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Effects of Exercise Using Hand-squeezing Balls and Freehand-squeezing on Handgrip Strength, Cognitive Function, Balance, and Depression among Older People

Pirom Leesuwan[1], Ratchanee Krongrawa[2], Narinee Yamsakul[3], Jarasporn Homjandee [4] and Akom Phosuwan[5]

[1,2,3,4,] Boromarajonani College of Nursing, Jakkriraj, Praboromarajchanok Institute, Ministry of Public Health, Thailand
[5] Boromarajonani College of Nursing, Suphanburi, Praboromarajchanok Institute, Ministry of Public Health, Thailand
Email:[1]akomph@hotmail.com, [2]voraroon.s@snc.ac.th

ABSTRACT

This study was quasi-experimental research aimed at learning about the effects of exercise using hand-squeezing balls and freehand-squeezing on handgrip strength, cognitive function, balance, and depression among older people living at Boek Phrai, Lat Bua Khao, and Krap Yai sub-districts in Ban Pong District, Ratchaburi. The sample group consisted of 150 people obtained for the research project by purposive sampling according to the inclusion criteria. The participants were taught exercise techniques to increase handgrip strength with monthly monitoring for three months. The research instrumentation consisted of handgrip dynamometers, the place of assessment, timed up and go test, a stopwatch, and the Thai version of the Mini-Mental State Examination form (MMSE-Thai 2002), the 2Q and 9Q evaluation forms of the Department of Mental Health, and notebooks for recording activities. Data were collected by the research team and assistants taught by experts. Data were analyzed with handgrip strength analysis by individual with reference to the handgrip strength standards for Thai people by age with frequency distribution in numbers, percentages, pre-test and post-test handgrip strength comparisons using paired t-test, and comparison of differences in handgrip strength among three groups using one-way ANOVA statistics.

Keywords
Handgrip strength, Muscle strength, Cognitive Function, Balance, Depression in older people

Introduction

The United Nations has proclaimed 2021–2030 the Decade of Healthy Ageing, with the World health organization focusing on action to improve the lives of older people, their families, and communities [1]. Thailand fully transforms into a complete aging society. This population will require special care and will pose challenges to health teams in providing care such that the population's good health is maintained for as long as possible while delaying health problems that will occur. At present, almost of older people in Thailand struggle with health problems such as hypertension, diabetes, osteoarthritis, disability, and depression. In addition, the primary cause of falls and reduced ability of older people to perform activities of daily living, is reduced muscle mass with clearly observable symptoms including difficulty getting up and sitting down, poor balance, frequent falls, unintentional weight loss, extreme fatigue such that activities of daily living are hindered, and potentially depression and
reduced quality of life [2]. Normally, handgrip strength decreases by an average of 35% at 70 years of age and 55% at 80 years of age, whereby the clinical characteristics of sarcopenia can be assessed by using the criteria of the Asian Working Group for Sarcopenia (AWGS), which covers low muscle mass, reduced handgrip strength (muscle strength), and reduced physical performance. The reduction in handgrip strength and muscle mass causes sarcopenia, which increases risk of falls and reduces the ability to perform responsibilities [3] while increasing risk of physical disability [4], and causing anxiety and depression. All of these limitations impact quality of life, especially the ability to perform activities of daily living, thus inhibiting older people from socializing. The Department of Health under the Ministry of Public Health recognizes the importance of older people and has specified guidelines for promoting, protecting, and solving problems in older people with a concept to stop falls, forgetfulness, and depression, while promoting good meals. These guidelines are known as 4 SMARTS or Smart walk (exercise for good health), Smart brain & emotions (cognitive training and promotion of mental and emotional health through participation in activities), Smart sleep (getting sufficient sleep), and Smart eat (eating foods covering all five food groups while having at least 20 teeth) [5]. However, the researcher viewed older people to be a large population and that promotion and support for older people to maintain their ability to perform activities of daily living and solve problems effectively in their daily lives can promote self-esteem in older people and reduce burden in the care of older people from the family to the national levels.

