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Ritsumeikan Asia Pacific University for the Degree of Doctor of Philosophy

Using Smart Technologies in Mental Health Promotion

— A Comparative Study of South Korea and Japan —

By

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ABSTRACT

This thesis explores the determinants of using smart technologies in mental healthcare intervention and demonstrates the attributes of a comprehensive stepped-care method of mental healthcare. The determinants influence users', experts', authorities' and other stakeholders' views and roles in mental healthcare management. The examined determinants and attributes include user satisfaction, users' positive and negative experiences, their views on the use of technology and their healthy change behavior. The research focuses on pioneering projects using smart technologies in mental healthcare, especially in South Korea and Japan, as these technologies are not currently as widely invested or optimally used in this form of care. The findings of the research can assist the mental healthcare systems in South Korea and Japan to improve mental healthcare services, since users prefer comprehensive stepped-care using smart technologies rather than the hardly accessible "conventional" mental healthcare systems. The new approach can support the transformation of our mental healthcare systems into services that add to the quality of life of people in South Korea and Japan. Furthermore, there are tremendous opportunities and challenges to using cutting-edge smart technologies in the field of mental healthcare. First, the study investigated the key concepts in this field through the lens of Gestalt psychological therapy with the researcher as an observer who recorded 19 participants' cases. Next, semi-structured interviews with 29 interviewees and 2 unstructured focus group interviews were undertaken. Then, experimental research survey interviews were conducted in South Korea with 15 participants of a mobile counseling service in actual use over 4 weeks. A comparative study was conducted through an online survey of 264 participants (150 Korean and 114 Japanese) to analyze the factors contained in the Technology Acceptance Model (TAM) and examine the acceptability of mental health intervention using smart technologies. This helped with the realization that smart technology intervention related to mental healthcare is still in an early stage in South Korea and Japan. The current procedure is to counsel using mobile phone applications available on smart technologies related to mental healthcare. The primary results demonstrate that smart technologies remain useful among their users, although sensitive issues relating to privacy, risk and ethics still remain. While smart technologies are accessible to the public, mental health (as well as mental illness) management can be developed by users, front line service providers, healthcare administrators, policy makers and governments for the whole continuum of care and many types and levels of mental health intervention, as the work of developers such as e-Mental Health Technologies has demonstrated. The wider use of smart technologies in mental healthcare can help reflect positive and negative experiences which may influence users' views and health behavior. Importantly, the study found user satisfaction to be more influential in the health psychology field than face to face mental healthcare due to perceived views on accessibility and reliability. Finally, this research is concluded by the construction of a suitable comprehensive stepped-care model of mental healthcare in South Korea and Japan for future research which may also assist mental healthcare organizations by helping them improve their service structure and become more proactive in mental healthcare strategies.

DECLARATION OF ORIGINALITY

I hereby declare that this thesis entitled ‘Using Smart Technologies in Mental Health Promotion: A Comparative Study of South Korea and Japan’ has been composed by myself, for the Degree of Ph. D. in Asia Pacific Studies. This thesis has not been presented or accepted in any previous application for a degree elsewhere. I confirm that this thesis is my own work, and reflects my personal views and values. It has been fully referenced including page numbers and inverted comas for all text quoted from books, journals, web, etc. All quotations have been distinguished by quotation marks and all sources of information have been acknowledged by means of references, including those from the Internet.

I agree that the University has the right to submit my own work to plagiarism detection sources for originality checks. I am aware of and understand the University’s policy on plagiarism and I certify that this thesis is my own work, except where indicated by referencing, and that I have followed the good academic practices of the University.

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October 2018

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1. INTRODUCTION

1.1 Introduction

The key research questions in this thesis are centered around the relatively dismal situation of mental health in Japan and Korea, as reflected in their high suicide rates among others, and the potential of using modern high-tech modalities to improve this situation considering the availability of advanced technologies that are highly accessible by the Japanese and Korean population. The data presented in the first part of this chapter will support the premise that Japan and Korea have had major issues in mental health status while both these countries enjoy a strong and highly advanced network of technologies that can help support mental healthcare. Some of these technologies have already been used to help provide the needed mental healthcare services and a summary of them will also be presented in this chapter.

According to the suicide data report of the World Health Organization, close to 800,000 people globally die due to suicide every year (WHO, 2017). In other words, one person commits suicide every 40 seconds somewhere. For over twenty years, suicide has also been a tragic social problem in South Korea and Japan. A high percentage of people who have committed or attempted suicide were suffering from psychiatric disorders such as major depression and bipolar disorders (OECD, 2015). Unfortunately, management options for mental healthcare are limited. So, what are the reasons for South Korea and Japan, both financially stable high-income countries, to have a high suicide rate that has hardly decreased despite a lot of efforts, and are there any suitable solutions for this? The high prevalence of mental health illnesses and behavioral disorders is receiving the attention they deserve in national and global health debates (Global Burden of Diseases Study, 2013). As with chronic diseases, mental illness can be a chronic burden, but it is a manageable disorder (Brynes, 2012). Mental health problems or mental illness are common and disabling, but the evidence is that fewer than half of sufferers seek any treatment, and fewer still receive any help from specialized mental health professionals (Schellenberg & Hatcher, 2014).

The purpose of this research is to investigate the possibility of using smart technologies for mental healthcare from the perspective of health psychology. A health psychological approach unifies the most potent and efficient features of behavior change platforms into low cost and effective interventions including the use of new technology such as mobile phones and the internet (Taylor, 2015). Smart technologies may reduce barriers to mental healthcare; however,

there are also numerous risks associated with it.

1.2 Rationale for the research

The rationale for selecting Japan and Korea for this study was first, the dismal level of mental health in the population of these two countries as explained in chapter 1, while, secondly, they both enjoy a highly advanced infrastructure at the macro level for their Internet connections as well as many small high-tech companies at the micro level providing modern technologies to support mental healthcare and counseling services.

Many of mental healthcare related technology researchers have focused on smartphone applications, so it is significant to research on other advanced mental health-related technologies. Previous research reviews have covered the period from 2008 to 2013; thus, there is a need a look at studies carried out since then as contemporary issues. There are many cases in the United States and Europe in this area, however, South Korea and Japan should also be studied as they have the highest suicide rates in Asia.

This study investigated general adults who are potential users, experts, caregivers of *SmartMentalTech* and their opinions about the recognition of *SmartMentalTech* in South Korea and Japan, their availability, and benefits of a comprehensive mental healthcare approach. A critical analysis of changing health behaviors through smart technologies is carried out in respect to the mental health of South Koreans and Japanese. The research focuses on the effective verification of mental health promotion planning in South Korea and Japan. Also, a critical analysis of the relevance of Health Psychology theories is carried out on the South Korean and Japanese literature regarding mental health technology industry. As a social scientist and a health psychologist, this research contributes to the achievement of the author's long-term career and expertise aspirations in a detailed way.

