EFFECT OF LINE APPLICATION ON ACTION AND COPING PLANS ON EXERCISE ADHERENCE AND FUNCTIONAL PERFORMANCE FOR OLDER ADULTS WITH KNEE PAIN IN SUBURBAN AREA OF BANGKOK METROPOLIS, THAILAND: A QUASI EXPERIMENTAL STUDY

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ผลของโปรแกรมไลน์ในการดำเนินการและการวางแผนรับมือ เพื่อให้เกิดการออกกำลังกายอย่างสม่ำเสมอ ในผู้สูงอายุที่มีอาการปวดเข่าในเขตชานเมือง กรุงเทพมหานคร ประเทศไทย: การศึกษาแบบกึ่งทดลอง

น.ส.ภัทราภรณ์ ภิวงศ์

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาสาธารณสุขศาสตรดุษฎีบัณฑิต
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By	Miss Pattaraporn Piwong
Field of Study	Public Health
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ภัทราภรณ์ ภิวงศ์ : ผลของโปรแกรมไลน์ในการดำเนินการและการวางแผนรับมือ เพื่อให้เกิดการออกกำลังกายอย่างสม่ำเสมอ ในผู้สูงอายุที่มีอาการปวดเข่าในเขตชานเมือง กรุงเทพมหานคร ประเทศไทย: การศึกษาแบบกึ่งทดลอง. (EFFECT OF LINE APPLICATION ON ACTION AND COPING PLANS ON EXERCISE ADHERENCE AND FUNC TIONAL PERFORMANCE FOR OLDER ADULTS WITH KNEE PAIN IN SUBURBAN AREA OF BANGKOK ME TROPOLIS, THAILAND: A QUASI EXPERIMENTAL STUDY) อ.ที่ปรึกษาหลัก : รศ. ดร.รัตนา สำโรงทอง, อ.ที่ปรึกษาร่วม : ดร.คาร์ล เจ นีเซอร์

การออกกำลังกายมีประโยชน์อย่างมาก เพียงแต่ผู้สูงอายุที่มีอาการปวดเข่าจะมีอาการออกกำลังกายอย่างไม่สม่ำเสมอและต่อเนื่อง การวิจัยกึ่งทดลองนี้มีวัตถุประสงค์เพื่อศึกษาผลของโปรแกรมไลน์ในการดำเนินการและการวางแผนรับมือต่อการยึดมั่นในการเกิดการออกกำลังกาย,ความมั่นใจในความสามารถของตนเองในการออกกำลังกาย,ความมั่นใจในความสามารถของตนเฉพาะด้าน (ประกอบด้วยความมั่นใจในความสามารถของตนในการทำตามภารกิจที่ตั้งไว้,ความมั่นใจในความสามารถในการคงไว้ซึ่งพฤติกรรมของตนและความมั่นใจในความสามารถของตนในการปรับตัวหลังจากเจออุปสรรคต่างๆ),ความสามารถในการทำงานของข้อเข่า (ประกอบด้วย พิสัยการเคลื่อนไหวของข้อเข่า(ROM),ความสามารถในการทรงตัว (TUG),ความแข็งแรงของกล้ามเนื้อขา (30CST), ความสามารถของข้อเข่าในการเคลื่อนไหวต่อการทำกิจกรรมต่างๆในชีวิตประจำวัน) และระดับอาการปวดเข่าของผู้สูงอายุที่มีอาการปวดเข่าในเขตชานเมือง กรุงเทพมหานคร ประเทศไทย

กลุ่มตัวอย่างคือผู้สูงอายุที่มีอาการปวดเข่า จำนวนทั้งหมด 86 คน อายุระหว่าง 50-65 ปี แบ่งเป็นกลุ่มทดลองและกลุ่มควบคุม จำนวนกลุ่มละ 43 คนเข้าร่วมในการวิจัยเป็นระยะเวลา 14 สัปดาห์ โดยเก็บรวบรวมข้อมูลก่อนและหลังด้วยแบบสอบถามที่มีโครงสร้างและการทดสอบความสามารถในการทำงานของข้อเข่า ในส่วนของการยึดมั่นในการเกิดการออกกำลังกายเก็บรวบรวมข้อมูลด้วยสมุดบันทึกการออกกำลังกาย วิเคราะห์ข้อมูลด้วยสถิติเชิงพรรณาและสถิติอ้างอิง ผลการศึกษาพบว่า ภายหลังการทดลอง กลุ่มตัวอย่างในกลุ่มทดลองมีการยึดมั่นในการเกิดการออกกำลังกาย,ความมั่นใจในความสามารถของตนเองในการออกกำลังกาย,ความมั่นใจในความสามารถของตนเฉพาะด้านและความสามารถในการทำงานของข้อเข่าที่เพิ่มขึ้นจากก่อนการทดลอง และเพิ่มขึ้นมากกว่ากลุ่มควบคุมอย่างมีนัยสำคัญทางสถิติ (P <0.05) นอกจากนี้ระดับอาการปวดเข่าในกลุ่มทดลองลดลงต่ำกว่าก่อนการทดลอง และลดต่ำกว่ากลุ่มควบคุมอย่างมีนัยสำคัญทางสถิติ (P <0.05) และภายในส่วนของควบคุม ผลการศึกษายังพบอีกว่าความมั่นใจในความสามารถของตนเองในการออกกำลังกายก่อนและหลังมีการเพิ่มขึ้นเพียงเล็กน้อย และมีความแตกต่างอย่างมีนัยสำคัญทางสถิติ (P <0.05)

ดังนั้นโปรแกรมที่ใช้ในการศึกษานี้ซึ่งมีการใช้โปรแกรมไลน์ร่วมกับการดำเนินการและการวางแผนรับมือสามารถนำไปประยุกต์ใช้ในการส่งเสริมการออกกำลังกายอย่างต่อเนื่องในผู้สูงอายุที่มีอาการปวดเข่า เพื่อลดอาการปวดเข่าในระยะยาวและป้องกันการเกิดโรคข้อเข่าเสื่อมในอนาคต

สาขาวิชา	สาธารณสุขศาสตร์	ลายมือชื่อนิสิต .....
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Pattaraporn Piwong :

EFFECT OF LINE APPLICATION ON ACTION AND COPING PLANS ON EXERCISE ADHERENCE AND FUNC TIONAL PERFORMANCE FOR OLDER ADULTS WITH KNEE PAIN IN SUBURBAN AREA OF BANGKOK ME TROPOLIS, THAILAND: A QUASI EXPERIMENTAL STUDY. Advisor: Assoc. Prof. Ratana Somrongthong, Ph.D. Co-advisor: Karl J. Neeser, Ph.D.

The known advantage of exercise for older adults who had knee pain is limited by low adherence to an exercise program. LINE application on action and coping plans do improve exercise adherence, knee functional performance and reduce knee pain. This quasi-experimental study determined the effect of LINE application on action and coping plans on exercise adherence, self-efficacy for exercise (SEE) , specific self-efficacy (task, maintenance, recovery), functional performance including knee range of motion (ROM), time up and go (TUG), 30-second chair stand (30CST) , knee outcome for activities of daily living (KOS-ADLS) and knee pain scale among older adults with knee pain in suburban area of Bangkok Metropolis, Thailand after implementation program. Total participants were 86 at aged 50-65 years and they were divided into 2 groups: intervention group (received action and coping plans with LINE application program) and control group (received usual care) with 43 participants in each group. Participants undertook 14 weeks period of the study program. All outcomes were measured at baseline and post-test except exercise adherence was collected after finishing the intervention program via exercise diary. Data were analyzed statically. The results demonstrated that there was a significant difference between 2 groups in all outcomes *(P*<0.05*).* Also, the study findings revealed that an intervention group improved significantly in all outcomes within-group after completed the study program while the control group has only one measure (SEE) was significantly difference within-group (*P*<0.05). Moreover, applying technology from application on a smartphone as LINE combination with action and coping plans was found effective to enhance older adults' adherence, motivate and encourage them to become adherer to exercise and decrease knee pain which it advantages to prevent them from knee pain and disability.

Field of Study:	Public Health	Student's Signature .....
Academic Year:	2021	Advisor's Signature .....
		Co-advisor's Signature .....

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INTRODUCTION

1.1 Background and Rationale

Knee pain is a major health problem of older adult population worldwide (Porcheret, Jordan, & Croft, 2007), especially occurring in 20% of older adult which aged over 50 years and it's frequently, but not always, related with radiographic of knee osteoarthritis (KOA) (J. G. Quicke, Foster, Thomas, & Holden, 2015b; K. S. Thomas et al., 2005). Prevalence rate of knee pain estimate was 46.2%- 65% (I. J. Kim et al., 2011; Nguyen et al., 2011), significantly high in women (58%) more than men (32.2%) (I. J. Kim et al., 2011) and the most common cause of knee pain which attribute to knee OA among women that increasing the prevalence is advancing age and changing of estrogen hormone (Muraki et al., 2009; Nevitt, Felson, Williams, & Grady, 2001; Roman-Blas, Castañeda, Largo, & Herrero-Beaumont, 2009; Thiem et al., 2013). Although women had high prevalence of knee pain more than men but the prevalence of this problem doubled up for the period of 20 years among women and tripled among men from reported of National Health and Nutrition Examination Surveys (NHANES) (Fox, 2012; Nguyen et al., 2011). Regarding to the number of knee problems is increasing of both genders, so these should be concern for older adults of male and female together. There are many personal factors affecting the occurrence of knee pain as gender, career, High Body Mass Index (BMI), knee posture in activity of daily living (ADL) for instance Thai people squatting, kneeling and sitting with the knee bent on the floor in a polite attitude, and knee injury (Lamb et al., 2000; Rogers & Wilder, 2008; Thompson et al., 2010; U.S. National Library of Medicine, 2016).

Knee pain is the most important cause of morbidity, loss of function also had negative effect on the quality of life (Frese, Peyton, Mahlmeister, & Sandholzer, 2013; Tavares Júnior et al., 2012). Mostly, knee pain attributed to knee osteoarthritis, is the common form of joint disease and a lead to disability of lower limb among older adult and effect to their ADL also alteration in self-concept (Kluzek et al., 2015; Peat, McCarney, & Croft, 2001). Uncertainty, had chronic knee pain tolerate for long time,

it's affect in every aspect of person. Nearby great suffering, knee pain had been found associated with impair of knee motion, inactivity and fatigue. Moreover, knee pain can lead to be happen of accidental falls (O'Mahony & Foote, 1998) that together with arthritis, represent more than 30% of all older adults had restricted-activity days (D.Woolf & Pfleger, 2003; Kosorok, Omenn, Diehr, Koepsell, & Patrick, 1992). As the burden of the knee pain among older adult will become even more considerable; for this reason, studying the multifaceted problem of knee pain is a public health mission of major consequence.

Lack of exercise and decreasing knee function can cause joint stiffness and thigh muscle atrophy. These symptoms have worse to ADL among older ever more. Therefore knee pain decreases, the older will improve to perform their ADL and more physical activity.

Physical functions of old age as leg strength, stability, and leg joints mobility will significantly decrease by age. Prevention of decrease physical function is important to allow the older adult to be healthy and independent in their daily life (Hurley, Rees, & Newham, 1998). Briefly, it is essential for the older to maintain the ability to achieve ADLs at above a certain level to sustain an independent daily life (Demura et al., 2000). Among many leg joints, knee joints have double the usual load of body weight as the forced on each knee joint when people standing in each leg or walking (Morrison, 1970).

Therefore, knee joints are vital for accomplishing independence in ADLs of older adult. In recent times, the number of older who suffers from knee pain as mild or severe levels has increased (S. C. O'Reilly, Muir, & Doherty, 1996; J. G. Quicke et al., 2015b).

A systematic review about knee pain in older people informed that in 1 year, 25 percent of aged more than 50 years have an occurrence of persistent knee pain , estimate 50 percent of whom report related with disability (Peat et al., 2001). Annual prevalence from self – reported showed that 33% of older adult had knee pain in many days for 1 month or longer (Dawson et al., 2004) and increasing to 47% they had pain around knee or in the knee from last year (C. Jinks, Jordan, Ong, & Croft, 2004). Almost 4.5 million of older adult in UK have severe complication from knee

pain (Jenkinson et al., 2009) . Moreover, knee pain is the most complaints of Malaysians population at 64.8 % from all musculoskeletal disorder in the country (Veerapen, Wigley, & Valkenburg, 2007). In Thailand, older at aged 50 years or more the prevalence of knee pain was presented at 67.11% and more than 50% of them had pain in both knees (Chokkhanchitchai, Tangarunsanti, Jaovisidha, Nantiruj, & Janwityanujit, 2010; Inthira Roopsawang & Aree-Ue, 2015). Additional health statistic of Thailand also confirmed that musculoskeletal system and connective tissue associated with indication are the other common cause for outpatient visits in hospitals metropolitan (Rawiworrakul et al., 2007) and knee pain is the most effect to long term disability as 34.4 % among Thai older of previous study was found in primary care unit (Chitpitaklert, Kongkum, Wiwatworaphan, & Dankul, 2005) . Consequently, knee pain it's significantly of health impact which should concern in primary care and guidance on the treatment of the symptom, rather than the pathology (Hadler, 1992). Knee pain as a risk to be knee OA represents particularly strong disagreement for a primary health care perspective on needs assessment (Foster, Hartvigsen, & Croft, 2012). Therefore, Health care personnel should focus in primary health care needs to motivate older adult to determine knee pain problem, achieving independence of their good health outcomes and disability.

The approaches of treatment for knee pain include non-pharmacologic interventions, pharmacologic therapies and surgical intervention. Many previous studies evaluating non-pharmacologic interventions have been published. The most effective way to treatment knee pain is exercise intervention which increase muscle strength (Alghadir & Anwer, 2016), range of motion (L. R. Wood, Peat, Mullis, Thomas, & Foster, 2011a), flexibility and walking speed(E Roddy, W Zhang, & M Doherty, 2005; Holland, Tanaka, Shigematsu, & Nakagaichi, 2002), improve ADLs levels (Hiroki Sugiura & Demura, 2013), physical performance (as stair climbing , walking distance) (M. Hasegawa, Yamazaki, Kimura, Nakano, & Yasumura, 2013), mobility and also reduce pain (Peat et al., 2001) along with increase self-efficacy (W. Jack Rejeski, Miller, Foy, Messier, & Rapp, 2001). Consequently, from these findings, exercise is accepted component as useful in the primary prevention for arthritis and treatment knee pain nowadays. Moreover, exercise benefit for individuals with any kind of knee condition

and safety (Bhatia, Bejarano, & Novo, 2013; Button, Roos, Spasić, Adamson, & van Deursen, 2015). Nonetheless, from many reported of studies found that the exercise programs were in hospital-based method (E Roddy et al., 2005; Noh, Lim, Shin, & Paik, 2008; Tunay, Baltaci, & Atay, 2010). Almost of these programs have employed intensive supervision and use the device which multipart and invaluable. Since knee pain as important of public health issue, an inexpensive and reasonable such as home-based approach would be desirable. Supervise clinical exercise is exceedingly resource consuming and that offer limited opportunities for suburban dwellers (Sealey, Raymond, Groeller, Rooney, & Crabb, 2015).

The Ministry of Public Health Thailand launched a "National plan for health 2007-2009"which highlighted "All for Health" (Ekachampaka & Taverat, 2008). The strategy of plan was to reinforce for 4 areas consist of physical, social, mental also include spiritual health. Especially physical health, the plan aimed to inspire all of Thai people and older adult to exercise on a regular basis with purpose of increasing Thai people had longevity and living without health risk disease. From National Statistical Office Thailand, report the percentage of Thais older have been found exercise only 41.4% which fewer than half (The National Statistical Office, 2007) and Thais older not achieve the goal of Thai National Health policy as adult should perform 30 minutes of moderate exercise in 3-5 days/week up to 60% (Asawachaisuwikrom, 2001; Bureau of Policy and Strategy Ministry of Public Health, 2001; Chinuntuya, 2003). Therefore, encourage people to exercise it's seem necessary, especially among older adults who had musculoskeletal problem as knee pain (Medical Service Department of Bangkok, 2016; L. R. Wood et al., 2011a). While the numerous evidence which benefit of exercise for people who suffering with knee pain and the recommendation for exercise as a key to treatment knee pain problem of non-pharmacologic method but rate of exercise among people with knee pain was low (Melanie A. Holden, Nicholls, Young, Hay, & Foster, 2014). Especially, older adults with knee pain had higher rate of inactivity and face with barrier to exercise (Damush, Perkins, Mikesky, Roberts, & O'Dea, 2005; J. G. Quicke et al., 2015b; Hiroki Sugiura & Demura, 2013). Moreover, previous studies found that older adults with knee pain had low performed range of motion exercises (ROM) (Ko,

Simonsick, & Ferrucci, 2015), reduce daily walking (White et al., 2016) as well as low rate of strengthening exercises (Mikesky et al., 2006). However, a little research about exercise adherence among knee pain in older adults population in Thailand also adherence to exercise programs that guidance given from healthcare professionals as known as poor performance (Jack, McLean, Moffett, & Gardiner, 2010; Pimpituk, Nualnetr, & Eungpinichpong, 2011) and better effects to elder's health if healthcare professionals could improve older knee exercise adherence behavior (O'Brien, Bassett, & McNair, 2013) . Previous research in 2010 found that more exercise adherence were highly significant with improved treatment of pain, physical function from self-report, physical performance and self-perceived effect(Pisters et al., 2010).

Exercise adherence is the extent to person's actions in agreement with the advised interval and exercise dosing regimen (Conraads et al., 2012). Furthermore, exercise adherence is complex behavior influenced by multiple factors (Hay-Smith J., Dean S. , Frawley H., McClurg D., & Dumoulin C, 2015). One of most important factor seems to have an effect on adherence behavior is self-efficacy (Bandura, 1977, 1997; J. Y. Kim & Kim, 2003; Schwarzer, Luszczynska, Ziegelmann, Scholz, & Lippke, 2008). Self-efficacy has been defined as "the belief in one's capabilities to achieve a goal or an outcome" (Bandura, 1986). It should be suggested that if self- efficacy improved it could lead to improve of adherence rates (Schwarzer et al., 2008). Moreover, it could be increase functional performance and improve self-perceived of person (Pisters et al., 2010). An intervention program by use of implementation intentions that enhanced self-efficacy beliefs then lead to change of behavior, it has been generally used in a variety of health settings as action and coping plans strategies (Schwarzer et al., 2008; Falko F. Sniehotta, Schwarzer, Scholz, & Schüz, 2005; Ziegelmann & Lippke, 2007)

Furthermore, there are many exercise interventions had a limitation as they miss to take a behavioral component, which could be a primary factor to consider while make an effort to change adherence for exercise program.

As for planning strategies to bridge the gap between intentions, and goal and behavior are implementation intentions (Peter M Gollwitzer, 1993). The planning strategies let participants to use cognitive reminders to organize for situational stimuli

which could be act as a barrier to behavioral intentions (Peter M. Gollwitzer, 1999). There are two parts of planning control as action plans and coping plans (Falko F Sniehotta, Scholz, & Schwarzer, 2005). Action plans are implementation strategies that need participants to act that how, when, where and with whom they are intended for start the exercise (F. F. Sniehotta, Scholz, & Schwarzer, 2006). Coping plans are strategies which help the participants confidently to coping with the barriers that might be block their achievement to the exercise (F. F. Sniehotta, 2009; F. F. Sniehotta et al., 2006). Action and coping plans strategies are appropriate treatment to help people bridge the gap of intention, behavior and goal (F. F. Sniehotta, 2009; Falko F Sniehotta et al., 2005; F. F. Sniehotta et al., 2006) . The previous studies showed that the significantly more likely to improve exercise adherence among participants who had the treatment of action and coping plans (Skidmore, 2012; Falko F Sniehotta et al., 2005; F. F. Sniehotta et al., 2006).

Because of specifically exercise are important for good health in older adults, particularly to decrease knee pain among in older ages. There is a need for cost-effective interventions, innovative which using them together with action and coping plans to increase exercise adherence and functional performance for older adults.

One approach that could provide a good effect to people with low exercise and inactivity is mobile health technology (Voth, Oelke, & Jung, 2016). To date, there are closely seven billion mobile subscriptions globally, through using of mobile devices reaching 90% in developing countries along with 96% worldwide (Hall, Cole-Lewis, & Bernhardt, 2015). From the review in 2012 (Deglise, Suggs, & Odermatt, 2012) showed that using mobile phone is increasing rapidly in developing country because of mobile device is affordable. In the Asia-Pacific region found that over 3.6 billion people already own a mobile phone or have access to mobile devices. In older adult, mobile subscriptions are also rising (Müller, Khoo, & Morris, 2016). As in Thailand, the older ages 6o or above, they have own mobile phone and up to 51% of them use a smart phone. Moreover, 84.3% of those people who use smart phone are also use mobile applications (Keaitthaweepong, 2017). Research also points out that the older use mobile phone to provide benefits information especially for their health (77.4%). This widespread use mobile technology has led to creation of mobile

device health care such as deliver health messages intervention to motivate exercise for older(Lilje, Olander, Berglund, Skillgate, & Anderberg, 2017; Müller et al., 2016). More than ever before, we cannot deny that one strategy to promote health behavior is electronic communication, for example Internet, Text messaging, Email, Facebook, Twitter and LINE application. As well their rapidly became integrated into many parts of our daily lives. The electronic communication was widely effective, convenience, time saving and reduced cost (Bishop, Press, Mendelsohn, & Casalino, 2013).

Nowadays, the older in Thailand have been increasingly use smart phone with internet for social media to sharing, make friends, and talk with others (Utakrit & Utakrit, 2015). Particularly, they use smart phone with social media for people who are in the same of their age group or have similar interest in specific issues. The application that most popular in social media among Thai people even in older group is LINE application (Sakdulyatham, Preeyanont, Lipikorn, & Watakakosol, 2017). Furthermore, in 2015 nation-wide survey of The National Institute of Development Administration (NIDA) ,Thailand which study of (Siamwalla & Pongtanalert, 2018) mentioned, they reported that 1,254 of Thai's older at age ≥ 60 years, they use social media as LINE (21%) followed by Facebook (13%), Email (4%) and Twitter (2.39%). Also, research in 2018 about impact of using Line application on older lifestyle found that the older effected by using LINE application as mostly for health aspects (Ketchan, Salungyou, & Makkha, 2018).

LINE application is free mobile instant messaging (IM) application for instant communication on electronic devices for example smartphones, tablets also personal computers. For LINE users can use this application as multi-tasking tools to communication with others at the same time such as sending texts messages, images, video and audio, video calling, clips and video conferences (LINE Corporation, 2011).

LINE could use to be one-to-one conversation or chat as a group, and be able to send messages up to 24 hours in anywhere while users can access the internet. LINE had attracted 217 million monthly active users worldwide(Statista,

2018), about two-thirds of all users based in its top 4 countries in Asia as Japan, Thailand ,Taiwan and Indonesia.

From the reported, Thai people take average time spends on their smartphone at 234 minutes/day, and they spent 70 minutes on using LINE application (Leesa-nguansuk, 2017). Since smartphones and internet access are playing the role of universal, IM was developed for people who use smartphone. IM carries more information, more effective and convenience than SMS also faster than email (Lauricella & Kay, 2013; Maina, 2013). However, there are very few of previous researches that used LINE application as IM to motivate older people to improve exercise adherence in a field of public health research. Consequently, it is interesting to apply LINE application as IM to motivate exercise among Thai older adults with knee pain in the part of action and coping plans implementation would be informative method.

Bangkok is a capital of Thailand. The population who lived in Bangkok is aging faster than in other provinces (Srichuae, Nitivattananon, & Perera, 2016). From the report of the office of the National Economic and Social Development Board showed that in 2008 the proportion of older people in Bangkok was 10% then will increasing to 21% in 2020 (Suwanrada, 2009). As reported by national survey, more than half of the populations in Bangkok have not performed any exercise (The National Statistical Office, 2007). Particularly older adult, the main problems of them are related with biological aging and self-efficacy to exercise. Moreover, the older adult who living in the community dwelling of Bangkok had reported significant knee pain then increasing trouble when they performing the usual daily activities (Inthira Roopsawang & Aree-Ue, 2015).

The Bangkok Metropolitan has 68 public health centers cover 50 districts (Bangkok Metropolitan Administration, 2007) From the report of public health center 61, Sangwantasanarom in Saimai district (Public Health Center 61, 2018) found that 30% of older adult who lived in Saimai community dwelling visited health center with knee pain problem while lack of orthopedics specialists who familiar with all aspects of this disease at public health center. Moreover, the older adult who lived in community dwelling of Bangkhen district had knee pain problem and obtain

muscle relaxants ,pain killers to treated their symptom from physicians at public health center 24, Bangkhen district increasing rate up to 20% from year 2016 (Public Health Center 24, 2018) that similarity rate of past history visited about knee pain and treatment of older adult the in Saimai district (Public Health Center 61, 2018).

They also reported having had low rate of exercise. Despite, the benefit of improve exercise adherence as the way of non-pharmacological management, and reduce knee pain improve and functional performance among older. This topic challenging researcher to design an intervention to implement program involved adherence strategies as action and coping planning together with using LINE application to improve exercise adherence of older adult with knee pain in the community dwelling metropolitan area of Bangkok as no previous research was found in Thailand. Therefore, researcher conducted this study to determine the effect of LINE application on action and coping plans to changing exercise adherence and functional performance among older adults with knee pain in suburban area of Bangkok Metropolis, Thailand.

As exercise adherence decrease over time, so researcher focused on the implement program for motivate people to adherence for exercise. Consequently, it is necessary to explore that action and coping planning with LINE application would be possible to improve exercise adherence and functional performance for people who had knee pain, furthermore these could be combined into further exercise programs to improve rates of exercise adherence and compatible to the life styles of older or any other age groups in Thailand.

1.2 Research Question

1.2.1 Does LINE application on action and coping plans effect on exercise adherence among older adults with knee pain in suburban Area of Bangkok Metropolis, Thailand after implementation program?

1.2.2 Does LINE application on action and coping plans effect on self-efficacy for exercise, specific self-efficacy (task, maintenance and recovery self-efficacy), functional performance, knee outcome for activities of daily living and knee pain

scale among older adults with knee pain in suburban Area of Bangkok Metropolis, Thailand after implementation program?

1.3 Research Objectives

1.3.1 General objective

1.) To evaluate the effect of LINE application on action and coping plans on exercise adherence , self-efficacy for exercise, specific self-efficacy (task, maintenance and recovery self-efficacy), functional performance, knee outcome for activities of daily living and knee pain scale among Thai older adults with knee pain in suburban area of Bangkok Metropolis, Thailand after implementation program

1.3.2 Specific objectives

1.) To compare exercise adherence between intervention group and control group after implementation program

2.) To compare self-efficacy for exercise scale and specific self-efficacy scale (task, maintenance and recovery self-efficacy) before and after implementation program within intervention group, within control group and between intervention group and control group.

3.) To compare functional performance score, knee outcome for activities of daily living scale before and after implementation program within intervention group, within control group and between intervention group and control group.

4.) To compare knee pain scale before and after implementation program within intervention group, within control group and between intervention group and control group.

1.4 Research Hypothesis

LINE application on Action and coping plans intervention has the effect to exercise adherence, self-efficacy for exercise, specific self-efficacy (task, maintenance and recovery self-efficacy), functional performance, knee outcome for activities of daily living and knee pain scale among Thai older adults who had knee pain in suburban area of Bangkok Metropolis, Thailand after implement the program

1.5 Expected benefit of study

The implementation of action and coping plans with LINE application could apply as motivation program to enhance adherence for exercise among Thai older adult with knee pain. If the results of this intervention program provide positive effect for older adult with knee pain in intervention group, researcher provided this intervention program to control group and conduct research procedure same as an intervention group in every step.

This study not only benefit for improve exercise behavior but also with improvement in other health outcomes. The findings of study provided and encourage public health administrator to apply this intention technique to promote in public health program to other populations and circumstances in Thailand. Furthermore, future research may possibly integrate programs as outlined for enduring the improvement for long term exercise adherence among older adult with knee pain and other musculoskeletal disorders. Lastly, the successful of this study would provide the action and coping plans with LINE application to enhance exercise adherence and reduce knee pain to the older adult in control group after completed the study.

1.6 Conceptual framework

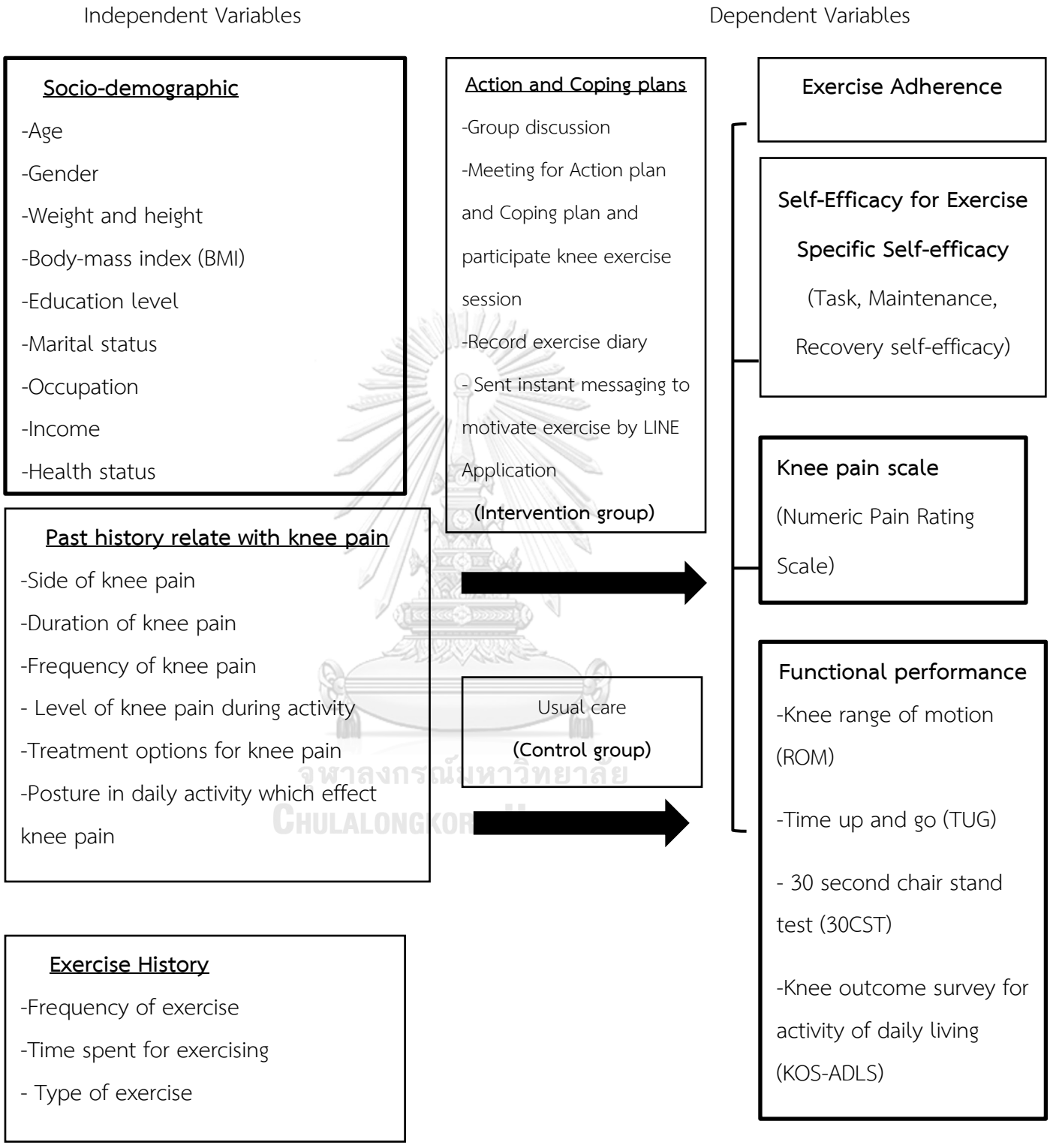


Figure 1: Conceptual framework

1.7 Operational definitions

1. **Older adult** refers to people at aged between 50 -65 years, both of men and women (Roebuck, 1979) (Hawley-Hague, Horne, Skelton, & Todd, 2016)

2. **Age** means the date of participant's birth, for this study recruit people at aged 50-65 years by the identity card.

3. **Gender** refers to male also female.

4. **Weight** is a body's of participant relation mass as the heaviness of the individual.

5. **Height** defined as the measurement of participants when they are standing (from their head to foot).

6. **Body Mass Index (BMI)** refers to a simple index of weight-for-height of older adults in the study which used to classify them as underweight or overweight. BMI defined as weight of older in kilograms divided by the square of his/her height in meters (kg/m2). Moreover, the normal range of BMI among Asian population as Thai people equal 18.5 – 22.9 (Pongchaiyakul et al., 2006; WHO, 2004, 2006)

7. **Education level** means the highest level of people have actually attained and got the degree of their education which including less than elementary school, elementary school, secondary school, high school or diploma, bachelor degree and master degree or higher

8. **Marital status** refers to the fact of people's being in which state such as single, married, widowed, and divorced/separated.

9. **Occupation** refers to person's job or person's principal work particularly to earn for a living classify by no occupation and carry on an occupation; retired government officer, government officer/ state enterprise officer, private company employee ,Self-employed /own Business, merchant/freelance, contractor and others occupation.

10. **Income** means the money that participants received from doing their work per month

11. **Health status** defined as a person's related to the level of wellness or illness that include no medical problem or had medical problem

12. **Side of knee pain** defined as the right, left or both parts that indicates a problem of knee pain among participants

13. **Duration of knee pain** means the period of times that knee pain happen to participant in any side of their knee such as left side, right side or both side for a months or years

14. **Frequency of knee pain** relate to participant's report of the often that knee pain happen to them in a periods by means of all the times, every day, every other day , every week, and every month

15. **Level of knee pain during activity** refers to the certain level of pain at the knee when people doing some activities for example, no feeling knee pain when doing activities, pain when step up- step down at the stair, always pain even rest and other things

16. **Treatment options for knee pain** defined as the methods that people did to reduce knee pain condition such as take the painkillers or NSAIDs, visit general practitioner, rest, using hot compression, or traditional Thai massage

17. **Posture in daily activity which effect knee pain** refers to the position that people holds their body when they act in their daily life at mostly such as sitting cross-legged, squat, sitting on the floor with legs to the side and etc.

18. **Frequency of exercise** refers to the number of times that people perform physical exercise for example, never exercise, 1 time per week, 2 times per week and 3 times per week or more.

19. **Time spent exercising** relate to the times in minutes that people used for performing physical exercise in each time

20. **Type of exercise** means a kind of physical exercises that people perform such as brisk walking, jogging, aerobic dance and so on

21. **Action and coping plans** defined as the plans that implementation intentions of person (Peter M. Gollwitzer, 1999). For this study will implement action and coping plans (F. F. Sniehotta et al., 2006) to motivate participants to enhance their exercise adherence, completed their goal for exercises and increase functional performance. Action plans are implementation strategies to require participants writing the goal of action plan to action as how, when, where and with whom they are intended to start the knee exercise and be more physically active. Moreover, coping plans as the approaches to encourage participants to overcome the barriers which could affect

their ability to be adhere to the knee exercise by write down the lists of barriers and the way of responses to overcome those barriers in the form. Moreover, this study was add up group discussion session for participants before start action and coping plan program to provide information about definition of knee pain, symptom of knee pain, effect of knee pain for older adult, treatment for knee pain, self-care management for knee pain and perform daily activities, method of knee exercise and demonstration, benefit of knee exercise for knee pain people to get the important and concern to the role of knee exercise and focus on why exercise is needed, based on self-efficacy theory.

