Study on Emotional Improvement and Health Promotion of Senior Citizens Participating in Virtual Reality Games

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***Abstract*—In addition to medical care and health promotion, happiness, care and thoughtfulness associated with medical assistance are among the expectations and demands of the elderly society. Therefore, this study aims to explore the effects of health promotion and emotional improvement on elderly people by understanding the behavioral intentions of elderly people with various personality traits in participating in virtual reality games. In this study, we used a questionnaire on five personality traits, including extraversion (Extraversion), friendliness (Agreeableness), diligence and integrity (Conscientiousness), and psychosomatic (Neurotic), which was designed by the scholar Martinez and John (1998) in 1998 as a tool to improve the mental health of the elderly.**

This study validates that sensorial perception is an important influencing factor in the theoretical model of the behavioral intention of the elderly using virtual reality (VR) wearable devices. That is, the stronger the behavioral intention of the elderly when using VR high-tech products, the more frequent the use will be, and the more significant the improvement of the emotional effect. It is suggested that future research could develop a game plan suitable for the elderly with different characteristics.

***Key words:* Health promotion for elderly, program design, emotional improvement, virtual reality.**

I. Introduction

A. The aging trend and current situation of baby boomers

In the context of the rapidly increasing number of the elderly, the social and medical needs of the elderly cannot be ignored. In addition to the increasing demand for support and preparation for medical care, the proportion of unpaid medical partners is declining as the demand for support increases, and the sense of well-being, care and consideration associated with medical assistance has become a key issue for the community to look forward to in innovative services(Bragg, E. J. & Hansen, J. C., 2015). For the elderly and retirees of the baby boomers, Luppi (2009) points out that education and learning should be an ambitious goal entitled "A New and More Valuable Lifestyle". It should not only help to change the roles of the retired and the key issues of the elderly, but also include the following four points: (1) to help convey the knowledge and skills lost in the life of the elderly; (2) to actively assist the elderly in using their leisure time; (3) to encourage the elderly to acquire new roles at this stage of life that are different from those of the past; and (4) to encourage the elderly to participate in community activities.

Whether the elderly aged over 65 make up 5%, 15% or 30% of the total population, it is a phenomenon that is occurring rapidly in the context of life. Therefore, the process of discussion on relevant topics should not only enable the elderly to become active learners and participants, but also prepare society for the various responses that aging brings. It is a vital but not yet acknowledged theme for the cognitive development and communication promotion of the elderly. The main reason is that from the perspective of economic development and investment, compared with young people, the elderly and the elderly are often not the priority group of organizational learning. However, the old age of study, and the life of the other end of the early childhood, because all stressed "learn to develop (learning to be)", so there are many similarities (Istanced., 2015).

B. The importance of playing games to promote the healthy development of the elderly and improve their emotional quality

The game can delay the physical and psychological deterioration of the elderly and achieve a delaying effect. The elderly can enhance their quality of life by "playing", increase their recognition and confidence in themselves, and enhance their interpersonal communication and interaction through the process of playing. Through the process of playing, the sensorial system, hand and brain use, body movement and mental agitation of the elderly can be stimulated, and at the same time develop an interest in playing(Tang Weilun, Li Chaojin, 2009; Lin Yandan, 2011). To promote the formation of the senior games market atmosphere, to provide products that meet the needs of users. The design of the senior toys aims at stimulating the sensorial system, hand and brain use, physical movement, brainstorming, and to cultivate the interest of playing, not only in the degree of use should be easy for senior consumers to grasp the content of the game, and creative to enhance the emotional effect, to enhance the elderly

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people's life satisfaction and quality of life(Liu Yijun, Chen Qiqing, 2015).

In addition, for the elderly who need rehabilitation after a stroke, problem-oriented rehabilitation strategies such as re-learning of physical skills and helping to regain life autonomy have been shown to help restore physical and social self-awareness. However, more literature indicates that rehabilitation models that are not emotionally oriented and cognitively focused should be more practice areas for rehabilitation treatment; they include: redefinition of self-assessment, reassessment of core values and reassessment of reality.