The literature review found that many different studies have been conducted on the handgrip strength of older people. For example, one study found screening for SARC-F sarcopenia to be correlated with physical performance and handgrip strength in older people in Thailand. Thanasuppakorn & et al. (2018) [6] studied older people with sarcopenia (SARC-F greater than 4) comparatively with older people with normal muscle mass (SARC-F 0-4) and found that TUG (time up and go) was greater with statistical significance ($p = 0.0000$) with slower 6 meters gait speed test with statistical significance ($p = 0.0000$), and lower strength in the hands, arms, and legs with lower handgrip strength with statistical significance ($p = 0.0004$). In

addition, Sombuntanon & Thiangtham (2018) [7] conducted a study into factors correlated to the ability to perform activities of daily living of older people in communities with low handgrip strength and found that subjects with low handgrip strength had mean scores on basic activities of daily living and instrumental activities of daily living and depression with negative correlations with basic activities of daily living ($r = -0.221$, $p < 0.05$). Furthermore, a study by the American psychologist Ruth Propper (2005) [8] found that tightly clenching the right hand can stimulate the memory storage portion of the brain and that tightly squeezing the left hand is correlated with information recall and that regularly squeezing the hands several times on a daily basis can effectively exercise the brain in an alternating manner to improve memory and reduce risk of dementia. This concurs with a long-term follow-up study in normal older people living in communities in Korea, which found that hand and arm muscle strengths as measured by handgrip strength were correlated with cognitive function as assessed by Mini-Mental State Examination scores with statistical significance [9]. Additionally, a study in older people aged over 85 years in communities in Japan found that handgrip strength contributed to cognitive function, particularly MMSE scores [10] and was correlated with advanced cognitive function in Stroop tasks or in selecting pictures correctly according to instructions [11]. There are many ways to develop hand or arm muscles such as by using freehand-squeezing or by squeezing rubber balls. Literature review, however, did not uncover reports of studies that compared hand and arm muscle development techniques on the muscle strength of hands and arms, which result from direct hand and arm muscle development according to the principle of use or disuse. In addition, the development of hand or arm muscles might contribute to basic cognitive function [9] and result from activities such as exercises by freehand-squeezing or squeezing natural rubber balls or balloon balls, which might enable older people to partake in greater activities such that their balance improves and depression is alleviated.

Therefore, the research committee became interested in studying the effects of handgrip strengthening by exercises with the use of hand-squeezing balls of different types and freehand-squeezing, which older people can perform on their own. The research committee applied the criteria of the Asian Working Group for Sarcopenia (AWGS) as the guidelines for performing assessments in the experiment and to set the conceptual framework in the study of handgrip strength (muscle strength) or reduction of physical performance impacting older people in multiple areas such as their ability to perform activities of daily living, increased risk of falls and disability, memory issues, anxiety, and depression for this study. This study applied knowledge study knowledge obtained in the integration of teaching with various missions of the college and academic services planning consistent with reality, including the development of health promotion activities in line with the 5 Or. principle under the Sufficiency Economy philosophy in a participatory fashion by the college. Therefore, purpose of the research was to study and compare differences in the use of hand-squeezing balls manufactured from natural

Research Hypotheses

1.The use of hand-squeezing balls manufactured from natural rubber, hand-squeezing balls manufactured from balloons, and freehand-squeezing produce will produce different measured handgrip strengths in older people.
2.Handgrip strength has a correlation with cognitive function, balance, and depression in older people.

Conceptual Framework

As the literature reviews revealed that increasing handgrip strength in older people is important to the quality of life of older people, the research committee was interested in studying the effects of increasing handgrip strength by exercises using hand-squeezing balls and freehand-squeezing by relying on the criteria of the Asian Working Group for Sarcopenia (AWGS) as the guidelines for assessing handgrip strength (muscle strength). Assessments were performed by the use of handgrip strength measurements and the correlation between handgrip strength and fall prevention was assessed by physical performance evaluation by the Timed Up and Go (TUG) method, while forgetfulness prevention was assessed by memory evaluation, whereby older people were instructed to remember and record items remembered within a specified time. In addition, depression prevention was assessed by the use of the 2Q and 9Q depression evaluation forms of the Department of Health. The study's conceptual framework is summarized as follows:

To study and compare differences in the use of hand-squeezing balls manufactured from natura

To study and compare differences in the use of hand-squeezing balls manufactured from natural

1. To study and compare differences in the use of hand-squeezing balls manufactured from natural rubber, hand-squeezing balls manufactured from balloons, and freehand-squeezing on handgrip strength as measured from handgrip dynamometers in older people.

