view of one's own external behavior or reaction behavior [27]. The Chinese student version of the Tennessee Self-Concept Scale examines self-concept from six aspects: physical, moral, ethical, psychological, family, social, and academic self-concept. It is applicable to students from the fourth grade of elementary school to the third grade of high school (vocational), and the applicable age is from 11 to 18 [28]. Wu Yuyi and Hou Yaling compiled the Elementary School Self-Concept Scale based on the self-concept hierarchy model proposed by Shavelson et al. [29,30]. Among the published test tools, the Tennessee Self-Concept Scale Chinese Student Version and the Elementary School Children's Self-Concept Scale have been found to have relatively good reliability and validity; the scales used to assess children's psychological conditions are limited.

Regarding the development of the self-concept in other countries, Zhao Xiaomei compiled many scales to show how children's self-concept has been measured since 1960 [31]. For example, American psychologists Piers and Harris compiled The Piers-Harris Children's Self-Concept Scale in 1969 [32]. In 1970, Cratty developed The Cratty Self Concept Scale, which is suitable for students from kindergarten to sixth grade [33]. Martinek, Zaichkowsky, and Chefers developed a non-linguistic self-concept measurement tool for children in 1977, which is suitable for children in grades one to eight [34]. Among them, the Piers-Harris Children's Self-Concept Scale has been recommended and used for self-concept evaluation in various fields of psychology (education, social, clinical) and different purposes (diagnosis, intervention evaluation) [35]. On reviewing relevant research on the self-concept of children and adolescents over the past two decades, Butler and Gasson pointed out that the Piers-Harris Children's Self-Concept Scale is the most widely used test tool. It accounts for 35% utilization rate, which is 14% higher than the Rosenberg Self-Esteem Scale, which ranks second in utilization rate of 21% [36].

The Piers-Harris Children's Self-Concept Scale was revised in 1974 to evaluate children's self-concept status [37]. The Chinese version of this scale was introduced and translated by scholar Wang Mengxin. This scale contains 80 true and false questions and is suitable for children aged 8–16. It is divided into six subscales, namely Behavioral Adjustment, Intellectual and School Status, Physical Appearance and Attributes, Freedom from Anxiety, Popularity, and Happiness and Satisfaction; the total score is calculated from the six subscales. The children fill in the answer sheet by themselves. The higher the scale,

the better the evaluation. The Chinese part refers to a translation by scholar Wang Tangyi in 2012 in *A Study on the Reliability and Validity of the Piers-Harris Children's Self-Concept Scale with Learning Disabilities in Elementary Schools* [14].

2.4. The Impact of Smartphone Games on Children

Smartphones have been widely used in daily life. Whether it is to contact people, purchase items, search for information on the Internet, or listen to music and play games, these actions can be easily completed by operating a smartphone, which makes these devices more modern and help integrate people's lives [38].

While advancements in science and technology have brought many conveniences, they also have caused hidden worries. The age of mobile phone ownership continues to drop, from young people down to teenagers. In recent years, it has become more popular among elementary school children and even kindergarten children. With the declining age and popularity of smartphones, children can have their own smartphones from an early age. Because the operation of smartphones is user-friendly, simple, and convenient, these devices are often a bridge between parents and children, and parents also use them to comfort children and reduce the pressure of care.

With rapid advancement in technology, a growing number of new technologies are used on smartphones. The most famous example in recent years is the Pokémon GO game released in August 2016 on Taiwan's smartphone game download platform, forming a new wave the game trend. A lot of news at that time kept reporting the grand occasions of everyone playing together. It can be seen that smartphones no longer only offer the main functions of sending and receiving text messages and calls, as in the past. There are also functions, such as games and online search for information. A wide range of applications are closely linked to our lives. The popularity of smartphones has also caused some problems. More and more young people are becoming fascinated by the virtual world created by mobile phones, leading to the emergence of addictions, which are harmful to their psychology, physiology, social relations, study, and life [39]. A smartphone addiction survey conducted by Samaha and Hawi on college students shows that the risk of smartphone addiction is positively correlated with stress, but stress is negatively correlated with life satisfaction. In addition, the risk of smartphone addiction is negatively correlated with academic performance, but academic performance is positively correlated with life satisfaction [40].

The definition of smartphone games in this study points to games played on smartphones or tablet devices. With continuous improvements in people's living standards, the number of mobile phone users is also rising, and the functions of mobile phones are becoming more and more abundant, promoting the development of the smartphone game industry [41]. Mobile phones are a must-have technology product for the modern person, and the age of access is decreasing year by year. Nowadays, most elementary school students have their own smartphones. Games are a kind of development and have an important function in assisting children's socialization. Parents should use games as a learning medium to let children learn to grow and adapt to society [42]. With the development of technology, the medium of games has increased from traditional toys and human-to-human interaction to many digital game methods, such as computers and mobile phones. In recent years, technologies such as AR and VR have been updated. Due to the portable nature of mobile phones, the number of smartphone games and the number of players has increased rapidly. With continuous advancements in mobile phone technology, the output value of the smartphone gaming industry is also rising. According to data forecast by Dutch market analysis company Newzoo at the end of April 2018, the total revenue of the global game market in 2018 will reach the highest in history of 137 billion U.S. dollars, and nearly 50% of the revenue will come from smartphone games [43]. With the popularity of smartphones and the increasing acceptance of the game market, more experts boldly say that by 2021, smartphone games will occupy 59% of the game market.

In this era, every child has the opportunity to be exposed to smartphone games from an early age.

Since there are so many types of smartphone games, children may not be familiar with all types. If this study was limited to a single game or type, it would not be able to fully reflect the general situation of today's society. Therefore, the study uses gaming experience as a variable to explore the influence of gaming experience on children's self-concept.

Chen Kaiwei's research focused on the smartphone-use behaviors and interpersonal relationships of senior elementary school children, and found that smartphone-use behaviors and interpersonal relationships were partly influential. The interpersonal relationships were real, including teachers, family, friends, and peers [44]. The mobile phone strengthens the communication between parents and children, and also increases the frequency of communication among teenagers, which helps to maintain interpersonal relationships, and even provides an appropriate communication channel for people with poor sociality [45].

Play is an important part of a child's socialization process [46]. Playing games is in the nature of children. They do not need special learning, but can learn basic skills, such as growth, experience, and life [42]. Children can use games to create imaginary worlds, rehearse the roles of adults, and practice and prepare the basic skills needed for adult life [47]. With changes in society and the advancement of technology, children's games have also suddenly turned into digital ones. This is a young and rapidly developing form of games [48]. Moyles believes that children are entertained by the game, but at the same time cultivate their concentration through the tasks and goals involved in the game [49]. Zhang Meiyun pointed out that games play an important medical value in psychology, relieving and releasing physical and psychological unpleasantness [50]. Zhang Zhuting's research pointed out that one of the reasons why consumers download smartphone games is for the need for mood transformation. Consumers mainly want to find an outlet and a way to relieve stress, or pursue short-term photosensitive stimulation to help emotional withdrawal [51]. Lin Zonghong's research also shows that users can quickly switch to a relaxed mood, pass time, relieve stress, and feel joyful and happy by using mobile casual games [52]. Li Yuanxiang found that mobile games have a significant positive effect on concentration and control, and on the relief and pleasure of the healing effect. Research results show that mobile games have a healing effect [53].