1.3 Research Aim and Objectives

The research question:

To what extent are smart technologies acceptable to users and caregivers in a comprehensive mental health stepped-care approach in South Korea and Japan.

The three core research objectives:

- I. To investigate the application feasibility of a prototype of smart technologies for mental health promotion in South Korea and Japan;
- II. To analyze how effectively the innovative smart technologies are applied in mental healthcare;
- III. To determine if the currently used smart technologies are comprehensively and continuously available to both users and caregivers.

1.4 Structure of the Thesis

This thesis contains six chapters. It is structured as follows: Chapter 1 provides initial insights into the research question and major reasons through relevant academic and practical benefits. The research objectives are also presented. Chapter 2 presents a review of the literature. Firstly, Smart Technologies are defined to provide an overview of the use of smart technologies for mental health promotion in South Korea and Japan. Next, for the theoretical background of the research, relevant Health Psychology and Technology Acceptance Model (TAM) literature is reviewed. This is followed by a discussion on the role of Smart Technologies in mental healthcare field practice, examples of mental health promotion and mental health prevention. In Chapter 3, the research approach is presented as well as the reasons why the participant observation method, semi-structured interviews and focus group interviews, and experiments and surveys were chosen as the suitable research methods for the collection of data. Chapter 4 provides a critical analysis of the research findings that emerged from the 13 participants of Gestalt group therapy and mindfulness, the 29 semi-structured interviews, the two focus group interviews, the fifteen participants' experiments, the 332 survey participants, and the additional 200 survey respondents contacted for the re-test. Chapter 5 discusses the results. Finally, Chapter 6 develops the crucial holistic research outline and concludes on the findings. Additionally, for mental health-related stakeholders, recommendations are suggested, and finally, the limitations and implications of the research for future research are debated.

2. REVIEW OF THE LITERATURE

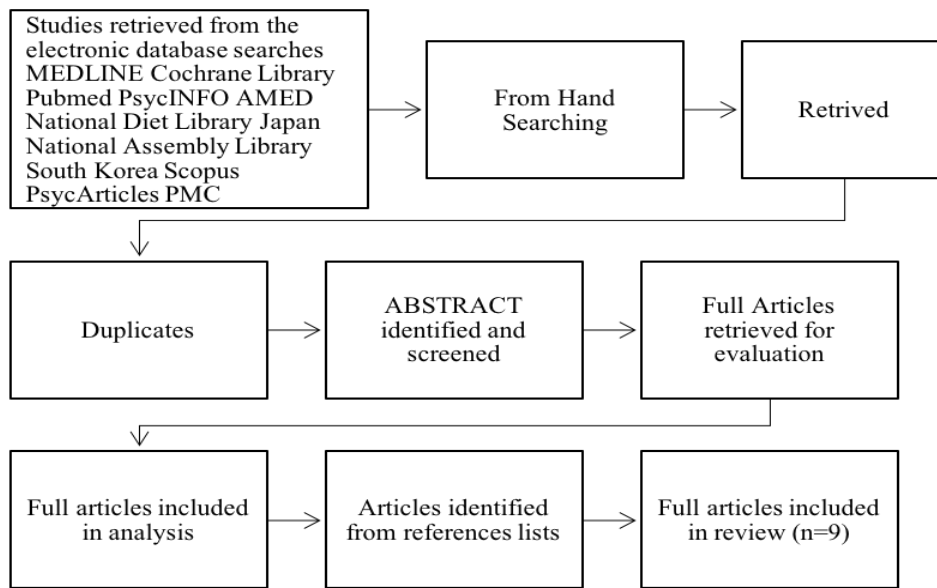
Chapter two presents the review of the literature that covers the four main theoretical concepts relevant to the research subject: (i) *smart technologies in mental healthcare: SmartMentalTech*, (ii) *practicable psychological therapies adopting to SmartMentalTech: Gestalt Therapy and Mindfulness meditation*, (iii) *Comprehensive Mental Healthcare Stepped-Care Model (CMHSCM)*, and (iv) *technology acceptance model (TAM)* within the context of comparative studies of South Korea and Japan.

2.1. Systematic review

The present research has reviewed the relevant published materials pertaining to contemporary smart technology using diverse applications in mental healthcare. These materials included the research of the fastest growing smart technology cases in mental health by a systematic review. Sufficient background information and theories have been collected. The suppliers of smart technology mental health applications in South Korea and Japan have been identified. Literature searches were conducted on online databases; MEDLINE, the Cochrane Library, PubMed, PsyINFO, EMBASE, AMED, National Assembly Library of South Korea and National Diet Library of Japan were searched from 2010 to 2017 by using relevant terms.

This review aimed to isolate the most reliable and evidence-based global measures of smart technologies in mental healthcare for the treatment-requiring population. Literature searches were conducted on the online database and hand searches of reference lists were also carried out. Studies were included in the review if they reported information on measures of global psychological well-being. Searches of reference lists were carried out to identify the most reliable research in this area. As a result, a total of 101 studies were included in the review, 9 of which had directly examined the inclusive research of smart technology in mental healthcare. However, few studies were found to have included mental health related to smart technology. The search was accompanied with a general Internet exploration and a search concentrated on the key research area.

Figure 1: Summary of the Literature Search



2.2. Smart technologies in mental healthcare: *SmartMentalTech*

Recently, the digital healthcare industry has had great attention because it is combined with technologies such as smart devices, mobile applications, big data and cloud computing in the existing medical industries and health-related industries. Topol (2015) showed that ‘the future of medicine is in your Smartphone-new tools are tilting health-care control from doctors to patients. The combination of the healthcare industry and smart technology helps individuals measure, diagnose and manage health-related information in real time’.

Smart technologies are transforming Mental Healthcare Distribution (Schellenberg & Hatcher, 2014). Psychologically people often are afraid of asking for help from experts due to pride and shame (Ross, 2013). They are frightened, guilty, embarrassed or shamed and worry about the stigma attached to that. This can seriously hinder mental health. Using smart technologies may be an effective way if the caregivers and users accept and appreciate using them.

Worden, et al. (2003) show that the words *intelligent* and *smart* are commonly used as tools to describe the industry new products but occasionally this is done with little thought as to what they should mean. A key attribute that must be shown to be considering truly smart technology, some of the new products can integrate the highest level of cutting-edge technology, but also they must be aware of the situation and be able to react to it.