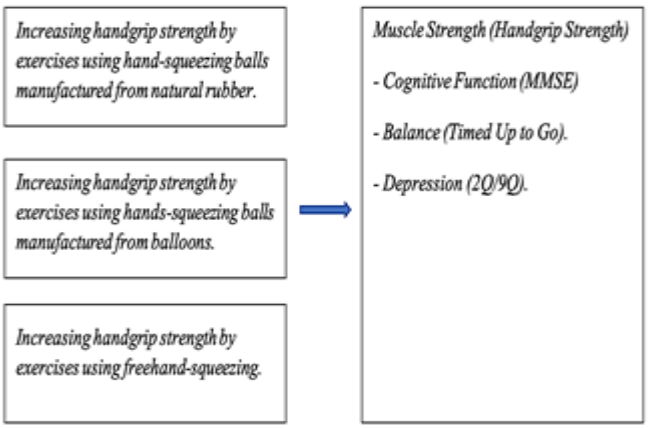

Figure 1. The Conceptual Framework

Methodology

aimed at studying the effects of exercises using hand-squeezing balls and freehand-squeezing on handgrip strength, cognitive function, balance, and depression in

older people residing at Ban Pong, Ratchaburi. The study lasted from July 2019 to September 2020.

Population/Sample Group

The population consisted of 28,829 older people who were aged 60 years or above (Older
People Affairs, Ratchaburi Public Health Office) residing in Ban Pong, Ratchaburi. The sample group consisted of 150 people divided into one control group (freehand-squeezing group) and two experimental groups: one group which squeezed balls manufactured from natural rubber and one group which squeezed balls manufactured from balloons. Each group contained 50 members. Subjects were obtained by simple random sampling by lottery to produce one control group and two experimental group. The selection method was sampled from a different sub-district in order to minimize chances of the groups meeting each other and lead to opinion exchanges between the experimental groups and the control group (contamination effect).

Data Collection Procedures

Data collection by the research team was divided into three groups covering increasing of handgrip strength by exercises involving squeezing by the use of equipment and by free hands. The practices were as follows:
Group 1 exercised by freehand-squeezing and represented the control group.
Group 2 exercised by squeezing balls manufactured from natural rubber.
The balls had a diameter of 2 inches and were developed by Anuchit Wichianchom from the Rubber and Polymer Technologies Subject Branch, Faculty of Science and Technology, Rajamangala University of Technology Srivijaya, Nakhon Si Thammarat Campus, to provide consistent ball flexibility and hardness.
This group represented Experimental Group 1 and Group 3 exercised by squeezing balls manufactured from balloons filled with all-purpose flour with a diameter of 2 inches by following the recommendations of the qualified experts for the research for the experimental group.
1. The research participations received explanations about the objectives and methodology of the experiment, including the recording of activities in exercise record notebooks and the desired outcomes of the experiment.
2. Performance assessments were performed by handgrip strength test, cognitive function and memory testing, Timed Up and Go, and depression evaluation.
3. The research team and assistants taught and provided knowledge and introduced three exercise techniques by the use of the devices assigned to each group, namely, freehand, natural rubber balls, and balloon balls, whereby 30 repetitions were to be performed per set for three sets per day consecutively for three months. The participants also received explanations on how to make records, by which they were to understand what as well as how to record.
4. Assessment records were made in the record notebooks of the older people as well as on a computer.
5. The accuracy and completeness of the data were verified monthly on three occasions for translation of record notebook assessment results. Incomplete records were subjected to inquiries and additional record teaching instructions.

Ethical Considerations

This research applied for certification of ethics for research involving human subjects by the Institutional Review Board on Research Involving Human Subjects of Boromarajonani College of Nursing, Jakkriraj, Praboromarajchanok Institute, Ministry of Public Health, Thailand (No.1-77/2562).

Data Analysis

1. performed on demographic data, handgrip strength, cognitive function, balance, and depression in the sample group by using frequencies, percentages, mean values, and standard deviations.

2. The handgrip strength of each subject was analyzed individually with reference to the Thai handgrip strength standards by age.

3. Analyses and comparisons were performed on handgrip strength, cognitive function, balance, and depression in the sample groups with pre-test and post-test handgrip strength comparisons by using the paired t-test, and differences in handgrip strengths were compared by an assessment of handgrip strengths among the three groups by using one-way ANOVA statistics.