3. Methods

This research uses a questionnaire survey method to collect information to understand the current situation of the smartphone gaming experience and self-concept of middle-grade students in elementary school. After the questionnaire is designed, a pre-test is conducted to test the reliability and validity of the questionnaire and collect feedback from the subjects to modify its content. One month after the end of the pre-test, the questionnaire is formally distributed for measurement, following which the results are analyzed. If no significant difference is found, the correlation between gaming experience and self-concept is re-analyzed; if there is a significant difference, it is summarized based on the analysis results to draw conclusions and make recommendations. The research framework is shown in Figure 1.

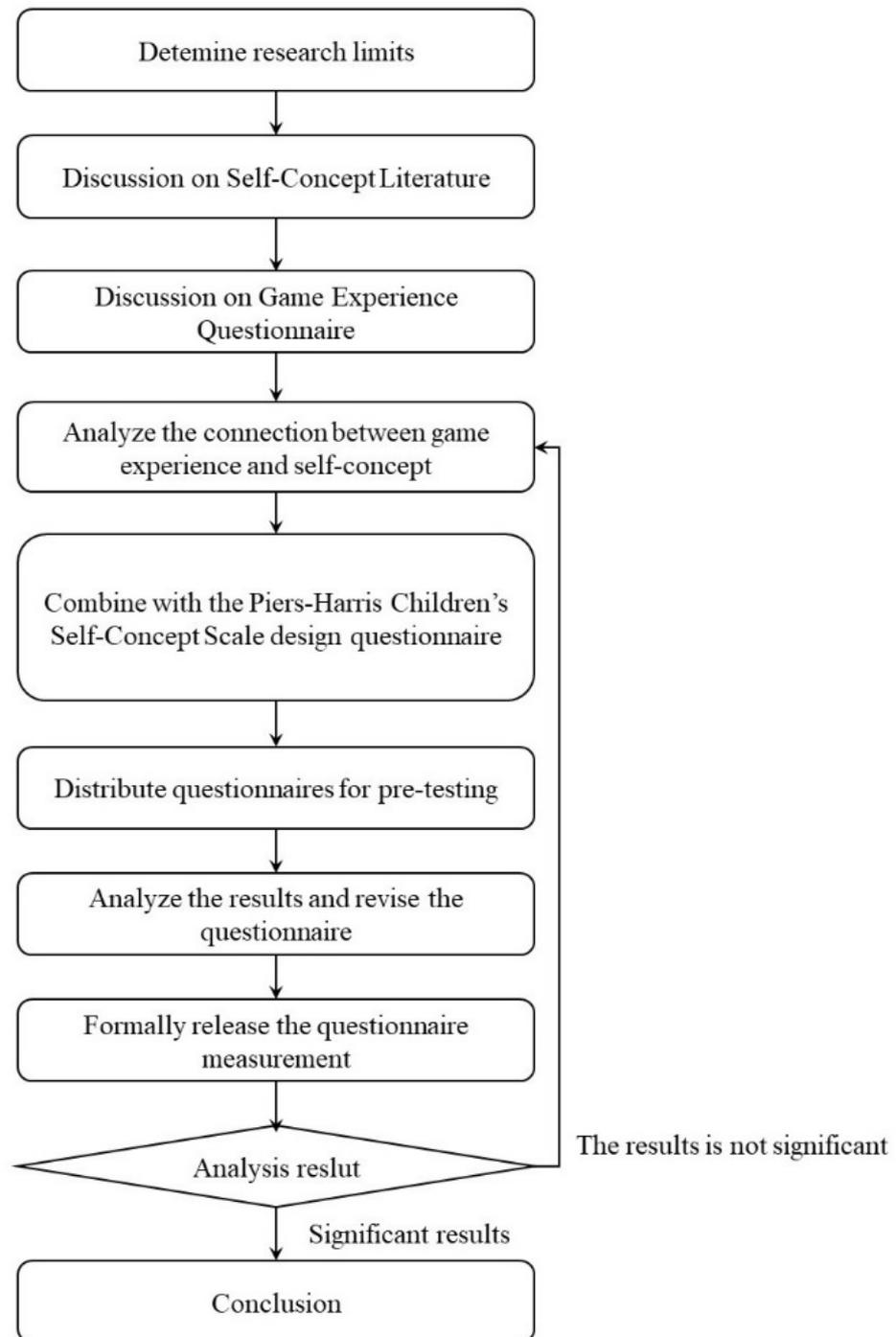


Figure 1. Research architecture diagram.

3.1. Research Object

Before conducting the research, this study interviewed two elementary school teachers—a junior teacher and a middle-level teacher. Both teachers recommended that the questionnaire be distributed to middle-grade and above students, because lower-grade students would have no idea about the content mentioned in many questions, or the concept would be vague to them, so they would need someone to assist them during the test. In other words, it is impossible for lower-grade students to complete the questionnaire alone, while middle-grade students can do so. Therefore, third and fourth grade students were chosen as the subjects of the questionnaire in this study.

3.2. Research Tools

Two questionnaires were used in this study—the Smartphone Game Experience and the Piers-Harris Children’s Self-Concept Scale. The former refers to the Online Game Experience Questionnaire compiled by Xinjie Wu [54]. The content of the test changed from online games to smartphone games, and some content was modified to obtain a smartphone gaming experience questionnaire, including time spent on smartphone games, and frequency of play on weekdays and weekends. The questionnaire used to understand self-concept is the Piers-Harris Children’s Self-Concept Scale.

The questionnaire was divided into three parts, including personal basic information, smartphone gaming experience, and self-concept scale. The questionnaire is shown in Figures 2–5.

The Impact of Smart Phone Games on Pupils' Self-Concept

Answer instructions

1. Please read the questions carefully before answering, don't miss out
2. Basic information and the first part, please select the option that matches your situation, and fill in the number in parentheses
3. The second part is right and wrong questions. There are a total of 80 questions. Please write O in parentheses for those that meet your actual situation or ideas, and X for those that do not.

Basic information:

() 1. Gender: (1) Boy (2) Girl

() 2. Grade: (1) Third grade (2) Fourth grade

Figure 2. The first page of the questionnaire.

first part:

This part is to investigate the usage of mobile games. Please select the option that suits your situation and fill in the number in parentheses.

() 1. Have you ever been exposed to mobile games?

(1) Yes (2) No (please fill in the second part directly)

() 2. How long has it been since you started to contact mobile games?

(1) Less than half a year (2) Half a year to 1 year (3) 1 to 2 years
(4) 2~3 years (5) More than 3 years

() 3. How many times do you play mobile games on average in a week?

(1) 1 to 2 times (2) 3 to 4 times (3) 5 to 6 times (4) 7 to 8 times (5) 9 times or more

() 4. On weekdays, how long do you spend playing mobile games on average every day?

(1) No play (2) Less than 1 hour (3) 1~2 hours
(4) 2~3 hours (5) 3~4 hours (6) 4 hours or more

() 5. On holidays, how long do you spend playing mobile games on average every day?

(1) No play (2) Less than 1 hour (3) 1~2 hours
(4) 2~3 hours (5) 3~4 hours (6) 4 hours or more

() 6. Can you play mobile games at home?

(1) Yes (2) No

Figure 3. The second page of the questionnaire.