22. **LINE application** is mobile messaging application use for send instant text messages, pictures, stickers cartoon, sharing photos, Clips or videos, voice messages also free voice call. Regards to this study use LINE application for motivate, send reminders to the older adults as participants to change their better exercise adherence and reduce knee pain

23. **Exercise adherence** refers to the degree to which people be able to maintain an exercise program for a prolonged period of time as this study will measure exercise adherence in terms of times per week (frequency), minutes per day (duration) and the number of sets as participants perform knee exercises per week

24. **Self – efficacy for exercise** refers to the belief in person's ability to make actions that are required to accomplish a goal for exercise (Bandura, 1986), this study will use self – efficacy for exercise scale (SEE) to measure their self-efficacy expectations of older adults associated with the ability to maintain exercising even they face of any barriers to exercise

25. **Specific self-efficacy (task, maintenance, recovery self-efficacy)** is the a individual's confidence in their ability to do a specific behavior (Bandura, 1977) which consist of 3 parts; for example, task self-efficacy of this study refer to participant's ability to carry out knee exercises program and continue to perform knee exercise. Also, maintenance self-efficacy means positive beliefs about participant's ability to sustain the exercise behavior, nevertheless, any barriers interfere on that period of time. As well as, recovery self-efficacy relates to participant's opinions about their ability to begin to perform knee exercise again after they break or give up.

26. **Knee pain scale** means intensity of knee pain of participants that measure by numeric pain rating scale (NPRS) which it has 11 scales point from 0 (no pain) to 10 (the worst pain)

27**. Functional performance** defined as ability of participant's to do a variety of lower limb function, especially the knee during activities of daily life. The study measured knee's functional performance by using the tests such as knee range of motion (ROM), Time up and go test (TUG), and 30 second chair stand test (30s-CST).

CHAPTER II

LITHERATURE REVIEW

The purpose of the study is to determine the effect of action and coping plans to exercise adherence, evaluate effect of action and coping plan to changing self-efficacy for exercise, specific self-efficacy (task, maintenance and recovery self-efficacy), functional performance, knee outcome for activities of daily living and knee pain scale among Thai older adults with knee pain in suburban area of Bangkok. Furthermore, the objective is to compare the effect of action and coping plans implementation program between intervention group and control group. To support concept and methodology of this study, review of literature also knowledge and ideas have been established on a thesis topic, all of details are mentioned as follows:

2.1 Knee pain

2.1.1 Prevalence of knee pain

2.1.2 The cause of knee pain

2.1.3 Consequence of knee pain

2.1.4 An assessment of functional performance

2.1.5 Best practice management for older adult with knee pain

2.2 Exercise adherence

2.2.1 Measurement of exercise adherence

2.2.2 Determinant of adherence to exercise

2.2.3 Impact of mobile instant messaging to exercise adherence

2.3 The consequence of self-efficacy on exercise adherence

2.4 Theoretical models grounded in self-efficacy used for exercise adherence

2.5 Smartphone and instant messaging application

2.5.1 Instant messaging applications

2.5.2 LINE application history

2.5.3 Overview of LINE features

2.6 The relevant research studies

2.6.1 Action and coping plans on exercise adherence

2.6.2 Smartphone technology improve exercise adherence

2.1 Knee pain

2.1.1 Prevalence of knee pain

Knee pain is one of the most common symptoms that discomfort in the knee(s) structure among people worldwide (C. Jinks et al., 2004). People will have experienced of painful or stiffness at knee joint either when they are rest or move in a daily life. Its prevalence and effect to older adult population, also its seem to rise in the future among group of older adults which its leading cause of later knee osteoarthritis (Peat et al., 2001). The precise incidence of knee pain and prevalence varies (from 10 to 60 %) which depending on the difference of knee pain definitions as well as population sources (Miranda, Viikari-Juntura, Martikainen, & Riihimäki, 2002). In the United states, the study collected data from 6 National Health and Nutrition Examination Surveys (NHANES) between 1971 and 2004 found that prevalence of knee pain among American people at age 60 - 70 years increased by about 65 percent in a 33 years period and the prevalence showed that its tripled in male besides its doubled in female over 20 -year period (Nguyen et al., 2011). The previous study from UK, prevalence about knee pain in 1 year period among older adults at age ≥ 50 years is approximately 50% (C. Jinks et al., 2004). About 25% of all older experience knee pain lasting ≥ 3 months (C. Jinks et al., 2004). Moreover, estimate about 50 % of older adults who had knee pain reported that they had experience with bilateral knee symptoms (C. Jinks, Jordan, & Croft, 2002).

The finding of study from India revealed that people at age above 40 years who living in the community had knee pain problem 18.6% which is the highest prevalence of pain compared to other parts of their body that they have pain problem (Muthunarayanan, Ramraj, & Russel, 2015). From the cross-sectional study of South Korea, the prevalence of knee pain among older adult population was high as 46.2% (including men 32.2% and women 58%) and knee pain increased with age among women. Furthermore, they had poor physical performance when compared to the people without knee pain problem(I. J. Kim et al., 2011).

Like most developing country of the world, the prevalence of knee pain in Southeast Asia as Thailand was significantly high in older adult group, from the

reported show that most of older adults aged ≥50 years, 67.11% had knee pain problem (Chokkhanchitchai et al., 2010) and more than half of them experienced the pain at both knees (Inthira Roopsawang & Aree-Ue, 2015). Also, Vietnam people who lived in Ho Chi Minh City with aged more than 40 years had self-reported knee pain up to 35% in men and 62% in women. The study result reveled that self-reported knee pain had statistically significant effect to knee osteoarthritis (prevalence ratio 3.1; 95% CI 2.0 to 4.6)(Ho-Pham et al., 2014).

Development of knee pain as the sign of important and persistent that decreases the person's ability to perform daily activities (C. Jinks, Jordan, & Croft, 2007). In conclusion, high prevalence of knee pain and its effect to functional performance and activity daily living means that finding methods to prevention would seem to be a first priority for public health (Blagojevic, Jinks, Jeffery, & Jordan, 2010).

2.1.2 The causes of knee pain

Knee pain accounts for estimate 35% of musculoskeletal problems in a primary care (Calmbach & Hutchens, 2003a) and its commonly causes such as inflammatory conditions, damage at musculoskeletal structure of the knee as well as degenerative of knee joint changes and (E. Thomas et al., 2008). The causes of knee pain generally difference due to age group of people. Especially, older adult that the functional impairment do not appear to be an unavoidable result of increased the structural damage, disease severity also future disability (Farrokhi et al., 2016). The older adults who had knee pain are likely to have a variety of causes such as knee overuse syndromes, trauma for example meniscal tear or sprain at ligament and infection (Calmbach & Hutchens, 2003b).

The overuse syndromes consist of patellofemoral pain syndrome, patellar tendinitis also known as jumper's knee, Osgood-Schlatter disease, medial plica syndrome, pes anserinus tendinitis (bursitis) ,Iliotibial band friction syndrome (as runner's knee) and popliteal tendinitis (Pecina, Bojanic, & Haspl, 2001), details see at figure 2. There are many causes that possible to be the pain at knee joint from

overuse but the patellar tendinitis and Iliotibial band friction syndrome are the most found (Pecina et al., 2001).

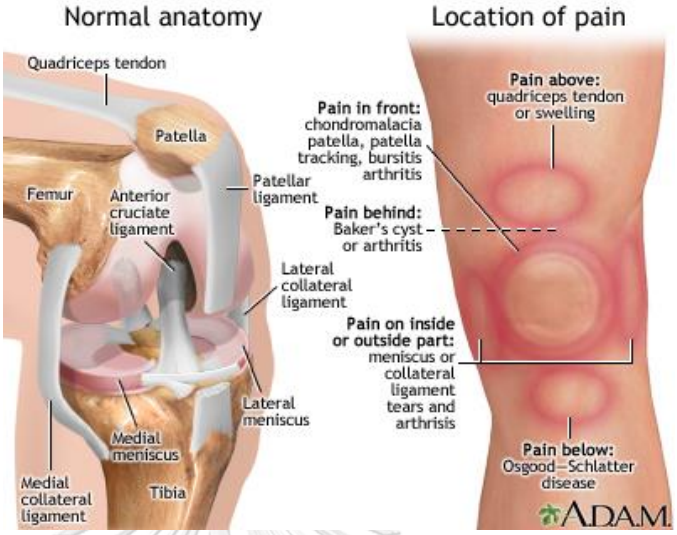


Figure 2 :Normal knee anatomy and location of knee pain (U.S. National Library of Medicine, 2018)

Patellofemoral pain syndrome is the cause of anterior knee pain problem among women and commonly occurs with activity then often worsens when people descending the steps, and also triggered when its prolonged of sitting (McCarthy & Strickland, 2013). Medial knee pain that causes by ; medial plica syndrome which occurs when people increased their activities more than usual as they are repetitive overuse. Also, pes anserine bursitis is the one of medial knee pain causes. Iliotibial band friction syndrome is usually the cause of lateral knee pain which occurs after repetitive motion of the knee for example climbing the stairs, and normally occurs in a runner (Lavine, 2010). The others of cause of lateral knee pain is popliteal tendinitis which occurs when a straining to the popliteus tendon come to be inflamed. It commonly occurs from an overuse injury, its symptoms such as pain, knee swelling, or sensitivity outside of the knee structure, and inflammation(Olson & Rechkemmer, 1993).

Overall, knee pain in older also has several risks factors that could be effect this symptom involve individual factors; age, higher weights, female gender and genetic (Blagojevic et al., 2010; I. J. Kim et al., 2011). One study have shown the prevalence of knee pain was higher in woman (E., J., M., M., & J., 1999). Recent study

suggest that individual socioeconomic status such as income and education associated with knee pain, the lower education had been shown to be related with knee pain problem(Miranda, Viikari-Juntura, Martikainen, & Riihimaki, 2002). Also an evidence exist linking the people with poorer health status had knee pain more frequently than those who had no underlying disease (Carlesso Lisa C et al., 2017). There is even some reported that posture of activity in daily life had effect for instance increased risk to knee pain such as excessive kneeling(Dawson et al., 2003), squatting (Hartmann, Wirth, & Klusemann, 2013), climbing steps (Demirci, Kinikli, Callaghan, & Tunay, 2017), standing (more than 2 hours per day)(Waters & Dick, 2015) and lifting (Bergenudd, Nilsson, & Lindgarde, 1989; K. M. Lee et al., 2018; Miranda, Viikari-Juntura, Martikainen, & Riihimäki, 2002). Furthermore, these are the onset of new knee pain as detectable factors which could be targeted to help prevention of disabling knee pain problem.

2.1.3 Consequence of knee pain

Knee pain in older adults is the most common cause of disability (Croft, Jordan, & Jinks, 2005; Dawson et al., 2004). Globally, the older adults had knee pain account for 10% of all of years lived in disability regardless of musculoskeletal disorder (Vos et al., 2012) and associated with difficulty climbing up or down stairs (Farrokhi et al., 2016), walking speeds (Bindawas, 2016), also its cause of accident falls (Leveille, Jones, Kiely, & et al., 2009) Possibly related to reduced mobility and its present of more than four of comorbidities(W. Kim et al., 2015; Lamb et al., 2000). The interaction between comorbidities should have a more impact on disability among the older(J. P. Wood, Connelly, & Maly, 2009). Moreover, effect from pain feeling associated with disabilities and the older experienced knee pain had limitation of their activity daily living (ADLs) and poor functional performance (Evcik, Ay, Ege, Turel, & Kavuncu, 2009; Hiroki Sugiura & Demura, 2013, 2014). The knee joints have the maximum load-bearing capability, and its usual load by doubled of human body weight that enforced on each knee joint when people walking or

standing on one leg (Morrison, 1970). Furthermore, knee joints are essential for achieving independence in ADLs (Okanishi, Takahashi, & Turumi, 2001).

The previous study used ADL survey in 2012 reported that the older with knee pain had poorer movements and posture change than the older without knee pain problem(H Sugiura & Demura, 2012). Moreover, the older who had severe knee pain would find the more difficult to perform their ADLs than those with mild or moderate knee pain (Hiroki Sugiura & Demura, 2013). Additionally, knee pain is one part of musculoskeletal disorders that lead to disability affecting people around the world more than 1.7 billion people (Vos et al., 2012) and its increasing 45% in two decades (Lim et al., 2012). In US, people who suffering from knee pain in long term then attribute to knee osteoarthritis had reported of effective treated by total knee replacement was double in the US's Medicare population for the duration of the first 10 years of 21st century (Cram et al., 2012) and more than 3 million procedures of treatment are in planned in 2030 (Bitton, 2009). Importantly, knee pain problem such as the older adult could have consequence by increased risk seeking for the health care (Hartvigsen, Davidsen, Søgaard, Roos, & Hestbaek, 2014) and severity of knee pain usually related to disability are consistent with increased all the causes of mortality (Liu et al., 2015).

2.1.4 An assessment of functional performance

Functional performance is the most important outcomes measures in the study for older adults with knee pain (Alkhawajah & Alshami, 2019). Many instruments have been developed for specific symptoms. Therefore, this study considered self-report measurement and actual functional performance test to measured outcomes in the study including Knee Outcome Survey Activities of Daily Living Scale (KOS-ADLS) as self-report questionnaire and knee range of motion by goniometer, Time up and test (TUG), 30 second chair stand test (30CST) as actual functional performance test. The details are explained as follows;

1. Knee Outcome Survey Activities of Daily Living Scale (KOS-ADLS) : This measurement tool was used to evaluated the knee symptoms and functional limitation in a daily activities affected by many knee pathologies(Irrgang JJ, Snyder-Mackler L, Wainner RS, Fu FH, & CD., 1998). It is appropriate for a variety of knee

disorders as well as older adult group (Bove et al., 2017). The KOS-ADLS likely to generalizable to various knee conditions and different populations for the reason that it is validity and reliability was found from the literature (McHugh, Droy, Muscatelli, & Gagnier, 2020).

. 2. Knee range of motion (ROM) : To measure knee extension and flexion was used goniometer to determine knee joint range of motion (Feland, Myrer, Schulthies, Fellingham, & Measom, 2001). For people who had experience knee pain often have a limited range of motion, then the full extension of the knee is an important point decrease quadriceps muscle contraction and help the older people can walking and standing with a good balance (Hancock, Hepworth, & Wembridge, 2018). This is a quick, easy and accurate technique to measure knee joint movement inflexion and extension plane.

3. Time up and go test (TUG) : For community setting areas, TUG has been recommended as a general screening tool, primary to investigate lower-limb muscle strength and balance among older people because it easy to assessment without special training and be able to use in most environmental contexts. (Zasadzka, Borowicz, Roszak, & Pawlaczyk, 2015). This test was reported to be the most consistent in the differences among older with knee pain in moderate level and mild level (Oka et al., 2020). As the older adults who had high level of pain were noted to have poorer TUG score.

4. 30 second chair stand (30CST): it is a measurement that evaluates older's functional lower extremity strength. A validity and reliability of the tool which suitable for health prevention program (Dahlberg, Dell'Isola, Lohmander, & Nero, 2020). A sufficient quadriceps muscle strength is important to accomplish daily activates and it is rlated with stair climbing, walking and sitting. The 30 CST demonstrated an excellent reliability in participants with knee pain problem (Tanaka, Hirohama, & Ozawa, 2019).

2.1.5 Best practice management for older adult with knee pain

At present, there are many guidelines of treatment and management for knee pain among older adult. In general, there are split into non-pharmacological method,

pharmacological method and surgical (Babatunde et al., 2017; Golding & Lee, 2016; Mitchell & Hurley, 2008; Porcheret, Jordan, Jinks, & Society, 2007). A non-pharmacological method is considered as primary therapy. Normally utilized this method to reduce knee pain includes exercise, bracing, weight loss, acupuncture, and insoles (Porcheret, Jordan, Jinks, et al., 2007). Nevertheless, knee pain is global public health concern; one of non-pharmacological method that has received much consideration has been exercise. It's usually accepted that to be advantage for knee joint of older adult (Bosomworth, 2009; Jenkinson et al., 2009). From the current report of systematic reviews have been accomplished on the effects of exercise in older with knee pain (J. G. Quicke, Foster, Thomas, & Holden, 2015a; Wang et al., 2012), and consequently some have been used to develop management the guidelines of exercise treatment for knee pain an internationally (Geneen et al., 2017; Logerstedt DS, Scalzitti D, & Bennell KL, 2018). The most significant research study which investigate the benefit of exercise for older with knee pain will be reviewed the literature in this part.

For instances, previous studies revealed that after participants finishing exercise based programs, older who had the pain at lower limb have increased their perception and functional performance of the ADLs when compared with those who not attended in exercise programs as a control groups (Accardo, 2017; Chou, Hwang, & Wu, 2012; L. R. Wood, Peat, Mullis, Thomas, & Foster, 2011b) . In addition, the findings has been shown limited side effect and well designed for exercises intervention (Jenkinson et al., 2009; Sandal, Thorlund, Ulrich, Dieppe, & Roos, 2015), given that further support which it should be use as treatment option for knee joint. Such a knee pain comorbidity and severity, current clinical guidelines mention about range of motion exercises and strengthening exercise that its improve knee joint mobility, muscle strength also reduce the pain (pain start to decrease within 2 weeks after exercise) (Cottrell, Foster, Porcheret, Rathod, & Roddy, 2017; Fransen et al., 2015). The exercise can implement in class of meeting or individually, and undertaken in either health center or park in the community area or at home (Oida et al., 2008; L. R. Wood et al., 2011a). For exercise should be focus on reduce knee pain, improve functional performance and person's exercise adherence (M. A.

Holden, Nicholls, Young, Hay, & Foster, 2012; Room, Hannink, Dawes, & Barker, 2017). Based on systematic reviews published of (M. J. Jansen, W. Viechtbauer, A. F. Lenssen, E. J. Hendriks, & R. A. de Bie, 2011; Juhl, Christensen, Roos, Zhang, & Lund, 2014) recommended a combination of strengthening exercise , range of motion exercise (ROM), whilst (L. R. Wood et al., 2011b) mention that implementation program to carrying out intention technique for increasing adherence to exercise include strengthening or range of motion exercise carried out only 12 week program, its effective program to improve people adherence , reduce the pain and increase their functional performance.

One of the most common methods of completing knee functional improvement is by people should following dairy exercises (Dekker, Boot, van der Woude, & Bijlsma, 1992). The guidance from healthcare staff guarantees that exercise should being practiced appropriately. Unfortunately, there is high demand in health care service, and it is often impossible to answer of everyone's needs, mainly people who have difficulty traveling to the gym or training center. Therefore, exercise could be done in both way as attend to exercise group meeting and exercise at home(Carvalho, Bittar, Pinto, Ferreira, & Sitta, 2010). It was clearly shown by the study of (Deyle et al., 2005) , which compared a group of older with knee pain attribute to knee osteoarthritis submitted to exercises , as one group received individual manual therapy and home exercise program for 4 weeks while the other group received the same of home exercise program and appointment to health center in 2 week later. The finding showed that participants in both group had significant of clinical improvement when compare to the baseline and result of both group were equally beneficial in 1 year later. The same as previous study, they have been found home exercise for people with knee pain problem had a cost effective caused by limited of resources to require to carrying out the program and the outcome revealed that higher level of home exercise program adherence have a positive correlation with reduce the pain at knee joint (K. S. Thomas et al., 2002).

Specific exercise such as range of motion and strengthening exercises on lower limb were improved both impairments (pain , muscle strength) and activities (gait speed), moreover, its benefits for self-efficacy (Aoki et al., 2009) . (Topp,

Woolley, Hornyak, Khuder, & Kahaleh, 2002) finding that isometric strength exercises had more effective than isotonic strength exercises for enlightening complete of functional performance in people with pain at lower extremities. Weight bearing exercises have confirmed to be not any effective more than non-weight bearing exercises for improvement of functional performance and muscle strength among the older with knee pain and attribute to knee osteoarthritis(Jan, Lin, Lin, Lin, & Lin, 2009). On the other hand, the study of (Jan et al., 2009) reveled that weight bearing exercises was significantly more effective than non-weight bearing exercises for increase postion sense .

Presently, there are no evidence suggested that what specific type of exercise is better than other one. Systematic reviews imply that implementation comprehensive program to take people's intention to enhancing their adherence plus range of motion and strengthening exercises is the best current management for people who had knee pain problem(M. J. Jansen, W. Viechtbauer, A. F. Lenssen, E. J. M. Hendriks, & R. A. de Bie, 2011; Juhl et al., 2014; L. R. Wood et al., 2011b). Nevertheless, exercise program could be effective if only the participants are adhered to the program, limited evidence for existing study about how to extent of participants' adherence to exercise program that is interesting point.

2.2 Exercise adherence

Exercise adherence define as "people acts in accordance with the advised interval, exercise dose, and exercise dosing regimen"(Conraads et al., 2012). The participant's adherence is important point to achieve of any exercise program(Wocken, 2013). There is some driver for exercise adherence. As the study of (Dishman, DeJoy, Wilson, & Vandenberg, 2009) conducted by given motivational tools for increase their goal of setting skills among participants as home depo employee (intervention group), when compared to control group that did not give the motivational tools. The result shown that control group they are more likely lower exercise than intervention group. The researchers encouraged participants to start exercises 10 mins / day or increasing times of exercise 10 mins after they participated exercise program. They got an instruction to how setting the goals for exercise and

they were given a journal. The finding shown that exercise adherence was 51% after participants given the motivational tools, it's increasing from 31% when they were not starting program. Moreover, their time had increase and consistency of their exercise.

A study including 211 coronary heart disease (CHD) patients had randomly assigned in 3 groups to compared their physical exercises after implementation intentions program to increase their self-efficacy, physically active and exercise by taken action plan only (treatments group1) , action plan and coping plan (treatment group2) and control group (usual care) (F. F. Sniehotta et al., 2006). This study was conducted in 10 week period, for two treatment groups were taken part of planning session. Participants attended ≥3 times in a week to do exercise such as bicycle ergometer training or 3 to 5 sessions of walking and they were advised to enhance their physical activities in their daily life for example using bicycle rather than using car. For planning intervention which first treatment group was taken action planning only, researcher gave them action planning sheet to formed up their plan to intended to exercises and second treatment group (combined of action and coping planning) received action plan and coping plan form to wrote about strategies to overcome the barriers for them. The finding suggested that participants in the combined action and coping plans group did significantly physically active, more exercise than 2 other groups. Consequently, the theoretical distinction between action planning and coping planning has useful to describe about change in health-related behavior and improve individual self-efficacy, these could be effective for anyone who had such severe challenges to exercises then perhaps these approach might be effective to general population also.

2.2.1 Measurement of exercise adherence

Treatment of adherence is multidimensional requiring different behaviors for treatment of different aspects in a variety of situation. Therefore, different tools have been supported for measurement of adherence to exercise. There were many different types of measure used. This section will describe about dichotomous/

categorical measure and commonly method to measure exercise adherence for older people as self-reporting and direct observation.

In general, continuous measures were numeric values which they had a level of magnitude between them. For example number 10 is twice value of number 20 and 32 is before 33. Continuous values involved counts/rates. Continuous measure of adherence to exercise comprise of number and duration of exercise completed, time of exercise in minutes per exercise session, counting exercise as the number of set per week of knee exercise, total number of time spent for exercise in minutes. Dichotomous variables involved 2 categories; yes/no, 1or2, complete/incomplete. The categorical, dichotomous variables consist of accomplishment number for exercise sessions, self-rating for exercise as to participants had finished exercises weather or not when they exercise at home as often as they got suggestion also change in overall of their activity (Smith-Forbes, 2015). Also, categorical variables contain of 3 or more categories representing adherence level, there were a selected of completed level of exercises for example, <50, 50-75%, > 75% and so on.

The first common method to assess exercise adherence is participant's self-report by using exercise diary as the most common to utilized in systematic review (Jack et al., 2010). Participants can be completed in the form of diary or rating.
The second method is direct observation, this method use in clinical trials. However, it's possible to use for only in treatment periods and cannot assess for long term adherence also this method does not important to represent of behavior change during exercise session (Brewer et al., 2000).

2.2.2 Determinant of adherence to exercise

Exercise and physical activity play critical roles in public health issue. Exercise has been defined as "planned, structured, repetitive, and purposeful in the sense that the improvement or maintenance of one or more components of physical fitness is the objective" (WHO, 2019). Regarding the purpose of this study, researcher focus on exercise rather than physical activity. For physical activity is less structured and consist of activities for example gardening, doing house chores (WHO, 2019).

Exercise is typically defined by older adults as something which is deliberately planned, include commitment and action (Stead, Wimbush, Eadie, & Teer, 1997). For the majority of older adult adherence to exercise has been found to lack relevance and less intention are given higher priority.

It has been recommended that understanding what influences and motivates people to become adherence to exercises and be physically active might be a prerequisite for designing effective intervention to improve exercise adherence(Dishman, Sallis, & Orenstein, 1985). There are many determinants which its influence to exercise adherence have been studied, consist of personal characteristics, environmental factors, and exercise program characteristics.

Personal characteristics

Lack of motivation, obesity, and job status such as blue collar worker are the most normally to identify that personal characteristics associated with decreased exercise adherence also give up from exercise programs(Jordan, Holden, Mason, & Foster, 2010; Kohlstedt, Weissbrod, Colangelo, & Carter, 2013; Manini et al., 2010).

The study of (Abby C King et al., 1997), its study of healthy people at age 50-65 years old both men and women to identified valuable combinations of socio-demographics, physiological problems, and psychosocial factors predictors of an exercise participation in long term among this group of people. In this study conducted 4 groups of exercises; 3 group of high intensity and 1 group of control. After past 1 year of study, the results showed that there was 67% of participants' adherence to exercise, but its only 36% of adherence in second year. The finding revealed that those people who had lower body weight were more adherences to exercise than higher body weight, same as people who had low stress in their life, they had more adherences. Also, individual with higher physically active, they were more adherence to exercise.

Also, the factors which may influence older adult to participation to physical activity and adherence to exercise comprising of personal demographic characteristic for instance gender, education, exercise history and marital status. For example, physical activity participation is lower in older females (Janke, Davey, & Kleiber, 2006; Weiss, O'Loughlin, Platt, & Paradis, 2007) and less educated among seniors older

(Janke et al., 2006; Weiss et al., 2007). As well as higher levels of education and exercise history are related with physical activity and exercise adherence (Rhodes et al., 1999). Fascinatingly, active men are more likely to have an active spouse and previous studies showed that older who married persons are higher levels of physical activity (Janke et al., 2006; Pettee et al., 2006). Moreover, choices for older adults to be adherence to physical activity and exercise are influenced by personal determinants particularly one's motivation, self-efficacy and their self-regulation skills such as feasible setting goal for achievement, tracking of exercise and physical activity (Abby C King & King, 2010; McAuley et al., 2007)

Environmental factors

To identify in another area in the literature review as the factor that predictive for exercise adherence the one that interesting is the environment. The level of social support obtained by program participants, particularly from their family members, its has been showed the most highly correlated with exercise adherence(Park, Elavsky, & Koo, 2014). Lack of time as the most commonly reason that related to people that give up for exercise program (Bethancourt, Rosenberg, Beatty, & Arterburn, 2014).

Additionally, environmental factor that related to physical activity and exercise adherence among older adult is physical environment, include availability and/or access of facilities for exercise as being one that important in influencing their exercise adherence and physical activity (Trost, Owen, Bauman, Sallis, & Brown, 2002).

Exercise program characteristics

The characteristic of exercise program that also the one of important determinant of adherence to exercise among people. Moderate exercise programs are more easily to sustain than others programs such as vigorous exercise(Aoki et al., 2009).

Knee exercise program as moderate exercise appear to have improved adherence over some other types of exercise and suitable for people with knee pain (Melanie A. Holden et al., 2014; Jordan et al., 2010).

From previous study investigated attitudes and beliefs about knee exercise that could predict physical activity level among knee pain in older adults at aged

over 45 years old with randomized controlled trial study(J. Quicke, Foster, Ogollah, Croft, & Holden, 2016). Participants were randomly selected to receive personally tailored exercise or targeted exercise adherence intervention program and usual care with minimally exercises. The measured outcomes were attitudes and beliefs about exercise by used Self-Efficacy for Exercise (SEE) scale, measured at baseline, 3 months, and 6 months. The results suggest that self-efficacy had highly correlation with physically active behavior of participants and associated with individual exercise adherence. Consequently, self-efficacy is a key base that could be considered as possibly modifiable factors for predicting new behavior for people to exercise. Self-efficacy described by Bandura as "an individual's ability to determine how to successful he or she believes that they can be in making a behavior change"(Bandura, 1977). Also, exercise program characteristic that influence to older participation to exercise program and increase physical activity include the format, intensity, convenience, time, location, structure and affordability of the program (A. C. King, 2001). From the study of (Hong, Hughes, & Prohaska, 2008) revealed that group exercise or facility based programs for older have been shown to predict higher participant's attendance of exercise session when compared to individual or exercise at home.

2.2.3 Impact of instant messaging to exercise adherence

Smartphones and mobile phones turn into daily necessities and were found to be effective in changing people's behaviors and improving their health outcomes (Hall et al., 2015). Smartphone instant messaging had significant effect to improve attendance rate and compliance among people who control their weight (Stephens & Allen, 2013). Moreover, instant messaging also improve physical activity and promoted exercise adherence in older people (Antoine Parker & Ellis, 2016; H. C. Chen, Chuang, Lin, Lin, & Chuang, 2017). The systematic review revealed that positive behavioral changes improved after conducted mobile instant messaging interventions(Buhi et al., 2013). The practical to use and inexpensive approach instant messaging provides has been used to maintain physical activity behavior in adult and older people (Gell & Wadsworth, 2015). Findings from these previous

studies showed that the strength of instant messaging to promote exercise adherence in term of health care lies in its ability to effect to people's health behaviors and its could apply to their natural environments though going about their activities in daily life.

2.3 The consequence of self -efficacy on exercise adherence

Self-efficacy was defined at first by Bandura as a main idea of social cognition theory. Self-efficacy has proven to be an important construct in a study that related with health behavior. From now its seem to be an necessary component of the major models that explain about behavior change (Conner & Norman, 2005). Behavior change is greatly influenced by a person's sense of control, if any person believe that they can control their action or behavior, they will be more motivated to make the things change and then they will continue with that behavior (Conner & Norman, 2005).

Self-efficacy is defined as specific context. Therefore, the measurement tools need to be considered to measure self-efficacy in the context of the behavior being studied. It was found as the type of self-efficacy mandatory for behavior change can change by itself through the task acquisition and maintenance (Bandura, 1995). For this reason, self-efficacy divided into 5 phases or being subcategories consist of task self-efficacy as pre action /action, maintenance self-efficacy as coping and recovery self-efficacy, resistance self-efficacy, and harm reduction self-efficacy(F. F. Sniehotta et al., 2006). As task self-efficacy has been associated with exercise adherence. Also its liked to exercise therapy, task self-efficacy is "the beliefs that people have of their ability to adopt new exercise behaviors". Maintenance self-efficacy, also define as "coping self-efficacy, describes peoples' beliefs about their capability to overcome barriers that may prevent them from continuing to complete their exercises". Recovery-self efficacy as known as "belief that people have about their ability return to their exercise program after they break or a return to old behaviors" (Scholz, Sniehotta, & Schwarzer, 2005).

Sources of self-efficacy

Self-efficacy beliefs effect human thought patterns and emotions that empower goal directed actions in any conditions where people believe they can exercise some control. Given the key role of self-efficacy beliefs in understanding behaviour of people, it is important to understand exactly how these believe are formed (Bandura, 1997). Self-efficacy in itself does not imply ability, but only belief that one be able to perform a behaviour. From previous research of (W Jack Rejeski, Katula, Rejeski, Rowley, & Sipe, 2005) found that conducted self-efficacy intervention among older adults combined with trainning exercise produced improved older adults adherence than trainning exercise alone.There are 4 main sources of information which impact people's self-efficacy perceptions consist of the first source is mastery experience, second souce is vicarious experience, third source is verbal persuation and the last one is physiological and affective states.

For mastery experience is the most influential source of self efficacy. From the previous of success or failure performing any task or behaviour greatly influence future attempts to perform a task. While failures destabilize people efficacy but success build up people efficacy. Older adults are susceptible to having less of mastery experiences by sterotyping, cognitive declines and age related physical(Welch & West, 1995)

. The second source, vicarious experience as known as observing to other people successfully do the action that one is intending. People as observer has the occasion to consider their own abilities because the model provides a standard also this be able to help the observer set their goals for their own. The greater the assumed similarity between model and observer, the more convincing will be confidence that one owns capabilities to leading comparable activities. As some development models provide vicarious experiences concluded strategy in action (MacPhail, Mullan, Sharpe, MacCann, & Todd, 2014; O'Brien et al., 2013). As older adults need to be encouraged to attend a group of exercise session to perform exercise together with the other olders based on comparable peers and attend intervention program which enhance their self efficacy relate exercise adherence.

Verbal persuasion, represents as trying to convince someone of his or her abilities to successfully perform the task. From (Bandura, 1997) explained that verbal persuasion can be a source of self-efficacy , but it is supposed that its effects are far less substantial than other source as vicarious experience or mastery experience. For verbal persuasion describes as form of encouragement, reinforcement, feedback, teaching and another motivational techniques which can increase self-efficacy by causing individuals to put forward more effort. Even though it is usually not as robust as mastery experience, this source be able to very useful particularly when the source is reliable. To encouragement people to do knee exercise when it specific. Example. “You just do knee exercise 20 minutes per day, you can do 30 minutes per day” this word its better than said only “You can do it”. The experts or researchers, when encouragement people in interventions, especially older adult must be careful not to unintentionally demoralize self-efficacy by boosting someone to be unsuccessful.

The last one is physiological and affective states, For human body is regularly adapting to the situation or envirionment it is placed in and this physiological adaptions can be interpreted as negative and postive. Regarding to emotional expression of the physiological states has the potential to greatly encourage or demoralize self-efficacy. Such as when older adults beginning to do exercise following the expert instructions at first time, they will feeling pain or fatique and another physiological changes that they are not familiar with it. For emotional response to physiological states also perceived stress could changes one’s perception of their both abilities and outcomes.

2.4 Theoretical model grounded in self efficacy for exercise adherence

As the review previously, self-efficacy is significant contributor to behavior change and its turn into a component of most behavior change model(Conner & Norman, 2005).

The social cognitive theory

To see the starting idea about social cognitive theory model is self-efficacy (as in figure below). The theory inferred that human motivation and action are

controlled by onward believed and planning. The other key construct is outcome expectancy that described as magnitude which is predicted as a result of the behavior change actions. For another 2 constructs of this theory are goals and socio-structural factors, both of which are supposed to be affected by self-efficacy. Goals influence behavior directly, while socio-structural factors do not directly affect behavior but affect goals. It is measured that the socio-structural factors and outcome expectancies effect to goals that in turn effect to behavior.