Smart technology has defined healthcare technology solutions that can be portable for devices that require hands-free functionality and a user interface. For example, tracking devices, voice communication devices, and technical devices that facilitate workflow, and access to electronic medical record (EMR) are important. The services offered include clinical information system (CIS), computerized physician order entry (CPOE), tracking, barcoding, robots, Radio Frequency Identification (RFID), Personal Digital Assistant (PDA), smart beds, smart pumps, wireless on wheels, laptop/tablet, smart card, tube system, kiosks, decision support, Global Positioning Systems (GPS), cameras and data warehouses. The use of technology has become common in the medical field, but this has not been adopted in a way that has the greatest potential. Technology should be ubiquitous (Bolton, et al., 2008).

2.3. Classification of *SmartMentalTech*

SmartMentalTech can be divided into the following categories based on the outlines of some of the most popular existing technologies that are assisting mental health services. The classification is based on the latest data, information, and monographs from news websites specialized in technologies in this area which helped distinguish 12 different types of existing *SmartMentalTech* (Lee, 2018) (Table 1.1). 12 types of *SmartMentalTech* are described in detail to examine the applicability and methods for providing the value of the use of existing *SmartMentalTech* which is the aim of this research.

2.4. Practical psychological therapies to be adopted by *SmartMentalTech*

Technology alone is not sufficient to gain access to the mental issues of complex human beings; its use should be considered from a philosophical point of view. Simply, *SmartMentalTech* can help people's mental health fundamentally in various ways. However, it is necessary to apply careful theories related to existing psychotherapy or mental health treatments. As the start strategy for this, Gestalt therapy and meditation, which are well known and used in South Korea and Japan, maybe one appropriate way that can be adopted by *SmartMentalTech* in expert consultation.

The founder of Gestalt therapy was Fritz Perls (1893-1970). In general psychology, the term Gestalt is usually associated with the thinking aspects of the cognitive perspective. It becomes relevant to the humanistic approach which emphasizes *the existence* of the individual in psychotherapy (Benson & Loon, 2012; 106).

Table 1: Classification of 12 types of SmartMentalTech

Type	Description	Application
① Smartphone Applications (Apps)	These may support users with mental health concerns in relieving symptoms or increasing awareness (Radovic, et al., 2016).	Mental health information, Stress, Relaxation, Symptom relief, General mental health education, etc. <i>South Korea: Blue touch, Stress test & Japan: Utsu Reco (depression records)</i>
② Social Networks (SNS)	Online social networks can help individuals who feel apprehensive about one-on-one interactions, by taking advantage of a new form of communication. In times of need, this may help regulate emotions (Buechel & Berger, 2017).	Facebook, MySpace, Twitter, Google, Instagram, YouTube, etc. Microblogging (e.g., sharing Facebook status updates or tweeting)
③ Artificial Intelligence (AI)	With AI, the initial diagnosis is made, and the prospects for effective treatment and control of the mental illness are available (Cecchi, 2017).	Clinical decision making, treatment, psychological assessment, and clinical training (Luxton, 2013).
④ Big Data	Big Data technological manufacturers use opportunities, offering various devices and services and integrate all generated mental health data. The users' preference to integrate data can be channeled to mobile technologies, increasing their own personal mental health services (Mota, et al., 2016).	Sleep pattern, physical activity, location tracking data sets are simply acquired from reasonable and affordable wearables (Mota et al., 2016). Bipolar disorder and all psychiatry (Monteith, et al., 2015). <i>Google Study Kit, Apple Research Kit</i>
⑤ Chatbot	Chatting robot with Artificial Intelligence (AI) for mental healthcare and personalized Cognitive Behavior Therapy (CBT) (Rucker, 2018).	<i>Woebot</i> (Created by Dr Alison Darcy)- a Facebook-integrated computer program that attempts to reproduce conversations a patient with his/her psychotherapist.
⑥ Robots	The use of robotics technology in mental health care is still emerging, however it signifies a possibly useful tool in experts' toolbox (Riek, 2016).	<i>Paro</i> (the robotic seal that can support dementia); <i>NAO</i> (a two-foot-tall humanoid robot that helps kids with Autism) (Cabibihan, et al., 2016). Anorexia (Lipsman, et al., 2013).
⑦ Brain Implant (BI)	Deep brain stimulation is associated with applying sustained electrical stimulation to certain areas of the brain through surgically implanted electrodes (Bazian, 2013).	
⑧ Wearable devices	Smartwatches and fitness trackers for stress follow-up, mindfulness.	<i>Apple watch Series 3, Misfit, Fit bit Ionic, Garmin Vivosport, Thync Relax Pro, Spire Stone, Muse, WellBe</i> (Caddy, 2018).
⑨ E-therapies	As treatments delivered by computers in a health care setting, often on-line or by a mobile phone (Hatcher, 2013).	Telemedicine, email or text message, traditional face-to-face services also available (Hatcher, 2013).
⑩ Virtual Reality Therapy (VRT)	The advantage of virtual reality is that it can be used to create scenarios that may be impossible to replicate in real life (Schellenberg & Hatcher, 2014).	The treatment of post-traumatic stress disorder in soldiers (Schellenberg & Hatcher, 2014). Acrophobia; Delusions (Freeman, et al., 2016).
⑪ Hologram	Virtual Home Robot for loneliness.	<i>Gatebox</i> - Hologram robot girlfriend (Gatebox Inc., 2018).
⑫ y-brain	A medical device based (MINDD) on Transcranial Direct Current Stimulation (tDCS) by applying a weak current through a wearable module (ybrain, 2018).	Treatment of depressive symptoms of patients with Major Depressive Disorder (MDD) (ybrain, 2018).

Source: Composed by the author from analysis of individual case studies

Gestalt therapy is also based on ontology and existentialism (Watson & Greenberg, 1998). Mindfulness meditation aims to emphasize people's awareness of the present without being distracted or distressed by stress and aims to strive for a state of mind that concentrates, accepts, and acknowledges at this moment (Taylor, 2015). The goal of mindfulness meditation is to allow people to approach the situation in a calm manner, taking into account stress rather than automatically reacting to that stress (Hölzel et al., 2011).

2.5. Comprehensive Mental Healthcare Stepped-Care Model (CMHSCM): A Health Psychological approach

The rapidly changing mental healthcare technologies may bring complex questions to potential users regarding access and usage. In this respect, health psychology can support them in making a better and more suitable decision on treatment options (Taylor, 2015). The relevant literature on Health Psychology was reviewed and a Comprehensive Stepped-care Model (CSM) was modified and applied by the author (Taylor, 2015; Abrams, et al., 1996) (Figure 2).