The second part:
 This part is to investigate the development of children's self-concepts. Please fill in O or X in the brackets according to your own situation or ideas

()1.My classmates make fun of me	()2.I am a happy person
()3.It is hard for me to make friends	()4.I am often sad
()5.I am smart	()6.I am shy
()7.I get nervous when the teacher calls on me	()8.My looks bother me
()9.When I grow up, I will be an important person	()10.I get worried when we have tests in school
()11. I am unpopular	()12.I am well behaved in school
()13.It is usually my fault when something goes wrong	()14.I cause trouble to my family
()15.I am strong	()16.I have good ideas
()17.I am an important member of my family	()18.I usually want my own way
()19.I am good at making things with my hands	()20.I give up easily
()21.I am good in my school work	()22.I do many bad things
()23.I can draw well	()24.I am good in music
()25.I behave badly at home	()26.I am slow in finishing my school work
()27.I am an important member of my class	()28.I am nervous
()29.I have pretty eyes	()30.I can give a good report in front of the class
()31.In school I am a dreamer	()32.I pick on my brother(s) and sister(s)
()33.My friends like my ideas	()34.I often get into trouble
()35.I am obedient at home	()36.I am lucky
()37.I worry a lot	()38.My parents expect too much of me
()39.I like being the way I am	()40.I feel left out of things
()41.I have nice hair	()42.I often volunteer in school
()43.I wish I were different	()44.I sleep well at night
()45.I hate school	()46.I am among the last to be chosen for games
()47.I am sick a lot	()48.I am often mean to other people

Figure 4. The third page of the questionnaire.

()49.My classmates in school think I have good ideas	()50.I am unhappy
()51.I have many friends	()52.I am cheerful
()53.I am dumb about most things	()54.I am good-looking
()55.I have lots of pep	()56.I get into a lot of fights
()57.I am popular with boys	()58.People pick on me
()59.My family is disappointed in me	()60.I have a pleasant face
()61.When I try to make something, everything seems to go wrong	()62.I am picked on at home
()63.I am a leader in games and sports	()64.I am clumsy
()65.In games and sports, I watch instead of play	()66.I forget what I learn
()67.I am easy to get along with	()68.I lose my temper easily
()69.I am popular with girls	()70.I am a good reader
()71.I would rather work alone than with a group	()72.I like my brother(sister)
()73.I have a good figure	()74.I am often afraid
()75.I am always dropping or breaking things	()76.I can be trusted
()77.I am different from other people	()78.I think bad thoughts
()79.I cry easily	()80.I am a good person

Figure 5. The fourth page of the questionnaire.

The self-concept scale contains six subscales, namely Behavioral Adaptation, Intellectual and School Status, Physical Appearance and Attributes, Freedom from Anxiety, Popularity, and Happiness and Satisfaction; see Table 1.

Table 1. Number of questions and corresponding question number of each subscale in the self-concept scale.

Self-Concept Subscale	Total Number of Questions	Question Number
Behavioral Adjustment	16	12, 13, 14, 21, 22, 25, 34, 35, 38, 45, 48, 56, 59, 62, 78, 80
Intellectual and School Status	17	5, 7, 9, 12, 16, 17, 21, 26, 27, 30, 31, 33, 42, 49, 53, 66, 70
Physical Appearance and Attributes	13	5, 8, 15, 29, 33, 41, 49, 54, 57, 60, 63, 69, 73
Freedom from Anxiety	14	4, 6, 7, 8, 10, 20, 28, 37, 39, 40, 43, 50, 74, 79
Popularity	12	1, 3, 6, 11, 40, 46, 49, 51, 58, 65, 69, 77
Happiness and Satisfaction	10	2, 8, 36, 39, 43, 50, 52, 60, 67, 80

- (1) Reliability analysis: a total of 47 questionnaires were collected. After deleting questionnaires that did not have signed parental consent, those that were filled out by students who had never played smartphone games, and those that were incomplete, a total of 41 questionnaires were found to be valid (87%). In this study, the internal consistency coefficient was used for reliability analysis, SPSS was used to analyze its Cronbach's α coefficient, and the six subscales and total scores of the self-concept scale were analyzed separately, for a total of seven items. The analysis revealed that Cronbach's α coefficient of the total score reached 0.927, and the subscales ranged from 0.646 to 0.851, which shows that this scale has good internal consistency. According to the analysis results of each subscale, in the Happiness and Satisfaction subscale, after question 43 I wish I were different is deleted, the Cronbach's α coefficient of the Happiness and Satisfaction subscale rises from 0.730 to 0.837. Increased by 0.107, the reliability is significantly improved, so this question is deleted. Except for this question, the Cronbach's α coefficient of the remaining questions after being deleted from each subscale only increased by 0.046, so in terms of reliability testing, only question 43 was deleted.
- (2) Participants' feedback: in addition to the results of the reliability analysis, due to some participants' reactions (there are no other brothers or sisters in my family), question 32: I pick on my brother(s) and sister(s) and question 72: I like my brother(sister) were not answered. Considering that the current society is moving towards declining birthrates and the proportion of only children is increasing, these two questions are deleted.
- (3) Final result: there were 77 questions in the revised self-concept scale; see Table 2.

Table 2. The number of questions and corresponding question numbers of each subscale of the revised self-concept scale.

Self-Concept Subscale	Total Number of Questions	Question Number
Behavioral Adjustment	16	12, 13, 14, 21, 22, 25, 33, 34, 37, 43, 46, 54, 57, 60, 75, 77
Intellectual and School Status	17	5, 7, 9, 12, 16, 17, 21, 26, 27, 30, 31, 32, 41, 47, 51, 64, 68
Physical Appearance and Attributes	13	5, 8, 15, 29, 32, 40, 47, 52, 55, 58, 61, 67, 70
Freedom from Anxiety	13	4, 6, 7, 8, 10, 20, 28, 36, 38, 39, 48, 71, 76
Popularity	12	1, 3, 6, 11, 39, 44, 47, 49, 56, 63, 67, 74
Happiness and Satisfaction	9	2, 8, 35, 38, 48, 50, 58, 65, 77
total	77	1–77

3.3. Analysis

In this study, after the questionnaire was collected, the valid samples were coded and registered, the data was input into the computer for storage and file formation, and the collected data was analyzed and processed by SPSS. The data was analyzed in the following ways to achieve the research purpose and prove whether it was supported. The analysis method is described as follows:

- (1) Descriptive Statistics

Descriptive statistics is a general term for statistics used to describe or summarize the basic situation of observations. Through the analysis of data, we can understand the concentration and dispersion of observations in each variable, such as mean and standard deviation. This method is used to count gender, grade, gaming experience, and self-concept.

(2) T test

The T test is often used to compare whether two sets of data are significantly different. The T test is classified into three types based on the nature of the analytical data. A single sample T test used to compare the relationship between the sample at hand and a specific value; it is used to evaluate whether there are significant differences between mutually independent data in the two groups of independent sample T test; a paired sample T test used to compare the mean difference between two groups of dependent samples. This study uses an independent sample T test. This method is used to analyze the differences between sex and grade at six levels of self-concept and overall.

(3) One-way ANOVA

One-way ANOVA is used to compare the mean difference between multiple groups of samples. If the group effect is significant, a post-comparison will be performed to confirm the difference in each group. Methods for post-comparison include the Bonferroni method and Scheffe method, among others. In this study, the Scheffe method is used to perform simultaneous joint pairwise comparisons for all possible pair-average combinations, which has the advantage of a lower error rate. This method is used to analyze the differences between the six levels of self-concept and the whole of the smartphone gaming experience.

