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ORIGINAL ARTICLE

Innovative mobile technology application to enhance healthcare and quality of life for senior citizens in Bangkok, Thailand

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ABSTRACT

This research is aimed to explore the innovative mobile technology application incorporating smartphone (Apps), sport watch, mobile health devices, e.g. heart rate & blood pressure to enhance healthcare and quality of life for senior citizens in a district of Bangkok. The sample for this study was divided into two groups, one with active exercise and the other with less exercise. The questionnaires were designed to collect data on their demographics, health records, physical activity, and mobile health devices usage and skill. WHO's quality of life questionnaire was also adapted to assess their quality of life. The population was between the ages of 50 to 70 with an average age of 61 years.

The research results indicated that all participants in this study were using the smartphone and at least one social network. Among the active group, 15% were using sport watch and 65 % were using mobile heart rate & blood pressure devices to monitor their exercise routine and health regularly. Concerning, health record, both groups showed 50 % cases of sickness. In the active group, 18% were found with non-communicable diseases (NCD), such as, Heart disease, Strokes, Diabetes, High blood pressure and Cancer; 15 % were found with bone-related sickness and 8% with allergy. The less exercise group was found with a higher rate of sickness with 31% NCD, 22 % bone sickness and 16% with allergy. For the quality of life (QOL), the active group showed a high level in all 5 aspects: physical health, mental health, social, living environment and sexual satisfaction whereas the less exercise group had lower scores in every aspect. There was a statistically significant difference ($p<0.05$) in the physical health aspect.

The innovative mobile technology could be applied to enhance healthcare and QOL for the seniors with active exercise and drive telehealth system.

Keywords: mobile technology, sport watch, mobile health devices, quality of life, telehealth

INTRODUCTION

Thailand has become an aged society with a population aged 60 and over of 10.7 million in 2015, or 16% of the total population. It is going to be a completed aged society with 20 million in the next few years [1]. Healthcare service for the elderly is a great concern for the years to come. In the last decade, non communicable diseases consisted of heart disease, stroke, diabetes, high blood pressure, and cancer became the number one cause of death in the world [2]. Mobile technology in healthcare looks toward a brighter future [3]. Telehealth in primary healthcare was applied for Diabetes self-management [4]. Social participation and healthy aging were studied for significant protective factor for chronic non communicable conditions [5].Emerging new era of mobile health technologies creates a new opportunity in telehealth [6-8]. Mobile medical and health apps, state of the art, concerns regulatory control and certification [9]. The World Health Organization defied Telehealth as the use of telecommunications and virtual technology to deliver health care outside of traditional health care facilities [10]. Telehealth can also help promote health awareness, healthcare delivery and improve quality of life for those, particularly senior citizens to improve their well-being with a lower cost of healthcare and self-control. mHealth or mobile health is a term used for the practice of medicine and public health supported by mobile devices [11-3]. A research on innovative health care delivery systems through telecare was also conducted [14].

Wearable technology is becoming an integral part of the solution for providing health care to a growing world population that will be strained by a ballooning aging population [15]. Wearable computing has the potential to encourage physical activity by increasing health awareness and persuading change through just-in-time feedback [16]. A research study found that there was positive and significant relationship between social networks and quality of life in the elderly [17]. Quality of life was also related to physical activities of daily living among elderly [18]. An internationally applicable instrument to access quality of life in the elderly was suggested [19]. A study indicated the effectiveness of mobile-health technology-based health behaviour change or disease management interventions for health care consumers[20]. Another study was conducted incorporating mobile technology into psychosocial and health behaviour treatments[21]. Many studies were conducted concerning application of mobile technology and mobile health apps to promote healthcare[22-23]. It was found older adults and mobile technology enhance behavior in the context of behavioral health[24].