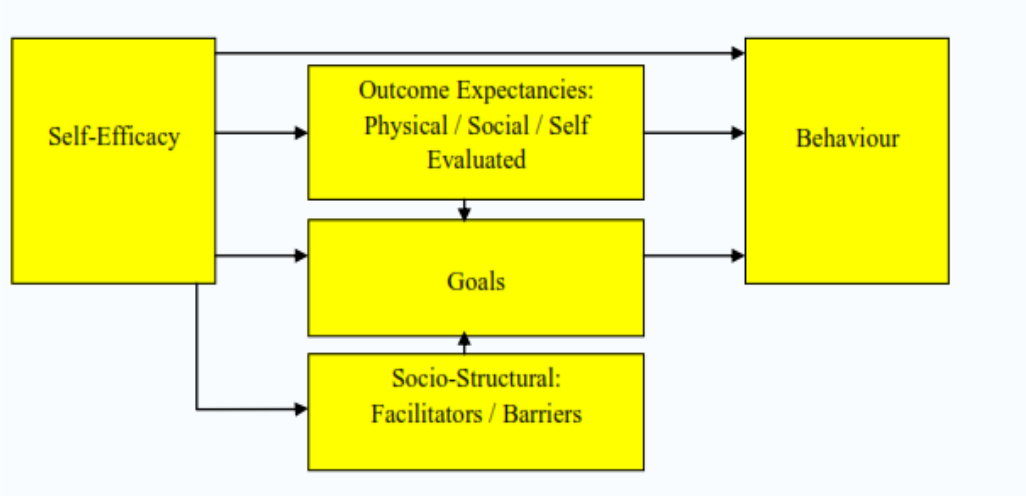


Figure 3: The social cognitive theory applied from (Bandura, 1977)

This social cognitive theory was not to be used as model for intervention. It was the original model which suitable for predicts behavior but it does not facilitate behavior. Hence the stages models, for example Health Action Process Approach (HAPA) (Falko F. Sniehotta et al., 2005) are better suited to implementation for intervention.

The Health Action Process Approach (HAPA) model

To overcome the barrier or limitations of the social cognitive theory (Schwarzer et al., 2008) developed The Health Action Process Approach (HAPA) as see in figure below, there are 2 stage of intervention model including planning stage and action stage based on the social cognitive theory, on the other hand this model designed to involve implementation of intentions (as known as action and coping planning) to bridge the gap between person's behavior and goal. This model shows that outcome expectancy is influencing by risk perception then it's turn to task self-efficacy. The model shows risk perception influencing outcome expectancy and in

turn task self-efficacy. Task self-efficacy influences goals, implementation intentions (action and coping planning), initiates task or action (behavior change), maintenance of the behavior (as known as coping) and recovery of the behavior when it's a relapse. Moreover, HAPA model also separations self-efficacy into 3 types required to complete the task, recognizing that the type of self- efficacy required could be change at the different stages of the adoption of the new behavior. For instance, task self-efficacy is required for the initial person's behavior change and then the maintenance self-efficacy and recovery self-efficacy turn into the key for coping with barriers to maintenance the behavior.

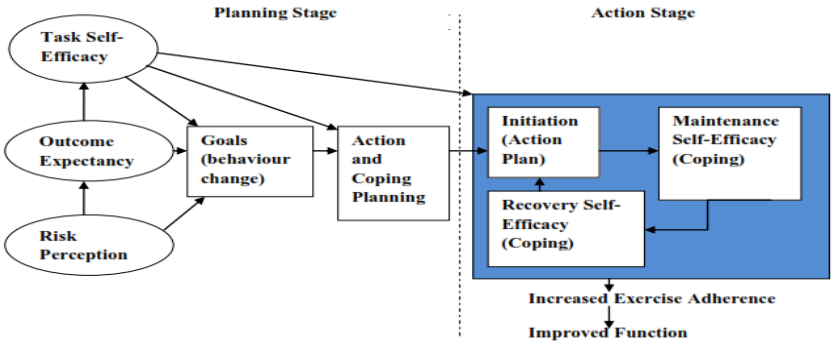


Figure 4:Health Action Process Approach (HAPA) model applied from (Conner & Norman, 2005)

2.5 Smartphone and instant messaging application

Smartphones are becoming central to people in everyday lives (S Gill, Kamath, & Singh Gill, 2012). Nowadays, smartphone's are the most important devices taking the front end and playing the role of worldwide mobile terminal. Smartphone is a mobile phone that delivers integrated services with advanced features and functionality as making outgoing calls and sending instant messages. Also smartphone are equipped with the abilities to display photos, play games and videos, direction finding like navigation, built-in camera, video or audio playback and recording, send and receive via e-mail, built in applications for social web sites and surf the Web, wireless Internet and more (Sarwar & Soomro, 2013). Advantages of smartphones provide better means of communication, great exposure to the newest things and modest way to access applications. From these advance smartphone technologies, they have positive impacts on business

(Kumar & Zahn, 2003), education (Short, Lin, Merianos, Burke, & Upperman, 2014) ,also its especially impacts on health intervention with good health outcomes (Derbyshire & Dancey, 2013; Higgins, 2016; Stuckey, Carter, & Knight, 2017).

In the last few years, smartphone has been used in health research as a device for reminder and motivate participants in the studies to be physically active, adherence to exercise, dietary management, fall detection, follow up medical appointment and sexual health education (Bert, Giacometti, Gualano, & Siliquini, 2014; Brayboy et al., 2017; Joe & Demiris, 2013). Consequently, innovative health strategies and health interventions using smartphones as essential tool because smartphone is growing capability and they are increasingly being used as the main device for people worldwide and smartphones device could carry around everywhere and every time.

2.5.1 Instant messaging applications

From the rise of smartphone and available mobile applications (apps) seem to have been increasing exponentially and instantaneously in recent years. Most of applications provide users with their positive experiences, they are supposed to choose the best application that suitable for them (Caro-Alvaro, Garcia-Lopez, Garcia-Cabot, de-Marcos, & Martinez-Herraiz, 2018). Mobile instant messaging applications are becoming widely used in recent years, like a technological development of short messages service (SMS) (Hsieh & Tseng, 2017). Mostly mobile messaging applications offer free voice or video calling, free mobile texting, concluded both Wi-Fi and data plan of users.

1.WhatsApp

One of the most of instant messaging that people used worldwide. This application is easy to use and free with no additional equipment required. The user able to exchange messages, share location or photos, share document and contacts. Also, people can make a video call or voice calls (Ellanti, Moriarty, Coughlan, & McCarthy, 2017). One things about this application that attractive many users other than its most popularity is the adding of end-to-end encryption for privacy and security (Clifford, 2013).

2.WeChat

WeChat instant messaging application was released by Chinese company in 2011. This application has turn into the one of the most popular app on smartphones in China (Montag, Becker, & Gan, 2018). WeChat offers the usual messaging applications features such as sharing photos or video, voice call and sharing location. This app integrated new services for example to book transportations in China's metropolitan areas or to pay for transportation fines and supports payments, games and more.

3.Facebook Messenger

This application separate from Facebook that make users more convenient to chat with others. Facebook launched Messenger app in August 2011 (Black, 2018). There are a lot of features in this app e.g. texting one to one, sent free stickers, emojis and GIFs, share the locations ,share files also sent some money in any markets or sent money to people thru using debit card information (Khanna, 2015). Some features of this application is useful such as it has typing indicator to see when people writing somethings, read receipts and delivered receipts, even timestamp it always show when the message was sent, with others for when the most resent message was read. Facebook messenger also supports video and voice calls with HD quality video and highly clear voice.

4. Viber

Viber is the one of leading instant messaging and voice communication apps for smartphone. This application allows users to send text messages or direct voice, and video connectivity. Viber has many options that basically superior than another such as user can video call with high quality and voice calling service to any mobile number even if the dialed number is using Viber or not. (This case have some additional charge). Users can use Viber app like a group chat rooms as same as the other instant messaging app, moreover its offer called "public chat room" which allow people who use this app can communicate openly that suitable for hobby group or even large social networks communities (Sutikno, Handayani, Stiawan, Riyadi, & Subroto, 2016). Viber has functions for voice and video calling for a few years before WhatsApp start to offer this similar services. As a results of its earlier development, this is reasonable that Viber be able to compromise a better voice

quality thru less noise throughout all bandwidths when comparison with other app such as WhatsApp (Aal, Parmar, Patel, & Sen, 2014).

5. LINE

LINE is communication application that allows users make a high quality free voice calls, free for international calls and send free stickers or emoji messages whenever and whatever users are in 24-hours a day. This app has about 217 million active users and they used in over 230 countries (Statista, 2018). LINE has been number one in the rank of free instant messaging app in 39 countries such as Japan, Thailand, Singapore, Taiwan, Malaysia, Switzerland, Hong Kong and more (Statista, 2018).

LINE is Asia-based app improvement company, initiated a concept of using instant messenger app with extra services for example sending money, games, send photos and voice messages with convenient way, sharing location info to friends ,money wallet even e-commerce.

2.5.2 LINE application history

Line messenger application was born in Japan. The starting point of this application is described as Japan was hit by earthquake with 8.9 magnitude which started a 30 foot of high tsunami in March 2011. After that occurred huge wave then triggered a nuclear plant of Fukushima Daichi breakdown. The relief efforts began after earthquake, people was dead > 18,000 people and Japan's phone system had completely destroyed from this situation. Stranded citizens had no way to calling their family or who they loved to checking that people got effect from earthquake or not. Therefore, they had to catch an internet access to contact their families. From distressing event prompted NHN's employees in Japan, as minor internet company named "Naver" in South Korea, to arrange best solution for people to contact friends and family thru this bad crisis. Consequently, LINE application was launched in 3 months later. In one year LINE had 50 million users which took 3 years for Facebook application to get users in the same number, as stated by Reuters (Bushey, 2014). A key feature inserted of this application is that users be able to call or text by use their smartphones over remaining web data plan.

2.5.3 Overview of LINE features

Here is the information of features in LINE application that is definitely going to be new experiences for users and they are gathered below:

1) Texts and Messages: Users can send free one–on-one or group texts to friends anytime, this application is works on many type of smartphones (for example Android, iPhone, window phone and Nokia) and even personal computer (pc). LINE app has variety function for users to add their friends such as QR code, line id and shaking phones which convenience for people to use it. When users sent messages, they will pop-up in the message box for reading and replying to make it easy to look and communicate. LINE brings more fun than WhatsApp by users can sending stickers when chatting, all users also can share media in group chat by making groups and joining groups reach up to 500 people. Moreover, this app offer bulletin boards that users can post, comment or like as they want. People can share music, photos, videos, voice audio, emoji or emoticon to their friends and sent their current location or any specific location. Also users be able to see messages confirmation in real-time when messages are sent to another users and they received them in messages box.

2) Free Voice and Video calls: LINE application also makes free voice calls and video calls. Users can join the group calls reach to 200 people. This feature allows users to call for free in 5 minutes to anywhere worldwide. It's free for domestic or international calls to mobile devices and landline. For LINE's users can call to people who don't use LINE app or don't access Wi-Fi connection for free.

3) Stickers: This is best feature of LINE that brings more fun to users because people can sending stickers in group chats. The stickers are used thru chatting between users and action like larges sized emoji. Users express the feeling when chatting with friends by LINE stickers plus exchange greetings and regularly used text rapidly without having to type. LINE stickers mostly need to be purchased with LINE coins or credit and debit cards. Purchased stickers are attached to LINE account also users can used them on another platforms. LINE stickers have original characters such as anime, cartoon comic, and gaming characters etc.

4) Timeline: There is a feature which similar to Facebook app where users be able to post and share photos or stickers to public, So many friends of users can see what they posted.

5) Themes: People can customize the skin of LINE app by choosing any cartoon characters such as Hello kitty, Rilakuma and LINE characters which are the first set of LINE themes that's popular theme. LINE themes keep changing to LINE start screen, chat screens, menu buttons also friends contact lists (LINE Corporation, 2014) In 2013, LINE themes with popular characters as Brown and Cony have been download for free, there are reported that its reaching more than 200 million downloads (LINE Corporation, 2014). For new version has LINE theme shop which is the place for users can buy a variety of LINE themes.

6) Privacy: LINE app has feature 4 digit pass-code lock that is was not found in other applications as WhatsApp. For smartphone device has Touch ID, LINE's users can unlock this app by use their fingerprint recognition from the device. Users can select who can add them as a friend in LINE by searching LINE ID. Moreover, LINE has "Filter Message option" for reject messages which sent from the users who are not on the contact lists. Users can accept or deny a friend requests as they want. Moreover, the "Letter Sealing "is the one that is good feature in LINE app, it is messages protection by using advanced encryption. This feature will works when friends of users activate this "Letter Sealing" on their device also.

7) Keep: it's like a storage of messages and media that easily for users to share with friends later in LINE app.

8) LINE Pay: This service of LINE app is amazing, users can request and send money to their friends in the list of LINE's contact also they can making mobile payments in LINE store (Corbin, 2014). The services of LINE Pay also allow other features to run offline wire transfers for example people allowed to making purchases and ATM transactions that's similar to withdraw money or deposit money.

9) LINE Games: For LINE users can play LINE games and played with friends. Many of games in LINE app have friend points for users to keep it after they send items to their friends in game's list. The type of games consist of battle, puzzles, stimulation and so on.

10) LINE Taxi : This feature it's like LINE Pay, users can request a taxi to go to any place as they need and then pay taxi fare when they link the account to LINE Pay.

11) LINE Man: This feature is delivery services in Bangkok area, its on-demand services to users as given that convenience to people with busy lifestyles. LINE man has 3 delivery services: delivery food, document, package, also convenient buying goods and delivery.

2.6 The relevant research studies

These are relevant researches-related to this study.

2.6.1 Action and coping plans on exercise adherence

Previous study in 2013, Researchers conducted an intervention named "The moving heart program", based on using action and coping plans to improving exercise adherence and physical activity among heart disease outpatients in Brazil. This is experimental study which it has 3 times of data collection (baseline, 1 and 2 months after baseline). Randomly selected the participants was used to assigned in 2 groups consisted of action and coping plans group (intervention group with 69 people) and a standards care group (control group with 67 people). The result revealed that patients in action and coping plans group has significant higher level of physical activity in 2 months after baseline when compared to control group also they had more active and higher exercise adherence than patients with standard care(Rodrigues, Joao, Gallani, Cornelio, & Alexandre, 2013). Therefore, an intervention based on action and coping plans was suitable to improve people for more active and exercise. It seems meaningful to study with person who fail to change their behavior despite they have good intention to exercise which benefit for their health.

Regarding to the study of Ziegelmann and Lippke (Ziegelmann & Lippke, 2007) which they investigated about using action planning and coping planning to improve exercise adherence among younger and older in orthopedic rehabilitation. This longitudinal study revealed that using action planning and coping planning intervention as development strategy use that it could enhance people in younger and older ages to adhere to a strict to exercise program.

Moreover, an experimental study which test the efficacy of intervention by used action and coping planning in encouraging to adherence to preventive exercises among 373 people with knee pain in 2 weeks (Koh, Hagger, Goh, Hart, & Gucciardi, 2017). The participants were measured the severity of knee pain and their behavior in the past then they were assigned to taking action and coping planning group (experimental group) and control group. The result showed that participants in experimental group were higher number of preventive exercise sessions more than control group after 2 weeks period.

From the study of (Hattar, Pal, & Hagger, 2016) which they determined the action and coping plans from HAPA model to predicting changes in biomedical and psychological outcomes of overweight and obese adults undergoing exercise for weight loss intervention program within 12 week. The results found that participants had confidence to maintain their target behavior and intention to perform physical activity and exercise as a new behavior after periods 12 weeks of implemented program. This is important as we can concerned that action and coping plans have effects on intention to new behavior related to exercise, as specified via HAPA model. Due to many studies from reviewed about action and coping planning, there are point out that action and coping planning strategy has most likely to be affected to improve exercise adherence among people in individuals or different ages within 8-12 weeks after completed program. On the other hand, the nature of people who has non-adherence of exercise it's like multidimensional, the strategies to enhance people's adherence seem like to be broad in spectrum. Therefore, if design a combine interventions such as using smartphone technology to remind and motivate people to have more intention to exercise regimen within 12 weeks period could be more effective to improve their exercise adherence.

2.6.2 Smartphone technology improve exercise adherence

The global number of smartphone's users reached to 2.71 billion (Statista, 2019). Even in low or middle income countries the penetration rate of smartphone is increasing in every year. The widespread ownership of smartphone and the prospect of automation technology leads to a potential to bring behavior change intervention

to peoples in large numbers in low cost. The interventions with using smartphone are possibly to deliver massages to improve exercise adherence such as use smartphone to motivate or remind people to do a daily exercise. The development of text messaging should follow some theory and the messages would be developed for specifically target population which suitable for them and research intervention. As for the study of Hearn (Hearn, 2017), this study used smartphone to send text messages to remind and motivate them to exercises and combined with 2 theories such as Social Cognitive Theory and HAPA to investigate maintenance-self efficacy and action and coping planning skills among female who adhered to exercise and who did not. The findings showed that there was highly significant of exercise adherence and maintenance self-efficacy in female who adhered and there was increase of mean of perceived usefulness of text messaging among participants which benefit for their healthy life as to be adhered to exercise. Also, another study was determine the impact of smartphone text messaging to reminder on exercise and medical adherence in myocardial infraction (MI) patients. The two single randomized controlled pilot trials study consist of medication adherence trial and exercise adherence trial. For medication adherence trial, there was randomized 34 patients in 2 groups as receive usual care with text message reminders to take medication (treatment group) and usual care group (control group). Also, exercise adherence trial, 50 participants were random selected to receive usual care with 4 text messages in a day to enhance and remind them to exercise. This study revealed that text messaging to reminders patients led to a mean 14.2% point improvement in their medication adherence than usual care. Moreover, there was an additional 4.2 days and 4 hours of exercise per month among MI patients in treatment group than usual care group after conducted an exercise adherence trial.

This smartphone technology represents a simple and effective to develop an intervention which promote and enhance exercise adherence for many people as possible. Such as real-times interventions by using text messaging should be useful in enlightening people to recognize the benefit of exercise for their health then they become the adherer.

CHAPTER III

RESEARCH METHODOLOGY

This chapter outlines research methodology on the study about effect of LINE application on action and coping plans on exercise adherence and functional performance among older adults with knee pain in suburban area of Bangkok Metropolis, Thailand. All of procedure in this chapter would be replied research question of this study. As for, the geographic area whereas the location of study, type of study design also population and sample are describe. Additionally, research instruments were used to collect all data of this study, intervention process and data analysis was clarify in this chapter.

3.1 Research Design

This is a quasi -experimental (pre-posttest) design: one intervention group and one control group to determine effect of LINE application on action and coping plans on exercise adherence among older adults with knee pain in suburban area of Bangkok Metropolis, Thailand.

A Consideration of this research design

Quasi-experimental study that aim to determine interventions, validate causality between an intervention and outcome(Harris et al., 2006). It is evident that lots of published studies in social sciences used the quasi-experimental design and this design suitable to study for pre and post intervention measurements (Harris et al., 2006). Therefore, this designs that reasonable to define effect of LINE application action and coping plans on exercise adherence and functional performance among Thai older adults.

3.2 Study Area

This study conducted in 2 areas of Bangkok : Saimai district where is the first ranked from 50 districts of Bangkok which is the most of population living in the area (total population = 197,715 , 94,942 households and 79 communities) and BangKhen district is the third ranked of Bangkok (next below of Bangkhae district) , has a population of 190,483 and 101,537 households and 77 communities (National Statistical Office, 2015). The total number of older adult at age 50-65 years old who

living in Saimai district as 39,744 persons and (Official Statistics Registeration System, 2015b) and 40,288 persons in Bangkhen district (Official Statistics Registeration System, 2015a). The majority of populations of both districts are Thai (see Figure 5).

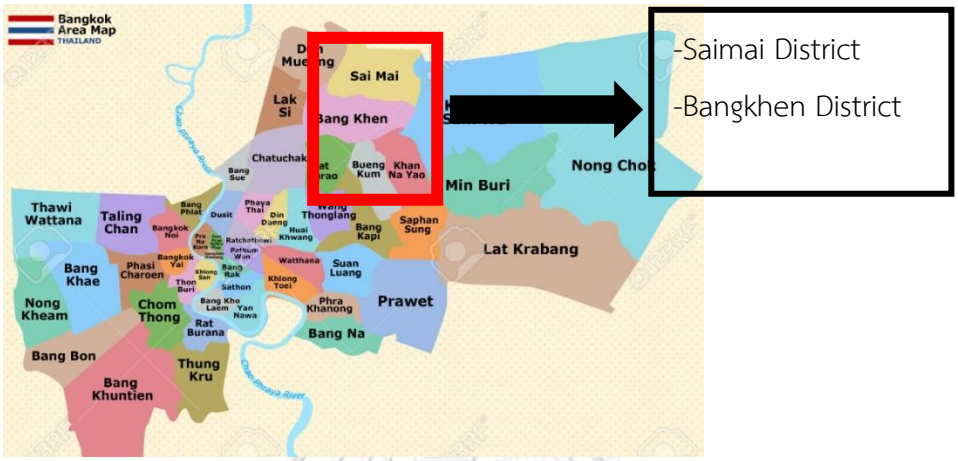


Figure 5: Area of Saimai and Bangkhen district of Bangkok (123RF.com, 2017)

Regarding to the reported of older adults visited for knee pain problem at public health centers of Saimai district and Bangkhen district found that older adults obtained muscle relaxants and pain killers to treat their knee pain the rate was increased more than 20% from year 2015 which is same reported. (Public Health Center 24, 2018; Public Health Center 61, 2018). Total number of older persons who had visited Public health center 61 at Saimai district for knee pain problem and had diagnosed knee pain by medical doctor are 490 (Public Health Center 61, 2018) and the number of older who had the medical history diagnosed as knee pain from the reported of Public health center 24 in Bangkhen district are 472 (Public Health Center 24, 2018) Moreover, the highest rank of older adults who living in community of Saimai district which they had knee pain problem are living in Tubfah community Also, the located in Bangkhen district the older adults who living in Chaleumsuk9 community, they had reported of the top rank of older people who had knee pain problem.

For Tubfah community has 282 households, total population is 1338 people and over 400 people of them are older adults at aged ≥50 and all of them can communicate in Thai (Figure 6).

Figure 6 :Tubfah community in Saimai district

The located of Chaluemsuk9 community is in Bangkhen district, suburban area of Bangkok as show (figure 6) below. This community has 213 household and total population of this community is 1266 people.

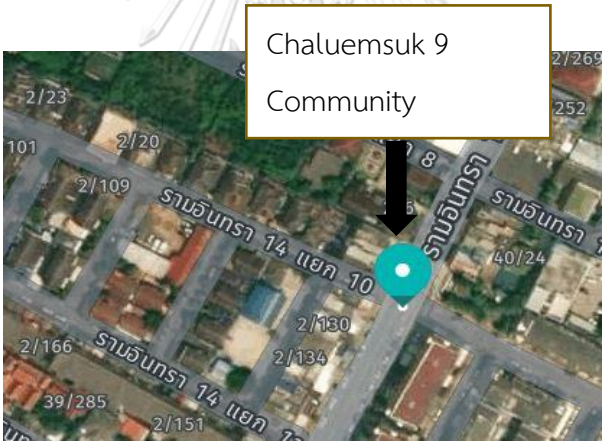


Figure 7 :Chaluemsuk 9 community in Bangkhen district

Therefore, researcher selected research setting in Tubfah community of Saimai district as intervention group and Chaluemsuk9 community in Bangkhen district as control group. In addition, there were quite similarities about population size of older adult who residing in the areas also environment and socio-cultural characteristics. Moreover, both of communities have community yard that suitable setting area to conduct research study.

3.3 Study Population

The target of population is older adult at age between 50 to 65 years old with knee pain and did not exercise regularly, it has been reported that Bangkok province is the most highest of population in the central region of Thailand. Moreover, the reported show that more than 50 % of older in Bangkok lack of exercise (The National Statistical Office, 2007) and approximately seventy percent of them have not meet the goal of Thai health policy which should perform 30 minutes for exercise within 3-5 days per week (Poolsawat, 2007). Consequently, older adult who residing in Tubfah community, Saimai district received an intervention group and older adult who residing in Chaluemsuk 9 community as a control group.

3.4 Sample and Sample size calculation

As for target population of older adult with knee pain who residing in Tubfah and Chaluemsuk 9 communities which they had reported as highest rank of the older visited with knee pain problem in Saimai and Bangkhen district of Bangkok. Therefore ,this study selected the participants for both intervention and control groups by using the screening questionnaire and interview following a criteria which applied from review literature (Clare Jinks, Jordan, & Croft, 2001). The details of screening questionnaire involve 34 choices to asking participants about their history related with knee pain and exercise (Appendix A)

Researcher interviewed and screening the older adult and their family to get the information. Using the selection approach by chooses only 1 member per household as allow participating in this study: If the participants meet the criteria more than 1 person and they residing in the same household. The process of participant selection is the researcher will request their ID card by choosing anyone who is youngest in a house by date, month and year of birth. The reasons of choosing the youngest because it has been reported that nearly half of older adult at age 50 report occurred knee pain (Farrokhi et al., 2016). Moreover, the onset of new knee pain is start at 50 years of age (C. Jinks et al., 2004). Furthermore this study is prevention program to prevent older adult with knee pain to slow progression of

their knee not to be attribute to knee osteoarthritis in the future and knee pain. For example, if in the same household have 2 or more than 2 persons see as the table below:

Birth date	Selection	
	Yes	No
1 Jan 1965		
3 July 1966		
3 July 1969		
5 October 1969	✓	

Table 1:Selection approach of participants

All of participants of the study will select base on criteria as following:

Inclusion Criteria

1. The older adult both male and female between 50 and 65 years of age

2. Residing in Tubfah community of Saimai district and Chaluemsuk 9 community of Bangkhen district over 6 months

3. Can communicate in Thai, able to read and write to carry out the action and coping plans and answer to self-reply questionnaire

4. Having knee pain either left, right or both knee during movement, knee pain at least on most days in a week or more within the past twelve months (Ho-Pham et al., 2014; C. Jinks et al., 2004)

5. Had previous diagnosed as knee pain by physicians and had completed treatment options for knee pain such as physical therapy, taking a pain reliever, taking a nonsteroidal anti-inflammatory drug (NSAIDs) or corticosteroid Injection within the past 3 months, but still having knee pain. This criteria researcher obtain participants details by screening questionnaire which applied from standard screening tool for knee pain in general population in aged 50 and over (C. Jinks et al., 2004).

6. The older who did not always exercise, perform exercise less than 30 minutes and exercise less than 3 days in a week, (Bureau of Policy and Strategy Ministry of Public Health, 2001; Hawley-Hague et al., 2016; World Health Organization, 2010)

7. Ability to perform daily activities on their own and independent ambulation without walking aid

8. Older adult who willing to participate knee exercise program by using action and coping plans process in 14 weeks period of study

9. Older adult who intention to setting plan for exercise but in the past have failed to achieved the plan, and intention to setting plan again then try to accomplish the plan.

10. Have owned smartphone and using LINE application and be able to access the internet

Exclusion criteria

1. Having currently of physical therapy for the knee or current taking of nonsteroidal anti-inflammatory drugs or receiving corticosteroid intra-articular injections treatment for knee pain within past 3 months (Jenkinson et al., 2009)

2. Existing diagnosed osteoarthritis knee or total knee replacement of any knee joint, had history of knee injury, previously diagnosed of systemic inflammatory arthropathy such as rheumatoid arthritis or gouty arthritis, present of neurological conditions as lower limb weakness

3. The older that having history of surgical procedures of either lower extremity in past 6 months

4. Present of the physical impairment unrelated to the knee but it should prevent the older for safely when participating in the study program for example having history of stroke, neurological disease or neuropathy and previously diagnosed cardiovascular disease (Jenkinson et al., 2009; K. S. Thomas et al., 2002)

5. The participants who had mental disorder or general co-mobility that rendered the participants unable to exercise such as pulmonary disease, Grade 2 moderate hypertension (systolic blood pressure 160-179 mmHg and/or diastolic blood pressure 100-109 mmHg) and Grade 3 severe hypertension (systolic blood pressure ≥180

mmHg and/or diastolic blood pressure ≥ 110 mmHg). Moreover, participants taking at least one antihypertensive drug (Thai Hypertension Society, 2019).

6. Participant who misses to participate intervention program more than 3 sessions from all 12 sessions.

Sample size calculation

The sample size calculation performed by G* power program version 3.0.10. Cohen's d was used to determine the effect size (Cohen, 1988) ,The medium to large of effect size 0.65 from the meta-analysis showed that action plan and coping plan to implement people intention had an generally effect on their goal achievement (Peter M. Gollwitzer & Sheeran, 2006) and applied to use in researches that action and coping plan effect to behavior change to improve exercise adherence and functional performance (O'Brien et al., 2013; Rodrigues et al., 2013). The a prior power calculation based on a level of significance at 0.05 and power of 0.80, A number of older adult are 39 per group need in the study. Recruitment 43 participants per group of account for a possible dropout rate of 10% during the study (Clayton et al., 2015; Knoop et al., 2013). Therefore, researcher aimed to include a total number of 86 participants for this study. The participants who eligible to criteria were invited as there are limited number of places accessible on the implementing program, the selection process and enrolment are made on a first-come, first-served basis.

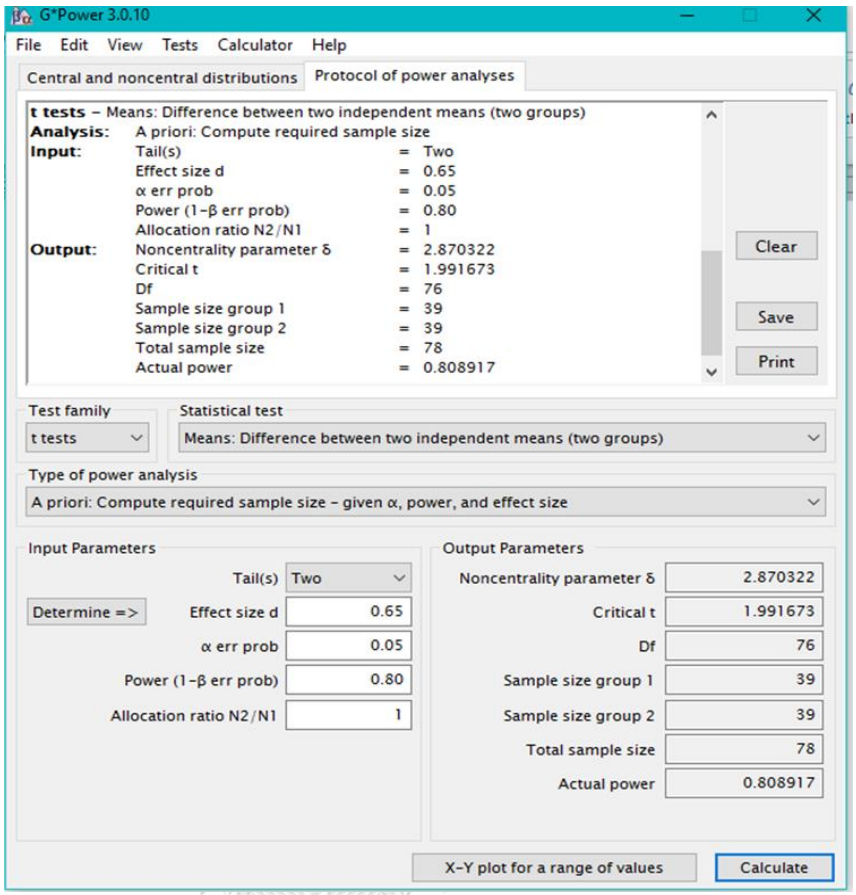


Figure 8:Sample size calculation

3.5 Sampling technique

Bangkok Metropolitan currently has 50 districts (Department of Provincial Administration, 2007). Pupusive sampling technique was used to select the participants as being a representative of population. The number of older adult who at age between 50-65 years, living in Saimai district and Bangkhen district are 39,744 persons and 40,288 persons respectively. The participants for two districts was selected in second step. After that selected the older who met all of criteria for this study from Tubfah community as the highest rank of older with knee pain problem and living in community of Saimai district from the total number of 490 older who visited Public health center 61 to determine the most appropriate participants for 43 people in the intervention group by purposive sampling. As well as select 43 older

adult from Chaluemsuk 9 community as the highest rank of knee pain visited from total number of 472 older who visited Public health center 24 for control group.

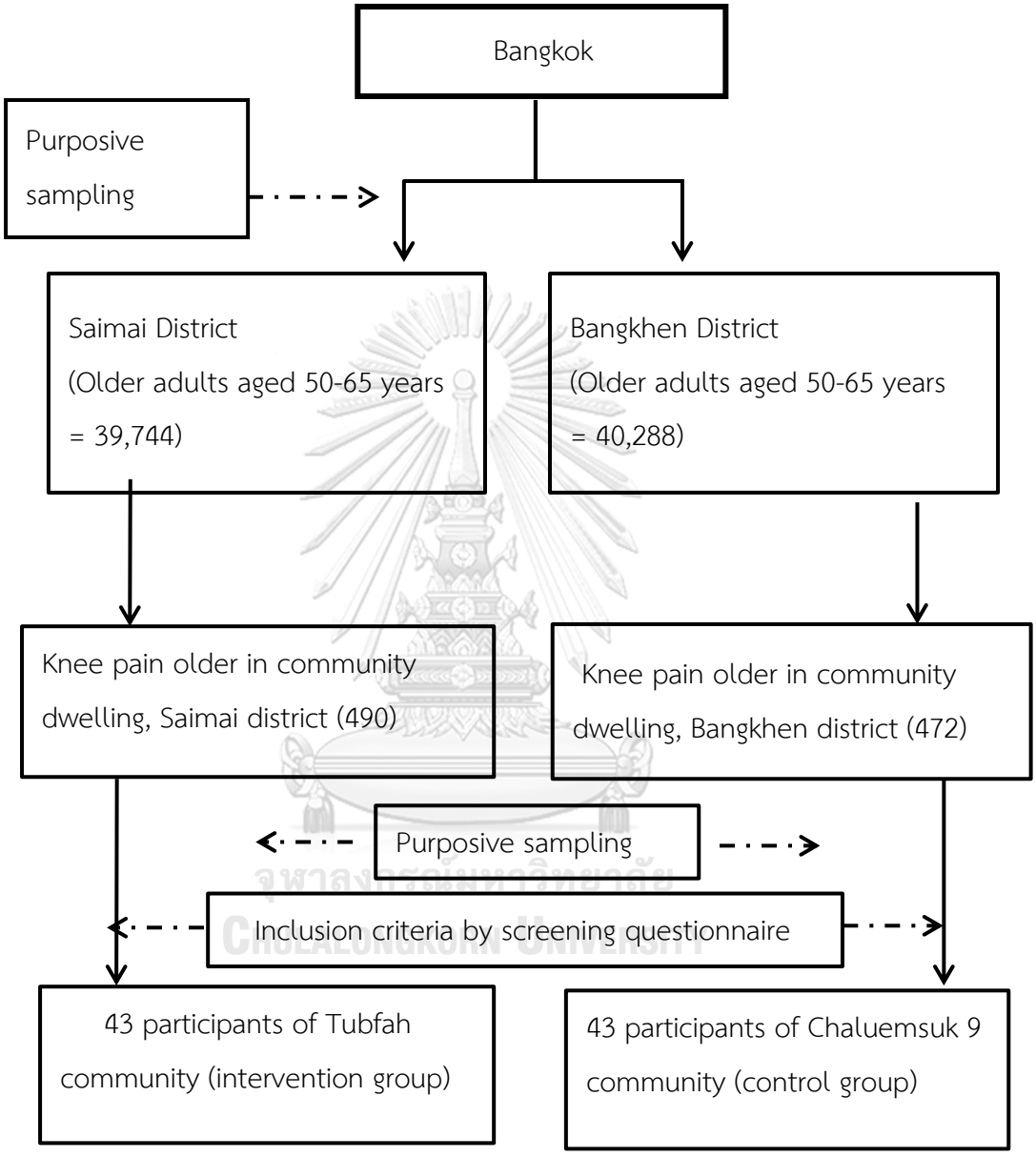


Figure 9: Sampling technique

This study concerned to scope of appropriate study population by select participants based on sampling technique by using purposive sampling at first and using

purposive sampling at second step as it showed above. For more details explain briefly as following:

1. Researcher use screening questionnaire to screen older adult who had history of knee pain who living in In Tubfah community of Saimai district as the highest rank of older with knee pain problem in Saimai district then researcher select this older adult with knee pain in this community to be intervention group. Also, screening older adult who had history of knee pain in Chaluemsuk9 community of Bangkhen district also the highest rank of older with knee pain problem then researcher select older adult with knee pain who living in this community to be control group by purposive sampling. After that recruit participants who meet the inclusion criteria of this study.