3.4. Research Limitations

This section will focus on the research restrictions.

- (1) The subjects of this study are students in the third and fourth grades of elementary school, and their age group is 8–10 years
- (2) The questionnaires were issued mid-semester, not during winter or summer vacations. Weekdays are defined as school days in this study and holidays as non-school days
- (3) This research defines smartphone games as entertainment, which is the main type of games most children play during leisure and entertainment activities. Smartphone games developed for learning purposes are not included in this research.

4. Results and Discussion

This study analyzes and discusses the results of the questionnaire survey to understand the current situation of the smartphone gaming experience and self-concept of middle grade students in elementary school and the relationship between the two. A total of 378 questionnaires were collected; 273 valid questionnaires were obtained by eliminating those with incomplete answers, no parental consent, and those of students who have not played smartphone games. Among them, 35 were from those who had never been played smartphone games. After analyzing the reliability and validity of the 273 valid questionnaires, it was found that the internal consistency coefficient of the total score is 0.915. The internal consistency coefficient of each subscale is 0.781 for Behavioral Adjustment, 0.811 for Intellectual and School Status, and 0.746 for Physical Appearance and Attributes, 0.749 for Freedom from Anxiety, 0.587 for Popularity, and 0.578 for Happiness and Satisfaction.

4.1. Research Results and Discussion on the Experiences of Smartphone Games among Middle School Students in Elementary School

The purpose of this section is to understand the current situation of smartphone gaming experience of middle-grade elementary school children, in order to complete research objective 1—the current situation of smartphone gaming experience of middle-grade elementary school children.

In order to understand the same, the results are analyzed by frequency distribution and percentage. The results are shown in Table 3.

Table 3. Summary of the analysis of the current situation of mobile games experience of middle-grade students in elementary and middle school.

Item	Category	Number of People	Percentage	Cumulative Percentage
Player qualifications	(1) Less than half a year	44	16.1	16.1
	(2) Half a year~1 year	45	16.5	32.6
	(3) 1~2 years	59	21.6	54.2
	(4) 2~3 years	41	15.0	69.2
	(5) Over 3 years	84	30.8	100.0
Play days per week	(1) 0 days	26	9.5	9.5
	(2) 1~2 days	157	57.5	67.0
	(3) 3~4 days	45	16.5	83.5
	(4) 5~6 days	28	10.3	93.8
	(5) More than 7 days	17	6.2	100.0
Weekday play times	(1) Did not play	108	39.6	39.6
	(2) Less than 1 h	108	39.6	79.2
	(3) 1~2 h	39	14.2	93.4
	(4) 2~3 h	8	2.9	96.3
	(5) 3~4 h	4	1.5	97.8
	(6) More than 4 h	6	2.2	100.0
Weekend play times	(1) Did not play	24	8.8	8.8
	(2) Less than 1 h	102	37.4	46.2
	(3) 1~2 h	83	30.4	76.6
	(4) 2~3 h	20	7.3	83.9
	(5) 3~4 h	12	4.4	88.3
	(6) More than 4 h	32	11.7	100.0
Can I play smartphone games at home?	(1) Yes	237	86.8	86.8
	(2) No	36	13.2	100.0

The results in Table 3 are divided according to the experience of different smartphone games, which are described as follows:

- (1) Player qualifications: this research shows that the number of people with more than three years of experience in smartphone games is the largest, accounting for 30.8%, indicating that nearly 30% of school children have been exposed to smartphone games before entering elementary school. Those who have played for more than two years account for 45.8%, indicating that nearly half of school children have been exposed to smartphone games in their early grades.
- (2) Play days per week: in the play days per week, 1~2 days is the most common, accounting for 57.5%. It shows that most elementary school children play smartphone games 1~2 days. This result is the same as Zheng Yazhen's study of senior elementary school children [55].
- (3) Weekday play times: in weekday play times, those who have not played or played for less than an hour are tied for the most, both accounting for 39.6%. Researchers speculate that due to the long time at school on weekdays, even if one plays smartphone games, the playing time will not be too high.
- (4) Weekend play times: this research shows that weekend play times is less than 1 h as the most, accounting for 37.4%. 76.6% of schoolchildren play less than two hours, indicating that most middle-grade schoolchildren do not play for more than two hours, even on holidays. The results of this research are the same as those of Wu Xinjie on the online gaming experience of senior students. The proportion of children whose weekend play times do not exceed 2 h accounted for more than 50% of the total [54].

- (5) Can I play smartphone games at home: this research shows that those who can play smartphone games at home account for 86.8%; those who cannot play at home account for 13.2%. This shows that it is quite common to play smartphone games at home, but there are still 10% of school children who cannot play at home. Most of them have been exposed to smartphone games, but are not currently playing them.

4.2. Results and Discussion of Self-Concept Research of Middle-Grade Students in Elementary School

In order to complete research objective two (understand the current situation and differences of the self-concept of elementary school students) and research objective three (understand the elementary school students), this section is divided into two parts. The first part is the analysis of the current situation of the self-concept of middle-grade students in elementary school, the second part is the difference in the self-concept of different background variables, and the third part is a comprehensive discussion.

4.2.1. Analysis of the Current Situation of the Self-Concept of Middle-Grade Pupils

The total number of questions in the 'Self-Concept Scale' of this study is 77, which is divided into Behavioral Adjustment, Intellectual and School Status, Physical Appearance and Attributes, Freedom from Anxiety, Popularity, Happiness and Satisfaction, and Total Score. Each question has a correct answer. The higher score of the subject is at this level, the higher degree of self-concept development is in the item. The descriptive statistics of the self-concept status of middle-grade students in elementary school are summarized in Table 4 below.

Table 4. Analysis of the current situation of the self-concept of middle-grade students in elementary school.

Subscale	Average	Standard Deviation
Behavioral Adjustment	12.73	3.02
Intellectual and School Status	10.64	4.00
Physical Appearance and Attributes	7.50	3.02
Freedom from Anxiety	8.85	2.89
Popularity	8.94	2.10
Happiness and Satisfaction	7.42	1.58
Total score	54.54	11.98

4.2.2. Analysis of Differences in the Self-Concept of Variables in Different Backgrounds

The self-concept subscale and the total score are analyzed and compared with different background variables. In the section, 'the influence of gender and grade on self-concept', an independent sample T test is used for analysis and discussion. The influence of concepts part uses single-factor variance analysis for analysis and discussion. The results are as follows:

(1) Gender

To check whether the performance of middle-grade students in elementary school is different due to gender differences, an independent sample T test is used for analysis. The results are shown in Tables 5 and 6.

Table 5. Number of people of different genders, and average and standard deviation.

Standard Deviation	Gender	Number	Average	Standard Deviation
Freedom from Anxiety	(1) Boy	130	9.04	2.67
	(2) Girl	143	8.67	3.07
Popularity	(1) Boy	130	8.87	1.77
	(2) Girl	143	8.99	2.35

Table 6. Analysis table of the independent T test for different genders.

Standard Deviation	F	P	t
Freedom from Anxiety	4.816	0.029	1.069 1.076
Popularity	4.588	0.033	−0.456 −0.462

In terms of self-concept, middle-grade elementary school children of different genders show significant differences in the two subscales of Freedom from Anxiety and Popularity.

In terms of Freedom from Anxiety, significance ($p = 0.029$) < 0.05 , $t = 1.076$, indicating a significant difference; the boys' average (9.04) is higher than the girls' average (8.67).