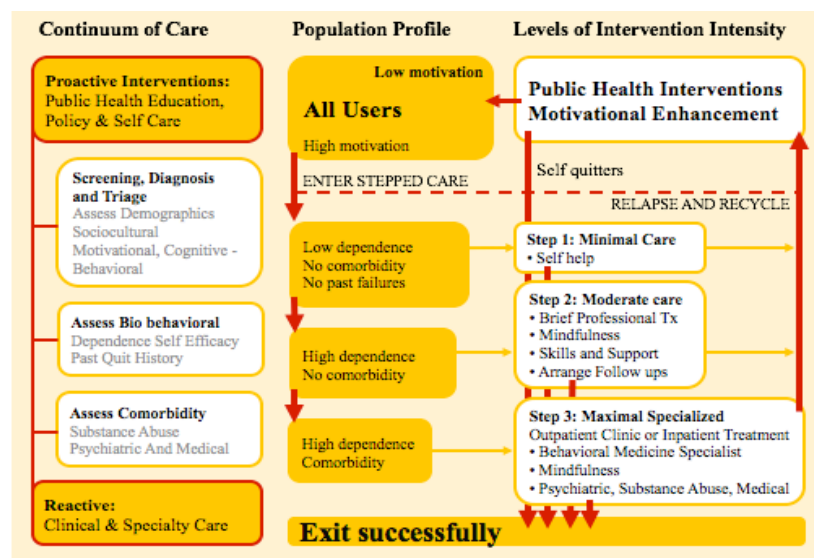
This research explores the determinants of using *SmartMentalTech* in mental health intervention known as CSM. In previous research, CSM has already been suggested and used to access the integrating individual and public health perspectives of treatment of tobacco dependence under managed health care (Abrams, et al., 1996). This study investigated the existing smart mental healthcare technologies and analyzes the views of potential users to devise a comprehensive mental healthcare stepped-care model (CMHSCM) for managing individual preventive care or treatment (Figure 1.1). The development of various *SmartMentalTech* solutions may meet the growing demands in mental healthcare intervention and overcome the limitations of traditional mental healthcare system regarding accessibility.

Figure 2: Comprehensive Mental Healthcare Stepped-care model (CMHSCM)

Comprehensive stepped-care model for Mental Healthcare

Modified from

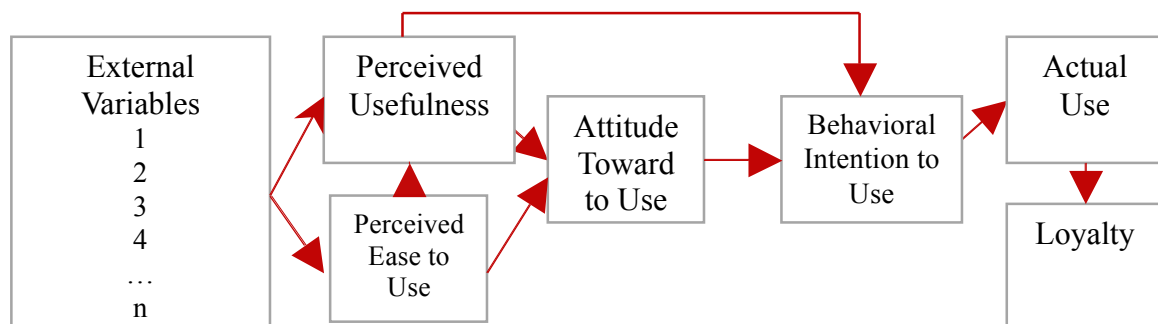
Abrams, D., Orleans, C. T., Niaura, R. S., Goldstein, M. G., Prochaska, J. O. & Velicer, W. (1996). Integrating individual and public health perspectives for treatment of tobacco dependence under managed health care: a combined stepped-care and matching model. *The Society of Behavioural Medicine*.



2.6. Technology Acceptance Model (TAM) in *SmartMentalTech*

The question of whether users actively accept and use new information or technologies has been a major research problem in many disciplines for a long time (Lee, 2014). In this study, the Technology Acceptance Model (TAM) is adopted to examine the direction of development through innovation in the field of mental health and to suggest solutions for the proposal for the use of smart technology. This part presents the literature review of the technology acceptance models. Therefore, this study suggests theories leading to the development of the novel technology *SmartMentalTech* theoretical framework. Fred D. Davis Jr. firstly presented the Technology Acceptance Model (TAM) in 1985. The TAM has emerged as a powerful and concise way to demonstrate the advancement of system use through its belief about 2 factors: “the perceived ease of use” and “the perceived usefulness” of an information system (Taylor & Todd, 1995; Davis, 1989, 1985; Davis, et al., 1992, 1989) (Figure 3).

Figure 3: *Technology Acceptance Model (TAM)*



Source: Davis, F. D. (1989).

3. RESERCH METHODOLOGY

3.1. Research Approach and Strategy

This research used mixed methods. Mixed methods approaches are increasingly being used to recognize the complexity of human lives as they are embedded within rich contexts. This study adopted both the inductive and deductive approaches, in other words, combining approaches. The inductive approach helps build a theory through examining the primary data of smart technology usage in mental healthcare with current phenomena and its potentials, based on qualitative analysis. Second, experimental research is done with a deductive approach. Finally, quantitative analysis is conducted at the end with also deductive research. Research methodology is thus an enquiry strategy that guides a set of processes (Petty et al., 2012; Creswell, 2009).