Results

The results showed that demographic data of the sample group, it was found that there were more female than male older people at 86.7% and 13.3%, respectively. Age-wise, the participants were aged 60 to 69.9 years the most at 79.3%, while BMI ranged from 23 to 29.9 the most at 43.4%, with blood pressure above 130/30 millimeters of mercury the most at 57.3% and normal blood pressure at 42.7% respectively. For depression, it was found that every project
participant had a depression score as evaluated by the 2Q evaluation form of = 0 points both pre-test and post-test.
As for the mean values and standard deviations of the control group and the experimental groups as shorted by handgrip strength, cognitive function, balance, and depression in the older people pre-test and post-test, the details were as follows: Handgrip strength, cognitive function, and balance increased after the experiment in every group. The control group that performed freehand-squeezing had mean values and standard deviations on handgrip strength in older people in the right and left sides at 18.13 (SD = 4.77) and 18.16 (SD = 4.63). In addition, the experimental group that used hand-squeezing balls manufactured from natural rubber had those values at 21.21 (SD = 6.15) and 21.46 (SD = 5.81), while the group that use balloon hand-squeezing balls had those values at 20.97 (SD = 5.69) and 19.64 (SD = 4.72). For cognitive function, the value was 24.05 (SD = 3.79), and for balance the value was 11.69 (SD = 1.78), and the post-test mean values and standard deviations in the control group that used freehand-squeezing had handgrip strength in older people in the left

and right sides at 19.22 (SD = 4.63) and 18.70 (SD = 4.40), while those of the experimental group that used natural rubber hand-squeezing
balls were 23.28 (SD = 6.50) and 22.53 (SD = 6.11), and those of the experimental group that used balloon hand-squeezing balls were 22.65 (SD = 5.61) and 21.21 (SD = 5.41), with cognitive function scores at 24.82 (SD = 3.78) for the freehand-squeezing group, 25.72 (SD = 3.05) for the natural rubber hand-squeezing balls group, and 24.05 (SD = 3.69) for the balloon hand-squeezing balls group. For balance, that of the control group that used freehand-squeezing was 12.31 (SD = 1.78), and 11.69 (SD = 2.30) for the experimental group that used natural rubber hand-squeezing balls, and 13.10 (SD = 2.61) for the balloon hand-squeezing balls as shown in Table 1.

On analysis comparing the mean handgrip strength in older people among the group that used natural rubber hand-squeezing balls, the group that used balloon hand-squeezing balls, and the group that used freehand-squeezing as measured on both sides pre-test and post-test, the group that used natural rubber hand-squeezing balls had different pre-test and post-test handgrip strengths in the right and left hands as measured in kilograms with statistical significance ($P < 0.001$ and $P < 0.05$, respectively), while the pre-test and post-test handgrip strengths of the group that used balloon hand-squeezing balls were different with statistical significance ($P < 0.001$), and the group that used freehand-squeezing had different pre-test and post-test handgrip strengths with statistical significance ($P < 0.05$).

Table 1 – Mean Values and Standard Deviations for Handgrip Strength, Cognitive Function, and Balance of Older People Pre-test and Post-test

Test	Group		Pre-test		Post-test	
			$\bar{x}$	*SD*	$\bar{x}$	*SD*
Handgrip strength	Freehand-squeezing	Right	18.13	4.77	19.22	4.63
		Left	18.16	4.99	18.79	4.40
	Natural Rubber Hand-squeezing Balls	Right	21.21	6.15	23.28	6.50
		Left	21.46	5.81	22.53	6.11
	Balloon Hand-squeezing Balls	Right	20.97	5.69	22.65	5.61
		Left	19.64	4.72	21.21	5.41
Cognitive Function	Freehand-squeezing		24.05	3.79	24.82	3.78
	Natural Rubber Hand-Squeezing Balls		24.77	3.87	25.72	3.05
	Balloon Hand-squeezing Balls		23.35	3.61	24.05	3.79
Balance	Freehand-squeezing		11.69	1.78	12.31	2.89
	Natural Rubber Hand-Squeezing Balls		12.11	2.69	11.69	2.30
	Balloon Hand-squeezing Balls		12.31	2.89	13.10	2.61