Therefore, even in the context of rehabilitation therapy, patients are being actively assisted in establishing a close connection between their physical knowledge and their perceptions (Timothy E. K. Graham F. P. levack, W. M., 2016). For patients with Parkinson's disease, the advantage of virtual reality is that it can effectively improve patients ' operation performance, improve the performance of functional activities in their daily life, and interact with the real task in a virtual environment (Ma Huiying, 2014).

C. Research Purpose

As the health condition and emotional development of the elderly are different from that of the general adult or adolescent, because the elderly may face some obstacles arising from aging in terms of physical and mental development, emotions, personality traits and so on, including the elderly are prone to emotional sensitivity, personality appears to be somewhat conservative, withdrawal, and even have their own unique values for some things, due to changes in physical condition, they tend to think about the emotional quality of the elderly, or even have more frequent symptoms of depression and mental and mental health problems.

Therefore, this study used five personality traits (Lewis, R.G., 1990) to analyze the behavioral intention of the elderly using virtual reality wearable devices, and then used the design of health promotion and emotional enhancement activities in the elderly. The use of virtual reality games to achieve effective health and emotional positive enhancement, not only enhanced the overall quality of life of the elderly, but also enhanced the overall self-esteem of the elderly. As a whole, the main research hypothesis is as follows:

(1) Five personality traits positively influence perceived perception of Wearable Devices for virtual reality gaming. (2) Individual differences among the elderly positively affect perceived perception of Wearable Devices for virtual reality gaming. (3) Perceptual perception positively affects users' intention to use Wearable Devices for virtual reality gaming. (4) User behavioral intention positively affects health promotion and mood improvement.

II. BACKGROUND

A. Characteristics of development in advanced age

According to the health statistics data, the mortality rate of all age groups in 2013 was the highest among the elderly, and the prevalence of depression in the elderly in the community was 16-25%, which showed the importance of enhancing the mental health of the elderly; overall, how to meet the needs of elders ' multiple health in the future, and promote their physical, mental health and their health To improve the quality of life in the elderly and prevent the occurrence of dementia is an important issue for the elderly health. Cattell (1970) points out that the personality traits of the elderly in terms of extraversion (warmth, sociability, self-confidence, motivation, clarity) and sociability (trust, distrust, cooperation, compassion, courtesy, and stubbornness) are lower. Elderly people in this part of the personality values are different from ordinary people, prone to interpersonal difficulties. The personality of the elderly is the basis of their interpersonal relationships and interactions. Usually the integrative or mature type represents their activity and adaptation to society, and life satisfaction is also high. Other types have a certain degree of adaptation, so the performance of interpersonal relationships is not satisfactory.

B. Characteristics of development in advanced age

Lin Ju-yu (2012) takes the game technology cultivated by orchids as an example to explore the behavior patterns of the elderly in accepting digital game technology at the psychological level. The factors found in the study include: (1) simple operation interface, (2) consideration of the physiological limitations of the elderly, (3) provision of help in the life of the elderly, (4) enhancement of interpersonal interaction among the elderly and (5) use of social assistance, the virtual activity support system, (2013). The results show that past experience has negative interference effect on the perception usefulness and attitude relationship of the elderly people using virtual reality leisure activities, which shows that the more experienced the past, the less the influence of perceptual usefulness on attitude. In addition, the results of the study reflect that the importance of cognitive activity to the health and interpersonal interaction of the elderly far exceeds the usability of the activity, and also confirms that attitudes affect behavioral intentions.