3.2. Research design: Mixed methods procedures

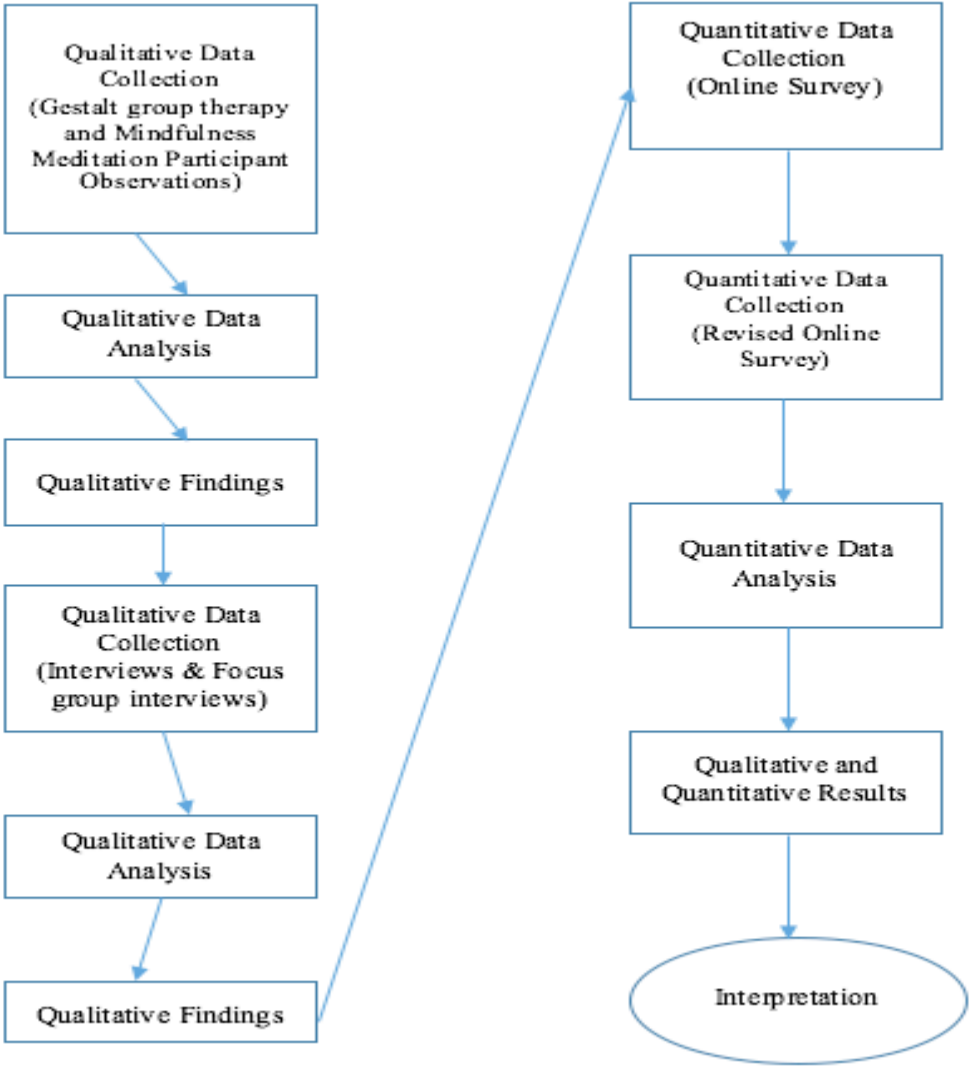
The focus of this research was to examine the use of technologies in mental health intervention and a comprehensive stepped-care program for influencing users, experts, authorities, and other stakeholders' views and their mental healthcare in South Korea and Japan. In general, social researchers agree on two points: (i) how research should be managed (research method) and (ii) why we should use a particular approach (research methodology) (Smith, 2008).

The choice of mixed methods for this study is because of its power of representation in both quantitative and qualitative research and offsetting the limits of both methods at a general level. Likewise, it provides a sophisticated at a practical level, and complicated approach to study that applies to those on the lead of new research processes. Additionally, this is useful tactic to have a comprehensive understanding of research problems or questions (Creswell, 2014).

This research adopted the *exploratory sequential mixed methods design* of the above group. The study reverses the *explanatory* sequential approach and begins with the qualitative phases followed by the quantitative phases; thus, it has an *exploratory* sequential approach. An exploratory sequential mixed method is a design in which the researcher first starts by exploring with qualitative data and analysis and then uses the findings in a second quantitative phase. The second database builds on the results of the initial database. The intent of the plan

is to improve enhanced measurements with explicit samples of populations and to understand if data from a few individuals in qualitative phase can be generalized to an enormous sample of a population in quantitative phase (Creswell, 2014).

Figure 4: *Exploratory Sequential Mixed Methods Design*



With the basic design of exploratory sequential method, this research added an experiment framework to measure actual smart technology usage by the real users (Figure 5).

Figure 5: Advanced Mixed Methods Designs



3.3. The Conceptual framework of the studies conducted

The research process at hand comprises five phases (Table 2).

Table 2: Conceptual framework of the studies conducted

	<i>Respondents</i>	<i>Conceptual framework</i>	<i>Construct of interest</i>
<i>Phase I</i>	Clinical psychologist, counselors (high school, University), social worker, psychologist, minister, therapist, housewife, student, school teachers, professor and freelancers	Self-awareness, Gestalt Group Therapy, mindfulness meditation, BAND mobile application	Importance of psychological features, key features of mental healthcare
<i>Phase II</i>	Experts in research area, technology developers, potential users, local government officers	Smart technologies in mental healthcare	Possibility of smart technologies to support a new paradigm of mental healthcare, preferences, stepped-care model
<i>Phase III</i>	Mobile counseling service users and counselors	Self-awareness, trust, quality of experience, intervention fidelity, perceived usefulness, perceived easy to use, attitude toward to use, behavioral intention to use	Effectiveness of mobile counseling services, evaluate interventions delivery Satisfaction, loyalty
<i>Phase IV</i>	Potential users of smart technologies in mental healthcare	Self-awareness, perceived enjoyment, timeliness, personalize care, collaboration with professionals, perceived usefulness, perceived easy to use, attitude toward to use, behavioral intention to use	Potential users' preferences, continuous availability, stepped-care model
<i>Phase V</i>	Recollected of a part of Phase IV in South Korea by data collection scholarship	As same as Phase IV, but used the brief information about smart technologies with images and descriptions instead of short Videos information for better understanding to the respondents	Potential users' preferences, continuous availability

Phase I examines important psychological features, the key features of mental healthcare, and so on. Phase II then investigates the possibility of smart technologies to support a new paradigm of mental healthcare, preferences, and the stepped-care model. Phase III focuses on the measurement of the effectiveness of an actual mobile counseling service smart technology as an example and evaluates its intervention delivery to users. Phase IV and V comprise potential users' preferences, continuous availability, and the stepped-care model.

The research philosophy, as the researcher's worldview, is pragmatism. This informs the most crucial element of the ontology, epistemology, and axiology that the researcher adopted in relation to the research question. Within this philosophical realm, mixed methods are highly appropriate. There were 5 phases to reach the research aims. All data were collected in February 2017 to March 2018 in both South Korea and Japan for this comparative study.

In phase (I) the researcher participated as an observer at the 19 respondents' gestalt group therapy in South Korea; phase (II) included semi-structured 29 individual and 2 focus group interviews from South Korea and Japan; phase (III) was the experiment of mobile counseling services; for phase (IV) an online survey was designed and data from 332 respondents collected for analyzes, and in phase (V), for optimal accuracy and age bias concerns, 200 respondents were contacted through one of the scholarship institutes of South Korea. The statistical analyzes were carried out using Microsoft Excel, SPSS 25.0 and AMOS 18.0.

3.4. Time horizons of the research: Cross-sectional study

This research is cross-sectional and studies the contemporary phenomena of using smart technologies in mental healthcare in South Korea and Japan. Depending on the research question, a 'diary' perspective is called longitudinal while the 'snapshot' time horizon taken at a particular time is called cross-sectional (Saunders et al., 2009, p. 155). This *cross-sectional study* employed qualitative methods, case studies, and survey strategies to seek and describe the incidence of the phenomenon of the given research question and objectives.