In terms of Popularity, significance ($p = 0.033$) < 0.05 , $t = -4.62$, indicating a significant difference. The girls' average (8.99) is higher than the boys' average (8.87).

In addition, there were no significant differences in Behavioral Adaptation, Intellectual and School Status, Physical Appearance and Attributes, Happiness and Satisfaction, and Total Score.

There are two significant differences in the self-concept subscale, which means that there is a significant difference in the self-concept, and this difference is shown in Freedom from Anxiety and Popularity. From this, we know that Hypothesis 1 is supported: different genders show significant differences in the self-concept of middle-grade pupils in elementary school.

(2) Grade

To check whether the performance of middle-grade students in elementary school is different due to differences in grades, an independent sample T test is used for analysis. The results are shown in Tables 7 and 8.

Table 7. Number of people in different grades, and average and standard deviation.

Standard Deviation	Gender	Number	Average	Standard Deviation
Intellectual and School Status	(1) Third grade	134	10.68	4.24
	(2) Fourth grade	139	10.58	3.75

Table 8. Independent T test analysis table for different grades.

Standard Deviation	F	p	t
Intellectual and School Status	5.884	0.016	0.199 0.199

In terms of self-concept, middle school students of different grades only show significant differences in the Intellectual and School Status subscale.

In terms of Intellectual and School Status, significance ($p = 0.016$) < 0.05 , $t = 0.199$, indicating a significant difference; the average (10.68) of the third grade is higher than the average (10.58) of the fourth grade.

In addition, there are no significant differences in Behavioral Adjustment, Physical Appearance and Attributes, Freedom from Anxiety, Popularity, Happiness and Satisfaction, and Total Score.

There is a significant difference in the self-concept subscale, which means that there is a significant difference in the self-concept, and this difference is shown for Intellectual and School Status. From this, we know that Hypothesis 2 is supported: different grades show significant differences in the self-concept of middle-grade elementary school children.

(3) Gaming Experience

To check whether the performance of middle-grade students in elementary school is different due to differences in gaming experience, this part uses one-way ANOVA to analyze. The following is an analysis of the five different questions individually.

Results analyzing if middle-grade students in elementary school have different self-concept performances due to the differences in player qualifications. The average of middle-grade students in elementary school with different player qualifications at the Behavioral Adjustment level is half a year~1 year as the highest: the average is 13.20, and significance is 0.839; Intellectual and School Status level average is highest at 2~3 years: the average is 11.17, and significance is 0.399; the Physical Appearance and Attributes level average has less than half a year as the highest: the average is 8.31, and significance is 0.287; the average of the Freedom from Anxiety level is half a year~1 year: the average is 9.28, and significance is 0.822; the average of the Popularity level is half a year~1 year is the highest: the average is 9.31, and significance is 0.322; Happiness and Satisfaction is less than half a year as the highest: the average is 7.61, and significance is 0.810; Total Score is the overall average—less than half a year is the highest: the average is 56.52, and significance is 0.556. To sum up, in the self-concept of different player qualifications, the significance of all the seven parts is greater than 0.05, and none of them reach a significant difference. Therefore, there is no significant difference in self-concept among middle-grade students in elementary school with different player qualifications.

Results analyzing if middle-grade students in elementary school have different self-concept performances due to differences in play days per week: from the perspective of self-concept, the average of 7 days is the highest in the Behavioral Adjustment level of elementary school children in different play days per week: the average is 12.88, and significance is 0.980; at the Intellectual and School Status level, the average is the highest at 7 days, and it is 10.88, with significance of 0.972; at the Physical Appearance and Attributes level, the average is at 7 days, with an average of 8.11 and a significance of 0.395; at the Freedom from Anxiety level, the average of 3~4 days is the highest, with an average of 9.11, and significance of 0.751; at the Popularity level, the average is the highest at 7 days, and is 9.35, with a significance of 0.482; the highest average at the Happiness and Satisfaction level is at 5~6 days, with an average of 7.64 and significance of 0.813; Total Score overall average is the highest at 7 days, with an average of 55.23 and significance of 0.943.

To summarize, the significance of the seven parts in distinct play days per week in the self-concept is all greater than 0.05, and none of them reach a significant difference. Therefore, there are no significant differences in self-concept among middle-grade students in elementary school of different play days per week.

Results analyzing if middle grade students in elementary school have different self-concept performance due to differences in weekday play times: from the perspective of self-concept, the average value of middle school children in different weekday play times at the Behavioral Adjustment level is 4 h or more; the average is 13.66, and significance is 0.968; at the level of Intellectual and School Status, the average is the highest at less than 1 h: the average is 10.87, and significance is 0.911; at the level of Physical Appearance and Attributes, the highest average is 2~3 h: the average is 8.62, and significance is 0.839; for the Freedom from Anxiety level, the highest average is over 4 h: the average is 9.83, and significance is 0.465; for the Popularity level, the highest average is 2 to 3 h: the average is 9.75, and significance is 0.632; for the Happiness and Satisfaction level, the highest average is 2 to 3 h: the average is 7.87, and significance is 0.900; Total Score overall average is highest at 2 to 3 h: the average is 55.25, and significance is 0.996.

To summarize, in the self-concept of different weekday play times, the significance of the seven parts is greater than 0.05, and none of them reach a significant difference. Therefore, there are no significant differences in self-concept among middle-grade students in elementary school at different weekend play times.

Results analyzing if middle grade students in elementary school have different self-concept performances due to differences in weekend play times. The results are shown in Tables 9 and 10.

Table 9. Number of people at different weekend play times, and average and standard deviation.

Standard Deviation	Group	Number	Average	Standard Deviation
Behavioral Adjustment	(1) Did not play	24	12.54	2.48
	(2) Less than 1 h	102	13.57	2.71
	(3) 1~2 h	83	12.18	3.36
	(4) 2~3 h	20	11.75	2.73
	(5) 3~4 h	12	13.00	1.70
	(6) More than 4 h	32	12.12	3.40
Intellectual and School Status	(1) Did not play	24	10.16	4.02
	(2) Less than 1 h	102	12.07	3.68
	(3) 1~2 h	83	9.89	4.00
	(4) 2~3 h	20	9.50	3.63
	(5) 3~4 h	12	11.16	3.37
	(6) More than 4 h	32	9.03	4.23
Popularity	(1) Did not play	24	8.66	2.14
	(2) Less than 1 h	102	9.29	1.81
	(3) 1~2 h	83	8.80	2.36
	(4) 2~3 h	20	7.90	2.38
	(5) 3~4 h	12	10.08	1.31
	(6) More than 4 h	32	8.56	1.91
Total Score	(1) Did not play	24	53.12	12.21
	(2) Less than 1 h	102	58.22	11.67
	(3) 1~2 h	83	52.65	11.86
	(4) 2~3 h	20	50.90	11.01
	(5) 3~4 h	12	55.91	7.20
	(6) More than 4 h	32	50.50	12.54

Table 10. One-way ANOVA with different weekend play times.

Standard Deviation	F	p
Behavioral Adjustment	2.979	0.012
Intellectual and School Status	4.794	0.000
Popularity	2.718	0.020
Total Score	3.717	0.003

According to Tables 9 and 10, from the perspective of self-concept, middle-grade students in elementary school at different weekend play times achieved significant results in the four items of Behavioral Adjustment, Intellectual and School Status, Popularity and Total Score.