The mean handgrip strengths of the right hand of older people in at least one pair were different with statistical significance ($P < 0.001$). Upon comparing the exercise techniques, it was found that the group that used natural rubber hand-squeezing balls and the group that used balloon hand-squeezing balls had higher mean handgrip strength in older people than the group that used freehand-squeezing with statistical significance ($P < 0.01$) and that the mean handgrip strengths of the left side of older people were different in at least one pair with statistical significance ($P < 0.05$). Upon comparing the exercise techniques, it was found that the group that used natural rubber hand-squeezing balls and the group that used balloon hand-squeezing balls had higher mean handgrip strength in older people than the group that used freehand-squeezing with statistical significance ($P < 0.05$).

Older people in the group that used natural rubber hand-squeezing balls had handgrip strength, cognitive function, and balance different in at least one pair with statistical significance ($P < 0.05$). Upon comparing each area, it was found that handgrip strength and balance and balance and cognitive function had different mean values with statistical significance ($P < 0.05$). However, the mean values for handgrip strength and cognitive function were not different.

Older people in the group that used balloon hand-squeezing balls had handgrip strength, cognitive function, and balance different in at least one pair with statistical significance ($P < 0.05$). Upon comparing each area, it was found that handgrip

strength and balance and balance and cognitive function had different mean values with statistical significance ($P < 0.05$). However, the mean scores for handgrip strength and cognitive function were not different.

Older people who exercised by freehand-squeezing had differences in handgrip strength, cognitive function, and balance in at least one pair with statistical significance ($P < 0.05$). Upon comparison of each aspect, it was found that handgrip strength and balance and balance and cognitive performance had different mean scores with statistical significance ($P < 0.05$). However, the mean scores for handgrip strength and cognitive function were not different.

Conclusion and Discussion

The findings from the study on the effects of exercise by using hand-squeezing balls and freehand-squeezing on handgrip strength, cognitive function, balance, and depression in older people can be explained as follows:

On analysis comparing the mean handgrip strengthin older people among the group that used natural rubber hand-squeezing balls, the group that used balloon hand-squeezing balls, and the group that used freehand-squeezing as measured on both sides pre-test and post-test, the group that used natural rubber hand-squeezing balls had different pre-test and post-test handgrip strengths in the right and left hands as measured in kilograms with statistical significance ($P < 0.001$ and $P < 0.05$, respectively), while the pre-test and post-test handgrip strengths of the group that used balloon hand-squeezing balls were different with statistical significance ($P < 0.001$), and the group that used freehand-squeezing had different pre-test and post-test handgrip strengths with statistical significance ($P < 0.05$).

That is, the mean handgrip strength of the group that used hand-squeezing balls manufactured from natural rubber, the group that used hand-squeezing balls manufactured from balloons, and the group that used freehand-squeezing had higher mean scores post-test. To explain the finding, consistent development of hand and arm muscles by hand-squeezing strengthened hand and arm muscles, giving them vigor, endurance, and flexibility. It can be explained in the same manner that every exercise caused muscles to work by flexing and exerting together, and such work produced handgrip strength and power in muscles when they were required for use [12]. The finding concurs with a study into the primary cause of falls and the reduced ability to perform activities of daily living of older people, which found that reduction in muscle mass in older people produced visible symptoms such as difficulty in getting up and sitting down, poor balance, frequent falls, limited ability to perform activities of daily living, and poorer quality of life [13]. Thus, it can be said that the exercises in the older people in the group that used hand-squeezing balls manufactured from natural rubber, the group that used hand-squeezing balls manufactured from balloons, and the group that used freehand-squeezing contributed to increased handgrip strength in the older people who participated in the project.

Furthermore, it was found that the post-test cognitive function mean scores for all three groups were higher, and the participants had improved balance without depression. It can be explained in the same manner that exercise improves the effectiveness of the body's systems, thus improving the function of muscles and senses along with promoting good memory despite older age [12]. The findings concur with the concept that development of hand or arm muscles may impact basic cognitive function [9]. Hence, greater hand and arm strength in older people contributes to improved balance, thus reducing risk of falls. In addition, exercise promotes blood flow to the brain, thus brightening moods and enhancing focus, and continuous exercise causes the body to secrete endorphins that relaxes the body and increases psychological comfort, leading to effective reduction or treatment of depression and stress [14]. It can be said that increasing handgrip strength in older people contributes to improved quality of life in older people and promotes greater activities in older people such that they develop better balance management and improved cognitive function while reducing depression [9].