The rapid advancement of mobile phone technology and mobile health devices create an opportunity for healthcare for seniors, chronic disease patients or athlete. The new invention sport watch, smart watch and mobile health devices can monitor all-day activity and record the level of their exercise, i.e. time, distance, speed, step, position (via GPS), heart rate, breath, blood pressure, calories, and sleep pattern. The data will be monitored during their exercises or all-day activity analyzed and transmitted through the application installed on the smartphone to share with their trainers, doctors, family, and friends. As Thailand is in the transition to 5G together with the new development of sport watch, mobile health devices and the Apps, healthcare and quality of life enhancement can be driven for the senior citizens. Therefore, the objectives of this research were (1) To explore the application of innovative

mobile technology incorporating smartphone, sport watch, and mobile health devices, e.g. heart rate & blood pressure to enhance healthcare and the Quality of Life (QOL) for senior citizens and (2) To compare health and the Quality of Life of an Active exercise group with a Less exercise group of senior citizens in a district of Bangkok.

METHODS

This research was designed to find the effectiveness of applying innovative mobile technology to enhance health and QOL for senior citizens in Bangkok and compare their health and QOL between active exercise and less exercise group.

The target population consisted of senior citizens who regularly exercised at the public parks in Taweewattana district of Bangkok. The sample was purposely selected and invited to participate in the research. They voluntarily registered to respond to an online questionnaire. A total of 70 participants was divided into two groups. Those with actively exercised 3-7 times a week was put in the Active Exercise Group (AEG) and those with less exercise in the Less Exercise Group (LEG).

The research instruments conprised a set of questionnaires designed to collect data in 5 categories as follows.

- Demographic data
- Health & sickness records (adapted from WHOQOL-BREF-THAI questionnaire[25])
- Exercise & Physical activity
- Smartphone and Mobile health App usage, skill and attitude
- Quality of Life (adapted from WHOQOL-BREF-THAI questionnaire[25])

The questionnaire were tested for reliability with a similar group of 30 seniors. The Cronbach's Alpha was .95 Data collection was conducted through an online questionnaire. Descriptive statistics and independent sample t-test were applied to analyze the data.

This research has been approved by Assumption University and conducted with the participants who voluntarily participated. Their responds have been kept confidential for the research only.

RESULTS

The result results showed that the participants consisted of seniors between the ages of 50 to 70, with an average age of 61. The AEG group consisted of 31% males and 69% females, whereas the LEG had 42% males and 58% females. About half of both groups, 51-55% were retired or almost retired government officials, and 29-33 % were private company employees and 10%-13% were business owners. In both groups, 32-33% had a bachelor's degree and 62-68% possessed higher degrees. Most of them, 54-74% still lived with their family.

Almost all participants, 94-95 % were using LINE combined with Facebook and a few were using LINE with email. Regarding connection times or being online, in both groups, 52-56% connected 1-5 times a day and 26-29% connected more than 10 times a day. As for the total time used, most of both groups, 59-61% spent 2-3 hours per day.

Table 1: Health and Sickness Record

Item	Active Exercise Group, % (no.)	Less Exercise Group, % (no.)
Health Record		
No disease	51.28 (20)	48.39 (15)
Heart diseases and Strokes	5.13 (2)	3.23 (1)
Diabetes	2.56 (1)	12.90 (4)
High Blood Pressure	7.69 (3)	9.68 (3)
Cancer	2.56 (1)	6.45 (2)
Allergy	7.69 (3)	16.13 (5)
Other Symptoms		
Bone	15.38 (6)	22.58 (7)
Respiratory	2.56 (1)	9.68 (3)
Digestion	2.56 (1)	9.68 (3)
Nerves	2.56 (1)	-
Skin	2.56 (1)	3.12 (1)

Table 1: shows that both groups had about half, 49-50% suffering from sickness. The AEG also was found to have 18% with non-communicable diseases (NCD), such as, Heart diseases, Strokes, Diabetes, High Blood Pressure and Cancer; 15 % were afflicted with bone-related sickness and 8% with allergy. The LEG was found with 32% NCD, 23 % bone problems and 16% with allergy, much higher percentage compared to AEG.

Table 2: Physical Activity.

Activity	Active Exercise Group, % (no.)	Less Exercise Group, % (no.)
Exercise and Sports		
Walking	51.28 (20)	58.06 (18)
Running	20.51 (8)	16.13 (5)
Aerobics and Dancing	25.64 (10)	3.23 (1)
Bicycle	2.56 (1)	16.13 (5)
Others	-	6.45 (2)

Table 2: indicates that in both groups, 51-58% preferred walking. The AEG was more active with regular exercise, 3-5 times a week through walking, running, and aerobics or dancing at 51%, 21% and 26% respectively. Their major reasons to exercise were for good health (87-90%) followed by stress release, social and sickness recovery.