Although the significance of Behavioral Adjustment is $0.012 < 0.05$, reaching a significant difference, after the Scheffe method, a difference between the groups was not found. In terms of Intellectual and School Status, a significant difference of $0.000 < 0.05$ was seen. After the Scheffe method, it is found that the score of weekend play times, less than 1 h (12.07), is higher than the score of 1~2 h (9.89) and more than 4 h score (9.03), but there is no significant difference between 1~2 h and more than 4 h. In terms of Popularity, although the significance is $0.020 < 0.05$, which is a significant difference, after the Scheffe's method, a difference between the groups cannot be found. In terms of Total Score, although the significance is $0.003 < 0.05$, reaching a significant difference, after Scheffe's method, a difference between the groups cannot be found. In addition, there are no significant differences in Physical Appearance and Attributes, Freedom from Anxiety, and Happiness and Satisfaction among elementary school middle-grade students at different weekend play times.

To check if the self-concept performance of middle-grade students in elementary school is different due to the difference in “can I play smartphone games at home”, one-way ANOVA was used to analyze. The results are shown in Tables 11 and 12.

Table 11. The number of people who can play smartphone games at home, and average and standard deviation.

Standard Deviation	Group	Number	Average	Standard Deviation
Popularity	yes	237	9.04	2.06
	No	36	8.22	2.19

Table 12. One-way ANOVA that can play smartphone games at home.

Standard Deviation	F	p
Popularity	4.898	0.028

According to Tables 11 and 12, in terms of self-concept, middle-grade students in different “can I play smartphone games at home” have significant differences in terms of Popularity. The significance of Popularity is $0.028 < 0.05$, indicating a significant difference. The average (9.04) for those who can play smartphone games at home is greater than the average (8.22) for those who cannot play smartphone games at home.

In addition, there are no significant differences in Behavioral Adjustment, Intellectual and School Status, Physical Appearance and Attributes, Freedom from Anxiety, Happiness and Satisfaction, and Total Score.

4.2.3. Comprehensive Discussion

The statistical analysis results of the self-concept of middle-grade students in elementary school with different background variables are summarized in Table 13.

Table 13. Summary of difference analysis results of all background variables.

Variable	Group	Intellectual and School Status	Freedom from Anxiety	Popularity
Gender	(1) Boy (2) Girl		1 > 2	2 > 1
Grade	(1) Third grade (2) Fourth grade	1 > 2		
Weekend play times	(1) Did not play (2) Less than 1 h (3) 1~2 h (4) 2~3 h (5) 3~4 h (6) More than 4 h	2 > 3 2 > 6		
Can I play smartphone games at home?	(1) Yes (2) No			1 > 2

After sorting out the results of this research, we obtained the differences between Behavioral Adjustment, Intellectual and School Status, Physical Appearance and Attributes, Freedom from Anxiety, Popularity, Happiness and Satisfaction, and Total Score of the self-concept of elementary school middle-grade students with different background variables.

This study shows that there are significant differences between Freedom from Anxiety and Popularity among middle-grade elementary school children of different genders. However, there are no significant differences in Behavioral Adjustment, Intellectual and School Status, Physical Appearance and Attributes, Happiness and Satisfaction, and overall, in the middle grades of elementary school of different genders. Therefore, Hypothesis 1

is supported: different genders show significant differences in the self-concept of middle-grade pupils in elementary school.

Regarding research on the self-concept of different genders, there are different results. In a study on the relationship between online gaming experience, self-concept, and the sense of meaning of life among senior elementary school children in Kaohsiung city, Wu Xinjie mentioned that the reason why the concept is higher in girls than boys is because girls' physical and mental development takes place earlier than boys, and they also have better communication skills in the face of interpersonal relationships. Therefore, they are significantly higher than boys in terms of the overall self-concept, individual self, and social self [54]. This has an impact on self-concept at the Popularity level, resulting in higher scores for girls.

In general, girls hit puberty between the ages of 8–13 years and boys between 9–14 years. Due to better quality of life, coupled with environmental changes, girls are reaching puberty about 1 to 2 years earlier than in the past. In terms of height, puberty age is a critical factor. Taking the third and fourth grades of elementary school as an example, girls often begin to develop earlier than boys and gradually mature in thinking, whereas boys develop later and thus have more childlike innocence and are more easily optimistic about many things. As a result, when it comes to Freedom from Anxiety, boys dominate girls.

This research shows that there are significant differences in Intellectual and School Status among middle-grade students in different grades. Therefore, Hypothesis 2 is supported: different grades have differences in the self-concept of middle-grade students in elementary school. Chen Tongling and Zheng Yazhen point out that there are significant differences in the self-concept of students in the upper grades in elementary school, with the fifth grade being higher than the sixth grade [55,56]. This study found that there are significant differences in self-concept among middle-grade students in different grades. Third-grade students were found to be higher than fourth-grade students. Compared to former research, the lower grades are found to be higher than the higher grades. The researcher thinks that it is possible to increase the research results of the lower grades and analyze all six grades of the elementary school together. It may be possible to find the stage at which the self-concept score is the highest.

In this research, regarding the relevance of gaming experience and the self-concept, the following is a breakdown of the question items of different gaming experiences, which are described as follows:

(1) Player qualifications

This study shows that there are no significant differences in the self-concept levels of middle-grade students in elementary school with different player qualifications. Researchers believe that smartphone games are a common form of leisure and entertainment for school children, and it may be difficult to judge the relevance of the length of contact with self-concept. The results of this research are the same as Wu Xinjie's research on online games and the self-concept of elementary school students— there is no significant difference [54].

(2) Play days per week

This study shows that there are no significant differences in the self-concept of middle-grade students with regard to different play days per week.

(3) Weekday play times

This research shows that there are no significant differences in the self-concept of middle-grade students at different levels of weekday play times. Researchers believe that during school days, except for school hours, most school children's play time is approximately one hour, so it has little effect on self-concept levels.

(4) Weekend play times

This research shows significant differences in the Intellectual and School Status level of middle-grade students with different weekend play times. Researchers believe that it is a common phenomenon to play smartphone games on holidays; however, the time spent on it should not be too long. Lin Zonghong's research shows that users can switch to a relaxed mood in a short period of time and relieve stress by playing casual mobile phone games [52]. Due to the high pressure of schoolwork on weekdays, most of the day is anyway spent on schoolwork, and there is not much time to play. However, with a short time spent on mobile games, students are able to de-stress and can properly use their abilities in other aspects of life. Therefore, in terms of Intellectual and School Status, those with less than 1 h play time had higher scores than those with 1~2 h and more than 4 h. This research result and Wu Xinjie's research result show that those who play online games for no more than 2 h on holidays perform better than those who play online games for more than 4 h, and those who have less time are higher than those who have higher time [54].

(5) Can I play smartphone games at home?

This study shows that "can I play smartphone games at home" had significant differences in the Popularity level of middle-grade students in elementary school. Those who play smartphone games at home had higher scores than those who cannot play smartphone games at home. Researchers believe that because smartphone games have become a common leisure activity for school children, a part of the interaction among students revolves around smartphone games. The ability to play smartphone games at home increases the interaction between schoolchildren and their classmates; it has a positive influence. Therefore, those who "can play smartphone games at home" have higher scores at the Popularity level than those who cannot.

To summarize, this study shows that elementary school children with different smartphone gaming experiences have significant differences in the Intellectual and School Status and Popularity levels. Therefore, Hypothesis 3 is supported: different smartphone gaming experiences show significant differences in the self-concept of middle-grade students in elementary school.