4. RESULTS

4.1. Introduction

This chapter describes and illustrates the key research findings and results based on data collected and analyzed as described in chapter 3. The core purpose of this chapter is to announce the results from phase 1 to phase 5 studies and to lead to a discussion of the major issues of mental health promotion in South Korea and Japan from the various insights, based on mixed methods. As the set method, Exploratory Sequential Mixed Methods Design, this chapter includes the findings from five consecutive studies in a sequential order: (i) the first phase of participating Gestalt group therapy and mindfulness meditation, the importance of psychological features, key features of mental health care from qualitative research; (ii) the second phase by experts in the research area, the possibility of smart technologies to support a new paradigm of mental health care, preferences, and stepped-care model from qualitative research; (iii) the third phase of experimental research, the effectiveness analyses of mobile counseling service, evaluate interventions delivery, Satisfaction, and loyalty; (vi) the fourth phase of quantitative research, potential users' preferences, continuous availability, application for a stepped-care model, and (v) a re-evaluate of a part of phase IV in South Korea.

4.2. Results

This study was divided into 5 phases and 8 Steps. In this Chapter, the finding and results from phase I to phase V as generated by the exploratory sequential mixed methods used have been discussed. In the first phase of the study, in order to access the psychological problems of people directly, the participant observation method was effective. Through a 40-hour psychological therapy program involving Gestalt group counseling sessions in South Korea, the current South Koreans were found to be in a serious 'absence of communication,' in other words 'severance' from their environment. Given the various and serious mental problems that the 19 participants showed, the study moved to the second phase to figure out how to find suitable ways to solve these problems.

Using *SmartMentalTech* results in a solution that combines psychological and health psychological foundations, not just the technology itself to protect real mental health was found to be appropriate. Moreover, after completing the group counseling session SNS was used for continuous interaction with participants and psychologists and this showed the

potential to use it positively for mental health. In the second phase of the study, we obtained qualitative data from 29 interviewees. These were a diverse range of mental health professionals, psychologists, psychiatrists, and people who have been receiving psychological counseling for a long time or who have never had this experience. A deep discussion of *SmartMentalTech*, a solution presented by researchers from their respective perspectives resulted.

Next, four focus group interviews were held in South Korea and in Japan. In particular, the Korean side was able to find out from the CEO of the largest psychological consulting company in South Korea, the development manager of *SmartMentalTech*, and the medical doctor (the doctor who launched the mobile medical app directly) to what stage it had been developed. Psychiatrists and psychologists have many negative views, while developers and related business people have largely viewed it as a positive solution to their problems. Similarly, the focus group interviews with nurses who have more than 10 years of experience in general hospitals in Japan gave a good overview of Japan's mental health-related welfare programs. Most of these respondents had negative views on medication used for depression. As in South Korea, it was also found that postpartum depression is a serious situation leading to suicide attempts.

However, for mental health support research using *SmartMentalTech*, a dubious result was derived. Nurses were reluctant to discuss themselves, but the ones treating others showed a somewhat positive response to these techniques. Through Phase II, the following main results were obtained: to be able to use *SmartMentalTech* for mental health promotion, the important issues for potential users are: accessibility, ease to use, timeliness, usefulness, self-awareness, self-efficacy, enjoyment, trust, fidelity, quality of experience, care, and collaboration with professionals. These were set as the variables, and online surveys conducted in the next phase. For phase III the Technology Acceptance Model (TAM) was proposed as the data analysis technique and causal relationships were verified through the theoretical lens outlined in Chapter 2. However, some key variables were not suitable for *SmartMentalTech* in the pre-commercial stage such as trust, self-efficacy, quality of experience, and intervention fidelity. Nevertheless, the mobile psychotherapy consulting application currently used in South Korea has now been incorporated in an experimental study of the verification of the actual use of TAM.

Mobile psychotherapy counseling covered 15 participants for 1 month (10 times) directly, and the efficacy results were derived (18 hypotheses were tested and all were significant). As one type of *SmartMentalTech*, mobile psychological counseling has proven to be useful. In phase IV, the TAMs of 264 potential users (150 South Korean and 114 Japanese) with little experience of *SmartMentalTech* were verified with other variables such as self-awareness, perceived enjoyment, timeliness, penalized care, and collaboration with professionals.

A survey of 12 types of willingness to use *SmartMentalTech* showed different results for South Koreans and Japanese. A structural equation model (SEM) was used to analyze the quantitative data. Confirmatory factor analysis (CFA) and path analysis were used for analyzing and testing a further 15 hypotheses. One of the remarkable findings is that for many of the psychological counselors in phases I and II self-awareness is emphasized by psychiatric counseling specialists but experience-oriented researchers do not accept the hypothesis. Finally, the causal relationships between the given variables were analyzed and verified, and the results of the total effect and direct effect indirect effects derived. Additionally, in order to re-test the fit between the research model and the research, a second online survey was conducted with 200 participants in South Korea. This analysis produced the same results as phase IV.

5. DISCUSSION

5.1. Introduction

The following discussion section briefly explores the findings of various perspectives, exploring what the results of the previous Chapter (Chapter 4) on *SmartMentalTech* in South Korea and Japan. There are implications for the potential use of *SmartMentalTech*. Here we shall discuss how to use technology acceptance, i.e., “intention to use” and to what extent, and in what direction, mental health promotion can be used, and also discuss the main contents at the end: (i) phase one, (ii) phase two, (iii) phase three, (iv) phase four, (v) and phase five.

5.2. Discussion

This discussion section examines in detail the results obtained at every stage of this study from various perspectives, describes the limitations of the research, and suggests follow-up research.

Implications for the potential use of SmartMentalTech

This study classified 12 types of *SmartMentalTech* that have been applied to CMHCSM. In the choice of technology types, there were some differences between South Korean and Japanese users. The study concluded that *SmartMentalTech* should be promoted as an accompanying solution that is readily accessible for the users and described the four steps of the stepped-care approach for comprehensive management. Further research in the form of an evidence-based analysis of the use of 12 types of smart technologies in mental healthcare is recommended.

The important factors in accepting technology and its applicability and application in the stepped-care model have been confirmed. The study confirmed the direction that it can be used for mental health promotion, and finally, the causal relationships between the influencing factors influencing the use of *SmartMentalTech* through the Technology Acceptance Model (TAM) were identified. After applying the path analysis of the *SmartMentalTech* service based on the proposed model, the main results suggest that perceived enjoyment, timeliness, and external variables, and co-operation with work have a direct impact on acceptance and opportunity use. Therefore, perceived enjoyment, timeliness, co-operation with the profession, ease of use, and attitude to use can be a key element of *SmartMentalTech* as it can contribute to the solving of potential user concerns in the face of mental health problems.