2. After screening and received the number (n) of participants in this study then researcher selected participant by purposive sampling also considering participants with similar qualifications to obtain the number of participant amount 43 people for intervention group and 43 people for control group.

3. After researcher receive baseline information from 43 participants of each group, researcher tasted the homogeneity and considering the distribution of each group.(Normal distribution)

3.6 Participants Recruitment and Data Collection Procedure

This section describes how the study processes would be performed as following the steps below:

Preparation phase

For preparation phase has initial step as research assistants preparation before start research program.

In this part of study, researcher recruit two orthopedics clinical nurse specialist who graduated bachelor degree from Royal Thai Air Force Nursing College, both of them had 12 years experiences for caring older adult patients in orthopedics department of Bhumibol Adulyadej Hospital to be a research assistants. The research assistants received training by the researcher before start the intervention program. Researcher describe about purpose, procedure, instruments, details and process of intervention program to research assistants. Moreover, researcher training research

assistants about how to assist and care for older adult to helping them to do appropriate movement while they performing functional performance testing as knee range of motion (ROM), Time up and go (TUG) and 30 second chair stand test (30s-CST) in pre-test and post-test of research program. Also, research assistants get training about support and providing safe older adults care for prevention any injury or harm while older adult performing knee exercise. Therefore, research assistant's role in this study is help researcher to assist and support older adult between performing functional performance test and take care to older adult closely and modesty during conduct research program if they had any injury or unexpected adverse event occurs. Due to process of data collection such as gathering data from questionnaire, measure knee range of motion, measure Time up and go (TUG) and 30 second chair stand test (30s-CST) which they conducted by researcher only.

Moreover, researcher contact community leader of Tubfah and Chaluemsuk 9 communities to requesting permission to access community and recruitment the older adults who had diagnosed knee pain at age between 50 to 65 years with completed or finished their treatment process and living in both communities. Additionally, the researcher also apply to printed promotional material distributed at communities. Participants who interest to participate this study were completed a screening questionnaire for knee pain of older with low exercise adherence (C. Jinks et al., 2004). The participants enrollment registry at Tubfah community yard (intervention group) and Chaluemsuk 9 community yard (control group). The data from the screening questionnaire were used to classify potential participants to participate in the study. One exclusion criteria for detection of moderate and severe hypertension is also needed in screening phase. Preparation of blood pressure test will inform to participants such as Don't exercise, smoke or consume foods or drinks containing caffeine (for example coffee or tea) at least 30 minutes before blood pressure measurement, Wear loose-fitting and comfortable clothes and Rest or relax

for 5 minutes. Researcher measure blood pressure by digital blood pressure monitor following guideline (Thai Hypertension Society, 2019) as detailed below:

1. Participants Sit comfortably and relaxed with back supported, Make sure your arm is supported on a tabletop at an even level with your heart, Keep your feet on the floor and do not cross the legs and do not hold bladder

2. Checking blood pressure after rest for 5 minutes and inform the participant as do not taking or moving while measure blood pressure.

3. Using arm cuff with proper size is required for accurate blood pressure measurement (cuff size of 1/3 of people arm)

4. Measure blood pressure by digital blood pressure monitor (with calibrated and accuracy)

5. Record blood pressure as both systolic blood pressure and diastolic blood pressure

6. Measure blood pressure 2 times then calculate an average of blood pressure result

After that Researcher inform participants about preparing to wear clothes which are loose and comfortable such as comfortable pants, shorts, and gym or other rubber soled shoes in the day of functional performance test at Tubfah and Chalurmsuk 9 communities yards and researcher wear t-shirt and comfortable pant and sport shoe to do the functional performance test of participants .

Furthermore, researcher inform participants about preparation themselves for functional performance test before the day to do pre-test. The details are following:

1. Avoid to do intense or high-impact activities or strenuous exercise in 1-2 days before functional performance test.
2. Rest and get at least 8 hours of sleep before functional performance test
3. Participants should avoid drinking alcohol 24 hours before the functional performance test begins.
4. Eat light meal 1 hours before the test.

To protection research participants, while do the function performance test or after finished the test, researcher and research assistants always take participant

under observation closely. If any of participant who feeling exhausted or faint or dyspnea or muscle pains, participant got inform to rest and stop to do function performance test on that day. If any physical harm or injury occurs while doing the test, participant received first aid by researcher and research assistants then refer to nearest health center or hospital. All costs of medical treatment covered by researcher.

Data collection phase

1. The researcher contacted older adult who residing in Tubfah and Chaluemsuk 9 communities to spread information of research study and recruit 43 participants base on inclusion criteria with a selection of one person per one household in each area. Furthermore, the details of procedures necessary to describe for participants such as the study purpose, the process of this research, method of the data collection and the participant human's right protection.

If older adult agreement to participate in research and sign consent form, they would be given a copy of informed consent form and appointment date for the first meeting to join the study program at their community yard.

2. Researcher informs 43 participants of intervention group about the details and all of process of this study and conduct interview face-to-face by using structured questionnaires then perform the functional performance tests. The respondents (43 persons) from control group answered a structured questionnaires and the test of funcional performance at their community yard for baseline measurement same as intervention group. Both groups researcher collected baseline measurement in the first week, the details as following:

Structured questionnaire	*Functional performance testing*
Part 1: Self effecicacy for exercise (SEE)	1.Knee range of motion (ROM)
Part 2 : Specific Self efficacy (Task ,maintanience, Recovery)	2. Time up and go (TUG)
Part 3: Knee pain scale (NPRS)	
Part 4: Knee outcome for activity daily living (KOS ADL)	3. 30 Second chair stand test (30CST)

The participants answered the structured questionnaire in the area of their community and researcher helped participants for complete answers a questionnaire. A set of questionnaire consists of a pen and pencil (either is participants suitable to use for finishing the questionnaires) , one questionnaire which take time about 20 minutes to complete it. After finished participants can return the questionnaire by using enclosed envelop to researcher. After that, researcher took the pre test of functional performance as knee range of motion (ROM) , Time up and go (TUG) and 30 second chair stand test take times 20 minutes for 3 of fuctional performance test at Tubfah community yard (intervention group) and Chalurmsuk 9 community yard (control group)

The Structure of study process for intervention and control groups

The researcher conducted study process within 14 weeks in briefing as the schedule below;

Table 2: Briefly the study process for participants in both group

Week	Activities	Times (min)	Intervention group	Control group
1	Pre -test (collecting baseline by structured questionnaire and test of functional performance)	40	X	X
2	-Researcher give leaflet provides general information about knee pain and knee exercises to older adult	30	X	X
	-The exercise diary was distributed to all of participants and researcher gave them an instruction how to record it		X	X
3*	Knee pain group discussion session	40	X	
	Action plan + knee exercise group	50	X	
4*	Coping plan+ knee exercise group	50	X	
5*	Action plan + knee exercise group	50	X	
6*	Coping plan + knee exercise group	50	X	
7*	Action plan + knee exercise group	50	X	

8*	Coping plan + knee exercise group	50	X	
9*	Action plan + knee exercise group	50	X	
10*	Coping plan + knee exercise group	50	X	
11*	Action plan + knee exercise group	50	X	
12*	Coping plan + knee exercise group	50	X	
13*	Action plan and group of knee exercise	50	X	
14*	Coping plan + knee exercise group	50	X	
	and Post-test (Collecting by structured questionnaire and test of functional performance)	40	X	X

X = require group to get list of activities in each week

* = Send instant messaging by LINE application to motivate and reminding to do knee exercise every week for intervention group

Intervention group procedure

All participants in this group were invited to attend the program which describe in 14 consecutive weeks as following;

During the first week: The participants received the structured questionnaire which had 4 parts to seeking information on the participants: (1) self-efficacy for exercise (SEE scale) includes 9 items to rating scales. (2) Specific Self-efficacy as task, maintenance and recovery which had 5, 4 and 3 items to report a scale as 1-4 in each item. (3) Pain numeric rating scale to measure the scale of knee pain (via rating scale 0 - 10). (4) Knee Outcome Survey Activities of Daily Living Scale (KOS-ADLs) to measure the knee functional performance by rate the level of functioning at scale 0-5 during the usual daily activities in 6 items and measure knee functional limitations with activities of daily living by response 0-5 rating scales involve 8 items. Also, functional performance test include Knee range of motion (ROM), Timed up and go (TUG) and 30 second chair stand test researcher will describe the procedure of functional performance testing below;

Knee range of motion (ROM)

A standard transparent plastic goniometer is used to measure knee joint range motion (ROM). This study will use goniometer to measure knee ROM of the participants as knee flexion (starting position: supine position with both legs and flat on the flat floor, the center of the goniometer is at the side view of the knee joint, and the arms of the goniometer are aligned in the middle of the long bones directly above and below the knee. Ending position: As the knee is fullest flexion the movable arms arrange to measure of the degree of knee flexion) and knee extension (starting position and ending position: supine position same as it is when starting to measure knee flexion then measure the degree of knee extension). Each of position will measure 3 times and record by researcher then calculate the average value. (Appendix C)

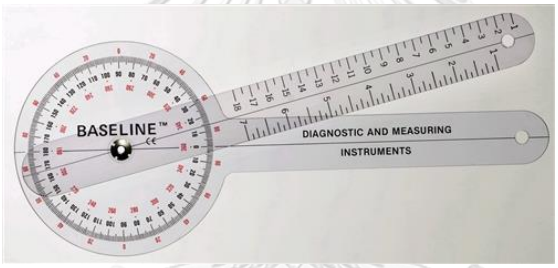


Figure 10: Goniometer

Motion of the knee	Starting position	Ending position
Flexion		
Extension		

Figure 11:Measurement knee range of motion

The way to measure of knee range of motion for participant is to :

1. Researcher inform participant to lie down on the back with leg straight, on a flat floor.

2. Researcher place the axis of goniometer over lateral femoral epicondyle of participant.
3. Line the stationary arm of goniometer up with the greater trochanter alongside of the outer thigh
4. Researcher line the other arm of the goniometer up with the lateral malleolus of participant's ankle

To measure of knee flexion by researcher inform participant to bend the knee as far as they can by sliding foot up towards their buttocks, then researcher keeping the arms and axis of goniometer of goniometer in place then measure knee flexion(Norkin & White, 2016).

To measure of knee extension by researcher instruct participant to push the knee down gently into the floor through using their leg muscles not their hands then the knee as straight as it go and researcher measure knee extension (Norkin & White, 2016).

Timed up and go (TUG) test

The Timed up and go (TUG) is a test of basic functional mobility, walk ability and balance in older adults (Podsiadlo & Richardson, 1991). Researcher measure time in seconds, the time was count when the participant stand up from the arm chair (estimate seat 46 centimeters of height), walk in the directions for 3 meters , turn then walk back to the chair and sit down. The stopwatch could be used to time the trial and researcher took the test 2 times after that calculates the average score.*(Appendix D)*

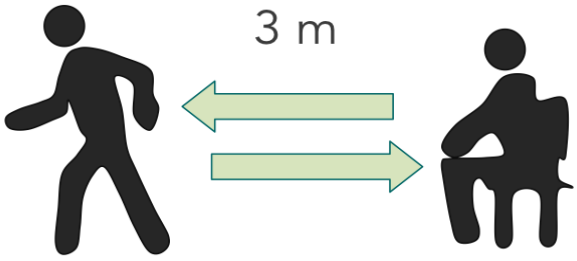


Figure 12:Timed up and go test

To conduct Timed up and go (TUG) test is to:

1. Researcher set an arm chair and put the object 3 meters away for walk and turn back to the chair as the starting point.

2. Inform the participant to sit in the chair with both arms resting comfortably, put both feet on the floor. After that researcher say word “GO”, participant stand up from the chair by may not use the arms of the chair to help for stand up and walk in the direction in 3 meters, turn around, return to the chair and sit down again. The participant can move as quickly as they feel safe and comfortable.

3. Researcher start timing when say the word “GO” and participant start to stand up from the chair and stop timing when participant seated again correctly in the chair.

4. Safety consideration for this test, while the test begin the researcher walk alongside to prevent the danger of falling to the elderly. (Without disturbing the pace of walking)

5. Researcher demonstrated how to perform the test to participant first after that participant perform a practice 1 time run followed by two timed tests. The average record time of the two tests recorded on the TUG record sheet.

The 30-Second Chair Stand

The 30 second chair stand test is the tools of measure of lower body strength and endurance in older adults(C. Jessie Jone & Roberta E. Rikli, 2002). Researcher began this test by give instruction to participant to sitting on the edge of the chair

and their arms were crossed over the chest then ask them to sit and stand as quickly and carefully as they can do in 30 seconds. For one chair stand is note down as older standing up from the chair with straight legs and then sit down again. It was record that how many number of completed chair stands within 30 seconds that they could do. (Appendix E)

Figure 13: The 30-Second Chair Stand test

The description of 30-Second chair stand test as following:

1. Researcher set a chair with a straight back and without arm rests, placed the chair against a wall to prevent it moving.

2. Inform the participant to sit in the middle of the chair, back straight, place their the feet flat on the floor by feet approximately shoulder width apart and placed them on the floor at an ankle slightly back from the knees. Also, arms are crossed at the wrists and held at the chest.

3. When researcher say the word “GO”, participant rise to a full standing position then sit back down again. The researcher encourage participant to complete as many full stands as possible within 30 seconds.

4. The participant should practice a repetition 1-2 times for the right movement before start completing the test. Do the test only 1 round

Though researcher monitoring participant’s performance to certify proper form, the score of the test is the total number of fully stands within 30 seconds (if the participant is over halfway up at the end of 30 seconds count it as a full stand). Incorrectly exclude stand are not count such as they cannot do a fully standing position (legs and body are not straighten) , while sitting position , hips and back side of upper legs are not touch the chair.

For safety consideration of 30-Second chair stand test, researcher placed the chair against the wall to prevent it moving when testing participant and observe participant carefully about their balance while testing, if they feel any pain during the test, researcher informed them to stop to perform the test immediately.

In this week, researcher asked the permission from participants to make a new LINE group and invite them to be a member of this group in LINE application. For this LINE group, researcher let the participants create the name of group chat on their idea from base on objective of research study as less knee pain and improve exercise adherence. Researcher and participants joined and started chat or greeting all members, send and receive text messaging, share photos or videos and send stickers.

The second week of session:

At the second visit, all participants in this group provided the leaflet about general information of knee pain and knee exercises which include 5 knee exercise sessions. Moreover, the researcher provided exercise diary for each participant and explain them how to perform as 3 set of 10 repetitions for each session of knee exercise (5 sessions) in every day. The knee exercise instruction writing on page 1 of the exercise diary together with explain the way to record in each day, in minute and set of exercise for each session (Appendix F) .From the exercise instruction allowed the participant perform all of exercises at 1 times or split them in a day. The exercise regimen design by researcher as orthopedics nursing experts to improve their knee functional performance as strength, flexibility, knee range of motion and mobility at surrounding joints (S. O'Reilly, Muir, & Doherty, 1999) (Sangkom, 2008; L. R. Wood et al., 2011b) (R. Hasegawa et al., 2010) (J. G. Quicke et al., 2015a). The researcher gave an instruction to all of participants about the way to accomplished exercise diary and explain them that the exercise diary was used to record exercise adherence and pattern of their exercise. The most of important things to complete the exercise diary, researcher was emphasize them that they must be truthful, accurate, and

honest when recording in the diary. Moreover, researcher explained the benefit of record diary that it can keep a record for them to see how well they are progressing toward their exercise goals, can help to keep them motivated, writing down on exercise diary helps them remember and keeping track of exercise that they want to see improvement on it.

By the third week of the implementation program:

Participant in the intervention group are invite to attend knee pain group discussion session in 40 minutes by researcher before attend to action and coping plan program at Tubfah community yard. The session provide information about definition of knee pain, symptom of knee pain, effect of knee pain for older adult, treatment for knee pain, self-care management for knee pain and perform daily activities, method of knee exercise and demonstration, benefit of knee exercise for knee pain people to get the important and concern to the role of knee exercise and focus on why exercise is needed, based on self-efficacy theory (Bandura, 1977) see in attached document . The details of group session are described below;

Table 3: Briefly details of group discussion session

Time	Brief the details of group discussion session
10 mins	1. Building the familiarity between participants, researcher and explain an objective of group discussion. The process of group discussion include a Power Point presentation by researcher.
30 mins	2. Researcher provide information about definition of knee pain, symptom of knee pain, effect of knee pain for older adult, treatment for knee pain 3. Researcher giving information to participant about self-care management for knee pain and perform daily activities 4. The participants received information about knee exercise such as objective of knee exercise, benefit of knee exercise, researcher demonstrate 5 knee exercise sessions to participants and give participant practice knee exercise following researcher

	5. Researcher support and encouragement to participant to increase participant's motivation, increase their self-efficacy for knee exercise , exercise adherence and remind them about benefit of knee exercise and benefit of record to exercise diary by: -verbal support and encouragement - show a picture of older adult who had knee pain and reduce knee pain by always do knee exercise in a daily by using power point presentation to give participant feel motivate, empowerment and confident to perform knee exercise continuously. -remind and emphasize to the participant about benefit of knee exercise and benefit of record to exercise diary 6. Group discussion

After that participants participate in a meeting of action plan program at Tubfah community yard which development and application from the action and coping plans base on the study of (Falko F. Sniehotta et al., 2005) consisting of goal writing of action plan, researcher gave an instruction about how to writing an action plan as the way to write very detailed and specific goal to achieved knee exercise in a week, for example, to be able to do knee exercise for 30 minutes in every day. After that, researcher checked their goals to make sure that all of their goals were detailed and precise enough and if they are not, the researcher offered the suggestions that they would add up to their goals and reach them. Then the participants, under the researcher's guidance was completed an action plan which indicated specifically "when, where, how and with whom that they are going to achieve all of knee exercise sessions" (e.g. "I will do knee exercise with my husband for 30 minutes in everyday at 5 pm") To Implementing the action plan its take 20 minutes. Furthermore, the participants attended the knee exercise sessions after they finished the action plans in this week. The researcher demonstrated each knee

exercise and asked participants to demonstrate all of knee exercises till they could perform 10 repetitions for each exercise session properly and safely. Therefore, the participants be able to perform 10 repetitions with 3 sets of each knee exercise session together with researcher. The details of knee exercises are as follows;

Range of motion exercise

The participants received an instruction to perform range of motion exercise at first exercise session. The position is lay on the back or sitting with extension the knee and take legs out as straight as possible. After that bend the knee and straighten by sliding the heel toward and take it back as the same when starting this position, hold for 3 second at the end of range and take the foot flat on the surface at participants are laying or sitting on. This exercise should perform 10 times for 1 set and do 30 times (3 sets) through 30-45 seconds rest between sets . The alternate leg should perform this exercise if they had knee pain problem on both side.

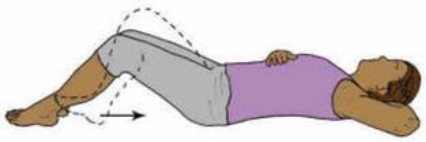


Figure 14: Range of motion exercise (heel slide)

Strengthening exercises

The strengthening exercise were divided into two types consist of non weight bearing and weight bearing exercises. The researcher instructed the participants to do strengthening exercises in 4 sessions including non weight bearing exercise (2 sessions ; isometric quadriceps contraction and straight leg raises) also weight bearing exercise (2 sessions; sit to stand and step-ups). They should perform strengthening exercises ≥ 20 minutes in everyday.

<u>Strengthening exercises (non weight bearing)</u>

- Isometric quadriceps contraction

The olders are lay down on the back or sitting by take the leg straight. Then tighten the quadriceps muscle (muscle in the front of the thigh) and pushing knee down against the floor though the foot as full dorsiflexion. This exercise should

perform 10 repetition per set and do 3 set in a daily with holding 6 seconds when pushing knee down with muscle contraction.

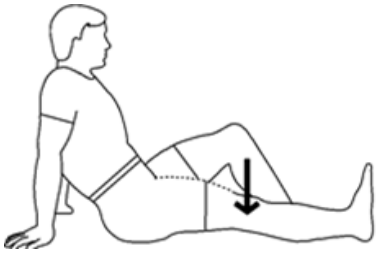


Figure 15: Isometric quadriceps contraction

- Straight leg raises

The position of this exercise is supine, bending one leg at the knee and holding the other leg straight with tighten quadriceps muscle then lift the foot off the surface about 15-20 centimeters .The participants should perform 10 repetitions per set and do 3 set in a daily with holding 3 seconds for each contraction.

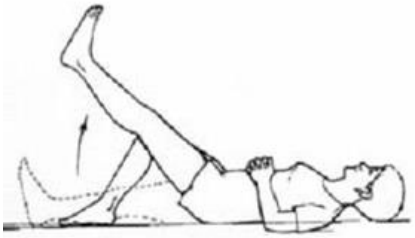


Figure 16: Straight leg raises

Strengthening exercises (weight bearing)

- Sit to stand

The position is sit on the chair, after that stand up then sit back down with both arms crossed on chest. The participants could perform 10 repetitions for 1 set and should do 3 set in a daily.

Figure 17: Sit to stand

- *Step-ups*

This exercise starting by stand in front of a bottom step of stair or 4 legged stool. Then place foot involved the leg on the step and slowly pushes up with keeping aligned of the knee over the foot. Then slowly step down. They could perform with alternate legs if they had both side of knees pain problem. The exercise could do repeat 10 times per 1 set then progress to 30 times (3 set) per day. The participants should progress to higher steps and increase the number of steps as they could perform.

Figure 18: Step-ups

Additionally, the intervention group also be invited to attend the intervention program community yard in a weekly (one day per week, on Friday either morning or afternoon) until last week of intervention program (week 14th) This group received aninformation to bring their exercise diary when they attend the intervention program in every week for the reason that they exercise adherence was recorded on that day and if they had any questions about recording in the diary, researcher gave them instruction and support them directly.

Send instant messages by LINE application

In the third week, researcher started to send instant messages to participants in LINE group chat until week 14th as the last week of study period. For instant messaging that researcher send to them consist of text messages, photos, sticker, and video to motivate and remind them to do daily knee exercise following exercise

diary. Participants received instant text messaging 2 messages per week in the morning (Kinnafick, Thøgersen-Ntoumani, & Duda, 2016). Exemplary of instant text messages are displayed as follows:

Table 4: Exemplary of instant text messages

Type of instant text messaging	Exemplary text messages	Frequency of sending
Motivate and encourage	-You can be proud of yourself that you do knee exercise every day. its reduce your knee pain and be healthy -To be less knee pain to be better do knee exercise -You would rather say “I did it” than “I gave up” -Hey! you just started great exercises that’s for your healthier life - Congratulation! You do great job today - Superb! On daily knee exercise. Keep going for it tomorrow.	2 messages per week alternately
Reminding	-Don’t forget! Knee exercise everyday -Remember! Health knee come from your daily exercise -You have your goal! Let’s do it -Hello, healthy knee waiting	2 messages per week alternately

	you conquer it!	

Create album in LINE group

Researcher created album of photos after finish meeting session in each week (start from 3rd week to 14th week). The album collected action plan and coping plan photos of all participants which they are create plans for their exercise in each week. In this way, it's benefit to participants to read what are their plans in weekly by there are not missing any photos of the plans and they can sharing their action and coping plans to their friends in the group that makes participants have more motivate to achieve them.

For the fourth week: this group received an instruction to develop their coping plan, researcher encourage them to think about the barriers that could affect their ability to adhere to knee exercise and stop them from continuing develop the newly exercise behavior. The participants write down the lists of barriers that might prevent them to attend the knee exercise sessions at meeting and lists of barriers which could prevent them from achieve the knee exercise program during the week in coping plan form. For example "I am lazy to do knee exercise in the morning". Then, they list specially of the things that they should do to overcome or coping with these barrier by write down as the sentence, "I can overcome this barrier by....." (e.g. I can overcome this barrier by I will not sleep late and wake up in early morning and do the knee exercise for 30 minutes before I go to work). For these coping plans, the researcher gave them the guidance and suggestion to complete it. To Implementing the coping plan its take 20 minutes. Moreover, the participants attended the knee exercise sessions after they finished the coping plan in this week (exercise session same as the program in the third week). The researcher collects exercise diary then return and instructs them to bring the diary again for the upcoming week.

In the fifth week, seventh week, ninth week, eleventh week and thirteenth week:

The intervention group takes part in the action plan and knee exercises program same as the third week procedure. For the action plan implemented in alternate on a weekly basis until the thirteenth week (see in the brief schedule of study procedure).

At the sixth week, eighth week, tenth week, twelfth week and fourteenth week :

All participants in this group take part in the coping plan and knee exercise program same as the availability of study procedure used in the fourth week.

For week 14th, the participants take the post-test after finished intervention program by fill out the questionnaire consist of (1)self-efficacy for exercise (SEE scale), (2)specific Self-efficacy as task, maintenance and recovery self-efficacy (3)pain numeric rating scale, (4) Knee Outcome Survey Activities of Daily Living Scale (KOS-ADLs) and testing the functional performance including Knee range of motion (ROM), Timed up and go (TUG) and 30 seconds chair stand test. The researcher collects the exercise diary from all participants to collect exercise adherence data.

The intervention group has 12 sessions of implementation program which start from week 3rd to week 14th. In this study used 75 % attendance as complete intervention program (Taylor, Makambi, Sween, Roltsch, & Adams-Campbell, 2011). Therefore, participants are allowed to missed 3 sessions (25%) from 12 sessions (100%).

Additional Technique to use for each of four sources of self-efficacy to enhance self-efficacy and improve exercise adherence in this study is illustrated below.

Table 5: Four sources of self- efficacy to enhance self-efficacy and exercise adherence

Sources of self–efficacy	Intervention techniques use in this study
Mastery Experience	-Researcher provide knowledge about knee pain involves review knee exercise and give participants practice knee exercise with others participants in a group together with researchers which it lead to increase their

	confidence and self-efficacy to exercise. Also it can help to keep them do knee exercising regularly. -Periodic individual updates on participants by exercise diary
Vicarious Experience	-Participants will invite to attend group discussion and knee exercise session together with other older adults with knee pain. -Researcher demonstrate knee exercise and show the modeling of older adult who had knee pain and successful by knee exercise by using power point presentation to participants
Verbal Persuasion	-During intervention program such as group discussion session, action and coping plan session and knee exercise session, researcher provide verbal persuasion to participants. For example successful participants practicing knee exercise and support from researcher and other participants also include. -Knee exercise will instruct by researcher and encourage participants -Researcher help the participants to create action plan and coping plan to achieve the goal.
Physiological and affective states	-Researcher arrange a suitable place for intervention activities and set a relaxing environment for participants. -Researcher ask participants about how they feel after knee exercise and how to improve

	their level of knee symptom as pain. -Participants will invited to join action and coping plan program to set their “goals” for action plan and coping plan goal to achieve their knee exercise in alternate on a weekly basis. As setting goals will take participants gain confidence to perform knee exercise.

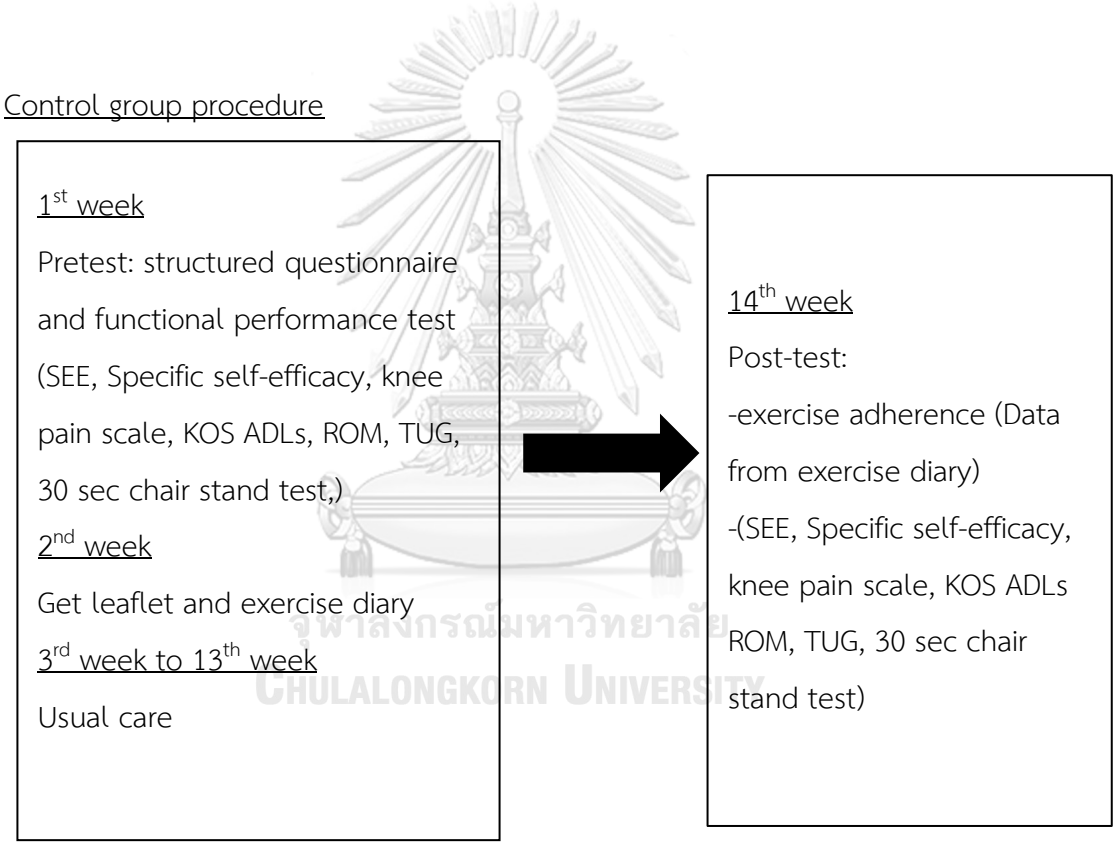


Figure 19: Study procedure of control group

Action and coping plan program and send text messaging by LINE application will not implement in control group .The researcher was invite the participants in this group to meeting at yard of Chaluensuk 9 community, the detail is mentioned as follows:

At 1st week, following the meeting at first visit, participants answered the structured questionnaire which involve SEE, Specific self-efficacy as task, maintenance and recovery self-efficacy, knee pain scale, KOS ADLs and take the functional performance test which included range of motion (ROM), timed up and go (TUG) and 30 second chair stand test same as an intervention group at Chaluemsuk 9 community yard.

For 2nd week, the older adults in this group received the leaflet about general information of knee pain and knee exercises also get the exercise diary. They will get an instruction about how to do knee exercises in each session and researcher give them the direction about how to record the exercise diary and complete it. Moreover, researcher explained the benefit of record diary that it can keep a record for them to see how well they are progressing toward their exercise goals, can help to keep them motivated, writing down on exercise diary helps them remember and keeping track of exercise that they want to see improvement on it.

During 3rd week to 13th week, there is no intervention for control group, the participants received usual care

Usual care for control group

In this study, usual care refer to participants in control group continue to receive their usual care as recommended about general information of knee pain and knee exercises. Participants received with exercise diary to record their knee exercise as researcher give the instruction to them. Participants were advised to continue their daily routine activities in which they usually do and would be provided with a diary to record their knee exercise which they engage soon after completing them, or by the end of the day because adherence to the exercise was

monitored by using an exercise diary. Moreover, the participants in control group are not to received LINE instant messages and attending action and coping plan program.

Lastly, at 14th week, participants of control group take part in the post-test of study procedure to answer the questionnaire consist of SEE, Specific self-efficacy, knee pain scale, ROM, TUG, 30 sec chair stand test, KOS ADLs and take the functional performance test which included range of motion (ROM), timed up and go (TUG) and 30 second chair stand test. On return of the exercise diary in last week, researcher collects exercise diary from participants to collect exercise adherence data.

3.7 Measurement tools

For the measurement tools, researcher Research can also be divided in three category involve (1) the questionnaires tools (2) exercise diary (3) functional performance tests, these are explain it further below;

3.7.1 The questionnaires tools

3.7.1.1 The screening questionnaire

This screening questionnaire was used as recruit the older adults who had knee pain and lack of exercise to participate in the study which apply form the standard of Knee Pain Screening Tool (KNEST) (C. Jinks et al., 2004). There are 34 questions to asking older adults about previous history related with knee pain and treatment for knee pain, previous history of exercise and health problems which it possibly have affect exercise participation the details in Appendix A.