C. Research on the Effect of Virtual Reality Games on the Health Promotion of the Elderly

The life support and health care needs that accompany the rapid growth of the elderly population cannot be satisfied simply by increasing the number of caregivers and the care resources (Xu Yeliang, 2014). Ye Yicheng, Hu Mengxiang (2014) with 12 weeks include cards, the program of brain-matching and reading, which is involved in the course activities of the elderly, discovers that the cognitive function delayed memory and orientation of the elderly are significantly improved before the intervention of the Learning program, indicating that the training of brain-strengthening program can improve the cognitive function of the elderly. Therefore, we must eliminate the stereotype of the elderly. Mikropoulos and

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Natsis (2011) Reviewing the 53 studies on education-related issues in virtual reality over the past 1999-2009 years, it is pointed out that the vast majority of studies are applying virtual reality technology to science, technology, mathematics and other disciplines. Assist students in learning the phenomena or abstract concepts which are not directly observed in daily life experience. The study of rehabilitation strategies for acute stroke patients found that in the process of patient rehabilitation, according to the flow theory, if the balance can be found in difficulty and interest, it will help participants to have interest and motivation in the process of rehabilitation, in which the participants who are involved through virtual reality technology, A more stable and high level of response in the rehabilitation process. In addition, cognitive ability does not affect the effectiveness of users in using virtual reality rehabilitation techniques, in this study, participants with normal cognitive abilities did not have much of a difference in game performance from those with mild cognitive impairment after minor assistance (Lee, M., Pyun, Chung, and B. J. J., Kim J. J. Eun, Yoon, B. et al., 2016).

III. Research Design and Methodology

In this study, five personality traits were used to analyze the behavior intention of the elderly people using wearable devices for virtual reality games, and then to analyze the related scheme design of the elderly with different personality traits in planning related health promotion or mood promotion. The five personality traits described in this study are as follows:

1. Extraversion：sociable, gregarious, talkative, and active.

2.Agreeableness：Polite, flexible, trusting, kind, cooperative, forgiving and soft hearted.

3. Conscientiousness：Cautious, careful, thoughtful, responsible, organized, planning, diligent, and achievement oriented.

4. Neuroticism： Low self-esteem, nervousness, excessive worry, lack of security, less good at controlling their emotions, depression, frustration, guilt, and irrational thoughts, mental and physical distress and ineffective behavior.

5. Openness：Ambitious, bold, adventurous, and averse to familiarity or routine.

The questionnaire used in this study on the five personality traits was based mainly on the facet design proposed by the scholar Lewis (1990), with a total of 44 questions. In this study, the distribution of questions and the sources of questions about the five personality traits are summarized in Table 1.

Table 1 The distribution table of five personality traits and the source of the questions

Characteristics	Question No.
Extraversion	1, 6, 11, 16, 21, 26, 31, 36
Agreeableness	2, 7, 12, 17, 22, 27, 32, 37, 42
Conscientiousness	3, 8, 13, 18, 23, 28, 33, 38, 43
Neuroticism	4, 9, 14, 19, 24, 29, 34, 39
Openness	5, 10, 15, 20, 25, 30, 35, 40, 41, 44

Data source：Lewis R. G. (1990). An alternative “description of personality": The Big-Five factor structure. *Journal of Personality and Social Psychology*, 59(6), 1216-1229.

In view of the above five personality traits, this study proposes the hypothesis that senior citizens participate in the virtual reality wearable device game practice:

H_{1a}：Extroversion positively affects perception

H_{1b}：Kindness positively affects perception

H_{1c}：Conscientiousness negatively affect perceptual feelings

H_{1d}：The negative effect of neuroticism

H_{1e}：Empirical Openness Affects Perceptual Feeling

In addition, the self-efficacy hypothesis refers to an individual's assessment of his or her ability to perform a specific performance. An individual's self-efficacy perception affects his or her ability to face problem situations and his or her level of effort. For self-efficacy, assumptions are made:

H_{2a}：Self-efficacy positively affects perception

In addition, James et al. (2002) suggest that sensory perception distinguishes between extrinsic and intrinsic motivation, and that intrinsic motivation refers to the pleasure and satisfaction an individual receives after performing an action, whereas extrinsic motivation emphasizes the performance of an action to achieve a specific goal or reward. The results show that perceived pleasure has a significant effect on the willingness of the user:

H_{2b}: Personal innovation positively affects perceived perception

In the Use Behavior Intention section, Venkatesh and Davis (2000) point out that use behavior intention is the degree to which users and non-users are willing to use the product. In this study, we hypothesized that the use of virtual reality wearables in the elderly has a positive effect on the user's intention:

H_3: Perception Feelings

Xie Yijun (2014) developed a 50 shoulder remote rehabilitation system combining virtual reality, wearable device and tele-rehabilitation technology, which has positive effect on rehabilitation effect. Therefore, the present study suggests that the elderly virtual reality wearable device is helpful to rehabilitation, and the use of this virtual reality game product has the intention and the degree of reuse for the old people.

This study is aimed at improving the health and depressive symptoms of the elderly using virtual reality wearable devices, and making assumptions:

H_4: Positive effect of user intention on health promotion and reduction of depression symptoms.

A. Data Analysis of Questionnaire sample

Based on the experience of elderly people playing virtual reality games through wearable devices, this study analyzed the use intention of elderly people with different personality traits and summarized the types of activity programmes suitable for elderly people with different personality traits. The questionnaire was administered from February to May 106. A total of 167 valid questionnaires were collected from ordinary community residents, residents of community care centers, day

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photo centers and senior university students. The effective rate was 76.6%.

This study divided the basic information of the questionnaire into four parts: including gender, age group of the elderly, education level, experience of using virtual reality wearable devices. The sample number and percentage of these four questions are summarized in Table 2. In Table 2, for each question in the table, the description is as follows:

(1) Gender survey sample, the gender distribution, the male effective questionnaire is 76, the female valid questionnaire is 52.

The proportion of males is 59.4%, female is 40.6%. (2) The age of the respondents in this study can be found to be mainly 60-70-year-olds, the proportion of which is 50.8%, the 70-80-Year-old is 34.3%, and the 80-year-old ratio is 14.9%.

We can learn from this that most of the questionnaires are based on the age level of the newly retired people.

(3) The level of education in terms of education, to the following degree accounted for the majority of the 49.21%, the second is a high school education: 26.57%.

Table 2 Basic Personal Data Statistics

Type	Data categories	The number of people	Percentage
Gender	Male	76	59.40%
	Female	52	40.60%
Age level of the elderly	60-70 years old	65	50.80%
	70-80 years old	44	34.30%
	Over 80 years of age	19	14.90%
Education level	Below Secondary	63	49.21%
	High school	34	26.57%
	University	27	21.09%
	Institute or above	4	3.13%

IV. Conclusion and Discussion

This study uses five personality traits and individual differences as an influential factor to explore the relationship between the perception and the use behavior intention of the elderly in the virtual reality wearable device. After empirical research and analysis, I hope to be able to further research on the direction of development and the practical sector market development. The contribution of this study is as follows:

A. The relationship between extraversion and perceptual feeling

There was no significant positive correlation, although extroverted seniors, although willing to share their own experiences, also liked to walk outdoors and did not like virtual reality games that spent long hours in wearable devices. Therefore, the perceptual perception effect of information technology products and games is relatively insignificant. This may also be related to cultural differences in the background of Taiwan seniors' growth. Future studies can continue to explore whether cultural differences have a moderating effect on extraversion of perceived and perceived behavior and the use of wearable devices.

B. The relationship between affinity and perceptual sensation

The elderly have positive impact perception on the use of virtual reality wearable devices, will also indirectly affect the use of intent, the more friendly people are willing to share their pleasant experience, there will be altruistic ideas, but also willing to help others, so they will share the use of wearable devices for health promotion or other types of activities of the Happy experience, And the sense of perception that is felt by itself. Therefore, for adult teachers who use virtual reality technology in the course, they may be asked to provide the participants with higher degree of affinity or participants in the course, so it is necessary for the elderly to have positive influence and promotion to use wearable devices.