6. CONCLUSION

6.1. Introduction

This study sought to answer the following question:

“To what extent are smart technologies acceptable to users and caregivers in a comprehensive mental health stepped-care approach in South Korea and Japan.”

The study continued to explore the feasibility of a *SmartMentalTech* and identified the classification of the existing *SmartMentalTech* and the perceptions of potential *SmartMentalTech* users (caregivers, the developers, and other stakeholders) in South Korea and Japan. The comprehensive mental health stepped-care system on trial through *SmartMentalTech*, the important factors and the causal relationships among those factors for accepting *SmartMentalTech*, and the impact of the mobile counseling service on users were analyzed. This study also sought to show whether *SmartMentalTech* can provide effective support for untreated mental health illness and suicide reduction problems in South Korea and Japan, particularly regarding the social stigma associated with mental illness and the potential severance among human beings. In the context of this research area, and in particular the acceptability of *SmartMentalTech*, the general theoretical literature is inconclusive on these crucial questions within the diversification discourse.

The three core research objectives were as follows:

1. To investigate the application feasibility of a prototype of smart technologies in mental health promotion in South Korea and Japan;
2. To analyze how effectively the innovative smart technologies are applied in mental healthcare;
3. To determine if the currently used smart technologies are comprehensively and continuously available to both users and caregivers.

6.2. Synthesis of empirical findings as answers to research questions and objectives

The main empirical findings are in Chapter 4, are section specific and were summarized within the respective empirical sections: (1) the measure of the first phase was qualitative research, based on participant observation in gestalt group therapy from 13th to 18th February 2017 and mindfulness meditation 14th April 2017 in South Korea; (2) the measure of the second phase was qualitative research using interviews and focus group interviews both in South Korea and Japan from July 2017 to January 2018; (3) the measure of the third phase

was a quantitative study of mobile counseling services comparing ‘TROS’ in South Korea and ‘PINT’ in Japan from November to December 2017; (4) the measure of the fourth phase was an online survey in both South Korea and Japan; and (5) the measure of the fifth phase was an online survey for re-evaluation of phase IV in South Korea.

This section synthesizes the empirical findings to answer the study’s main research question and its three core objectives:

1. What is the application feasibility of a prototype of *SmartMentalTech* in mental health promotion in South Korea and Japan?

a. Preventive mental healthcare: Both South Koreans and Japanese in this study have shown interest in the prototypes of *SmartMentalTech*, which are being actively developed at present. They feel that the idea of using this kind of technology before they get mental illness is good. Many respondents highlighted that *SmartMentalTech* should be used from an early stage in the mental healthcare system;

b. Self-awareness support: the majority of experts stressed that users’ psychological self-awareness should be supported by using *SmartMentalTech*. They noted that the combination of psychological and psychiatric treatment techniques is the key; therefore, the role of professionals, especially psychiatrists, is needed.

c. The government’s active intervention: the necessity for the development of better technology was asserted by experts and potential users. They believed that mental health is closely related to the quality of life of the entire population; *SmartMentalTech* should be supported with investment and development at a national level rather than by a private developer.

d. Evidence-based effective results and validity: nearly all Japanese respondents were interested in the development of prototypes of *SmartMentalTech* and were concerned about their technology readiness level, validity and proven effectiveness. The developers should make measurements of effectiveness. Nonetheless, they expected that it would be a long process to obtain applicable results, as it takes time to accept new technologies. However, if the use is generalized and there are no side effects, the respondents agreed they would accept them if they were valid for everyone.

e. Accessibility, convenience, being intuitive, easy to use, and reliability: Most South Koreans pointed out the importance of these advantages of *SmartMentalTech*. Moreover, they also insisted that the promotion of *SmartMentalTech* must be considered.

f. Ethical guarantees: Both South Korean and Japanese do not allow *SmartMentalTech* to acquire personal information without users' permission. The personal information protection is absolutely vital for using *SmartMentalTech*; and

g. A concern of potential users' Age: Many South Korean respondents expressed that *SmartMentalTech* cannot be suitable for all ages (e.g. the youngest, middle-age, and elderly). Therefore, it is necessary to develop mental health technology suitable to each user's condition.

2. How effectively is the innovative *SmartMentalTech* applied to mental health?

a. Providing comprehensive solutions: One of Japanese developers explained the effectiveness of IBM Watson business unit, and that for years they have been providing comprehensive solutions for smart devices to help people maintain physical and mental health as well. South Korean respondents expected that it can be used in various contexts with various interventions. It is very important to let each user choose the best solution.

b. Enjoyment and the contents: South Korean respondents recommended increasing the enjoyment of *SmartMentalTech*. So, it should be fun and interesting even if that is not the purpose of mental healthcare. The contents have to be first, not just the technical issues. It is good for developers to have content and be able to implement that content technically.

c. Anonymity support: Both South Korean and Japanese respondents said they fear to leave a mental health medical record; so some people pay in cash when they receive treatment even if they are eligible for national health insurance. "If there is a service that can anonymize the self-diagnosis of mental health, I would probably use it. It would be nice to use it together with my family, but it is also good to be anonymous".

d. Non-invasive adjustment techniques: For the use of *SmartMentalTech* in treatment there are "non-invasive" adjustment techniques like y-brain products. And, in terms of the management aspects, there are several techniques that can be used in diagnostics by collecting unstructured users' data, such as voice tones or users' usage patterns or behaviors. Therefore, when looking at new therapies or diagnostic methods, the existing ineffective parts can be reduced. As for the control of the brain utility, as the user may use it easily, the development of a technology the function of which is adjusted by itself is in progress. It seems to be moving in a positive direction.

3. How can existing *SmartMentalTech* be provided to users and caregivers both comprehensively and continuously?

a. Collaboration with professionals: Mental health is a very specialized and high-risk field, so convenience and expertise are required, and they should be provided with full consideration of various aspects and various positions. Collaboration with hospitals, especially with psychiatrists, is the key. Validated methods are the most important, and therefore thorough clinical trials should be the premise. A revision of the medical law would make it better for the actual psychiatrists to use *SmartMentalTech* in parallel. But in South Korea, it is still difficult to adopt this because of the regulations. Thus, adopting *SmartMentalTech* should be in collaboration with experts, and medication treatment should be done together besides psychotherapies. It is now a system that relies heavily on well-known mental health professionals.

b. Stepped-care treatment: The willingness to use this step-by-step care system for mental health care from the first stage may be increased if it has been reliably established. It is a system similar to a psychological counselling structured plan.