3.7.1.2 Structured questionnaire

This part focus on the structured questionnaire, researcher divided questionnaires into 4 parts; (1) Self-efficacy for exercise (2) Specific Self-efficacy (Task, maintenance and recovery) (3) Knee pain scale measure by numeric pain rating scale (4) Knee Outcome Survey Activities of Daily Living Scale (KOS-ADLs), The explanation are as follows:

Part1: Self-efficacy for exercise (SEE): Self-efficacy defined as person's perceptions of their capabilities involve specific conditions and activites (Bandura, 1997). A person's decision of their self–efficacy influences their choice in activity and their coping efforts. For people who had low self-efficacy, they "feel like give up" or "avoid engaging in activities" because they rely on that is exceed as they can coping

it, while people who had high self-efficacy, they will be self-reliance to engage in a given activites and effort to overcoming the challenge(Feltz & Payment, 2005). Therefore, implementing programs that increase self-efficacy are also enhance adhrence (Bandura, 1997). The self-efficacy for exercise scale (Resnick & Jenkins, 2000) as an instrument that it has 9 items scaled for asking the older adults that how they confidence to perform exercise in a difference of situation. The score for each item on range 0-10 as 0 means not confidence and 10 means very confidence. The method of scoring SEE questionnaire calculate by summing the numerical raitng of each response . The total score has range 0-90. In this study, a cut of point self-efficacy for exercise is divided into 3 level equally classified (Pedersen et al., 2013), A Classification of scores as follows:

Score 0-44.9 (< 50 % of total score) = low level

Score 45.0 -71.9 (≥ 50 < 80 % of total score) = moderate level

Score 72-90.0 (≥ 80 % of total score) = high level

The SEE was found to be reliable and valid in older adults, the value internal consistency was 0.92 (Resnick & Jenkins, 2000).From previous study with older adult to promote their exercise and physical activity in Thailand (Harnirattisai & Johnson, 2005), there was provided the evidence of internal consistency (Cronbach's alpha = 0.84).The SEE questionnaire was showed in Appendix B and the lettter of permission to use the SEE questionnaire could be found in appendix G .

Part 2 : Questionnaire of specific self-efficacy including task , maintenance and recovery this questionnare have been appied from (Scholz et al., 2005). There are 3 sections in the part of specific-self efficacy,for each section measured by use 4 point of likert scale for reponses which consist of 1 refer to strongly disagree, 2 refer to disgree , 3 refer to agree and 4 refer to strongly agree. The detail of this questionnaire is mentioned as follows:

1. Task self-efficacy have 5 Items are rated on a 4 point Likert scale, in each item starting with words “I am confident that I can….” and its relate to the participants’s ability to carry out knee exercises program, continue to do knee exercise also be active and follow the resercher’s advice about knee exercise (see appendix B), such as “I can promise to complete the number of my knee exercise sessions at least

once in a day". The study of (Scholz et al., 2005) showed that the reliability of this task self-efficacy scale was good (α =0.75). The method of scoring task self-efficacy is summing the numerical raitng of each response of items, the total score has range 5-20. Interpretation of task self-efficacy level divided into 3 levels based on range of score as following;

1. 5.0 - 9.9 score (< 50 % of total score) = low level
2. 10.0 - 15.9 score (≥ 50 < 80 % of total score) = moderate level
3. 16.0 - 20.0 score (≥ 80 % of total score) = high level

Furthermore, this scale was used in the study of (O'Brien et al., 2013) which implementation of action and coping plans to improve exercise adherence of older people with knee osteoarthritis, the internal consistency of this scale was 0.67.

2. Maintanience self-efficacy, there are 4 items to measure it with 4 point Likert scale. For each item beginning with " I am confident that I can do ....."and linked to the participants's perceived proficiency to continue their knee exercises (Appendix B). For example, "I am confident that I can do the knee exercise regularly even if exercising takes me a lot of time". The previous study of (Scholz et al., 2005) and (O'Brien et al., 2013) reported the internal consistency (Cronbach's alpha) of maintenance self-efficacy scale was 0.75 and 0.91 respectively. The method of scored maintenance self-efficacy is summing the numerical rating of each response of items, the total score has range 4 -16. Interpretation of maintenance self-efficacy level divided into 3 levels based on range of score as following;

1. 4.0 - 7.9 score (< 50 % of total score) = low level
2. 8.0 – 12.7 score (≥ 50 < 80 % of total score) = moderate level
3. 12.8 – 16.0 score (≥ 80 % of total score) = high level

3. Recovery self-effiacy was used to measure the opportunity of the participants that they give up or stop to do knee exercise program (see in appendix B). There are Likert's scale 4 points for 3 items with each item starting with the words "I am confident that I can restart to do knee exercise in regularly again, although I...", such as "I am confident that I can restart to do knee exercise in regularly again, although I feel weak after a period of illness". The study of (Scholz et al., 2005) was to assess the reliability of this recovery self-effiacy scale that reported Cronbach's alpha = 0.93

which is similar to the study of (O'Brien et al., 2013) that this scale had a coefficient alpha of 0.90 and its revealed that high internal consistency, the total score has range 3 to 12. Interpretation of recovery self-efficacy level classify into 3 levels based on range of score as following;

1. 3.0 -5.9 score (< 50 % of total score) = low level
2. 6.0 -9.5 score (≥ 50 < 80 % of total score) = moderate level
3. 9.6-12.0 score (≥ 80 % of total score) = high level

Part3 : Numeric pain rating scale (NPRS) most commonly used to assess pain intensity in adult (Abbott & Schmitt, 2014; Jensen & McFarland, 1993; Rodriguez, 2001).This tool was showed it's suitable psychometric properties and could be used in scientific studies. Therefore, this study was used NPRS to measure knee pain for older adults. The 11 point of numeric scale range from 0-10 ; 0 refer to "no pain" and 10 refer to "the worst possible pain" or "maximum pain". Participants verbally selected a the number from 0-10 that is the most in the line with the knee pain intensity that they have experienced from past 24 hours (Appendix E). Moreover, they can written the the numeric values of knee pain intensity of 0 – 10 and over the telephone as acceptable. The values of NPRS considered as appropriate the cut-off points for this measurement tool (Downie et al., 1978; Krebs, Carey, & Weinberger, 2007), the details as follows:

Scale 0 = no pain
Scale 1-3 = mild pain
Scale 4-6 = moderate pain
Scale 7-10 = severe pain

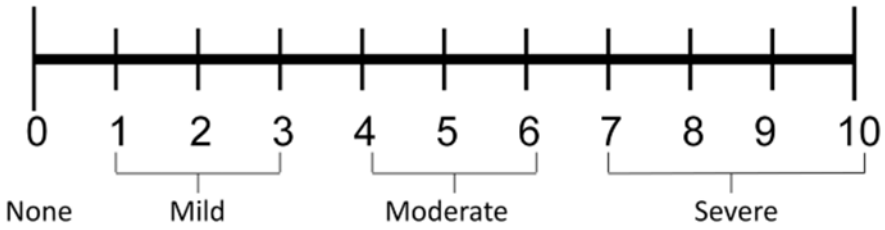


Figure 20: Numeric pain rating scale (NPRS)

This measurement tool had been shown as valid, reliable, good sensitivity and appropriate for measure pain intensity for clinical study or experimental study (Williamson & Hoggart, 2005). Moreover, the NPRS widely used in the studies related with knee pain and lower limbs (Piva, Gil, Moore, & Fitzgerald, 2009), below are examples of used NPRS to measure the pain outcome and value of the reliability.

Table 6: Reliability of Numeric pain rating scale (NPRS)

Authors	Country	Value of the reliability
(Bisi-Balogun & Torlak, 2015)	Germany	0.84
(Pimpituk et al., 2011)	Thailand	0.89
(Kongsanae, 2011)	Thailand	0.78
(Pitantananukune & Surit, 2011)	Thailand	0.94

Part 4: Knee Outcome Survey Activities of Daily Living Scale (KOS-ADLs),the determination of use KOS-ADLs in this study because this instrument can assess and follow up about knee symptoms of older adults which effect on knee funtional performance during their activities of daily living. Moreover, this tool can use to measure the functional limitation which related their knee in activities of daily living.(Irrgang JJ et al., 1998). There is 14 items scale and also avaliable to used in older adults in a difference knee conditions. The internal consistency of KOS-ADLs was reported Cronbach's alpha range between 0.89 to 0.98 and intraclass correlation coefficient (ICC = 0.94-0.98) (Collins, Misra, Felson, Crossley, & Roos, 2011; Irrgang JJ et al., 1998). The format as the response questonnaire within 2 parts including (1)

category of symptoms (2) category of functional limitations with activities of daily living.

(1) Category of symptoms invlove 6 items ,6-point Likert-type scales range from “I do not have the symptom (score 5)”, representing no symptoms to “The symptom prevents me from all daily activities (score 0)” representing severe symptoms that prevent the participants to perform all the activities of their daily living.

(2) Category of functional limitations with activities of daily living consist of 8 items, 6-point Likert-type scales range from “Activity is not difficult for me (score 5)”, representing do not have any limitations, to “I am unable to do the activity (score 0)”, representing lack of ability to perform the activity. For example, the functional limitations in each items that asking participants such as walk, stand, squat and rise from a chair among others. The researcher will ask participants to check that which one of the statements that suitable describes about their felt from last 1-2 days. The score = 70 is maximum raw score for this tool. The calculation of this score is summing the score of responses in each item. After that, calculate the score as percentage with this formula.

Score / (Maximum score = 70) * 100

E.g. the score 100% interpreted to the participants do not have any knee problems and no functional limitations in their activities of daily living. It should take about 5 minutes to complete this questionnaire *(Appendix B).* The permission letter to use this questionnaire from Dr. James J. Irrgang was attached *in* Appendix H

3.7.2 Exercise diary

To measure exercise adherence, the greatest common way to measure it for the health intervention program is use of self- reported for example, the hand held diaries for participants (Robson, 2002). While acknowledging the intrinsic threat to

reliability ,validity because of the response biases as social desirability and compliance, the hand held diaries for participants make available a fast, flexible, low costed and reasonable way to monitoring exercise adherence overtime, also said it had a good level of face validity (Vitolins, Rand, Rapp, Ribisl, & Sevick, 2000). The participants in this study will get the request to complete exercise diary to measure their exercise adherence for knee exercises during the study periods (start to record it at week 3 to week 14). The details of exercise diary consist of 5 knee exercises sessions; range of motion (ROM), Isometric quadriceps contraction, straight leg raises, sit to stand and step-ups *(See in appendix F).*

The exercise diary was measured the frequency of knee exercise as how often they performing knee exercise in a week, duration of knee exercise performing as minutes per day (Hawley-Hague et al., 2016), the number of set of each knee exercises of all for 5 sessions that they could perform in each day (one set include 10 repetitions, for each knee exercise session the participants could complete it by perform 3 sets = 30 repetitions per day , 7 days per week, Moreover, this study was measure exercise adherence as the frequency (a set) of participants perform knee exercise in each session by calculate that how many set that the participants perform for each knee exercise session in a week (Bollen, Dean, Siegert, Howe, & Goodwin, 2014; Osuka et al., 2015, 2017). For example, ROM exercise should perform as 3 set per day, 3*7 equal 21 set in a week. Furthermore, participants could response in the boxes of the reason if they are not performing knee exercises and write any additional comments(F.-K. I. Lee, Lee, & So, 2016).

3.7.3 Functional performance test

The functional performance tests contain of 3 type of the test to measure knee functional performance of older adults before and after implementation program including range of motion (ROM), Timed up and go and 30-Second Chair Stand

3.7.3.1 The range of motion (ROM)

To measure the knee joint's range of motion, the standard goniometer is the most widely used in clinical setting (Watkins, Riddle, Lamb, & Personius, 1991). The ICCs of knee range of motion measurements with a goniometer of flexion = 0.99 and extension = 0.98 (Watkins et al., 1991) also the reliability of measurement wit this tool was reported 0.90 for flexion and 0.86 for extension. This study was used goniometer for before and after implementation program by measure 3 times for knee flexion position and knee extension position then calculation, for the more precise of average for knee flexibility in a degrees (Luttgens & Hamilton, 1997; The University of California San Francisco, 2013). The researcher was measured and recorded by herself in individual participants in this study (Jakobsen, Christensen, Christensen, Olsen, & Bandholm, 2010).

3.7.3.2 Timed up and go (TUG)

The TUG test used to measure functional mobility of older adults as a standard tool which its developed by (Podsiadlo & Richardson, 1991). This test requires participants to sit in the chair then the researcher gives them instruction to rise from chair and walk in 3 meters, turn then turn back to sit back at the chair. This task was test repeated 3 times, calculate of the average then record (in second) (Bohannon & Schaubert, 2005; Poncumhak, Suwannakul, & Srithawong, 2016; Rakyoo, Hiransinsoonthorn, Nuang-nieo, & Boonsinsukh, 2013) (Appendix D). This instrument had reported test -retest reliability when testing in community dwelling older adults, ICC was showed range from 0.93-0.99(Jalayondeja, 2014; Ongsantiphap, Pirunsan, & Paungmali, 2015; Shumway-Cook, Brauer, & Woollacott, 2000) . The TUG also reported of excellent reliability = 1, when it examined among Thai elderly who living in community (Wongpanitkul, 2012) . The study of (Tsubaki et al., 2016) found that mean of TUG test of older adults at age range between 50-59 years = 5.2+/- 0.7 seconds (female) and 4.7+/- 0.6 (male). In this study was used the cut-off point of TUG that the most appropriate for use with older adults in community dwelling as ≤

20 seconds (Podsiadlo & Richardson, 1991). Moreover, the details of interpretation (Podsiadlo & Richardson, 1991) of test are given below;

Normal : ≤ 10 seconds

Good mobility and be able to move without gait : ≤ 20 seconds

Functional limitation, gait aid was required : ≤30 seconds

Accordingly the score, if the participants get low scores that related with good functional performance, higher scores that association with poor functional performance.

Table 7:The age-matched normal values for older adults

Timed up and go	Age (year)	Mean in second
	60-69	7.7+/-0.3
	70-79	7.9+/-0.9
	80-89	11.0+/-2.2 (no any device) 19.9+/-2.5 (with device)

3.7.3.3 30 -Second chair stand (30-s CST)

The 30 second chair stand test, which used to assess lower limbs muscle strength that participants could accomplish everyday tasks for example standing up from the chair or climbing of stairs(Jones, Rikli, & Beam, 1999). This is the version that developed from (Csuka & McCarty, 1985) as the name of timed – stands test, that person can completed the test in 30 seconds by specifically rather than recording total of time taken to complete specified amount of chair and stand replications. Previous study investigated test-retest reliability of 30-s CST test in older adults who living in community dwelling, the reliability was 0.84 among male and 0.92 for female and total participants (both male and female) =0.89 , It was determined that this test provides a sensibly reliable also valid indicator for lower

extremity strength among older adults(Jones et al., 1999). The cut-off reported that lower than 7 stands in 30 seconds was suggested for detecting older adults with, or risk being lower extremity strength impairment (Rikli & Jones, 1999). Furthermore, the 30-s CST test had most effective cut-off point as less than 14 times of stand in 30seconds can predicted to fall and lower extremity strength (Kawabata & Hiura, 2008). The normal range of scores was recommended for the test based on the age range is benefit (C. Jessie Jone & Roberta E. Rikli, 2002), the details as following;

Table 8: The normal of 30-CST range scores in various age range

Age	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85-89
30s Chair stand (number of stand) Male	18-23	16-21	14-19	12-18	12-17	11-17	10-15	8-14
30s Chair stand (number of stand) Female	16-21	14-19	12-17	11-16	10-15	10-15	9-14	8-13

This test can detect to predict functional performance declines thru the time by years, along with the higher scores mean older adult be more physically active and lower scores mean the older being less physically active.

3.8 Reliability and Validity

3.8.1 Research instrument reliability

Reliability is a measure of the stability or consistency of test scores. The scores would remain the same after the instrument is administered repetitively at different times and it should be consistent (Creswell, 2002). Cronbach's alpha **α** (or coefficient alpha was used to measure the internal consistency ("reliability") of the instrument in this study. Pilot testing for reliability of questionnaires will conduct with 30 older adults who had knee pain problem and living in the community dwelling at

Kannayao district, Bangkok, Thailand. Cronbach's alpha determines the internal consistency or average correlation of items in the questionnaires. The phrasing and clarity of words used in formulating a questions greatly simplify for pre-test of the instrument. The report of reliability of each questionnaire in this study are following:

-Self-efficacy for exercise (SEE) = 0.81

- Specific self-efficacy including task, maintenance, Recovery self-efficacy 0.79, 0.87 and 0.81

- Numeric pain rating scale = 0.85

- Knee Outcome Survey Activities of Daily Living Scale (KOS-ADLs) = 0.89

3.8.2 Research instrument validity

Validity means the ability of the tools to measure what it is supposed to measure (for example how well its measures what it significances to measure) (Friis & Sellers, 2013). Therefore, validity is the accuracy and precisely of the measurement. For this research, the content validity was used to measure an instrument. The development of the questionnaires were based on the literature review and the suggestions made by 3 of experts in related field as Geriatric physician , Orthopedics nurse specialist and public health experts. To check the validity, the researcher calculated Index of the Item Objective Congruence (IOC). The value of IOC was calculated by the IOC formula as following;

$$IOC = \sum R / N$$

N = Number of experts

R = Degree of agreement for each item

(0 means not sure, 1 means relate, -1 means not relate)

IOC = The Index of Item Objective Congruence

Figure 21: IOC formula

The scores predictable to be ≥0.5 that means acceptable for validity of the questionnaires. To generate on each item of questionnaires , rely on a panel of experts to comment on the items,the result of IOC in each items from 3 experts is no less than 0.6 .

3.9 Data Analysis

The researcher uses the Statistical Package for Social Science (SPSS) version 22 software for windows for analyze all the data in this study. Both of descriptive statistics and inferential statistics were analyzed. The statistical test was acceptable levels of statistical significance at 0.05. The statistics accessible for categorical variables are numbers and percentages, the continuous variables were summarized by means, standard deviations (SD).

3.9.1 Descriptive analysis analyzed the data in this study the details are as follows;

- The continuous variables such as age, self-efficacy for exercise, Specific self-efficacy, knee pain scale, Knee Outcome Survey Activities of Daily Living, functional performance score show as mean and standard deviation (SD).
- The categories variables such as gender, history of exercise showed as frequency and percentages

3.9.2 Inferential statistics use to analyze in the study as follows;

- Chi square test and Fisher's exact test used for analysis of baseline data about test of homogeneity of categorical data between intervention group and control group

- The independent t- test is used to find out the baseline of the differences for continuous outcomes between intervention group and control group

- Pair t-test is used to evaluate the baseline of the differences for continuous outcomes before and after implementation program within group

3.10 Ethical Consideration

This research study was approved by The Research Ethics Review Committee for Research Involving Human Research Participant, Health Science Group, Chulalongkorn University, Bangkok, Thailand (COA No.166/2020). The participants had been fully informed about research objectives and the process of this study. All of

participants sign the consent by willingness to participate in the study before conducting the research.

Chapter IV

RESEARCH RESULTS

This chapter presented the study results of quasi-experimental research design, the data collection period from August 2020 to November 2020. The purpose of this study was to evaluate the effect of LINE application on action and coping plans on exercise adherence ,self-efficacy for exercise, specific self-efficacy (task, maintenance and recovery self-efficacy), functional performance, knee outcome for activities of daily living and knee pain scale among Thai older adults with knee pain in suburban area of Bangkok Metropolis. An intervention program conducted meeting for Action and Coping plans and knee exercise session, group discussion, record exercise diary and sent instant messaging to motivate exercise via LINE Application. Researcher and research assistant collected baseline and post test data through structured questionnaire and actual function performance test in participants both intervention and control group. Eighty six participants have been recruited by purposive sampling based on the study inclusion criteria. The participants in 2 groups (intervention and control) had 100% retention with no drop out that accomplished baseline and post test data assessments. An outcomes were presented in 5 part as following:

4.1 Socio-demographic characteristics, past history related with knee pain and history of exercise of the older adults with knee pain at baseline assessment

4.2 Effect of LINE application on action and coping plans on self-efficacy for exercise (SEE) and specific self-efficacy (Task self-efficacy, Maintenance self-efficacy, recovery self-efficacy) among older adults with knee pain between and within group

4.3 Effect of LINE application on action and coping plans on knee pain scale (numeric pain rating scale: NPRS) among older adults with knee pain between and within group

4.4 Effect of LINE application on action and coping plans on functional performance among older adults with knee pain between and within group

4.5 Effect of LINE application on action and coping plans on exercise adherence among older adults with knee pain and described the various reasons of participants if they were not performed an exercise in some day between groups.

4.1 Socio-demographic characteristics, past history related with knee pain and history of exercise of the older adults with knee pain at baseline assessment

Table 9: Comparison socio-demographic characteristics of the participants for intervention group and control group at baseline (n=86)

Socio-demographic	**Interventiongroup** (n=43)	**Control group** (n=43)	***P*-value**
	n (%)	n (%)	
Age (years) Mean±SD	58.88±3.69	58.37±3.33	0.503[b]
Gender			0.181[a]
Male	19 (44.2)	13 (30.2)	
Female	24 (55.8)	30 (69.8)	
Blood pressure (mmHg)			
Systolic Mean±SD	136.05±5.32	135.09±5.63	0.422[b]
Diastolic Mean±SD	72.74±7.02	74.81±7.28	0.183[b]
Weight (kg.) Mean±SD	60.84±6.88	60.77±3.90	0.954[b]
Height (cm.) Mean±SD	163.30±6.17	165.09±3.98	0 .115[b]
BMI (kg/m^2) Mean±SD	22.79±1.51	22.32±1.09	0.104[b]

[a] Chi square test, [b] independent t- test

Table 10:Comparison socio-demographic characteristics of the participants for intervention group and control group at baseline (n=86) Cont.

Socio-demographic	**Intervention group (n=43)**	**Control group (n=43)**	***P*-value**
	n (%)	n (%)	
Education			0.970[a]
Primary School	8 (18.6)	6 (14.0)	
Secondary School	6 (14.0)	7 (16.3)	
High School /Diploma	11 (25.6)	12 (27.9)	
Bachelor Degree	12 (27.9)	13 (30.2)	
Master Degree or higher	6 (14.0)	5 (11.6)	
Marital status			0.607[a]
Single	12 (27.9)	9 (20.9)	
Married	15 (34.9)	14 (32.6)	
Widowed	9 (20.9)	8 (18.6)	
Divorced / Separated	7 (16.3)	12 (27.9)	
Occupation			0.432[a]
No occupation	8 (18.6)	3 (7.0)	
Retired Government Officer	5 (11.6)	9 (20.9)	
Government /state enterprise officer	4 (9.3)	5 (11.6)	
Private company employee	7 (16.3)	6 (14.0)	
Own Business/merchant/freelance	10 (23.3)	14 (32.6)	
Contractor/ others	9 (20.9)	6 (14.0)	

[a] Chi-square test, [b] Independent t- test

Table 11:Comparison socio-demographic characteristics of the participants for intervention group and control group at baseline (n=86) Cont.

Socio-demographic	Intervention group (n=43)	Control group (n=43)	*P*-value
	n (%)	n (%)	
Monthly income (THB/month)			0.762[a]
≤ 5,000	5 (11.6)	8 (18.6)	
5,001 – 10,000	11 (25.6)	7 (16.3)	
10,001 – 15,000	9 (20.9)	9 (20.9)	
15,001 – 20,000	8 (18.6)	10 (23.3)	
> 20,000	10 (23.3)	9 (20.9)	
Spend time to use smartphone (hour/day) Mean ±SD	3.21±1.42	3.70±1.24	0.094[b]
Reason of using smartphone			0.858[a]
Answer coming calls ,outgoing calls	9 (20.9)	7 (16.3)	
Watch movie, listen to music	7 (16.3)	10 (23.3)	
Using LINE, Facebook, Instagram etc.	11 (25.6)	9 (20.9)	
Searching for information online	10 (23.3)	9 (20.9)	
Shopping Online or Selling Online	6 (14.0)	8 (18.6)	
The most used application			0.867[a]
LINE	25 (58.1)	26 (60.5)	
Facebook	11 (25.6)	9 (20.9)	
Others (eg Twitter, Instagram)	7 (16.3)	8 (18.6)	

[a]Chi-square test , [b]Independent t- test

Table 12: Comparison socio-demographic characteristics of the participants for intervention group and control group at baseline (n=86) Cont.

Socio-demographic	Intervention group (n=43)	Control group(n=43)	*P*-value
	n (%)	n (%)	
Mainly purpose of use LINE			0.916[a]
Talk with family	12 (27.9)	11 (25.6)	
Contact close friend	5 (11.6)	7 (16.3)	
Send greeting to others	9 (20.9)	7 (16.3)	
Follow the news from friends in app	11(25.6)	10 (23.3)	
Make an appointment	6 (14.0)	8 (18.6)	
An average daily usage of LINE (hour/day)			0.739[a]
< 1 hour.	10 (23.3)	11 (25.6)	
1-3 hours.	12 (27.9)	9 (20.9)	
4-6 hours.	8 (18.6)	5 (11.6)	
7-10 hours.	7 (16.3)	10 (23.3)	
>10 hours	6 (14.0)	8 (18.6)	
Have any medical problems			0.621[a]
Yes	33 (76.7)	31 (72.1)	
No	10 (23.3)	12 (27.9)	

[a]Chi-square test , [b]Independent t- test

Totally, 86 participants (43 participants per group: intervention group vs control group) were complete baseline and post-test of questionnaires and functional performance test. All data regarding to socio-demographic characteristics at baseline of both intervention and control group were showed in the Table 9. The findings revealed that there were no any socio-demographic characteristics variables had a differences between intervention and control group (P > 0.05).The mean age of participants was 58.88 (SD=3.69) of intervention group and 58.37 (SD 3.33) for

control group. Most of them were female for intervention group (55.8%) and control group (69.8%). They had the mean of BMI 22.79 kg/m2 (SD=1.51), 22.32 kg/m2 (SD=1.09) for intervention group and control group respectively. Regarding to blood pressure, the mean of systolic blood pressure was 136.05 (SD=5.32) and diastolic blood pressure was 72.74 (SD =7.02) in intervention group which similar to control group as systolic blood pressure was 135.09 (SD=5.63), diastolic blood pressure was 74.81 (SD=7.28). Table 10, their educational level showed that mostly was a bachelor degree (27.9% vs 30.2%) for intervention vs control group. For marital status, most of them were married which 34.9% for intervention group and 32.6% for control group. Participants of intervention group had their own business or had merchant job at 23.3% as majority type of jobs which likely the same of control group as 32.6%. Table 11, the results showed that mainly (25.6%) of intervention group had monthly income 5,001 – 10,000 THB per month while the control group mostly had 15,001 – 20,000 THB per month (23.3%) with no statistical significant difference between 2 groups. According to the mean of their spending time to use smartphone, we found that intervention group spend 3.21 hour per day (SD=1.42) which they were not difference from control group as they spend 3.70 hour per day (SD=1.24). Regarding to the reason for using smartphone, intervention group mainly used for LINE, Facebook, Instagram applications (25.6%) and application that they used the most was LINE (58.1%), as well as control group most of them (23.3%) they used smartphone for watch movie and listen to music while LINE application was the most favorite application that they used (60.5%). From Table12, the study findings revealed that more than one forth from both intervention and control group used LINE for contact with their family (27.9% vs 25.6%). Also, participants from intervention group mostly used LINE application an average 1-3 hours per day (27.9%) along with control group 25.6% used this application approximately less than 1 hour per day. Furthermore, more than a half of participants for intervention and control group had medical history (76.7% and 72.1%).

Table 13: Comparison past history related with knee pain of the participants for intervention group and control group at baseline (n=86)

Past history related with knee pain	Intervention group(n=43)	Control group(n=43)	*P*-value
	n (%)	n (%)	
Side of knee pain			0.885[a]
Right side	18 (41.9)	17 (39.5)	
Left side	15 (34.9)	14 (32.6)	
Both side	10 (23.3)	12 (27.9)	
How long have you had knee pain			0.799[a]
< 7 days	11 (25.6)	13 (30.2)	
1-4 weeks	7 (16.3)	10 (23.3)	
>1 month but < 3 months	12 (27.9)	11 (25.6)	
>3 months	13 (30.2)	9 (20.9)	
Frequency of knee pain			0.849[a]
All the times	7 (16.3)	9 (20.9)	
Everyday	9 (20.9)	6 (14.0)	
Every other day	8 (18.6)	10 (23.3)	
Every week	10 (23.3)	11 (25.6)	
Every month	9 (20.9)	7 (16.3)	

[a]Chi-square test , [b]Independent t- test

Table 14:Comparison past history related with knee pain of the participants for intervention group and control group at baseline (n=86) Cont

Past history related with knee pain	**Intervention group(n=43)**	**Control group(n=43)**	***P*-value**
	n (%)	n (%)	
Level of knee pain during daily activities			0.316[a]
No pain	6 (14.0)	3 (7.0)	
Pain when step up- step down at the stair	5 (11.6)	11 (25.6)	
Pain when walking on the flat ground	7 (16.3)	5 (11.6)	
Always pain even rest/More pain at night	9 (20.9)	10 (23.3)	
Pain when sitting cross-legged	10 (23.3)	5 (11.6)	
Pain when sitting on the floor with legs - to the side	6 (14.0)	9 (20.9)	
Method to relieve knee pain			0.264[a]
Take the painkillers or NSAIDs	9 (20.9)	5 (11.6)	
Visit general practitioner at health center	11 (25.6)	7 (16.3)	
Take a rest	10 (23.3)	14 (32.6)	
Using hot compress	8 (18.6)	6 (14.0)	
Traditional Thai massage	5 (11.6)	11 (25.6)	

[a]Chi-square test, [b]Independent t- test

Table 15:Comparison past history related with knee pain of the participants for intervention group and control group at baseline (n=86) Cont

Past history related with knee pain	**Intervention group(n=43)**	**Control group(n=43)**	***P*-value**
	n (%)	n (%)	
Posture which perform the most in a daily activities			0.617[a]
Sitting on the floor with legs to the side	8 (18.6)	3 (7.0)	
Sitting cross-legged	5 (11.6)	6 (14.0)	
Squat	7 (16.3)	8 (18.6)	
Go upstairs and go downstairs	7 (16.3)	5 (11.6)	
Standing	6 (14.0)	9 (20.9)	
Walking	10 (23.3)	12 (27.9)	

[a]Chi-square test, [b]Independent t- test

From Table 13, there was no significant differences between intervention and control group in terms of past history related with knee pain. This current study found that most of participants had knee pain at right side as 41.9% from intervention group and 39.5% from control group. In addition to duration of knee pain, 30.2 % of intervention group had knee pain more than 3 months while control group had knee pain mostly less than 7 days (30.2%). Majority of the participants had knee pain every week (23.3%) for intervention group likely in control group was found 25.6%. Nearly one-quarter of participants' of intervention group (23.3%) had knee pain when sitting cross-legged and control group had knee pain when step up-step down at the stair (25.6%) as the results showed in Table 14. This research study also found that 25.6% of participants of intervention group visit general practitioner at health center when they had knee pain while control group mostly take a rest at home to relieve knee pain symptoms (32.6%). Table 15 illustrated that 23.3% of intervention group performed walking as the most in their daily activities which similar to control group (27.9%), there was no significant differences between groups.

Table 16: Comparison of history of exercise of the participants for intervention group and control group at baseline (n=86)

History of exercise	Intervention group(n=43)	Control group(n=43)	***P*-value**
	n (%)	n (%)	
Normally did you exercise or not			0.747[a]
Yes	37 (86.0)	38 (88.4)	
No	6 (14.0)	5 (11.6)	

[a]chi square, [b]independent t- test,

From the results in *Table 16,* it is clear that mostly of participants had history of exercise but not they did not perform it regularly (intervention group 86% and control group 88.4%). Moreover, our findings revealed that intervention group performed exercise less than 1 day per week as they answered others (35.1%) and control group performed exercise 1 day per week (36.8%). Majority of control group took 20-30 minutes (31.6%) when they had exercise while intervention group took less than 20 minutes (35.1%) per time of their exercise. Together, the present findings confirm that participants of intervention group liked to perform brisk walking the most (24.3%) and control group liked to do swing arms and other type of exercise (28.9%).

4.2 Effect of LINE application on action and coping plans on self-efficacy for exercise (SEE) and specific self-efficacy (Task self-efficacy, Maintenance self-efficacy , Recovery self-efficacy) among older adults with knee pain between and within group

Table 17: Comparison self-efficacy for exercise (SEE) score of the participants at baseline and post-test between group (n=86)

Time	Group	Mean±SD	t	*P*-value[b]
Baseline	Intervention (Min=35,Max=49)	44.07±2.41	1.58	0.118
	Control (Min=39,Max=49)	43.26±2.36		
Post test	Intervention (Min=59, Max=79)	71.07±4.63	28.00	0.000*
	Control (Min=38,Max=54)	45.60±3.75		

[b] Independent t- test, *significant difference *P*<0.001

Table 18: Comparison self-efficacy for exercise (SEE) score of the participants at baseline and post-test within group (n=86)

Group	Time	Mean±SD	$\overline{D}$	t	*P*-value[d]
Intervention	Baseline	44.07±2.41	-27.00	-35.61	0.000*
	Post test	71.07±4.63			
Control	Baseline	43.26±2.36	-2.34	-3.77	0.000*
	Post test	45.60±3.75			

[d] Paired t- test, *significant difference *P*<0.001, $\overline{D}$ = Baseline- post test

Table 17 showed that there were not different between the groups at baseline assessment of SEE score (t=1.58, *P* = 0.118), the mean score of both intervention and control group were low level of SEE score as score in range 0 - 44.9 (Mean= 44.07, SD =2.41 and Mean=43.26, SD=2.36) respectively. After conducted intervention program, the mean score of SEE of intervention group (Mean =71.07) was higher than control group (Mean = 45.60). Therefore, SEE score of intervention group had a significant differences higher than control group (t=28.00, *P*=0.000).

The findings of study showed that SEE score of intervention group was significant difference from baseline and post-test as score was higher after conducted program (t= -35.61, *P* =0.000). Surprisingly, there was significant increase in SEE score of control group as the mean score higher than baseline (t =-3.77, *P* =0.000) in *Table 18.*

Table 19: Comparison specific self-efficacy score (Task self-efficacy, Maintenance self-efficacy, Recovery self-efficacy) of the participants at baseline and post-test between group (n=86)

Specific Self-efficacy	**Time**	**Group**	**Mean±SD**	**t**	***P*-value[b]**
Task self-efficacy	Baseline	Intervention (Min=9,Max=17)	12.28±1.53	1.38	0.170
		Control (Min=10,Max=14)	11.88±1.07		
	Post test	Intervention (Min=13,Max=19)	16.42±1.25	15.60	0.000*
		Control (Min=10,Max=14)	12.28±1.20		
Maintenance self-efficacy	Baseline	Intervention (Min=6,Max=11)	9.37±1.15	-1.86	0.666
		Control (Min=8,Max=13)	9.79±0.91		
	Post test	Intervention (Min=11,Max=15)	13.16±1.02	14.93	0.000*
		Control (Min=8,Max=12)	9.93±0.98		
Recovery self-efficacy	Baseline	Intervention (Min=4,Max=10)	7.00±1.23	-0.98	0.330
		Control (Min= 5,Max=9)	7.23±0.94		
	Post test	Intervention (Min=8,Max=12)	9.77±0.97	12.30	0.000*
		Control (Min=6,Max=9)	7.33±0.86		

[b] Independent t- test, *significant difference *P*<0.001

Table 20: Comparison specific self-efficacy score (Task self-efficacy, Maintenance self-efficacy, Recovery self-efficacy) of the participants at baseline and post-test within group (n=86)

Specific self-efficacy	Group	Time	Mean±SD	$\overline{D}$	t	*P*–value[d]
Task self-efficacy	Intervention	Baseline Post test	12.28±1.53 16.42±1.25	-4.14	-19.52	0.000*
	Control	Baseline Post test	11.88±1.07 12.21±1.24	0.32	-1.63	0.109
Maintenance self-efficacy	Intervention	Baseline Post test	9.37±1.15 13.16±1.02	-3.79	-18.84	0.000*
	Control	Baseline Post test	9.79±0.91 9.93±0.98	-0.14	-0.77	0.445
Recovery self-efficacy	Intervention	Baseline Post test	7.00±1.23 9.77±0.97	-2.76	-16.68	0.000*
	Control	Baseline Post test	7.23±0.94 7.33±0.86	-0.09	-0.54	0.592

[d]Paired t- test, *significant difference *P*<0.001, $\overline{D}$ = Baseline - post test

Table 19 illustrated the results of specific self-efficacy score (Task self-efficacy, Maintenance self-efficacy, Recovery self-efficacy) of participants from intervention and control group. At baseline assessment, there was no difference between the groups about 3 component of specific self-efficacy score such as Task self-efficacy (t=1.38,P =0.170) , Maintenance self-efficacy (t=-1.86,P =0.666) Recovery self-efficacy (t=-0.98, P =0.330). The mean score of specific self-efficacy with 3 component of intervention group vs control group were not differences (Task: Mean= 12.28, SD=1.53 vs Mean =11.88, SD =1.07), (Maintenance: Mean =9.37, SD =1.15 vs Mean=9.79, SD =0.91), (Recovery: Mean= 7.00, SD=1.23 vs Mean =7.23, SD =0.94)

respectively. After conducted intervention program, we found that intervention group had a higher score of specific self-efficacy in 3 component than control group with statically significant at p =0.000 in each component (Task, Maintenance and recovery).