5. Conclusions

The aim of this research was to explore the current relationship between smartphone gaming experience and self-concept of middle-grade students in elementary school. The researchers first collected relevant literature to explore and understand the related research on smartphone games and the self-concept theory, as the theoretical basis of this research, and formed various research hypotheses. Then, a questionnaire survey was conducted, with 378 middle-grade students in elementary school as the research subjects. After the survey, various hypotheses were tested by descriptive statistics, T test, and single-factor analysis of variance, and the results were presented. This chapter explains the main findings of the research based on the analysis of the research results in Chapter 4, summarizes the conclusions, and finally puts forward specific suggestions.

Based on the statistical analysis results in Chapter 4, the following conclusions are synthesized. Elementary and middle-grade children have a high generality in smartphone gaming experience. With regard to school children playing smartphone games, there are more girls than boys, the fourth grade scores higher than the third grade, the most contact time is over 3 years, the most play days per week is 1~2 days, and the weekend play times those who have not played at all are tied for the most with less than 1 h, the weekend play times is the most with less than 1 h, and the most can play smartphone games at home. In terms of gender, grade, weekend play times, and can I play smartphone games at home, the self-concept of middle-grade students in elementary school have a significant impact.

- (1) In terms of gender, the score of middle-grade boys in elementary school for the Freedom from Anxiety level (9.04) is significantly higher than that of girls (8.67), with a significance of 0.029; the score of middle-grade boys in elementary school at the Popularity level (8.87) is significantly lower than the girl's score (8.99), with a significance

of 0.033. Therefore, Hypothesis 1 is supported: different genders show significant differences in the self-concept of middle-grade students in elementary school.

- (2) In terms of grades, the scores of third-grade elementary school children (10.68) at the Intellectual and School Status level are significantly higher than the scores of fourth-grade elementary school children (10.58), with a significance of 0.016. Therefore, Hypothesis 2 is supported: different grades show significant differences in the self-concept of middle-grade elementary school children.
- (3) In terms of weekend play times, the scores of those who played smartphone games for less than 1 h in the Intellectual and School Status level (12.07) are significantly higher than those who played 1 to 2 h (9.89) or more than 4 h (9.03), with a significance of 0.000. Therefore, Hypothesis 3 is supported: different smartphone gaming experiences show significant differences in the self-concept of middle-grade students in elementary school.
- (4) With regard to “can I play smartphone games at home”, the score of those who can (9.04) is significantly higher than the score of those who cannot (8.22) at the Popularity level, with a significance of 0.028. Therefore, Hypothesis 3 is supported: different smartphone gaming experiences show significant differences in the self-concept of middle-grade students in elementary school.

Author Contributions: Conceptualization, Y.-C.K. and Y.-C.C.; data curation, C.-H.L.; formal analysis, Y.-C.C.; investigation, Y.-C.K. and C.-H.L.; methodology, Y.-C.K. and C.-H.L.; validation, C.-H.L.; visualization, Y.-C.K. and Y.-C.C.; writing—original draft, Y.-C.K., C.-H.L., and Y.-C.C.; writing—review and editing, C.-H.L. All authors have read and agreed to the published version of the manuscript.

Funding: This work was supported by the Ministry of Science and Technology, the Republic of China, under grant MOST 108-2628-E-029-001-MY3.

Institutional Review Board Statement: The study was conducted according to the guidelines of the Declaration of Helsinki, and approved by the Institutional Review Board and Research Ethics Committee China Medical University & Hospital of REC No. CRREC-105-091.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. National Development Council. *Survey Report on Digital Opportunities of People with Mobile Phones in 107*; United Marketing Research Co., Ltd.: Taipei, Taiwan, 2018.
2. Tiehuai, Z.; Feiqing, C. The knowledge of the video game practice community displayed by elementary school players—takes free mathematics simulation as an example. *Sci. Educ.* **2016**, *24*, 31–55.
3. Shunzhi, K. Communication research turn: Understanding video games. *Mass Commun. Res.* **2010**, *102*, 365–372.
4. Daojing, Z. A Study on the Correlation between Family Communication Patterns and the use of Smartphones by Elementary School Children in China. Master’s Thesis, Master’s Degree Program of Youth and Child Welfare, Chinese Culture University, Taipei, Taiwan, 2018.
5. Ruohe, H. The development of self-concept. *Voice State Relig.* **1992**, *26*, 41–45.
6. Hui, L. An important factor that affects the self-concept development of elementary school children. *Natl. Educ.* **1994**, *34*, 6–9.
7. Cooley, C.H. *Human Nature and the Social Order*; Charles Scribner’s Sons: New York, NY, USA, 1902.
8. Mead, G.H. *Mind, Self and Society*; The University of Chicago Press: Chicago, IL, USA, 1934.
9. Rogers, C.R. *Client-Centered Therapy*; Mass: Cambridge, UK, 1951.
10. Chunxing, Z. *Educational Psychology—the Theory and Practice of Three Orientations*; Donghua: Taipei, Taiwan, 1996.
11. Xiuqing, S. Change in Self-Concept—A Change in Self-Concept after a Parent of a Special Child Applies Adler’s Encouragement Principle. Master’s Thesis, National Chung Cheng University, Chiayi, Taiwan, 2017.
12. Swann, W.B.; Hill, C.A. When our identities are mistaken: Reaffirming self-conceptions through social interaction. *J. Personal. Soc. Psychol.* **1982**, *43*, 59. [[CrossRef](#)]
13. Xiaoping, X.; Chunmei, Z.; Hong, Z. The developmental characteristics of primary school students’ self-concept and its relationship with personality. *Chin. J. Clin. Psychol.* **2006**, *14*, 294–297.
14. Tangyi, W. A Study on the Reliability and Validity of the Piers-Harris Children’s Self-Concept Scale for Children with Learning Disabilities in Elementary Schools. Master’s Thesis, Chinese Culture University School of Education, Taipei, Taiwan, 2012.