6.3. Theoretical implications

a. The Technology Acceptance Model (TAM): The theoretical cases for many technology acceptance factors need to be revisited to further understand the effectiveness of *SmartMentalTech* in South Korea and Japan and how it can be used more comprehensively and continuously. As interest in end-user responses to health information technology grows, the importance of the theory of predicting and exploiting health-care IT adoption and usage has increased (Holden & Karsh, 2010). It is noteworthy, however, that this study has specialized in the area of generalized health information technology as well as more specialized technology acceptance theories, especially on mental health-related technology. Although an extended version of TAM was explored to illustrate people's intentions to use mobile psychotherapy applications, the concept of *SmartMentalTech* extension beyond mobiles was not addressed regarding task-technology fit and social influence.

Standardized estimate factors were examined for acceptance of mobile mental health treatment applications (Becker, 2016). In this study, self-awareness, trust, self-efficacy, quality of experience, and intervention fidelity were set for acceptance of mobile counseling services in South Korea and Japan. Another study has looked at the concept of a theoretical model to clarify whether the elderly would adopt smart technology opportunities to cope with their discrepant distinctive or environmental conditions, thus enabling them to age in place (Golant, 2017). The theory may benefit from several additions and modifications: TAM is to

adapt the model specifically to the mental health care context, using various cases of theories and methods.

b. Comprehensive Mental Healthcare Stepped-Care Model (CMHSCM): The comprehensive mental health care was applied in this study to understand how the stepped-care model can be integrated into *SmartMentalTech* and traditional mental health systems and how it can be sustainable. Stepped-care generally involves more intensive treatment for those who do not benefit from primary care or who can accurately predict that they will not benefit from such treatment (Bower & Gilbody, 2005; Newman, 2000). This concept is a good match with *SmartMentalTech* ideas. Stepped-care standardizes systems and procedures with clear goals for efficiency (Bower & Gilbody, 2005; Scogin et al, 2003; Katon et al, 1997) in traditional treatments. This attempt may be just an ideal proposition at the moment, but it can be discussed in the sense of a starting point. This study suggests this to mental healthcare, in particular, using a new system, *SmartMentalTech*. This theoretical contribution supports other specific mental disorder treatments by *SmartMentalTech* (e.g. VRT, BI, y-brain etc.) such as for anxiety, depression, or migraine which belong to the category of psychological effects.

6.4. Policy implications

On January 12, 2017, in Japan, the first meeting was held by the Ministry of Health, Labor and Welfare on the promotion of utilization of AI in the field of healthcare. Application of deep learning to imaging diagnosis, mental illness diagnosis possibilities were the main issues (Ministry of Health, Labor and Welfare, 2018).

Recently, one particular development policy was established in South Korea; the Ministry of Health and Welfare announced on May 11, 2018 that it plans to develop mental health technology to help early detection of suicidal symptoms, diagnosis, and management of mental health without irritation, and rehabilitation of people with mental illness. It covers the development of key technologies in five areas including: the suicide risk prediction technology, the intelligent mental health counseling technology, the elderly mind care technology, the support technology for the community settlement of the mentally ill, and the AI-based mental health technology platform (Presidential Direct 4th Industrial Revolution Commission, 2018).

However, it seems that policy has not been fully implemented based on the theories related to this research thesis. This study has used empirical findings to show that the contemporary

developing policy in mental healthcare is not making the anticipated impact at this time, and the government's strong focus on AI technology, and thus other various *SmartMentalTech* applications, are omitted in their policy (Lee, 2018).

The theoretical arguments for this justification suggest the need for policy review that will enable diversification of developing policy to apply to citizens who are mentally ill and especially for suicide reduction (Jang & Cho, 2016).

6.5. **Recommendation for the future research**

The scale of this debate in mental healthcare is therefore serious and urgent at both the national and regional level in South Korea and Japan. To set up a new mental health care system besides traditional mental health care system, there is a need for more case studies over the effectiveness with the actual use of *SmartMentalTech* cases to allow further assessment of national dimensions of the *SmartMentalTech*. Exploring the following future research strategies can facilitate the attainment of this goal:

a. Accumulation of deepened technical knowledge and analysis of the connection between health psychotherapy consultation theory and specialized *SmartMentalTech*:

Although this variable was explored in various aspects, the generalized evaluation was mainly done from the perspective of potential users. Thus, further studies should be extended at a higher level of research on both the technical developer side and the mental health professionals' aspects based on the research results in this study.

b. A continuous research plan for completion of the CMHSCM: The CMHSCM proposed in this study will examine what can be applied in practice; the next studies should analyze the actual cases using *SmartMentalTech* one by one and with expert proof verification beyond mobile counseling services. In the near future, CMHSCM has proposed that *SmartMentalTech* service development be reassessed and modified through evidence-based analysis of real users and caregivers.

c. *SmartMentalTech* for suicide reduction: As far as *SmartMentalTech* may be used to reduce suicide with simple techniques, this potential is being researched and studies are underway.

6.6. **Limitation of the study**

This study has proposed a more accessible system using *SmartMentalTech* for improving mental health in South Korea and Japan. For those respondents who have never heard of *SmartMentalTech* or who have never used it, questions about this research were imagined or

predicted rather than experienced. It is necessary to investigate this experience and the effectiveness of using these technologies for actual users. Detailed core technological trends are needed for developers.

As a direct result of this methodology, the research has some limitations to consider. An experimental verification of the proposed model and its results is needed. The number of participants in the mobile counseling service experimental research was 14 in total, suggesting that the limited number of cases could weaken statistical validity, which suggests that there is a limit to generalizing the results of this study. The research was planned as a comparative study, but at the final phase had to proceed without comparison due to technical and financial issues.

6.7. Conclusions

Mental healthcare using *SmartMentalTech* could prove highly effective in mental healthcare and mental health promotion in South Korea and Japan. New *SmartMentalTech* methodologies for mental health should be continuously evaluated to provide support and improve their effectiveness and availability for mental health in South Korea and Japan.

Smart technologies do not completely act to replace traditional mental healthcare but instead they are considered as add-on and complementary for better and improved access, intervention and changing of mental health behavior. The need for SmartMentalTech in mental healthcare is to improve and increase awareness, accessibility, timeliness, quality, and cost-efficiency of the daily interventions of support users or patients, because they can help with a situation of lack of psychiatrists, long waiting lists, short time for consultations and mostly prescribed medication, cost burdens, and social stigma of not being mentally healthy. SmartMentalTech may help transform the societies by changing the people's perspectives, and improving mental health condition, rather than through the hardly accessible "conventional" mental healthcare system.

The development of various *SmartMentalTech* solutions can meet the increasing demands of mental health care interventions and overcome the limitations of traditional mental healthcare systems in terms of accessibility and coverage.

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