In *Table 20,* from this results it is clear that when compared the specific self-efficacy score within group of intervention group, the mean score of post-test was statically significant higher than baseline in every component (Task: t=-19.52, *P* =0.000, Maintenance: t=18.84, *P* =0.000,Recovery: t =-16.68, *P* = 0.000). On the other hand, there was not found the differences between baseline and post-test score of specific self-efficacy in 3 component within control group.

4.3 Effect of LINE application on action and coping plans on knee pain scale (Numeric pain rating scale, NPRS) among older adults with knee pain between and within group

Table 21:Comparison knee pain scale (NPRS) of the participants at baseline and post-test between group (n=86)

Time	Group	Mean±SD	t	*P*-value[b]
Baseline	Intervention	4.42±0.95	-1.22	0.208
	Control	4.70±1.08		
Post test	Intervention	2.33±0.89	-8.54	0.000*
	Control	4.58±0.95		

[b] Independent t-test, *p-value <0.001

Table 22: Comparison knee pain scale (NPRS) of the participants at baseline and post-test within group (n=86)

Group	Time	Mean±SD	$\overline{D}$	t	*P*-value[d]
Intervention	Baseline	4.42±0.95	2.09	12.88	0.000*
	Post test	2.33±0.89			
Control	Baseline	4.70±1.08	0.11	0.81	0.418
	Post test	4.58±0.95			

[d]Paired t- test, *significant difference p<0.001, $\overline{D}$ = Baseline - post-test

Our findings on knee pain scale (NPRS) when compared between group at baseline revealed that there was not significant difference of NPRS mean score between 2 groups at *P* = 0.208, t=1.22 (intervention Mean= 4.42,SD =0.95 and control Mean =4.70, SD =1.08) as they had moderate pain level (scale 4 to 6) in *Table 21*. However, for post-test the NPRS mean score showed a significant difference between group (t=-8.54, *P* = 0.000), intervention group had lower NPRS mean score (Mean =2.33, SD =0.89) than control group (Mean =4.58, SD=0.95). Participants of intervention group decrease knee pain to mind level (scale 1 to 3) after conducted the intervention program while control group had pain in moderate level.

The findings in *Table 22* showed that there was significant difference of NPRS mean score between baseline and post-test of intervention group (t= 12.88, *P* =0.000). In contrast with control group, there was not difference of mean NPRS score from baseline and post-test (t =0.81, *P*=0.418).

4.4 Effect of LINE application on action and coping plans on functional performance consist of Knee Outcome Survey-Activities of Daily Living (KOS-ADLS), Knee range of motion (ROM), Timed up and Go (TUG), 30-Second chair stand (30CST) among older adults with knee pain between and within group

Table 23: Comparison functional performance score of the participants at baseline and post test between group (n=86)

Variables	Time	Group	Mean±SD	t	*P*-value[b]
KOS-ADLS (%)	Baseline	Intervention	72.46±1.21	-0.57	0.239
		Control	72.66±1.99		
	Post test	Intervention	86.96±1.71	50.67	0.000*
		Control	72.09±0.88		
Knee ROM right side (degree)	Baseline Flexion	Intervention	121.78±2.22	0.88	0.379
		Control	121.07±3.55		
	Extension	Intervention	3.37±1.21	0.20	0.838
		Control	3.31±0.96		
	Post test Flexion	Intervention	127.05±3.48	6.10	0.000*
		Control	121.21±3.60		

[b] Independent t- test, *significant difference *P*<0.001

Table 24:Comparison functional performance score of the participants at baseline and post test between group (n=86) Cont

Variables	Time	Group	Mean±SD	t	*P*-value[b]
Knee ROM right side (degree)	post test Extension	Intervention Control	1.26±0.85 3.14±0.78	-8.52	0.000*
Knee ROM left side (degree)	Baseline Flexion	Intervention Control	121.41±2.08 121.62±1.76	-0.39	0.697
	Extension	Intervention Control	3.44±1.15 3.92±1.09	-1.54	0.128
	Post test Flexion	Intervention Control	127.89±3.68 121.08±2.03	8.37	0.000*
	Extension	Intervention Control	1.33±0.78 3.81±1.23	-8.74	0.000*

[b] Independent t- test, *significant difference *P*<0.001

Table 25: Comparison functional performance score of the participants at baseline and post test between group (n=86) Cont

Variables	Time	Group	Mean±SD	t	*P*-value[b]
TUG (Sec)	Baseline	Intervention Control	11.14±0.88 11.51±0.97	-1.80	0.075
	Post test	Intervention Control	8.74±0.86 11.34±1.24	-11.26	0.000*
30 CST (Times in 30 second)	Baseline	Intervention Control	12.30±1.48 12.12±0.82	0.71	0.475
	Post test	Intervention Control	16.26±1.09 12.09±1.21	16.73	0.000*

[b] Independent t- test, *significant difference *P*<0.001

From *Table 23, Table 24 and Table 25* showed the results of functional performance between intervention and control group. There were no significant differences in 5 component of functional performance between groups at baseline assessment (KOS-ADLS: t= -0.57, *P* =0.239), (knee ROM Right side flexion: t= 0.88, *P* =0.379, extension: t=0.20, *P* =0.838), (knee ROM Left side flexion: t= -0.39, *P* =0.697, extension: t=-1.54, *P*= 0.128), (TUG : t =-1.80, *P* =0.075) and (30 CST: t=0.71, *P* =0.475) For intervention group vs control group, the mean score of KOS-ADLS at baseline (72.46, SD =1.21) vs (72.66,SD = 1.99), the mean score of knee ROM Right side flexion (121.78, SD =2.22 vs 121.62, SD =1.76) and extension (3.37, SD =1.21 vs 3.31, SD =0.96), the mean score of knee ROM Left side flexion (121.41, SD =2.08 vs 121.62, SD=1.76) and extension (3.44, SD =1.15 vs 3.92, SD =1.09), the mean score of TUG at baseline intervention group (11.14, SD =0.88) and control group (11.51, SD = 0.97), the mean score of 30 CST at baseline of intervention group (12.30, SD =1.48) and control group (12.12, SD =0.82) . When comparison function performance between group at post-test, we found that there were significant differences in 5 component of functional performance as intervention group had a higher score or improve their functional performance than control group such as the mean score of KOS-ADLS (intervention group: Mean = 86.96, SD =1.71 vs control group: Mean =72.09,SD =0.88)

at *P= 0.000,* t=50.67. The mean of knee ROM Right side (intervention group flexion : Mean = 127.89, SD =3.68 vs control group flexion :Mean = 121.08, SD =2.03) at *P*=0.000, t= 6.10 and (intervention group extension: Mean = 1.26,SD =0.85 vs control group extension: Mean 3.14, SD= 0.78) at *P*=0.000, t= -8.52. Moreover, the mean of knee ROM Left side (intervention group flexion : Mean =127.89,SD =3.68 vs control group flexion :Mean =121.08, SD=2.03) at *P*= 0.000, t= 8.37 and (intervention group extension: Mean = 1.33,SD =0.78 vs control group extension: Mean = 3.81,SD =1.23) at P=0.000, t= -8.74. Regarding to TUG score at post-test, intervention group was improved from baseline (Mean = 8.74, SD =0.86) but control group was not improved their TUG score (Mean = 11.34, SD =1.24) at *P*=0.000, t= -11.26. Lastly, the result found that intervention group had higher mean score of 30 CST after completed intervention program when compared to control group (Mean = 16.26,SD= 1.09 vs Mean= 12.09, SD=1.21) at P =0.000, t= 16.73.

Table 26: Comparison functional performance score of the participants at baseline and post test <u>within group</u> (n=86)

Variables	Group	Time	Mean±SD	$\overline{D}$	t	*P*-value[d]
KOS-ADL(%)	Intervention	Baseline Post test	72.46±1.21 86.96±1.71	-14.50	-41.25	0.000*
	Control	Baseline Post test	72.66±1.99 72.09±0.88	0.56	1.88	0.066
Knee ROM Right side (degree)	<u>Intervention</u> Flexion	Baseline Post test	121.78±2.22 127.00±3.48	-5.22	-13.27	0.000*
	Extension	Baseline Post test	3.37±1.21 1.26±0.85	2.11	14.60	0.000*
	<u>Control</u> Flexion	Baseline Post test	121.07±3.55 121.21±3.60	-0.13	-0.64	0.526
	Extension	Baseline Post test	3.31±0.96 3.14±0.78	0.17	1.09	0.283

[d]Paired t- test, *significant difference *P*<0.001, $\overline{D}$ = Baseline - post test

Table 27: Comparison functional performance score of the participants at baseline and post test within group (n=86) Cont

Variables	Group	Time	Mean±SD	$\overline{D}$	t	*P*–value[d]
Knee ROM Left side (degree)	Intervention Flexion	Baseline	121.41±2.08	-6.48	-10.32	0.000*
		Post test	127.89±3.68			
	Extension	Baseline	3.44±1.15	2.11	12.94	0.000*
		Post test	1.33±0.78			
	Control Flexion	Baseline	121.62±1.76	0.53	1.25	0.223
		Post test	121.08±2.03			
	Extension	Baseline	3.92±1.09	0.11	0.82	0.416
		Post test	3.81±1.23			
TUG	Intervention	Baseline	11.14±0.88	2.40	20.75	0.000*
		Post test	8.74±0.86			
	Control	Baseline	11.51±0.97	0.16	1.26	0.212
		Post test	11.34±1.24			
30CST	Intervention	Baseline	12.30±1.48	-3.95	-14.97	0.000*
		Post test	16.26±1.09			
	Control	Baseline	12.12±0.82	0.02	0.15	0.881
		Post test	12.09±1.21			

[d]Paired t- test, **significant difference *P*<0.001, $\overline{D}$ = Baseline - post test

Table 26 and Table 27 demonstrated that function performance score of intervention group between baseline and post-test were significant difference of 5 component (KOS-ADLS, Knee ROM Right side , Knee ROM Left side, TUG and 30 CST) at *P* = 0.000 but no significant difference in any component in control group.

4.5 Effect of LINE application on action and coping plans on exercise adherence (Day/week ,Set/week : frequency), (Minutes/day :duration) among older adults with knee pain between group after implement program

Table 28: Comparison exercise adherence of the participants in each exercise session after implement program <u>between</u> intervention group and control group (n=86)

Exercise session	Adherence	Group	Mean±SD	t	*P*-value[b]
1.Range of - motion exercise	Day/week	Intervention	5.23±0.97	10.74	0.000*
		control	3.12±0.85		
	Min/day	Intervention	5.02±0.93	9.62	0.000*
		control	3.21±0.80		
	Set/week	Intervention	15.47±2.82	11.24	0.000*
		control	8.91±2.58		
2.Isometric - quadriceps contraction	Day/week	Intervention	5.33±0.94	12.06	0.000*
		Control	2.98±0.85		
	Min/day	Intervention	5.21±0.98	9.81	0.000*
		Control	3.33±0.77		
	Set/week	Intervention	15.72±2.78	12.41	0.000*
		Control	8.67±2.47		

[b] Independent t- test, *significant difference *P*<0.001

Table 29: Comparison exercise adherence of the participants in each session after implement program <u>between</u> intervention group and control group (n=86) Cont.:

Session	Adherence	Group	Mean±SD	t	*P*-value[b]
3.Straight leg raises	Day/week	Intervention	5.16±0.92	11.89	0.000*
		Control	2.88±0.85		
	Min/day	Intervention	5.05±0.97	10.32	0.000*
		Control	3.05±0.81		
	Set/week	Intervention	15.49±2.47	13.85	0.000*
		Control	8.12±2.46		
4. Sit to stand	Day/week	Intervention	5.09±0.92	10.58	0.000*
		Control	3.05±0.87		
	Min/day	Intervention	5.07±0.98	11.00	0.000*
		Control	2.88±0.85		
	Set/week	Intervention	15.16±2.35	12.74	0.000*
		Control	8.26±2.66		

[b] Independent t- test, *significant difference *P*<0.001

Table 30: Comparison exercise adherence of the participants in each session after implement program between intervention group and control group (n=86) Cont.

Session	Adherence	Group	Mean±SD	t	*P*-value[b]
5.Step-ups	Day/week	intervention	5.02±0.91	10.55	0.000*
		control	2.98±0.88		
	Min/day	intervention	4.95±0.97	8.21	0.000*
		control	3.30±0.88		
	Set/week	intervention	15.37±2.55	14.56	0.000*
		control	7.79±2.26		

[b] Independent t- test, *significant difference *P*<0.001

Our finding on exercise adherence of intervention group and control group after completed intervention program illustrated that a statistically significant differences appeared in terms of exercise adherence (frequency and duration) of both groups from 5 session of exercises at (*P*= 0.000). Participants of intervention group had a frequency and duration of exercise more than control group as in *Table 28 to Table 30*

Table 31: Comparison the reason of participants if they are not perform exercise in some day between intervention group and control group (n=86)

Reason if not perform exercise	Intervention group (n=43)	Control group (n=43)	*P*-value[a]
	n (%)	n (%)	
Busy	6 (14.0)	6 (14.0)	
Forget	7 (16.3)	22 (51.2)	0.002[#]
Feel tried	9 (20.9)	8 (18.6)	
Others reason	21 (48.8)	7 (16.3)	

[a] Chi-square test, [#] *P*-value < 0.01

Table 31 demonstrated that it was no statistical difference in terms of the reason if participants exercise in some day between two groups (*P* =0.002). For intervention group most of them had other reason when they are not exercise in

some day (48.8%) which difference from control group more than a half of them forget to exercise (51.2%).

Table32: Summary of outcomes that significant differences after implementation programs

Outcomes	Between group Significant (P <0.001)	Within group Significant (P< 0.001)	
		Intervention gr.	Control gr.
1. SEE	X	X	X
2. Specific Self-efficacy			
-Task	X	X	
-Maintenance	X	X	
-Recovery	X	X	
3.Knee pain scale (NPRS)	X	X	
4. Functional performance			
Knee ROM	X	X	
TUG	X	X	
30CST	X	X	
KOS-ADLS	X	X	
5. Exercise adherence	X	Measure only post test	

From table 32 showed that the statically significant improvement was found in all outcomes measurement among intervention group when compared between and within group. For control group, there was significant difference in SEE outcome within group after implemented program.

Chapter V

Discussion

This quasi-experimental research study aimed to determine the effect of LINE application on action and coping plans on exercise adherence and functional performance among older adults with knee pain. As researcher expected an intervention program could effect on participants adherence to exercise, self-efficacy for exercise and specific self-efficacy, knee pain scale and functional performance among the older with knee pain. Consequently, we obtained good results with this simple method of our intervention program, there was strong evidence to suggest that exercise adherence of the participants including frequency and duration were differences between intervention group and control group.

Moreover, in terms of self-efficacy and knee pain were improved as well as it was enhanced functional performance outcome of older adults of intervention group than control group. In this chapter, the results of the study discussed and interpreted in relevant related literature. The discussion part include limitation of the study, conclusion, recommendation and further research suggestion.

5.1 Discussion of the findings

Socio-demographic characteristics of participants

The study findings revealed that there was no significant difference in socio-demographic characteristics outcome between 2 groups because this current study using validated and standardized screening tools that is appropriate for screening older adults with knee pain in the community-dwelling as target population in the study (C. Jinks et al., 2004). Therefore, the method of stratify the data to eliminate impact of confounding factor as multivariate analyses is no need to use in the process of data analyzed for outcomes measurement. It is consistent with previous study (Ilori, Ladipo, Ogunbode, & Obimakinde, 2016) as the participants were screened by KNEST screening tools, the demographic data of knee osteoarthritis patients were not found in the study.

Self-efficacy for exercise and specific self-efficacy

There was showed noteworthy statistical significant differences of self-efficacy for exercise between two groups of participants. Furthermore, self-efficacy for exercise was found an improvement within both group also but control group slightly increase of their self-efficacy for exercise while intervention group had significantly a higher scores than control group after completed program. These in line with previous study (Chung et al., 2020) after 12 weeks periods of the study was found that both intervention and control group were increased self-efficacy for exercise among older people. We could explained that our findings echoed with the self-efficacy theory (Bandura, 1997) as who had the stronger individual's self-efficacy more likely it is that persons will initiate and continue with their given activity that self –efficacy for exercise was positive proportion to participants exercise adherence in those 2 groups. Regarding to specific self-efficacy (Task, maintenance and recovery) the results confirmed that intervention group after received action and coping plan together with LINE application for reminder, their perceptions about capability to function as this study measured by specific self-efficacy questionnaire significantly improved in 3 component of specific self-efficacy (Task, maintenance and recovery) at post-test, though no significant changes was found within control group. The relationship of action and coping plans and individual's self-efficacy was predicted by HAPA model (Schwarzer et al., 2008). The action and coping plans gave the participants plans to start their activities that in turn might have led to enhance their self-belief and confidence about their functional ability (Falko F. Sniehotta et al., 2005) along with increase their perceived ability to handle positively with exercise in their daily life. This present study had findings consistent with the prediction of HAPA model (Schwarzer et al., 2008) and other study (Luszczynska, 2006) as we can explain that action and coping plans are useful means to improved person's specific self-efficacy enhance person's intention to exercise and coping the barrier which happened while they had gave up from the plan to do exercise.

The other point to be highlighted was the results of this study illustrated that task self-efficacy as the highest differences score (t = 15.60, P< 0.001 level) from others 2 components of specific-self efficacy when compared between group. Due to the HAPA model (Schwarzer et al., 2008), task self-efficacy is the key which influences goals and implementation intentions of people. If they initiates task it is the starting point to become change to new behavior.

Knee pain and functional performance

As knee pain is the main problem of the participants in this study. The results revealed that there was significant difference decrease knee pain scale and improve functional performance among intervention group in every aspect when compared to those control group at post-test as it showing no significant differences in terms of knee pain and functional performance. An intervention program had effect to change older adults' knee pain scale and provide benefit to improving their knee function ability. From knee pain part, our results was consistent with the study in 2010 (Pisters et al., 2010) as the outcomes shown improvements in pain after participants completion an exercise program. There are the reason that we can explain the results that an intervention program was combined method base on self -efficacy theory and HAPA model also include instant massaging to motivate and remind participants to become adherence to exercise, meaning the participants complete an adequate exercise base on their followed the plan of intervention program among intervention group which their outcome were reducing pain and improve knee function. On the other hand, it was observed that control group had lower the duration and frequency of exercise (from record of exercise diary) that leading to a higher mean score of knee pain scale than intervention group. This was the reason of some participants in control group who had experienced common injury for example falls at home, therefore they tried to avoid to perform daily activities or doing exercise.

In term of functional performance, this present study found significant difference between both groups, and intervention group was found improvement functional performance such as KOSADLS, Knee ROM at left side and right side, TUG

and 30CST but in contrast no significant *(P* >0.05) differences was found in the control group of any component of functional performance. Improvement of function performance could have been influence from some factors. Firstly, an increase knee function performance by participants who accomplished program might be attribute to effect of intervention program which include exercise session with researcher every week (1 day per week) and doing home exercise. These similar improvement of functional performance is obtained from previous studies which have required older adults with knee pain to completed knee exercise program (H. Chen et al., 2019; Shelbourne, Biggs, & Gray, 2007). Second point, exercise adherence of intervention group was higher than control group because they received exercise session together with do the action plan and coping plan and receive instant messaging to motivate and remind them to reach their goal of exercise. These evidence in line with other study and systematic review (F.-K. I. Lee et al., 2016; van Gool et al., 2005) Third, an intervention program of this study as action and coping plans with LINE application could have affected the functional performance scores of older adults because their concentration on the exercise program, coping to an obstacles better with exercise program (Sohl & Moyer, 2009) and they had greater valuable beliefs in exercises that they accomplished (Boulton et al., 2019).

Exercise adherence

The significant difference was found exercise adherence between intervention group and control group after finished intervention program. The findings illustrated that intervention group received action and coping plans with LINE application which participants met with researcher every week even face to face and they can contact to researcher in LINE application as send messages motivate and reminder to them if they had any questions about knee exercise or intervention program they also freely to asked researcher in LINE application on the other hand control group was not received it. For these reason it has highlighted some of the issues that explain why participants of intervention group would have better exercise adherence with more frequently (estimate 5 day/weeks and 15 sets/week for frequency and exercise duration per each session approximately 5 minutes/day) and they improved knee

function performance and decreased knee pain(Aitken, Buchbinder, Jones, & Winzenberg, 2015). From process of intervention program may lead to researcher and participants had a good relationship, which is one factor that promote exercise adherence for older adults (Killingback, Tsofliou, & Clark, 2017) trusting relationships between researcher and participants likely affected to exercise adherence outcome. Moreover, perhaps of response bias cannot be excluded from this study. But it is known that adherence research study include self-report exercise diary, the participants could be record their overestimate or underestimate exercise adherence (Picorelli, Pereira, Pereira, Felício, & Sherrington, 2014).

5.2 Strength and Limitation

There were 2 main of strength of this study as following;

1. Regarding to 14 weeks of an intervention program gave insight into beneficial effect on adherence to exercise of participants.
2. Implementation action and coping plans with LINE application could convince participants to be interested and continue perform exercise than control group. As intervention program quite suitable and easy to perform exercise for older adults who living in community dwelling.
3. An intervention program of this study would be applicable in other similar area because an intervention involves online information technology via LINE application that encourage the older adults received motivation messages, encouragement and reminder them to continue to use action and coping plans while they stay at home or anywhere. The benefit of using online technology among older adults, it help them to maintain their adherence to exercise and improvement of knee functional performance in long term.

There are certain limitations in this study could be noted as following;

1. The accuracy of self-report as using for measurement in the study could be limited because it makes sense that short-term memory of older adult would impact recall-based methodologies and recording error might be under or over reported

2. For special need older adults with knee pain who used smartphone base on the study criteria, therefore other older adults who had not used smartphone did not have chance to participate to this study
3. Period of data collection after completed program at 14 weeks with no follow up for the long-term sustainability of exercise adherence and functional performance among older adults because the limited time of study.

5.3 Conclusion

The study findings demonstrate that action and coping plans with LINE application have beneficial effects to Thai older adults with knee pain, these effects were most perceptible in exercise adherence and functional performance. An intervention group revealed significant improvement of their self-efficacy for exercise , specific-self efficacy (task, maintenance and recovery) knee pain and knee functional performance outcomes such as KOSADLS, knee ROM,TUG and 30CST also they had better exercise adherence whereas control group only improved of the self-efficacy for exercise. Moreover, apply technology from application on smartphone as LINE combination with action and coping plans was found effective to enhance older adults' adherence, motivate and encourage them to become adherer of exercise and decrease knee pain which it advantage to prevent them from knee osteoarthritis and disability.

5.4 Recommendation and further research suggestion

The results of this study demonstrate that action and coping plans with LINE application program likely to effective health prevention program for help public health professional increase exercise adherence, reduce knee pain and improve knee function performance among older adults as it could prevent their knees not attribute to knee osteoarthritis and take step to disability. For future research directions should include larger samples and consider feasible long-term intervention

program and follow up older adults exercise adherence which their achieve maintenance of their exercise behavior and improve the musculoskeletal health. Moreover, weight management program is the one of important point that should be highlight for the research in the future because weight loss decrease knee joint loads and it has beneficial effects well beyond for those who had knee pain. Therefore, utilizing a combination of exercise and weight management program would be concern for health prevention program for Thai older adults.

Further analysis; the Difference-in-differences (DiD) method is recommended for comparison the changes in outcomes overtime between the intervention and the control group.

For health care policy, knee pain as a public health problem for Thai older adults and impact of developing to knee osteoarthritis. Consequently, the government should develop a health improvement and health prevention program to reduce knee pain in the older adults group as of great concern. Specially, public health nurse should integrate knee exercise program along with strategy to motivate individual intension and enhance their self-efficacy to maintaining their adherence to exercise and improve knee function, and take part in these anywhere then become part of older adult's daily routine.

Appendix A : Screening Questionnaire

หมายเลข

วันที่ _____เวลา_____

แบบสอบถามเพื่อคัดกรองผู้เข้าร่วมโครงการวิจัยเกี่ยวกับผลของโปรแกรมไลน์ในการดำเนินการและการวางแผนรับมือเพื่อให้เกิดการออกกำลังกายอย่างสม่ำเสมอในผู้สูงอายุที่มีอาการปวดเข่าในเขตชานเมืองของกรุงเทพมหานคร

คำแนะนำ: กรุณากรอกข้อมูลของท่านลงในช่องว่าง และทำเครื่องหมาย ✓ ลงในช่องว่างที่กำหนดไว้ให้ตามความเป็นจริงที่เกี่ยวกับตัวท่าน

วัน/เดือน/ปีเกิด_____ ปัจจุบันท่านอายุ_____ปี เพศ ☐ชาย ☐หญิง

ข้อความ	ใช่	ไม่ใช่
1. ท่านอาศัยอยู่ที่ชุมชนทัพฟ้า เขตสายไหม หรือ อาศัยอยู่ในชุมชนเฉลิมสุข 9 เขตบางเขนมากกว่า 6 เดือนขึ้นไป		
2. ท่านสามารถอ่านและเขียนภาษาไทยได้ เพื่อใช้ทักษะดังกล่าวในการเข้าร่วมกิจกรรมการดำเนินการและการวางแผนรับมือ และตอบแบบสอบถามต่างๆหรือลงบันทึกในสมุดการออกกำลังกายประจำวัน		
3. ท่านมีอาการปวดหรือเคยปวดที่บริเวณเข่าทั้งสองข้าง/เข่าข้างซ้าย/เข่าข้างขวาในระหว่างที่ท่านกำลังเคลื่อนไหว หรือมีอาการปวดเข่าเป็นเวลาหลายวันใน 1 สัปดาห์หรือมากกว่านั้น ในช่วง 12 เดือนที่ผ่านมา		
4. ท่านเคยไปพบแพทย์เกี่ยวกับการอาการปวดเข่าและแพทย์วินิจฉัยว่าท่านเป็นโรคปวดเข่า นอกจากจากนี้ท่านเคยได้รับการรักษา เช่น ทำกายภาพบำบัด, รับประทานยาแก้ปวด, ยาต้านการอักเสบ หรือฉีดยาสเตียรอยด์เข้าบริเวณข้อเข่าในช่วง 3 เดือนที่ผ่านมา ซึ่งกระบวนการการรักษาข้างต้นสิ้นสุดลงแล้ว แต่อาการปวดเข่าของท่านก็ยังไม่หาย		
5. ท่านออกกำลังกายน้อยกว่า 3 วันต่อสัปดาห์ และใช้เวลาในการออกกำลังกายน้อยกว่า 30 นาทีในการออกกำลังกายแต่ละครั้ง		
6. ท่านสามารถปฏิบัติกิจวัตรประจำวันได้ด้วยตนเองและสามารถเดินได้เองโดยไม่ใช้อุปกรณ์ใดๆในการช่วยเดินหรือช่วยพยุง		
7. ท่านมีความยินดีที่จะเข้าร่วมกิจกรรมการออกกำลังกายบริหารเข่า เช่น กิจกรรม		

ที่ใช้การดำเนินการและการวางแผนรับมือเพื่อการออกกำลังกายบริหารข้อเข่าอย่างสม่ำเสมอ		
8.ท่านเป็นคนที่มีความตั้งใจในการออกกำลังกาย แต่ประสบปัญหาว่าแผนที่เคยตั้งไว้เกี่ยวกับการออกกำลังกายล้มเหลว และท่านมีความตั้งใจที่จะวางแผนในการออกกำลังกายอีกครั้ง และจะพยายามทำตามแผนที่วางไว้ให้ได้		
9. ท่านใช้สมาร์ทโฟนและใช้แอพพลิเคชั่นไลน์บนมือถือของท่าน และสามารถเชื่อมต่ออินเทอร์เน็ตได้ตลอดเวลา		
10. ท่านได้รับการวินิจฉัยจากแพทย์ว่าเป็นโรคข้อเข่าเสื่อม หรือโรคข้ออักเสบรูมาตอยด์หรือโรคเกาต์ หรือท่านเคยมีประวัติการผ่าตัดเปลี่ยนข้อเข่าเทียมที่บริเวณเข่าข้างใดข้างหนึ่ง หรือเคยมีการบาดเจ็บที่บริเวณเข่า หรือมีอาการขาอ่อนแรงซึ่งเป็นอาการที่เกิดขึ้นจากโรคเกี่ยวกับระบบประสาทและสมอง		
11. ในช่วง 6 เดือนที่ผ่านมา ท่านเคยมีการผ่าตัดที่บริเวณอวัยวะส่วนล่าง เช่น ขา เข่า หรือบริเวณเท้า		
12.ท่านมีประวัติเป็นโรคหลอดเลือดสมอง,โรคเกี่ยวกับระบบประสาทและสมอง, มีประวัติเกี่ยวกับความผิดปกติทางจิตประสาทและอารมณ์,โรคหัวใจ,โรคเกี่ยวกับระบบทางเดินหายใจ เช่น โรคปอด,โรคหอบหืด หรือเป็นโรคความดันโลหิตสูงระดับปานกลาง โดยมีค่าความดันโลหิตตัวบนเท่ากับ 160-179 มิลลิเมตรปรอท และ/หรือความดันโลหิตตัวล่างเท่ากับ 100-109 มิลลิเมตรปรอท หรือโรคความดันโลหิตสูงระดับรุนแรง โดยมีค่าความดันโลหิตตัวบนมากกว่าหรือเท่ากับ 180 มิลลิเมตรปรอทและ/หรือความดันโลหิตตัวล่างมากกว่าหรือเท่ากับ 110 มิลลิเมตรปรอท นอกจากนี้ท่านได้รับประทานยาลดความดันโลหิตอยู่อย่างน้อย 1 ชนิด *เพื่อประเมินว่าค่าความดันโลหิตของท่านอยู่ในเกณฑ์ดังกล่าวหรือไม่ ผู้วิจัยจะทำการวัดความดันโลหิตให้ท่าน* วัดครั้งที่ 1 ค่าความดันโลหิตตัวบน/ตัวล่าง _____ มิลลิเมตรปรอท วัดครั้งที่ 2 ค่าความดันโลหิตตัวบน/ตัวล่าง _____ มิลลิเมตรปรอท ค่าเฉลี่ยความดันโลหิตตัวบน/ตัวล่าง_____มิลลิเมตรปรอท		

แบบสอบถามเกี่ยวกับข้อมูลทั่วไปเกี่ยวกับตัวท่าน

1. น้ำหนัก _____ กิโลกรัม

2. ส่วนสูง_____เซนติเมตร

3. ดัชนีมวลกาย_____กิโลกรัม/เมตร^2

4. ระดับการศึกษาสูงสุด

☐ ประถมศึกษา ☐ มัธยมศึกษาตอนต้น ☐ มัธยมศึกษาตอนปลายหรืออนุปริญญา

☐ ปริญญาตรี ☐ ปริญญาโทหรือสูงกว่า

5. สถานภาพสมรส

☐ โสด ☐ สมรส ☐ หม้าย ☐ หย่า/แยกกันอยู่

6. ปัจจุบันท่านประกอบอาชีพอะไร

☐ ไม่ได้ประกอบอาชีพ

☐ ข้าราชการเกษียร ☐ ข้าราชการ/รัฐวิสาหกิจ ☐ พนักงานบริษัทเอกชน

☐ ธุรกิจส่วนตัว ☐ ค้าขาย/อาชีพอิสระ 6☐ รับจ้าง ☐ อื่นๆ (ระบุ)_____

7. ท่านมีรายได้ต่อเดือนเท่าไหร่

☐ น้อยกว่า 5000 บาท/เดือน ☐ 5,001-10,000 บาท/เดือน ☐ 10,001 -15,000 บาท/เดือน

☐ 15,001 – 20,000 บาท/เดือน ☐มากกว่า 20,000 บาทขึ้นไป /เดือน

8. ท่านใช้สมาร์ทโฟนประมาณกี่ชั่วโมงต่อวัน _____ ชั่วโมง

9. เหตุผลที่สำคัญที่สุดในการใช้สมาร์ทโฟนของท่านคืออะไร

☐ รับสายโทรเข้าและโทรออก ☐ ดูหนัง,ฟังเพลง

☐ เล่นบริการทางสังคมเช่น ไลน์ เฟซบุ๊ก อินสตราแกรม ทวิตเตอร์

☐ ค้นคว้าหาข้อมูลทางอินเทอร์เนต ☐ ซื้อ-ขายสินค้าออนไลน์

10. แอพพลิเคชั่นที่ท่านชอบใช้มากที่สุดบนสมาร์ทโฟนคืออะไร

☐ ไลน์ ☐ เฟซบุ๊ก ☐ ทวิตเตอร์ ☐ อินสตาแกรม

11. เนื่องจากที่ท่านใช้แอพพลิเคชั่นไลน์บนสมาร์ทโฟน วัตถุประสงค์หลักของท่านในการใช้แอพพลิเคชั่นไลน์เพื่ออะไร

☐ สนทนาหรือพูดคุยกับคนในครอบครัวและญาติ ☐ ติดต่อกับเพื่อนสนิท

☐ ส่งคำอวยพรหรือให้กำลังใจผู้อื่น ☐ ติดตามข่าวสารต่างๆของเพื่อนในไลน์

☐ นัดหมายในการทำกิจกรรมต่างๆ ☐ อื่นๆ (โปรดระบุ)_____

12. ระยะเวลาที่ท่านใช้แอพพลิเคชั่นไลน์โดยเฉลี่ยกี่ชั่วโมงต่อวัน

☐ น้อยกว่า 1 ชั่วโมง ☐ 1-3 ชั่วโมง ☐ 4-6 ชั่วโมง ☐ 7-10 ชั่วโมง ☐ มากกว่า 10 ชั่วโมงขึ้นไป