Table 3: Mobile health devices Apps, skill and attitude.

Item	AEG, Avg. Score	LEG, Avg. Score
Satisfaction	3.90 (High)	3.41 (Mod.)
Technology skill	3.13 (Mod.)	2.78 (Mod.)
Advantage	3.49 (Mod.)	3.28 (Mod.)
Future trend awareness	3.69 (High)	3.50 (Mod.)
Overall Avg. Score	3.55 (High)	3.24 (Mod.)

Table 3: All of them were able to use a smartphone, 64-68 % could use mobile heart rate & blood pressure devices. About 15% of members in AEG used sport watch and sport wearable to monitor their exercise and health regularly, whereas in LEG only a few used sport watch.

As for mobile devices Apps skill and attitude, the AEG showed a high level of satisfaction and awareness about future trends and a moderate level of technology skill and advantage whereas the LEG showed lower scores in all aspects. Furthermore, the overall average score of the AEG showed a high level (High) and the LEG at a moderate (Mod.) level.

Table 4: Comparison of Quality of Life of the Active exercise and Less exercise group.

No.	Item	AEG, Avg. Score, Level		LEG, Avg. Score, Level		*p* value
1	Physical health	3.77	High	3.38	Mod.	.038*
2	Mental health	3.69	High	3.44	Mod.	.169
3	Social	3.79	High	3.51	High	.099
4	Living Environment	3.70	High	3.42	Mod.	.103
5	Sex satisfaction	3.62	High	3.23	Mod.	.127
Avg. Score		3.71	High	3.43	Mod.	.099

* *p-value* < *0.05*, if statistically significant at $\alpha = 0.05$

Table 4: The AEG showed a high level in all 5 aspects: *physical health, mental health, social, living environment and sex satisfaction, whereas* the LEG had lower scores in all aspects with moderate levels, except in *social* aspects with a high level. There was a statistically significant difference ($p<0.05$) in *physical health*. Their top levels in the AEG were for social, physical and living environments respectively.

DISCUSSION

The research results revealed that most of the senior citizens in a district in Bangkok were able to use the smartphone and social networks. They had a moderate to high level of skill in using mobile technology devices and Apps. Both groups had about half, 49-50% suffering from sickness. The AEG also was found to have a lesser percentage of sickness than LEG. Concerning the quality of life (QOL), the AEG showed in a high level in all 5 aspects: physical health, mental health, social, living environment and sex satisfaction, whereas the LEG had lower scores in all aspects with moderate level except the social aspect with high level. There was a statistically significant difference ($p<0.05$) in physical health. The top score levels in the AEG were found for social, physical and living environment respectively. In conclusion the AEG had better indicators than the LEG in the health and quality of life in all 5 aspects. Overall the seniors in a district of Bangkok were at a moderate to a high level of QOL by applying advanced mobile technology to enhance their health and wellbeing.

The research results revealed that the application of innovative mobile technology could help enhance healthcare and QOL for senior citizens. The results also complied with the research studies

that the social network among the elderly had a positive relationship with the quality of life [17] and improvement in quality of life was found by physical activities of daily living among elderly patients [18]. The research study also indicated the effectiveness of mobile-health technology in enhancing health behaviour change in healthcare [20]. It was suggested that the older adults and mobile technology could enhance behavior in the context of health [24].

CONCLUSION AND RECOMMENDATIONS

The research revealed that applications of innovative mobile technology incorporating smartphone, social networks, sport watch and mobile health devices can help senior citizens monitor their health and improve QOL through the use of the advanced technology.

It is recommended for further research study to monitor the participants for a longer period, 6-12 months and check their health and QOL in the long run. Furthermore, the population should be expanded to cover bigger target groups.

The application of mobile technology will also reduce the cost of healthcare in the seniors and provide timely treatment and rehabilitation for the chronic disease patients or low-income earners through online communication with doctors without several visits to the healthcare service facility.

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