15. Gonzalez-Jimenez, H. The self-concept life cycle and brand perceptions: An interdisciplinary perspective. *AMS Rev.* **2017**, *7*, 67–84. [CrossRef]
16. Yuwen, G. To Explore the Connotation of the Self-Concept of the Lower Grade Children in Elementary School Based on the Quaternary Chinese Self. Master's Thesis, Chinese Culture University, Taipei, Taiwan, 2013.
17. Van der Crujnsen, R.; Peters, S.; Zoetendaal, K.P.M.; Pfeifer, J.H.; Eveline, A. Crone, Direct and reflected self-concept show increasing similarity across adolescence: A functional neuroimaging study. *Neuropsychologia.* **2019**, *129*, 407–417. [CrossRef]
18. Xuezhen, W.; Cuimei, L.; Tingjia, L.; Junhao, H. *Developmental Psychology-Volume One*; Xuefu: Taipei, Taiwan, 2006.
19. Jianhou, H. *Personality Psychology*; Psychology: Taipei, Taiwan, 1999.
20. Walgermo, B.R.; Foldnes, N.; Uppstad, P.H.; Solheim, O.J. Developmental dynamics of early reading skill, literacy interest and readers' self-concept within the first year of formal schooling. *Read. Writ.* **2018**, *31*, 1379–1399. [CrossRef]
21. Qiuying, L. The Discussion of Cultural Migration on Children's Self-Concept-Take the Case as an Example. Master's Thesis, Nanhua University, Chiayi, Taiwan, 2020.
22. Jiayuan, L. Action Research on the Influence of Self-Concept of Fifth Grade Children in the Picture Book Class and Counseling Team. Master thesis, National Chung Cheng University, Chiayi, Taiwan, 2017.
23. Xianzi, C.; Kai, R. *Child Developmental Psychology*; Learn Rich Culture: Taipei, Taiwan, 2007.
24. Maiz, E.; Balluerka, N. Trait anxiety and self-concept among children and adolescents with food neophobia. *Food Res. Int.* **2018**, *105*, 1054–1059. [CrossRef]
25. Viljaranta, J.; Aunola, K.; Mullola, S.; Luonua, M.; Tuomas, A.; Nurmi, J.-E. Temperamentally inhibited children are at risk for poorer maths performance: Self-concept as mediator. *Soc. Psychol. Educ.* **2020**, *23*, 641–651. [CrossRef]
26. Guerin, S.; Tatlow-Golden, M. How Valid Are Measures of Children's Self-Concept/Self-Esteem? Factors and Content Validity in Three Widely Used Scales. *Child Indic. Res. Vol.* **2019**, *12*, 1507–1528. [CrossRef]
27. Qinming, L. The development of self-concepts among children and adolescents in China. *J. Educ. Psychol.* **1979**, *12*, 123–132.
28. Xingtai, L.; Xiaofeng, Z.; Meiguang, C. *Tennessee Self-Concept Scale Instruction Manual*; Quiz Publishing House: Taipei, Taiwan, 2000.
29. Yuyi, W.; Yaling, H. *Instruction Manual of Self-Concept Scale for Elementary and Elementary School Children*; Psychology: Taipei, Taiwan, 2000.
30. Shavelson, R.J.; Hubner, J.J.; Stanton, G.C. Self-concept: Validation of construct interpretation. *Rev. Educ. Res.* **1976**, *46*, 407–441. [CrossRef]
31. Xiaomei, Z. The Verification of the Multi-Layered Structure of Self-Concept both Enhances the Experimental Effect of the Self-Concept Curriculum. Ph.D. Thesis, National Taiwan Normal University, Taipei, Taiwan, 2001.
32. Piers, E.V.; Harris, D.B. Age and other correlates of self-concept in children. *J. Educ. Psychol.* **1964**, *55*, 91–95. [CrossRef]
33. Cratty, B.J.; Martin, S.M. *Perceptual-Motor Efficiency in Children*; Lea and Febiger: Philadelphia, PA, USA, 1969.
34. Martinek, T.J.; Zaichkowsky, L.D.; Cheffers, J. Decision-making in elementary age children: Effects on motor skills and self-concept. *Res. Q.* **1977**, *48*, 345–357. [CrossRef]
35. Veiga, F.; Leite, A. Adolescents' Self-concept Short Scale: A Version of PHCSCS. *Procedia—Soc. Behav. Sci.* **2016**, *217*, 631–637. [CrossRef]
36. Butler, R.J.; Gasson, S.L. Self-esteem/self-concept scales for children and adolescents: A review. *Child Adolesc. Ment. Health* **2005**, *10*, 190–201. [CrossRef]
37. Piers, E.V. *Piers-Harris Children's Self-Concept Scale: Remised, Manual*; Western Psychological Services: Los Angeles, CA, USA, 1984.
38. Jiaru, L. A Study on Smartphone Addiction Tendency and Personality Traits of Elementary School Children in Keelung City. Master's Thesis, National Taiwan Ocean University, Keelung, Taiwan, 2018.
39. Li, M.; Ren, Y. Mobile Phone Addiction in Youngsters: Concept and Measurement. In *Recent Developments in Data Science and Business Analytics*; Springer: Cham, Switzerland, 2018; pp. 463–469.
40. Samaha, M.; Hawi, N.S. Relationships among smartphone addiction, stress, academic performance, and satisfaction with life. *Comput. Juman Behav.* **2016**, *57*, 321–325. [CrossRef]
41. Huiling, W.; Hansheng, R. The design of a mobile game of Battle of Tanks based on MIDP2.0. *China Economist.* **2010**, *6*, 52–56.
42. Pengjia, G.; Yuling, C. On the relationship between play and children's development-theory and practice. *Coll. Phys. Educ.* **2011**, *113*, 15–21.
43. Newzoo Forecasts the Output Value of Mobile Games in 2018. Available online: <https://newzoo.com/insights/articles/global-games-market-reaches-137-9-billion-in-2018-mobile-games-take-half/> (accessed on 6 May 2019).
44. Kaiwei, C. A Study on the Interpersonal Relationship and Personality Traits of the Mobile Phone Students in the Upper Grades of Elementary Schools in Xinzhuang District, New Taipei City. Master's Thesis, Taipei City University of Education, Taipei, Taiwan, 2012.
45. Wei, R.; Lo, V.H. Staying connected while on the move: Cell phone use and social connectedness. *New Media Soc.* **2006**, *8*, 53–72. [CrossRef]
46. Zhoufen, M. Cultivate children's androgyny personality in games. *J. Chang. Inst. Technol.* **2008**, *26*, 36–39.
47. Honore, C. *Slow Education*; Bulk Culture: Taipei, Taiwan, 2009.
48. Shuhui, Y.; Jiaqi, C.; Chongjun, C. What do children do in "Maple Valley"? Explore children's behaviors and attitudes when playing online games. *Teach. Technol. Media* **2010**, *94*, 25–39.
49. Moyles, J.R. *More than just Games: The Role and Status of Children's Games*; Psychology: Taipei, Taiwan, 2000.

50. Meiyun, Z. Exploring the necessity of integrating leisure education into kindergarten curriculum from the perspective of games. In Proceedings of the Symposium on Early Childhood Education and Care in Social Changes, Kaohsiung, Taiwan, 5 May 2007; Taiwan Department of Early Childhood Care, Zhengxiu University of Science and Technology: Kaohsiung, Taiwan, 2007.
51. Zhuting, Z. User Research on Smart Phone Applications. Master's thesis, Shih Hsin University, Taipei, Taiwan, 2012.
52. Zonghong, L. The key lies in people or apps—the key to discussing the differences in the use intentions of different types of apps from the perspective of technological acceptance. In Proceedings of the 8th International Symposium on Knowledge Communities of the Digital Content Management Master Program of Chinese Culture University, Taipei, Taiwan, 8 June 2013; pp. 822–832.
53. Yuanxiang, L. Research on the Healing Effect of Mobile Games—Taking Multinational App Games as an Example. Master's Thesis, Daye University, Changhua, Taiwan, 2015.
54. Xinjie, W. A Study on the Relationship between Online Gaming Experience, Self-Concept, and Sense of Life Meaning of Senior Students in Elementary Schools in Kaohsiung City. Master's thesis, National Kaohsiung Normal University, Kaohsiung, Taiwan, 2013.
55. Yazhen, Z. A Study on the Correlation between the Self-Concept and Parent-Child Conflict of Elementary School Children Participating in Online Games—Taking Kaohsiung County as an Example. Master's Thesis, National Tainan University, Tainan, Taiwan, 2008.
56. Roid, G.H.; Fitts, W.H. *Tennessee Self-Concept Scale: Manual*; Counselor Recordings and Tests: Los Angeles, LA, USA, 1965.