13. ท่านมีโรคประจำตัวหรือไม่

☐ ไม่มีโรคประจำตัว ☐ มีโรคประจำตัว

ประวัติเกี่ยวกับการปวดเข่าของท่าน

1. ท่านปวดเข่าข้างใด

☐ ข้างขวา ☐ข้างซ้าย ☐ ทั้งสองข้าง

2.ท่านปวดเข่ามานานเท่าไร

☐ น้อยกว่า 7 วัน ☐ 1- 4 สัปดาห์ ☐ มากกว่า 1 เดือน แต่ไม่ถึง 3 เดือน

☐ 3 เดือนขึ้นไป

3. ความถี่ในการปวดเข่าของท่าน

☐ ตลอดเวลา ☐ ทุกวัน ☐ วันเว้นวัน ☐ ทุกอาทิตย์ ☐ ทุกเดือน

4. ท่านมีอาการปวดเข่าอยู่ในระดับใดเมื่อทำกิจกรรม

☐ ไม่ปวด ☐ ปวดเมื่อขึ้น-ลงบันได ☐ ปวดเมื่อเดินบนพื้นราบ

☐ ปวดตลอดเวลาแม้ขณะพัก ☐ ปวดมากขึ้นตอนนอนกลางคืน ☐ ปวดตอนนั่งไขว่ห้าง

☐ ปวดตอนนั่งพับเพียบ

5. ท่านทำอย่างไรในการบรรเทาเมื่อมีอาการปวดเข่า

☐ รับประทานยาแก้ปวดหรือยาต้านการอักเสบชนิดที่ไม่ใช่สเตียรอยด์

☐ ไปพบแพทย์ที่ศูนย์อนามัย ☐ นอนพัก ☐ ประคบร้อน

☐ นวดแผนไทย

6. ท่าทางแบบใดที่ท่านทำบ่อยที่สุดตอนทำกิจวัตรประจำวัน

☐ นั่งพับเพียบ ☐ นั่งไขว่ห้าง ☐ นั่งยองๆ

☐ เดินขึ้น-ลงบันได ☐ ยืน ☐ เดิน

ประวัติการออกกำลังกายของท่าน

1. โดยปกติแล้วท่านออกกำลังกายหรือไม่

☐ ไม่เคยเลย (หากตอบข้อนี้ไม่ต้องตอบคำถามข้อที่ 14 และข้อที่ 15)

☐ 1 วันต่อสัปดาห์ ☐ 2 วันต่อสัปดาห์

☐ 3 วันต่อสัปดาห์ ☐ อื่นๆ (โปรดระบุ)_____

2. ท่านใช้เวลานานเท่าไหร่ในการออกกำลังกายแต่ละครั้ง

☐ น้อยกว่า 20 นาที ☐ 20-30 นาที

☐ 31-60 นาที ☐ มากกว่า 60 นาทีขึ้นไป

3. ในชีวิตประจำวันท่านชอบออกกำลังกายแบบใดมากที่สุด

☐ เดินเร็ว ☐ วิ่งเหยาะๆ ☐ เต้นแอโรบิค

☐ปั่นจักรยาน ☐ รำไท้เก็ก/ชี่กง ☐ แกว่งแขน ☐ อื่นๆ (โปรดระบุ)_____

Appendix B : Structured questionnaire

หมายเลข

วันที่บันทึก_____

แบบสอบถามงานวิจัยเรื่อง: ผลของโปรแกรมไลน์ในการดำเนินการ และการวางแผนรับมือ เพื่อให้เกิดการออกกำลังกายอย่างสม่ำเสมอในผู้สูงอายุที่มีอาการปวดเข่าในเขตชานเมือง กรุงเทพมหานคร ประเทศไทย: การศึกษาแบบกึ่งทดลอง

แบบสอบถามนี้มีจุดประสงค์เพื่อศึกษาผลของโปรแกรมไลน์ซึ่งใช้ร่วมกับการดำเนินการและการวางแผนรับมือในผู้สูงอายุที่มีอาการปวดเข่าเพื่อให้ผู้สูงอายุได้มีการออกกำลังกายอย่างสม่ำเสมอ ผู้วิจัยจะนำผลจากการศึกษามาเป็นแนวทางในการวางแผนในการส่งเสริมสุขภาพของผู้สูงอายุในเสริมสร้างการออกกำลังกายอย่างต่อเนื่อง สร้างความมั่นใจในความสามารถของตนเองในการออกกำลังกาย และเพิ่มสมรรถนะของข้อเข่าและลดอาการปวดเข่าในระยะยาวเท่าที่เป็นไปได้ ข้อมูลทั้งหมดที่ได้จากการตอบแบบสอบถามของท่านจะใช้ในการศึกษาวิจัยเท่านั้น คำตอบของท่านในแบบสอบถามไม่มีถูกหรือผิด ดังนั้นจึงใคร่ขอความกรุณาตอบแบบสอบถามตามความเป็นจริงมากที่สุด และข้อคำตอบทุกข้อที่ท่านตอบ ผู้วิจัยจะเก็บไว้เป็นความลับ และจะไม่เกิดผลเสียต่อท่านแต่อย่างใด

แบบสอบถามจะประกอบไปด้วย 4 ส่วนดังต่อไปนี้

ส่วนที่ 1.แบบสอบถามความมั่นใจในความสามารถของตนเองในการออกกำลังกายของผู้สูงอายุที่มีอาการ-ปวดเข่า (9 ข้อ)

ส่วนที่ 2. แบบสอบถามความมั่นใจในความสามารถของตนเองเฉพาะด้านประกอบด้วย 3 ส่วนย่อย ดังนี้

2.1. แบบสอบถามความมั่นใจในความสามารถของตนในการทำตามภารกิจที่ตั้งไว้(5 ข้อ)

2.2. แบบสอบถามความมั่นใจในความสามารถในการคงไว้ซึ่งพฤติกรรมของตน (4 ข้อ)

2.3 แบบสอบถามความมั่นใจในความสามารถของตนในการปรับตัวหลังจากเจออุปสรรคต่างๆ (3 ข้อ)

ส่วนที่ 3. แบบประเมินอาการปวดเข่าด้วยตัวเลข

ส่วนที่ 4. แบบสอบถามเรื่องข้อเข่าที่เกี่ยวกับการทำกิจวัตรประจำวันประกอบด้วย 2 ส่วนย่อยดังนี้

4.1 อาการที่เกิดขึ้นกับข้อเข่าในการทำกิจวัตรประจำวัน (6 ข้อ)

4.2 ภาวะจำกัดในการทำหน้าที่ของข้อเข่าเกี่ยวกับการทำกิจวัตรประจำวัน (8 ข้อ)

ภัทราภรณ์ ภิวงศ์ นิสิตสาธารณสุขศาสตร์ดุษฎีบัณฑิต
วิทยาลัยวิทยาศาสตร์สาธารณสุข จุฬาลงกรณ์มหาวิทยาลัย

ส่วนที่ 1 แบบสอบถามความมั่นใจในความสามารถของตนเองในการออกกำลังกายของผู้สูงอายุที่มีอาการปวดเข่า

คำชี้แจง: จากข้อความต่อไปนี้คือสถานการณ์ที่แสดงถึงเหตุผลต่างๆที่ทำให้ไม่ออกกำลังกาย โปรดระบุว่าท่านมีความมั่นใจมากน้อยเพียงใดในการออกกำลังกาย ภายใต้สถานการณ์ต่างๆประกอบด้วยคำถามทั้งหมด 9 ข้อ โดยให้ท่านทำเครื่องหมาย X ลงบนตัวเลข 0-10 ที่ตรงกับคำตอบของท่านมากที่สุด โดยเกณฑ์การตอบคำถามมีดังนี้คือ

หมายถึง ท่านไม่มีความมั่นใจเลยที่จะสามารถออกกำลังกายบริหารข้อเข่า

10 หมายถึง ท่านมีความมั่นใจมากที่สุดจะสามารถออกกำลังกายบริหารข้อเข่า

ปัจจุบันท่านมีความมั่นใจเพียงใดต่อการออกกำลังกายบริหารข้อเข่าทุกวันอย่างน้อย 30 นาที

ข้อความ	ไม่มั่นใจเลย										มั่นใจมากที่สุด
1.ท่านสามารถออกกำลังกายบริหารข้อเข่าได้ทุกวัน ในวันที่สภาพอากาศไม่เหมาะสม เช่นอากาศเย็นหรือร้อนเกินไป	0	1	2	3	4	5	6	7	8	9	10
2. ท่านสามารถออกกำลังกายบริหารข้อเข่าได้ทุกวัน แม้ว่าจะรู้สึกเบื่อต่อโปรแกรมการออกกำลังกาย	0	1	2	3	4	5	6	7	8	9	10
3. ท่านสามารถออกกำลังกายบริหารข้อเข่าได้ทุกวัน แม้จะรู้สึกปวดเข่าตอนออกกำลังกาย	0	1	2	3	4	5	6	7	8	9	10
4.ท่านสามารถออกกำลังกายบริหารข้อเข่าได้ทุกวัน แม้ว่าท่านต้องออกกำลังกายเพียงคนเดียว	0	1	2	3	4	5	6	7	8	9	10
5.ท่านสามารถออกกำลังกายบริหารข้อเข่าได้ทุกวัน แม้ว่าท่านจะรู้สึกไม่สนุกในการออกกำลังกาย	0	1	2	3	4	5	6	7	8	9	10
6. ท่านสามารถออกกำลังกายบริหารข้อเข่าได้ทุกวัน แม้ว่าท่านยุ่งอยู่กับการกิจกรรมอื่นๆ	0	1	2	3	4	5	6	7	8	9	10
7.ท่านสามารถออกกำลังกายบริหารข้อเข่าได้ทุกวัน แม้ว่าท่านรู้สึกเหนื่อย	0	1	2	3	4	5	6	7	8	9	10
8.ท่านสามารถออกกำลังกายบริหารข้อเข่าได้ทุกวัน แม้ว่าท่านรู้สึกเครียด	0	1	2	3	4	5	6	7	8	9	10
9.ท่านสามารถออกกำลังกายบริหารข้อเข่าได้ทุกวัน แม้ว่าท่านรู้สึกเศร้าซึม ไม่แจ่มใส	0	1	2	3	4	5	6	7	8	9	10
คะแนนรวม											

การแปลผล : คะแนน 0 – 44.9 มีความมั่นใจในความสามารถของตนเองในการออกกำลังกายอยู่ในระดับต่ำ

คะแนน 45.0 – 71.9 มีความมั่นใจในความสามารถของตนเองในการออกกำลังกายอยู่ในระดับปานกลาง

คะแนน 72.0 - 90.0 มีความมั่นใจในความสามารถของตนเองในการออกกำลังกายอยู่ในระดับสูง

ส่วนที่ 2 แบบสอบถามความมั่นใจในความสามารถของตนเองเฉพาะด้านมี 3 ส่วนย่อย ประกอบด้วย

2.1 ความมั่นใจในความสามารถของตนในการทำตามภารกิจที่ตั้งไว้(จำนวน 5 ข้อ)

2.2 ความมั่นใจในความสามารถในการคงไว้ซึ่งพฤติกรรมของตน (จำนวน 4 ข้อ)

2.3 ความมั่นใจในความสามารถของตนในการปรับตัวหลังจากเจออุปสรรคต่างๆ (จำนวน 3 ข้อ)

ส่วนที่ 2.1: ความมั่นใจในความสามารถของตนในการทำตามภารกิจที่ตั้งไว้

คำชี้แจง: เนื่องจากการออกกำลังกายบริหารข้อเข่าเป็นกิจกรรมอย่างหนึ่งที่ช่วยลดอาการปวดเข่าลงได้ กรุณาอ่านข้อความในแต่ละข้อและใช้มาตรวัดต่อไปนี้ในการบ่งชี้ว่าท่านมีความมั่นใจมากน้อยเพียงใด การทำตามภารกิจที่ตั้งไว้ในการบริหารข้อเข่า โดยการทำเครื่องหมาย ✓ลงในช่องท้ายข้อความที่ตรงกับความคิดเห็นของท่านมากที่สุด

ข้อความ ท่านมีความมั่นใจว่า.....	(1) ไม่เห็นด้วยอย่างยิ่ง	(2) ไม่เห็นด้วย	(3) เห็นด้วย	(4) เห็นด้วยอย่างยิ่ง
1.ท่านจะออกกำลังกายบริหารข้อเข่าในทุกๆท่าตามที่ท่านตั้งใจไว้				
2.อย่างน้อยใน 1 วันท่านจะออกกำลังกายบริหารข้อเข่าให้ครบตามจำนวนครั้งของแต่ละท่าที่ต้องบริหารทั้งหมด				
3.ท่านสามารถออกกำลังกายบริหารข้อเข่าในแต่ละท่าได้หลายๆครั้งหรือใช้เวลาในการบริหารข้อเข่าตามคำแนะนำอย่างถูกต้อง				
4.ท่านสามารถออกกำลังกายบริหารข้อเข่าอย่างสม่ำเสมอ อย่างน้อย 3 ครั้งต่อสัปดาห์หรือมากกว่านั้น				
5.ท่านสามารถปฏิบัติตามคำแนะนำของผู้วิจัยเกี่ยวกับการออกกำลังกายบริหารข้อเข่าและจะเป็นคนที่กระฉับกระเฉงมากขึ้น				

การแปลผล: คะแนน 5.0 – 9.9 มีความมั่นใจในความสามารถของตนเองในการทำตามภารกิจที่ตั้งไว้อยู่ในระดับต่ำ

คะแนน 10.0 – 15.9มีความมั่นใจในความสามารถของตนเองในการทำตามภารกิจที่ตั้งไว้อยู่ในระดับปานกลาง

คะแนน 16.0 - 20.0 มีความมั่นใจในความสามารถของตนเองในการทำตามภารกิจที่ตั้งไว้อยู่ในระดับสูง

ส่วนที่ 2.2 : ความมั่นใจในความสามารถในการคงไว้ซึ่งพฤติกรรมของตน

คำชี้แจง: หลังจากที่ท่านเริ่มออกกำลังกายบริหารข้อเข่าแล้วนั้น สิ่งที่สำคัญคือท่านต้องปฏิบัติอย่างต่อเนื่องเป็นประจำ กรุณาอ่านข้อความในแต่ละข้อซึ่งแสดงถึงสถานการณ์ต่างๆที่เกิดขึ้น แล้วใช้มาตรวัดในการแสดงถึงความมั่นใจของท่านในการคงไว้ซึ่งการออกกำลังกายบริหารข้อเข่าอย่างต่อเนื่อง โดยการทำเครื่องหมาย ✓ ลงในช่องท้ายข้อความที่ตรงกับความคิดเห็นของท่านมากที่สุด

ข้อความ ท่านมีความมั่นใจว่า.....	(1) ไม่เห็นด้วยอย่างยิ่ง	(2) ไม่เห็นด้วย	(3) เห็นด้วย	(4) เห็นด้วยอย่างยิ่ง
1. ท่านสามารถออกกำลังกายบริหารข้อเข่าได้อย่างเนื่องเป็นประจำ ถึงแม้ว่าท่านจะไม่เห็นถึงผลลัพธ์ที่เกิดขึ้นจากการออกกำลังกายบริหารข้อเข่า				
2.ท่านสามารถออกกำลังกายบริหารข้อเข่าได้อย่างเนื่องเป็นประจำ ถึงแม้ว่าการออกกำลังกายแบบนี้จะใช้เวลาค่อนข้างมาก				
3.ท่านสามารถออกกำลังกายบริหารข้อเข่าได้อย่างเนื่องเป็นประจำ ถึงแม้ว่าท่านจะต้องคอยบังคับตัวเองให้ปฏิบัติในทุกๆวัน				
4.ท่านสามารถออกกำลังกายบริหารข้อเข่าได้อย่างต่อเนื่องเป็นประจำ ถึงแม้ว่าท่านอยากทำกิจกรรมอย่างอื่นมากกว่า				

การแปลผล : คะแนน 4.0 - 7.9 ความมั่นใจในความสามารถในการคงไว้ซึ่งพฤติกรรมของตนอยู่ในระดับต่ำ

คะแนน 8.0 – 12.7 ความมั่นใจในความสามารถในการคงไว้ซึ่งพฤติกรรมของตนอยู่ในระดับปานกลาง

คะแนน 12.8 – 16.0 ความมั่นใจในความสามารถในการคงไว้ซึ่งพฤติกรรมของตนอยู่ในระดับสูง

ส่วนที่2.3 : ความมั่นใจในความสามารถของตนในการปรับตัวหลังจากเจออุปสรรคต่างๆ

คำชี้แจง: กรุณาอ่านข้อความในแต่ละข้อที่แสดงถึงสถานการณ์จำลองที่ทำให้ท่านต้องล้มเลิกหรือหยุดออกกำลังกายบริหารข้อเข่าด้วยเหตุผลบางประการ แล้วใช้มาตรวัดในการแสดงถึงความมั่นใจของท่านในการปรับตัวหลังจากเจออุปสรรคต่างๆ และกลับมาออกกำลังกายบริหารข้อเข่าได้อย่างต่อเนื่องอีกครั้ง โดยการทำเครื่องหมาย ✓ ลงในช่องท้ายข้อความที่ตรงกับความคิดเห็นของท่านมากที่สุด

ข้อความ	(1) ไม่เห็นด้วยอย่างยิ่ง	(2) ไม่เห็นด้วย	(3) เห็นด้วย	(4) เห็นด้วยอย่างยิ่ง
1.ท่านมีความมั่นใจว่าท่านสามารถกลับมาออกกำลังกายบริหารข้อเข่าได้อย่างต่อเนื่องอีกครั้ง ถึงแม้ว่าท่านเคยพบกับความล้มเหลวในการบังคับตัวเองให้ออกกำลังกายบริหารข้อเข่า				
2. .ท่านมีความมั่นใจว่าท่านสามารถกลับมาออกกำลังกายบริหารข้อเข่าได้อย่างต่อเนื่องอีกครั้ง ถึงแม้ว่าท่านเคยไม่อยากออกกำลังกายบริหารข้อเข่าเพราะยังรู้สึกอ่อนเพลียหลังจากเพิ่งหายจากการเจ็บป่วย				
3. .ท่านมีความมั่นใจว่าท่านสามารถกลับมาออกกำลังกายบริหารข้อเข่าได้อย่างต่อเนื่องอีกครั้ง ถึงแม้ว่าท่านไม่ได้ออกกำลังกายบริหารข้อเข่ามาแล้วเมื่อ 2 วันที่ผ่านมา				

การแปลผล: คะแนน 3.0-5.9 มีความมั่นใจในความสามารถของตนในการปรับตัวหลังจากเจออุปสรรคต่างๆอยู่ในระดับต่ำ

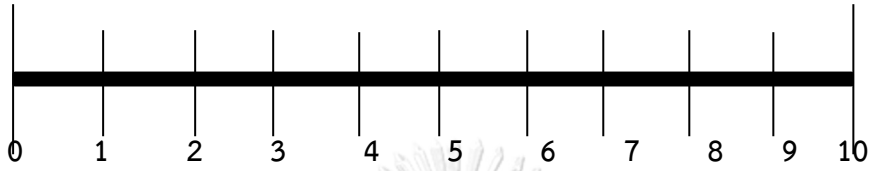
คะแนน 6.0-9.5 มีความมั่นใจในความสามารถของตนในการปรับตัวหลังจากเจออุปสรรคต่างๆอยู่ในระดับปานกลาง

คะแนน 9.6-12.0 มีความมั่นใจในความสามารถของตนในการปรับตัวหลังจากเจออุปสรรคต่างๆอยู่ในระดับสูง

หมายเลข

ส่วนที่ 3 แบบประเมินอาการปวดเข่าด้วยตัวเลข

คำชี้แจง: โปรดทำเครื่องหมาย ○ ลงบนตัวเลขที่ตรงกับอาการปวดข้อเข่าของท่านมากที่สุด ตัวเลข 0 หมายถึงไม่มีอาการปวดข้อเข่าเลยไล่เรียงไปจนถึงตัวเลข 10หมายถึงปวดข้อเข่ามากจนทนไม่ได้



ไม่ปวด ปวดมากจนทนไม่ได้

(สำหรับผู้วิจัย)

	คะแนนความปวด
ก่อนทำการทดลอง	
หลังทำการทดลอง	

หมายเลข

ส่วนที่ 4 แบบสอบถามเรื่องข้อเข่าที่เกี่ยวกับการทำกิจวัตรประจำวัน

คำชี้แจง : แบบสอบถามนี้เป็นการสำรวจความคิดเห็นของท่านเกี่ยวกับข้อเข่า ข้อมูลนี้จะช่วยในการติดตามอาการที่เกิดขึ้น และประเมินความสามารถของข้อเข่าในการเคลื่อนไหวในการทำกิจกรรมต่างๆในชีวิตประจำวันของท่าน

ส่วนที่ 4.1 อาการ: อาการที่เกิดขึ้นกับข้อเข่าของท่านในแต่ละข้อต่อไปนี้ มีอาการใดบ้างที่ส่งผลกระทบต่อกิจกรรมที่ท่านทำ และแต่ละอาการดังกล่าวมีผลกระทบต่อกิจกรรมที่ท่านทำในระดับใด กรุณาทำเครื่องหมาย ✓ ลงในช่องว่างในแต่ละข้อที่ตรงกับอาการของท่านมากที่สุด

อาการ		**มีอาการ และระดับผลกระทบของอาการต่อกิจกรรมที่ทำ (4) - (0)**				
	(5) ไม่มีอาการ	(4) ไม่มีผลกระทบ	(3) มีผลกระทบเล็กน้อย	(2) มีผลกระทบปานกลาง	(1) มีผลกระทบมาก	(0) ทำกิจกรรมไม่ได้เลย
1. ปวดเข่า						
2. ข้อเข่าฝืดตึง						
3.เข่าบวม						
4.เข่าหลวม หรือเดินแล้วรู้สึกเหมือนเข่าจะหลุดออกมา หรือเข่าทรุด						
5.เข่าอ่อน						
6. เดิน กระโผลก กระเผลก						

ส่วนที่ 4.2 ภาวะจำกัดในการทำหน้าที่เกี่ยวกับการทำกิจวัตรประจำวัน : เข่าของท่านมีผลต่อความสามารถในการทำกิจกรรมเหล่านี้อย่างไร กรุณาใส่เครื่องหมาย ✓ ในแต่ละข้อที่ตรงกับความเป็นจริงของท่านมากที่สุด

กิจกรรม	(5) ทำกิจกรรมได้ไม่ลำบากเลย	(4) ทำกิจกรรมได้ลำบากเล็กน้อย	(3) ทำกิจกรรมได้ค่อนข้างลำบาก	(2) ทำกิจกรรมได้ลำบากพอสมควร	(1) ทำกิจกรรมได้ลำบากมาก	(0) ไม่สามารถทำกิจกรรมได้เลย
1.เดิน						
2.ขึ้นบันได						
3.ลงบันได						
4.ยืน						
5.นั่งคุกเข่า						
6.นั่งยองๆ						
7.นั่งงอเข่า						
8.ลุกจากเก้าอี้						

(เฉพาะผู้วิจัย)

คะแนนรวมความสามารถของข้อเข่าในการทำกิจวัตรประจำวัน _____%

หมายเลข

Appendix C : Knee range of motion (ROM) record sheet

แบบบันทึกพิสัยการเคลื่อนไหวของข้อเข่าโดยใช้เครื่องมือวัดองศาของข้อเข่า

ครั้งที่	**งอเข่า**				**เหยียดเข่า**			
	ก่อนการทดลอง วันที่_____		หลังการทดลอง วันที่_____		ก่อนการทดลอง วันที่_____		หลังการทดลอง วันที่_____	
	เข่าซ้าย	เข่าขวา	เข่าซ้าย	เข่าขวา	เข่าซ้าย	เข่าขวา	เข่าซ้าย	เข่าขวา
1								
2								
3								
ค่าเฉลี่ย								

Appendix D: Timed up and Go (TUG TEST)

หมายเลข

แบบบันทึกการทดสอบความสามารถในการทรงตัวของผู้สูงอายุด้วยการ ลุก นั่ง ยืน เดิน

จุดประสงค์: ทดสอบดวยการเดินตามวิธีที่กำหนด โดยสังเกตทาเดินและจับเวลาที่ใชในการเดินเป็นวินาที

วิธีทดสอบมีดังนี้ :

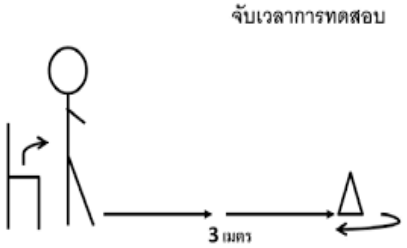
1.วางวัตถุสำหรับเดินอ้อมไว้ข้างหน้าของเก้าอี้โดยใช้เก้าอี้ที่มีทีเท้าแขน วางให้ห่างจากเก้าอี้ 3 เมตร

2. ให้ผู้สูงอายุนั่งที่เก้าอี้ เท้าสองข้างวางบนพื้น เมื่อผู้วิจัยพูดคำว่า “ปฏิบัติ” ให้ผู้สูงอายุลุกขึ้นโดยพยายามไม่ใช้มือพยุง แล้วเดินไปข้างหน้าเป็นระยะทาง 3 เมตร เดินอ้อมวัตถุที่วางไว้ แล้วเดินวกกลับมานั่งที่เก้าอี้ตัวเดิมอีกครั้ง โดยให้ผู้สูงอายุเดินด้วยความเร็วที่มากที่สุดเท่าที่ทำได้

3. ผู้วิจัยจับเวลาที่ใช้ในการเดิน ตั้งแต่เริ่มลุกยืนขึ้น จนกระทั่งกลับมานั่งที่เก้าอี้ตัวเดิมอีกครั้ง

4. ในระหว่างการทดสอบ ผู้วิจัยเดินตามไปข้างๆเพื่อป้องกันอันตรายจากการล้มของผู้สูงอายุ (โดยไม่รบกวนจังหวะในการเดิน)

5. ก่อนการทดสอบผู้วิจัยจะสาธิตปฏิบัติให้ดูก่อน และผู้สูงอายุจะลองทดสอบ 1 ครั้ง หลังจากนั้นจะปฏิบัติจริงโดยการให้ผู้สูงอายุทำการทดสอบ 2 ครั้ง เพื่อผู้วิจัยจะนำค่าที่ได้มาคำนวณหาค่าเฉลี่ย แล้วลงบันทึกผล



ครั้งที่	ก่อนการทดลอง วันที่_____	หลังการทดลอง วันที่_____
	วินาที	วินาที
1.		
2.		
ค่าเฉลี่ย		

Appendix E: 30-Second Chair Stand Test

หมายเลข

แบบบันทึกการทดสอบยืน-นั่งบนเก้าอี้ 30 วินาที

จุดประสงค : เพื่อประเมินความแข็งแรงกลามเนื้อขา,เข่าและร่างกายส่วนล่าง ซึ่งจำเปนสำหรับการทำกิจกรรมหลายอยางสำหรับผู้สูงอายุ เชน เดินขึ้นบันได, เดิน และลุกออกจากเกาอี้

วิธีการทดสอบ:

1. จัดเก้าอี้สำหรับการทดสอบยืน-นั่งให้ติดผนัง เพื่อป้องกันการเลื่อนไหลของเก้าอี้ขณะทำการทดสอบ

2. ให้ผู้สูงอายุนั่งบริเวณตรงกลางของเก้าอี้ (ไม่ชิดพนักพิง เพื่อให้สะดวกต่อการลุกขึ้นยืน) เท้าวางสัมผัสพื้นห่างกันประมาณช่วงไหล่ เข่าทั้งสองข้างวางห่างกันเล็กน้อยและนั่งหลังตรง แขนไขว้ประสานบริเวณอก มือทั้งสองข้างแตะไหลไว้

3. เมื่อได้ยินสัญญาณ “เริ่ม” จากผู้วิจัย ให้ผู้สูงอายุลุกขึ้นจากเก้าอี้ยืนตรง ขาเหยียดตึง แล้วกลับลงนั่งในท่าเริ่มต้นนับเป็น 1 ครั้ง ทำต่อเนื่องกันจนครบใน 30 วินาที โดยทำให้ได้จำนวนครั้งมากที่สุด

4.ก่อนที่จะปฏิบัติจริง ให้ผู้สูงอายุฝึกการปฏิบัติท่าทางที่ถูกต้อง 1-2 ครั้งและทำการทดสอบจริงเพียงรอบเดียว

5. เพื่อความปลอดภัยในการทดสอบผู้วิจัยจะจัดเก้าอี้ให้ชิดผนัง คอยสังเกตการทรงตัว และจะหยุดการทดสอบทันทีหากผู้สูงอายุบ่นว่ามีอาการปวด

หมายเหตุ ผู้สูงอายุจะต้องทำให้ได้จำนวนครั้งมากที่สุดในระหว่างการทดสอบ ในการทดสอบจะไม่นับจำนวนครั้งในกรณีต่อไปนี้ 1. ในขณะยืน ขาและลำตัวไม่เหยียดตรง 2. ในขณะนั่ง สะโพกและต้นขาด้านหลังไม่สัมผัสเก้าอี้

ผู้วิจัยจะบันทึกจำนวนครั้งทั้งหมดที่ผู้สูงอายุปฏิบัติได้อย่างสมบูรณ์ใน 30 วินาที ในวินาทีสุดท้ายหากผู้สูงอายุทำได้เกินครึ่งทางแล้ว ให้ถือว่าทำได้อย่างสมบูรณ์ ทำการทดสอบเพียงรอบเดียว

ก่อนการทดลอง วันที่_____	จำนวนครั้งที่ทำได้ใน 30 วินาที ครั้ง
หลังการทดลอง วันที่_____	จำนวนครั้งที่ทำได้ใน 30 วินาที ครั้ง

Appendix F: Exercise Diary

สมุดบันทึกการออกกำลังกายบริหารข้อเข่า

คำชี้แจง: สมุดบันทึกการออกกำลังกายบริหารข้อเข่านี้มีไว้ให้ท่านบันทึกการออกกำลังกายบริหารข้อเข่าของท่านในทุกๆวันเพื่อลดอาการปวดเข่าที่ท่านเป็นอยู่ ซึ่งท่านควรบันทึกทุกวันให้ครบในแต่ละสัปดาห์เมื่อท่านออกกำลังกายบริหารเข่า ท่าบริหารมีทั้งหมด 5 ท่า และมีคำถามให้ท่านเลือกตอบอยู่ท้ายตารางบันทึกหากท่านไม่ได้ออกกำลังกายบริหารข้อเข่าในวันใดวันหนึ่งของสัปดาห์นั้นพร้อมเหตุผล

คำแนะนำ

1. ในทุกๆวันท่านสามารถบริหารข้อเข่าได้ทั้งหมด 5 ท่า หรือท่านสามารถแบ่งทำท่าบริหารเป็น 2-3 ท่าในแต่ละช่วงวันก็ได้ อย่างเช่น ในช่วงเช้าทำท่าบริหารท่าที่ 1-3 และช่วงเย็นทำท่าที่ 4 และ5 แต่ควรทำจนครบทั้ง5 ท่าในแต่ละวัน

2. ท่าบริหารข้อเข่าในแต่ละท่านั้นท่านควรทำให้ครบทั้งหมด 30 ครั้ง เท่ากับ 3 ชุด (ทำซ้ำ 10 ครั้งของ แต่ละท่าบริหารนับเป็น 1 ชุด)

3. ท่านควรออกกำลังกำลังกายบริหารข้อเข่าอย่างต่อเนื่องเป็นระยะเวลาทั้งหมด 12 สัปดาห์ตลอดระยะเวลาที่ท่านเข้าร่วมในงานวิจัยนี้

4. ผู้วิจัยแนะนำว่าท่านควรออกกำลังกายบริหารข้อเข่าอย่างต่อเนื่อง ถึงแม้ว่าจะเสร็จสิ้นโครงการวิจัยแล้ว เพื่อลดอาการปวดเข่าในระยะยาว เพิ่มความแข็งแรงของกล้ามเนื้อข้อเข่าและการเคลื่อนไหวในการปฏิบัติกิจวัตรประจำวันที่ดีขึ้น

5. หากท่านมีอาการบาดเจ็บจากการฝึกออกกำลังกายบริหารข้อเข่าควรปฏิบัติดังนี้

-ควรหยุดพักการออกกำลังกายทันที เพื่อไม่ให้มีอาการบาดเจ็บมากขึ้น

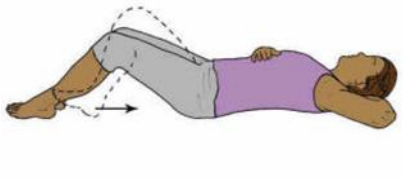
-ประคบเย็นตรงบริเวณที่ได้รับการบาดเจ็บ เพื่อลดการบวมและอาการปวด เช่น ใช้น้ำแข็งประคบภายใน 24-48 ชั่วโมงหลังได้รับการบาดเจ็บ ใช้เวลาประคบประมาณ 15-20 นาทีต่อครั้ง ให้ทำวันละ 2-3 ครั้ง หลังจากนั้นให้ท่านประคบร้อนหลังจากผ่าน 48 ชั่วโมงไปแล้ว เช่น ประคบร้อนโดยใช้ผ้าขนหนูชุบน้ำร้อนหรือถุงน้ำร้อน ในการประคบแต่ละครั้งไม่ควรใช้เวลาเกิน 15-20 นาที ให้ทำวันละ 2-3 ครั้ง

-ยกบริเวณที่มีอาการบาดเจ็บขึ้นสูง เพื่อป้องกันอาการบวมและเลือดคั่งในบริเวณที่มีการบาดเจ็บ

(ถ้าหากท่านอาการไม่ดีขึ้น แนะนำให้ท่านไปศูนย์อนามัยหรือโรงพยาบาลใกล้บ้านเพื่อรักษาอาการที่เกิดขึ้น)

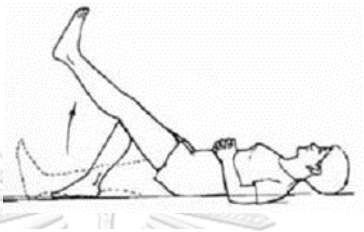
6. หากท่านมีข้อสงสัยประการใดเกี่ยวกับการออกกำลังกายบริหารข้อเข่าหรือความเสี่ยงที่จะเกิดขึ้นในการออกกำลังกายบริหารข้อเข่า ท่านสามารถสอบถามและติดต่อผู้วิจัยได้ตลอดเวลา

ท่าบริหารข้อเข่าทั้งหมด 5 ท่า ดังต่อไปนี้



ท่าที่ 1 : ท่าเหยียด-งอเข่า

ท่าที่ 2: ท่ากดเข่า



ท่าที่ 3 : ท่าขาตึง-เข่าตรง-เตะขาขึ้น

ท่าที่ 4 : ท่านั่ง-ยืน

ท่าที่5 : ท่าขึ้น-ลงบันได

สัปดาห์ที่ 1 : เดือน_____ พ.ศ._____

ท่าที่ 1 : ท่าเหยียด-งอเข่า	ระยะเวลาที่ใช้บริหารเข่า (นาที)	จำนวนชุด ของการบริหารเข่าที่ทำได้	ข้อคิดเห็นเพิ่มเติม
วันจันทร์		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	
วันอังคาร		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	
วันพุธ		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	
วันพฤหัสบดี		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	
วันศุกร์		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	
วันเสาร์		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	
วันอาทิตย์		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	