C. The relationship between conscientiousness and perceptual feeling

In the cautious part of the elderly who negatively affects perceptual feelings, cautious people tend to be careful, responsible, disciplined and relatively focused on fewer goals, and the elderly will carefully assess whether it is worthwhile to devote too much time to new things or wearable devices in High-tech products. Therefore, to break through the preconceived views of this type of old age users, to reduce the fun and entertainment of the elderly in the use of wearable devices, and thereby enhance their quality of health and mood, the elderly who are prone to weakness and depression will be helped by positive ascension.

D. The relationship between neuroticism and Perceived Pleasure

- There is no significant negative correlation between neuroticism and sensory perception in the elderly. Neurotic elderly are often emotionally unstable, fearful and nervous. Past studies have found that neurotic people are prone to computer anxiety. For the overall sample, neurotic people have no significant correlation with the use of virtual reality wearable devices and games.

E. The relationship between neuroticism and Perceived Pleasure

The open part of the elderly positively affects perceived feelings. Openness refers to the willingness of a person to accept new ideas and experiences. Individuals with a high degree of openness tend to have a rich imagination and be willing to try out new technological products. In this study, virtual reality wearable devices have many functions and games, but for those with a high degree of openness, they will of course still feel that there is a shortage in the United States.

F. The relationship between self-efficacy and perceived pleasure

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The elderly have no significant positive effect on self-efficacy and perceptual sensation, self-efficacy in the face of new things, they will show high confidence in the use of new things, in the past for wearable devices, self-efficacy will positively affect perceptual feelings, but our findings show no significant positive impact on the elderly, This also means that wearable devices should have more customized games for the elderly. The use of the user does not cause too much trouble, coupled with a wearable device virtual reality game perception, for the elderly in the operation more convenient, so it is a low degree of self-efficacy users. There is also considerable confidence in the use of wearable devices.

G. The Relationship between Individual Creativity and Perceived Pleasure

The elderly have a significant positive impact on perceptual feelings in their personal innovation, and personal innovation indicates willingness to try any new wearable device with virtual reality games. The higher the individual's creativity, the higher the willingness to attempt, and the greater confidence in the use of the new virtual reality wearable device. As for the elderly education advocates, we can first understand the individual innovation level of each senior citizen, and carry out attachment experiments for older users with high level of innovation, through early adopters, using them to reach social influence and persuading the elderly to use the wearable device game to carry out various learning activities.

H. Perceived Perception and Use Behavior Intention

In the elderly, the higher the sensory perception of the wearable device, the greater the relative health promotion, and the greater the use of the older person's intentions. Therefore, in addition to perceptual usefulness and perceived ease of use, perceptual perception is also one of the necessary considerations for new wearable devices. We cannot change the personality traits of everyone, but we can improve the level of perceptual perception, and future research can continue to look for the characteristics and disturbance variables of different information products to see if they affect the relationship between personality traits and perceptual feelings of different elderly people.

I. Use Behavior Intention and Health Promotion and Depression Symptom Relief

The elderly in the use of virtual reality High-tech products for the game, you can feel the user's intention to act more strongly, the more frequent use, improve the melancholy effect will become larger. Therefore, how to attract the use frequency of the elderly, in order to target the physiological and psychological characteristics of the elderly, the design of a lower repulsive wear device.

The second is to design more for the elderly to enter the lower threshold of the game for the elderly to use, I believe that improve the symptoms of depression and health promotion will be more effective.

Therefore, in the validation of this study, the verification of perceptual perception is an important influencing factor in the theoretical models that affect the intention of older persons to use Wearable Devices in virtual reality games. It is suggested that future research could be extended to the design of different innovative Wearable Devices in virtual reality, with the addition of different interference variables, or the appropriate addition of some regulatory variables, such as gender, cultural differences, or enhancement, to see if the results are different.

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