ท่าที่ 2 : ท่ากดเข่า	ระยะเวลาที่ใช้บริหารเข่า (นาที)	จำนวนชุด ของการบริหารเข่าที่ทำได้	ข้อคิดเห็นเพิ่มเติม
วันจันทร์		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	
วันอังคาร		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	
วันพุธ		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	
วันพฤหัสบดี		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	
วันศุกร์		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	
วันเสาร์		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	
วันอาทิตย์		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	

ท่าที่ 3 : ท่าขาดิ่ง-เข่าตรง-เตะขาขึ้น	ระยะเวลาที่ใช้บริหารเข่า (นาที)	จำนวนชุด ของการบริหารเข่าที่ทำได้	ข้อคิดเห็นเพิ่มเติม
วันจันทร์		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	
วันอังคาร		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	
วันพุธ		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	
วันพฤหัสบดี		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	
วันศุกร์		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	
วันเสาร์		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	
วันอาทิตย์		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	

ท่าที่ 4 : ท่านั่ง-ยืน	ระยะเวลาที่ใช้บริหารเข่า (นาที)	จำนวนชุดของการบริหารเข่าที่ทำได้	ข้อคิดเห็นเพิ่มเติม
วันจันทร์		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	
วันอังคาร		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	
วันพุธ		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	
วันพฤหัสบดี		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	
วันศุกร์		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	
วันเสาร์		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	
วันอาทิตย์		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	

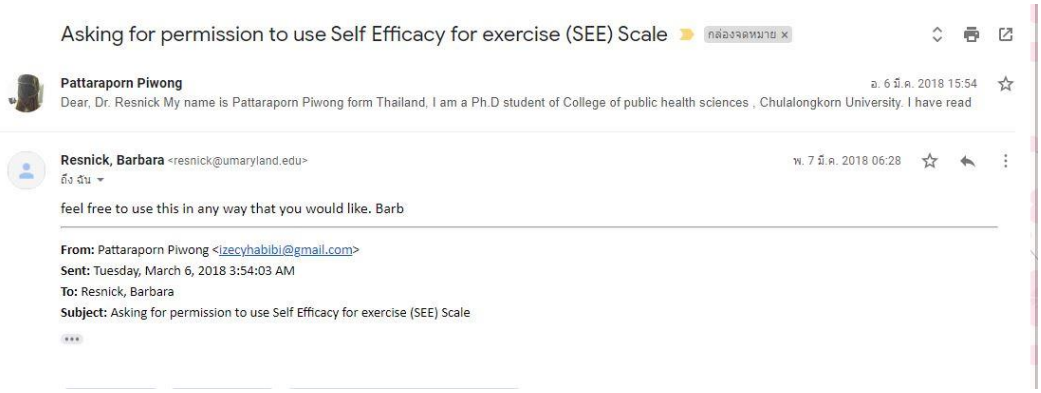
ท่าที่ 5 : ท่าขึ้น-ลงบันได	ระยะเวลาที่ใช้บริหารเข่า (นาที)	จำนวนชุดของการบริหารเข่าที่ทำได้	ข้อคิดเห็นเพิ่มเติม
วันจันทร์		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	
วันอังคาร		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	
วันพุธ		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	
วันพฤหัสบดี		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	
วันศุกร์		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	
วันเสาร์		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	
วันอาทิตย์		☐ 1 ชุด ☐ 2 ชุด ☐ 3 ชุด	

หากท่านไม่ได้ออกกำลังกายบริหารข้อเข่าในบางวันของสัปดาห์นี้ เนื่องจากเหตุผลใด กรุณาทำเครื่องหมาย ✓ ลงในช่องว่างที่ตรงกับความเป็นจริงที่เกิดขึ้นกับท่าน

1 ☐ ยุ่งมาก 2☐ ลืม 3☐ รู้สึกเหนื่อย

4 ☐ อื่นๆ (โปรดระบุ) _____

Appendix G : Letter for permission to use SEE questionnaire



Asking for permission to use Self Efficacy for exercise (SEE) Scale กล่องจดหมาย ×

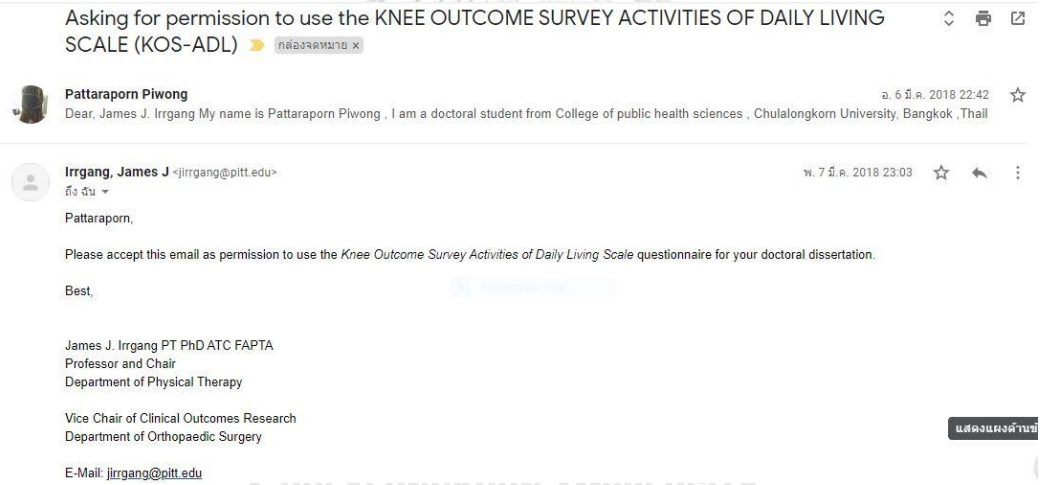
Pattaraporn Piwong อ. 6 มี.ค. 2018 15:54
Dear, Dr. Resnick My name is Pattaraporn Piwong form Thailand, I am a Ph.D student of College of public health sciences , Chulalongkorn University. I have read

Resnick, Barbara <resnick@umaryland.edu> พ. 7 มี.ค. 2018 06:28
ถึง ฉัน

feel free to use this in any way that you would like. Barb

From: Pattaraporn Piwong <izecyhabibi@gmail.com>
Sent: Tuesday, March 6, 2018 3:54:03 AM
To: Resnick, Barbara
Subject: Asking for permission to use Self Efficacy for exercise (SEE) Scale

Appendix H : Letter for permission to use KOS ADLs questionnaire



Asking for permission to use the KNEE OUTCOME SURVEY ACTIVITIES OF DAILY LIVING SCALE (KOS-ADL) กล่องจดหมาย ×

Pattaraporn Piwong อ. 6 มี.ค. 2018 22:42
Dear, James J. Irrgang My name is Pattaraporn Piwong , I am a doctoral student from College of public health sciences , Chulalongkorn University, Bangkok ,Thail

Irrgang, James J <jirrgang@pitt.edu> พ. 7 มี.ค. 2018 23:03
ถึง ฉัน

Pattaraporn,

Please accept this email as permission to use the *Knee Outcome Survey Activities of Daily Living Scale* questionnaire for your doctoral dissertation.

Best,

James J. Irrgang PT PhD ATC FAPTA
Professor and Chair
Department of Physical Therapy

Vice Chair of Clinical Outcomes Research
Department of Orthopaedic Surgery

E-Mail: jirrgang@pitt.edu

แสดงแผงด้านข้

Appendix I: Screening questionnaire English

Participants no.:	
Date :	Time:

The screening questionnaire

(Apply from C. Jinks et al., 2004)

Instructions: Please fill out your information into space below

Birth date:_____ Age:_____ years Gender ☐ Male ☐ Female

Instructions: Please check ✓ mark in the field that corresponds to the truth about yourself.

Questions	Answer	
	Yes	No
1) You living in Tubfah community at Saimai district or Chalurmsuk 9 community at Bangkhen district ,Bangkok		
2) Being able to read and write Thai language to carry out the action and coping plans program, answer the questionnaire or record exercise diary		
3) You have pain or have had pain in both knees / left knee / right knee during movement or having knee pain in most days in a week or more in the past 12 months.		
4) You still have knee pain even if you had visited the doctor and diagnosed as knee pain also finished all of treatment process such as physical therapy or currently taking of nonsteroidal anti-inflammatory drugs or receiving corticosteroid intra-articular injections within past 3 months		
5) You always exercise less than three days per week and less than 30 minutes in each time		
6) Ability to perform daily activities on their own and independent ambulation without walking aid		
7) You are interesting to participate in the motivation of knee exercise program such as you need to pay attention to the action and coping plans to enhance exercise adherence program		

8) You have good intentions but used to fail to plan for exercise		
9) You have a smartphone and using LINE application also be able to access the internet		
10) You have been diagnosed with osteoarthritis of the knee, total knee replacement of any knee joint, had history of knee injury, previously diagnosed as rheumatoid arthritis or gouty		
11) From the past 6 months, you had lower limb surgery		
12) You have been diagnosed with stroke, neurological disorders, and history of mental or emotional disorder, cardiovascular disease, respiratory disease such as pulmonary disease or ashma or moderate hypertension (systolic blood pressure =160-179 mmHg and/ or diastolic blood pressure = 100-109 mmHg) or severe hypertension (systolic blood pressure ≥ 180 mmHg and/ or diastolic blood pressure ≥ 110 mmHg). Moreover, you taking Antihypertensive drugs at least 1 type. * To evaluate your blood pressure as you are not in criteria above, the researcher will measure your blood pressure * 1 Systolic and diastolic blood pressure = mmHg 2. Systolic and diastolic blood pressure = mmHg 3. estimates blood pressure = mmhg		

Socio-demographic information

1. Age_____ years old

2. Gender ☐ Male ☐ Female

3. Weight_____ kilograms

4 Height_____ centimeters

5. BMI _____

6. What is your highest level of education?

☐ Elementary School ☐ Secondary School ☐ High School or diploma

☐ Bachelor Degree ☐ Master Degree or higher

7. What is your marital status?

☐ Single ☐ Married ☐ Widowed ☐ Divorced / Separated

8. What is your occupation?

☐ no occupation

☐ Retired Government Officer ☐ Government Officer / state enterprise officer

☐ Private company employee ☐ Self-Employed /Own Business

☐ Merchant/ freelance ☐ Contractor ☐ others, please specify____

9. How much is your income or wage per month?

☐ Less than 5,000 baht /month ☐ 5,001 – 10,000 baht/month

☐ 10,001 – 15,000 baht/month ☐ 15,001 – 20,000 baht/month

☐ more than 20,000 baht/month

10. How many hours per day do you use your smartphone? _____ hours

11. Which one of these aspects is most important reason to you for using smartphone?

☐ Answer coming calls and outgoing calls ☐ Watch movie, listen to music

☐ Using social media such as LINE, Facebook, Instragram, Twitter

☐ searching for information on the internet

☐ Shopping Online or Selling Online

12. Which application do you use the most on your smartphone?

☐ LINE ☐ Facebook ☐ Twitter ☐ Instragram

13. As you are using LINE application on your smartphone, what is the reason that you use line application?

☐ To talk or chat up with family and cousin ☐ To contact with close friends

☐ To send a greeting or to encourage others

☐ To follow the news from friends in Line application

☐ To make an appointment

14. How many hours (in average) a day do you use LINE application?

☐ Less than 1 hour ☐ 1-3 hours ☐ 4-6 hours

☐ 7-10 hours ☐ more than 10 hours

15. Do you have any medical problems?

☐ Do not have any medical problems

☐ Yes

Past history of knee pain

1. Which knee is bothering you?

☐ Right ☐ Left ☐Both

2. How long have you had knee pain?

☐ Less than 7 days ☐ 1-4 week ☐ more than 1 month but less than 3 months

☐ More than 3 months

3. How frequencies of knee pain happen to you?

☐ All the times ☐ everyday ☐ every other day

☐ Every week ☐ every month

4. What is the level of pain when you did this activity?

☐ No pain

☐ Pain when step up- step down at the stair

☐ Pain when walking on the flat ground.

☐ always pain even rest

☐ more pain at the night time

☐ Pain when sitting cross-legged.

☐ Pain when sitting on the floor with legs to the side

5. When you having knee pain, what you did for relieving knee pain?

☐ Take the painkillers or NSAIDs

☐ Go to visit general practitioner at health center

☐ Take a rest

☐ Using hot compress

☐ Traditional Thai massage

6. Which the most frequently of posture that you perform on your daily activities?

☐ Sitting on the floor with legs to the side

☐ Sitting cross-legged. ☐ Squat ☐ Go upstairs and go downstairs

☐ Standing ☐ Walking

History of exercise

1. Normally, did you exercise at all?

☐ Never exercise (If answer this item , please skip to question 3)

☐ 1 times per week ☐ 2 time per week

☐ 3 times per week ☐ Other, please specify_____

2. If you exercised, how long did you exercise?

☐ Less than 20 minutes ☐ 20-30 minutes ☐ 30-60 minutes

☐ 60 minutes or more

3. Which type of exercise that you like to perform the most in your daily life?

☐Brisk walking ☐jogging ☐ Aerobic dance

☐ Cycling ☐ tai chi / Qigong ☐ Swimming

☐ Other, please specify_____

Appendix J: Structured questionnaire English

No._____ Date :___/____/___

Questionnaire: Effect of LINE Application on Action and Coping plans on Exercise Adherence and Functional Performance for Older Adults with Knee Pain in Suburban Area of Bangkok Metropolis, Thailand: A Quasi Experimental Study

The objective of this study is to determine the effect of LINE Application on action and coping plans to changing exercise adherence for older adult who had knee pain. Researcher expected that results of the study might be alternative intervention to improve exercise adherence, self-efficacy for exercise and functional performance among Thai older with knee pain or having other health problems. The findings from this survey are used for conduct the research only. There is no right or wrong answers, so please choose the survey responses that best describe your own situation. So, please responsive by your own facts. The answers that you give during the surveys to be keep secret only this program.

Ms. Pattaraporn Piwong (Ph.D student)
College of Public Health Sciences, Chulalongkorn University

Instructions: Please check ✓ mark or write the answer in the blank of each questions please answer all questions.

Self Efficacy for exercise (SEE) Scale (Resnick & Jenkins, 2000)

Below are the list of some common situations that may be affect your ability to do the knee exercise. Please mark **X** on to scale as best indicates that how confident are you that you could doing knee exercise in everyday for 20-30 minutes which appropriate exercise as the best things you can do for knee pain if:

	Not Confident										Very Confident
1.The weather was bothering you	0	1	2	3	4	5	6	7	8	9	10
2.You were bored by the exercise program or activity	0	1	2	3	4	5	6	7	8	9	10
3.You felt pain when exercising	0	1	2	3	4	5	6	7	8	9	10
4.You had to exercise alone	0	1	2	3	4	5	6	7	8	9	10
5.You did not enjoy it	0	1	2	3	4	5	6	7	8	9	10
6.You were too busy with other activities	0	1	2	3	4	5	6	7	8	9	10
7.You felt tried	0	1	2	3	4	5	6	7	8	9	10
8.You felt stressed	0	1	2	3	4	5	6	7	8	9	10
9.You felt depressed	0	1	2	3	4	5	6	7	8	9	10

Score 0-44.9 Classify as low level

Score 45.0 -71.9 Classify as moderate level

Score 72-90.0 Classify as high level

Specific Self-efficacy (Task, Maintenance, Recovery self-efficacy)

Apply from (Scholz et al., 2005)

Task self-efficacy

Its important to do knee exercise, please rating scale to indicate that how confidence you are as you can please complete all of requirement below.

Item I am confident that.....	1 Strongly disagree	2 Disagree	3 Agree	4 Strongly agree
1. I can promise to do knee exercise at each of knee exercise session				
2. I can promise to complete the number of my knee exercise sessions at least once in a day				
3. I can do the repetition for each of exercise or exercise duration by following the instruction				
4. I can be physically active as doing knee exercise 3 times per week or more				
5. I can follow the advice from researcher about knee exercise program and become more physically active.				

Score of 5.0-9.9 Classify as low

Score of 10.0-15.9 Classify as moderate

Score of 16.0-20.0 Classify as high

Maintenance self-efficacy

After having start knee exercise. It is so important to continue the knee exercise on a long term basis. How confident are you that you will achieve knee exercise and you can manage in the conditions as given below? Please mark ✓ on the scale to respond in each of the conditions.

Item I am confident that.....	1 Strongly disagree	2 Disagree	3 Agree	4 Strongly agree
1. I can do the knee exercise regularly even if I do not see any effects of this exercise				
2. I can do the knee exercise regularly even if exercising takes me a lot of time.				
3. I can do the knee exercise regularly even if I have to force myself to do them again everyday				
4. I can do the knee exercise regularly even if I am tempted to do something else				

Score of 4.0-7.9 Classify as low

Score of 8.0-12.7 Classify as moderate

Score of 12.8-16.0 Classify as high

Recovery self-efficacy

Imagine that if some situations may happen to you that you have to give up or stopped knee exercise for sometimes because some reason such as you had health problems. How confident are you that you can restart to do knee exercise in regularly again? Use mark ✓ on following scale to complete the situations as following:

Item I am confident that I can restart to do knee exercise in regularly again	1 Strongly disagree	2 Disagree	3 Agree	4 Strongly agree
1. Although I had failed to pull myself together to do knee exercise				
2. Although I feel weak after a period of illness				
3. Although I haven't done knee exercise for a couple of days				

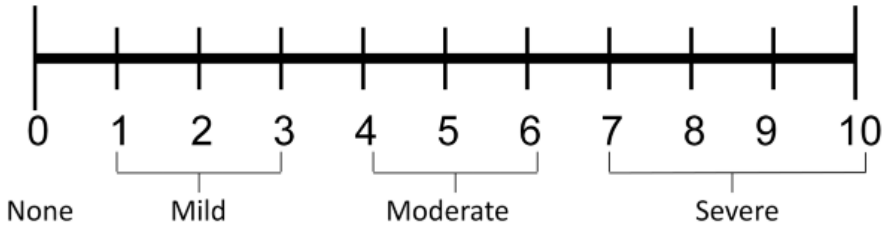
Score of 3.0-5.9 Classify as low

Score of 6.0-9.5 Classify as moderate

Score of 9.6-12.0 Classify as high

Knee pain scale by Numeric pain rating scale (NPRS)

From below we would like you to rate your knee pain scale of being no pain =0 to 10 being worse pain imaginable, please circle around the number



(For researcher Only)

	Numeric pain rating scale
Pretest	
Posttest	

Knee Outcome Survey Activities of Daily Living Scale (KOS-ADLs questionnaire)

(Irrgang, 1999)

Symptoms: To what degree does each of the following symptoms affect your level of activity? (Please check ✓ one answer on each line)

	(5) I do not have the symptom	(4) I have the symptom, but it does not affect my activity	(3) The symptom affects my activity slightly	(2) The symptom affects my activity moderately	(1) The symptom affects my activity severely	(0) The symptom prevents me from all daily activity
1. Pain						
2. Stiffness						
3. Swelling						
4. Giving way, buckling, or shifting of the knee						
5 .Weakness						
6. Limping						

Functional Limitations With Activities of Daily Living: How does your knee affect your ability to: (Please ✓ check one answer on each line)

	(5) Activity is Not difficult	(4) Activity is minimally difficult	(3) Activity is somewhat difficult	(2) Activity is fairly difficult	(1) Activity is Very difficult	(0) I am unable to
1. Walk						
2. Go up stairs						
3. Go down stairs						
4. Stand						
5. Kneel on front of your knee						
6. Squat						
7. Sit with your knee bent						
8. Rise from a chair						

(For researcher Only)

Total score:_____% physical function

Functional performance test

Knee range of motion (ROM) record by Goniometer

Trial	Flexion				Extension			
	Pre test (Date.....)		Post test (Date.....)		Pre test (Date.....)		Post test (Date.....)	
	Left knee	Right knee	Left knee	Right knee	Left knee	Right knee	Left knee	Right knee
1								
2								
3								
Average								

Timed up and Go (TUG TEST)

Equipment: Standard arm chair, stop watch and measured distances of 3 meters or 10 fleets

Directions:

1. Older adults wear their regular footwear and can use a walking aid, if needed. Begin by having the older sit back in a standard arm chair and identify a line 3 meters, or 10 feet away, on the floor.

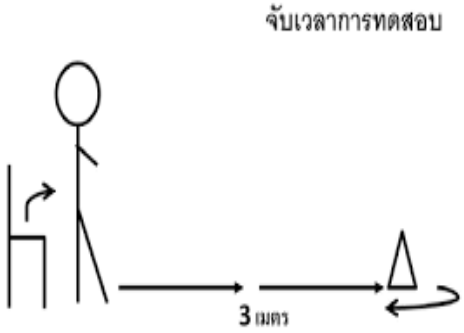
2. Mark a line 3 meters (approximately 10 feet) away from a standard armchair (May use the colored tape for easy to see)

3. Begin the test by having the older adult sit back in a standard arm chair. The upper extremities would not be placed on the assistive device, but it would be close within grasp.

4. The instructions for older adults as following “When say the word “GO” please stand up and walk at safe pace to the line on the floor, turn around and walk back to the chair and sit down again.”

5. The researcher conduct the test by start timing on the word “GO”. Stop timing after older adult buttocks have touched the chair then record the findings on the form. Complete 3 times of the test if possible and calculate the average score.

Trial	Pretest (Date.....)	Posttest (Date.....)
	Time in seconds	Time in seconds
1.		
2.		
3.		
Average		



-

The 30-Second Chair Stand Test

Equipment:-. A chair with a straight back without arm rests (approximately 43 cm.)

- Stop watch

Instruction for Older adult

1. Sit in the middle of the chair
2. Place the hands on the opposite shoulder crossed at the wrists
3. Keep the feet flat on the floor
4. Keep back straight and keep arms against the chest.
5. On “Go,” rise to a full standing position and then sit back down again.
6. Repeat this for 30 seconds.

On “Go,” begin timing.

If the older adult must use their arms to stand, researcher will stop the test. Then record “0” for the number and score.

Count the number of times the older adult comes to a full standing position in 30 seconds. If the older adult is over halfway to a standing position when 30 seconds have elapsed, count it as a stand. Record the number of times the older stands in 30 seconds.

Pretest (Date.....)	Number of times older stands in 30 seconds _____ times
Posttest (Date.....)	Number of times older stands in 30 seconds _____ times

Appendix K: Research ethical approval

AF 02-12

The Research Ethics Review Committee for Research Involving Human Research Participants, Group I, Chulalongkorn University

Jamjuree 1 Building, 2nd Floor, Phyathai Rd., Patumwan district, Bangkok 10330, Thailand,
Tel: 0-2218-3202, 0-2218-3049 E-mail: eccu@chula.ac.th

COA No. 166/2020

Certificate of Approval

Study Title No. 126.1/62 : EFFECT OF LINE APPLICATION ON ACTION AND COPING PLANS ON EXERCISE ADHERENCE AND FUNCTIONAL PERFORMANCE FOR OLDER ADULTS WITH KNEE PAIN IN SUBURBAN AREA OF BANGKOK METROPOLIS, THAILAND: A QUASI EXPERIMENTAL STUDY

Principal Investigator : MISS PATTARAPORN PIWONG

Place of Proposed Study/Institution : College of Public Health Sciences
Chulalongkorn University

The Research Ethics Review Committee for Research Involving Human Research Participants, Group I, Chulalongkorn University, Thailand, has approved constituted in accordance with Belmont Report 1979, Declaration of Helsinki 2013, Council for International Organizations of Medical Sciences (CIOM) 2016, Standards of Research Ethics Committee (SREC) 2017, and National Policy and guidelines for Human Research 2015.

Signature: _____ Signature: _____
(Associate Prof. Prida Tasanapradit, M.D.) (Associate Prof. Nuntaree Chaichanawongsaroj, Ph.D.)
Chairman Secretary

Date of Approval : 31 July 2020 Approval Expire date : 30 July 2021

The approval documents including;

1) Research proposal
2) Participant Information Sheet and Consent Form
3) Researcher
4) Questionnaires

126.1/62
31 JUL 2020
30 JUL 2021

The approved investigator must comply with the following conditions:

1. *It's unethical to collect data of research participants before the project has been approved by the committee.*
2. *The research/project activities must end on the approval expired date. To renew the approval, it can be applied one month prior to the expired date with submission of progress report.*
3. *Strictly conduct the research/project activities as written in the proposal.*
4. *Using only the documents that bearing the RECCU's seal of approval: research tools, information sheet, consent form, invitation letter for research participation (if applicable).*
5. *Report to the RECCU for any serious adverse events within 5 working days.*
6. *Report to the RECCU for any amendment of the research project prior to conduct the research activities.*
7. *Report to the RECCU for termination of the research project within 2 weeks with reasons.*
8. *Final report (AF 03-13) and abstract is required for a one year (or less) research/project and report within 30 days after the completion of the research/project.*
9. *Research project with several phases: approval will be approved phase by phase, progress report and relevant documents for the next phase must be submitted for review.*
10. *The committee reserves the right to site visit to follow up how the research project being conducted.*

Appendix L: leaflet of knee pain and knee exercise

ท่าบริหารเพื่อข้อเข่าแข็งแรง

ท่าที่ 1 : ท่าเหยียด-งอเข่า นอนหงาย งอเข่าเข้าหาลำตัวเท่าที่ไม่ปวด แล้วเหยียดเข่าออกไปจนสุด ทำซ้ำ 10 ครั้ง นับเป็น 1ชุด ให้ทำวันละ 3 ชุด (30 ครั้ง) และสลับไปทำอีกทำข้างหนึ่ง

ท่าที่ 2: ท่ากดเข่า นั่งบนพื้นเหยียดเข่า เกร็งเข่ากดกับพื้นค้างไว้ 6 วินาที แล้วปล่อยเกร็งเท่าที่ไม่เจ็บ ทำซ้ำ 10 ครั้ง นับเป็น 1ชุด ให้ทำวันละ 3 ชุด (30 ครั้ง) ทำสลับข้างซ้าย-ขวา

ท่าที่ 3 : ท่าขาตึง-เข่าตรง-เตะขาขึ้น นอนหงาย ชันเข่าข้างหนึ่งขึ้น ขาอีกข้างหนึ่งเหยียดตรง ค่อยๆ ยกขาข้างที่เหยียดให้สูงประมาณ 1 ฟุต เกร็งค้างไว้ นับ 1-10 แล้วค่อยๆ วางขาลง ทำซ้ำ 10 ครั้ง นับเป็น 1ชุด ให้ทำวันละ 3 ชุด (30 ครั้ง) ทำสลับข้างซ้าย-ขวา

ท่าที่ 4 : ท่านั่ง-ยืน นั่งเก้าอี้ เอามือกอดอก แล้วลุกยืน แล้วกลับมานั่งอีกครั้ง ทำสลับไปมา 10 ครั้งนับเป็น 1 ชุด ให้ทำวันละ 3 ชุด (30 ครั้ง)

ท่าที่5 : ท่าขึ้น-ลงบันได ยืนหันหน้าเข้าหาบันได หรือใช้เก้าอี้ตัวเล็กก็ได้ ก้าวเท้าขวาขึ้นบนบันได แล้วตามด้วย ก้าวเท้าซ้ายหลังจากนั้นถอยลงด้วยเท้าซ้ายแล้วตามด้วยเท้าขวา ทำซ้ำ 10 ครั้งนับเป็น 1 ชุด ให้ทำวันละ 3 ชุด (30 ครั้ง) สามารถทำสลับข้างได้

เริ่ม!! บริหารข้อเข่าไปจนนี้
เพื่อสุขภาพเข่าดี ชีวิตก็ดีขึ้น

ปวดเข่า

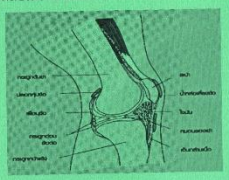
แผ่นพับนี้ให้ข้อมูลเกี่ยวกับอาการปวดเข่าและการออกกำลังกายบริหารข้อเข่าเพื่อลดอาการปวดเข่าและเพิ่มสมรรถภาพทางร่างกาย เพื่อให้ท่านสามารถปฏิบัติกิจวัตรประจำวันได้ดีขึ้นและในระยะยาว

จัดทำโดย ภัทราภรณ์ ภิวงศ์
นิสิตวิทยาลัยวิทยาศรสตร์สาธารณสุข
จุฬาลงกรณ์มหาวิทยาลัย

ปวดเข่า คืออาการปวดที่เกิดขึ้นบริเวณข้อต่อซึ่งเชื่อมระหว่างกระดูกต้นขาและกระดูกหน้าแข้ง ซึ่งเป็นส่วนที่ใช้รองรับน้ำหนักของร่างกาย ถึงแม้กล้ามเนื้อที่อยู่ด้านหน้าและด้านหลังข้อเข่าจะเป็นกล้ามเนื้อที่แข็งแรงที่สุดในร่างกาย อาการปวดเข่าพบได้ในคนทุกเพศทุกวัย แต่เมื่ออายุมากขึ้นกล้ามเนื้อจะอ่อนแอลง เป็นเหตุให้อาการปวดเข่าพบมากในคนอายุมากกว่า 50 ปีขึ้นไป หรือหลังวัยหมดประจำเดือน

โครงสร้างของข้อเข่า

ข้อเข่าประกอบด้วย กระดูก 3 ชิ้น ได้แก่ กระดูกต้นขา กระดูกหน้า แข้ง และกระดูกสะบ้า ยึดติดกันด้วย เส้นเอ็นซึ่งเป็นส่วนปลายของกล้ามเนื้อนับว่าเป็นส่วนสำคัญที่ทำให้ข้อเข่าแข็งแรง ผิวสัมผัสของกระดูกทั้งสามจะมีเยื่อบุข้อเซลล์ประสาทรับความรู้สึก และมีกระดูกอ่อนค่อนข้างหนาคลุมอยู่กระดูกอ่อนนี้มีลักษณะเรียบ มันวาว และผิวลื่น ทั้งนี้เพื่อรับแรงกระแทกที่เกิดขึ้น ขณะที่มีการเคลื่อนไหวข้อ และทำให้รูปร่างกระดูกพอดีกัน ช่วยให้ข้อมั่นคงภายใน ข้อเข่ามีน้ำหล่อเลี้ยงช่วยในการหล่อลื่นและถ่ายน้ำหนัก



โดยทั่วไปคนที่ปวดเข่าจะมีอาการต่อไปนี้

- งอเข่า หรือยืดเข่าได้ลำบาก
-มีเสียงผิดปกติเวลาขยับเข่า เช่น เสียงดังกึก เสียงลั่นในข้อ
-รู้สึกข้อเข่าขัดๆ เคลื่อนไหวได้ไม่เต็มที่
-มักจะอาการปวดเข่ามากเวลาเปลี่ยนจากท่านั่งเป็นท่ายืน หรืออยู่ในท่างอเข่า หรือท่านั่งคุกเข่า หรือนั่งพับเพียบ หรือเดินขึ้นลงบันได หรือยกของหนัก

แนวทางการรักษา

-การเปลี่ยนแปลงพฤติกรรมในชีวิตประจำวัน
-ทำกายภาพบำบัด
-การกินยาแก้ปวด
-การผ่าตัด ซึ่งเป็นวิธีสุดท้ายสำหรับผู้ที่มีอาการปวดเข่ามาก และไม่สามารถเคลื่อนไหวได้เลย

แต่!!! *การกินยาแก้ปวด หรือการผ่าตัด* ถือว่าเป็นการรักษาที่ปลายเหตุเท่านั้น ถ้าท่านยังไม่เริ่มที่จะเปลี่ยนแปลงตัวเอง ในการปรับเปลี่ยนพฤติกรรมในชีวิตประจำวัน และไม่ออกกำลังกายบริหารข้อเข่า
อาการปวดเข่าก็จะยังคงอยู่ และไม่ลดลง ซึ่งอาจส่งผลทำให้เกิดโรคข้อเข่าเสื่อมได้ในอนาคต

วิธีการรักษาข้อเข่า ที่ได้ผลดี โดยไม่เสียค่าใช้จ่าย และทุกคนสามารถทำได้ด้วยตัวเอง คือ

- การออกกำลังกายบริหารข้อเข่า
- ปรับเปลี่ยนพฤติกรรมในการดำเนินชีวิตประจำวัน
- การลดน้ำหนัก (หากท่านมีน้ำหนักตัวมาก)

ข้อแนะนำ ในการปฏิบัติตัว คือ

1.ท่านั่ง ควรนั่งบนเก้าอี้ที่สูงระดับเข่า ***ไม่ควร*** นั่งยองๆ นั่งพับเพียบ นั่งขัดสมาธิ นั่งคุกเข่า หรือนั่งราบบนพื้น เพราะท่านั่งดังกล่าวทำให้ข้อเข่าเสียดสีกันมากขึ้น

2.เวลาเข้าห้องน้ำ ควรนั่งถ่ายบนโถนั่งชักโครก ***ไม่ควรนั่งยองๆ*** เพราะทำให้ข้อเข่าเสียดสีกันมาก และเส้นเลือดที่ไปเลี้ยงขาถูกกดทับ ทำให้เลือดไปเลี้ยงขาได้ไม่ดี

3.การยืน ควรยืนตรงให้น้ำหนักตัวลงบนขาทั้งสองข้างเท่าๆกัน ***หลีกเลี่ยงการยืนหรือนั่งในท่าเดียวนานๆ***

4.การเดิน ควรเดินบนพื้นราบ ใส่รองเท้าแบบส้นเตี้ยหรือแบบไม่มีส้น พื้นรองเท้านุ่ม มีขนาดพอดีไม่คับหรือหลวมจนเกินไป ***ไม่ควร*** เดินในที่พื้นไม่เสมอกันก้น เช่นบันได ทางลาดเอียงที่ชันมาก

5.ลดน้ำหนักตัว เพราะเมื่อเดินน้ำหนักจะลงที่เข่าแต่ละข้างเป็น 3 เท่าของน้ำหนักตัว ถ้าหากวิ่งน้ำหนักจะลงที่เข่าแต่ละข้างถึง 5 เท่าของน้ำหนักตัว

6.ออกกำลังกายบริหารข้อเข่า เพื่อให้ข้อเข่าแข็งแรง เพิ่มความยืดหยุ่นของกล้ามเนื้อรอบข้อเข่า นอกจากนี้ยังเพิ่มพิสัยการเคลื่อนไหวของข้อเข่าและเพิ่มสมรรถภาพทางร่างกาย ช่วยลดการปวดเข่าที่เกิดขึ้น สามารถทรงตัวได้ดีขึ้นเวลายืน หรือเดิน และยังช่วยชะลอการเกิดข้อเข่าเสื่อม ***ซึ่งความตั้งใจในการออกกำลังกายบริหารข้อเข่าอย่างต่อเนื่องเป็นสิ่งที่สำคัญ***

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