The mean handgrip strengths of the right hand of older people in at least one pair were different with statistical significance ($P < 0.001$). Upon comparing the exercise techniques, it was found that the group that used natural rubber hand-squeezing balls and the group that used balloon hand-squeezing balls had higher mean handgrip strength in older people than the group that used freehand-squeezing with statistical significance ($P < 0.01$) and that the mean handgrip strengths of the left side of older people were different in at least one pair with statistical significance ($P < 0.05$). Upon comparing the exercise techniques, it was found that the group that used natural rubber hand-squeezing balls and the group that used balloon hand-squeezing balls had higher mean handgrip strength in older people than the group that used freehand-squeezing with statistical significance ($P < 0.05$). The finding can be explained in that as older people exercised by squeezing hands heavily or exercising sufficiently, their muscles developed in size, thereby increasing the hand and arm muscle strength of older people and leading all three groups to have higher mean handgrip strength scores post-test. This study utilized hand-squeezing exercises by the use of natural rubber balls, balloon balls and freehand-squeezing at 30 repetitions per set for three sets per day by starting with light squeezing followed by heavier squeezing continuously for up to three months. On the other hand, if training or exercise was insufficient, or exercise was not performed continuously and consistently, muscles would shrink while growing successively weaker. Additionally, analysis found that the post-test handgrip strengths between the group that used natural rubber hand-squeezing balls and the group that used freehand-squeezing were different with statistical significance ($P < 0.05$), but there were no statistically-significant differences between the group that used balloon hand-squeezing balls and the group that used freehand-squeezing. As the experimental groups were prescribed exercises by squeezing the different devices developed by the researcher to provide resistance to increase handgrip strength, differences in handgrip strength resulted due to the differences in the resistance of each type of device used. Natural rubber hand-squeezing balls produced greater resistance than balloon hand-squeezing balls and freehand-squeezing. The findings concur [15], which stated that in order to increase handgrip strength in order to boost performance, in addition to the component of the training program, which must be made to match the intended

purpose, it is necessary to consider the devices used to promote handgrip strength, by which they should require the maximum amount of exertion in a single repetition which that older people can perform on the type of resistance as all muscles were shrinking. The strength of local muscles depends on the resistance produced by the device used.

Older people in the group that used natural rubber hand-squeezing balls had handgrip strength, cognitive function, and balance different in at least one pair with statistical significance ($P < 0.05$). Upon comparing each area, it was found that handgrip strength and balance and balance and cognitive function had different mean values with statistical significance ($P < 0.05$). However, the mean values for handgrip strength and cognitive function were not different. With older people in the group that used balloon hand-squeezing balls had handgrip strength, cognitive function, and balance different in at least one pair with statistical significance ($P < 0.05$). Upon comparing each area, it was found that handgrip strength and balance and balance and cognitive function had different mean values with statistical significance ($P < 0.05$). However, the mean scores for handgrip strength and cognitive function were not different.

Older people who exercised by freehand-squeezing had differences in handgrip strength, cognitive function, and balance in at least one pair with statistical significance ($P < 0.05$). Upon comparison of each aspect, it was found that handgrip strength and balance and balance and cognitive performance had different mean scores with statistical significance ($P < 0.05$). However, the mean scores for handgrip strength and cognitive function were not different.

When Comparison of the mean scores on handgrip strength, cognitive function, and balance in older people in the group that used natural rubber hand-squeezing balls, the group that used balloon hand-squeezing balls, and freehand-squeezing balls revealed that handgrip strength was correlated with cognitive function, balance, and depression in older people. A study found that loss of balance in elderly people was often connected to osteoarthritis, loss of muscle strength, deterioration in sensory function, brain disease, or multiple causes together. The American psychologist Propper (2005) [8] found that tightly squeezing the right hand can boost the memory storage portion of the brain and that tightly squeezing the left hand is correlated with information recall and that regularly squeezing the hands several times per day every day can effectively exercise the brain in an alternating manner, thus promoting good memory, enhancing cognitive function, and reducing risk of dementia. Furthermore, a long-term follow-up study in normal older people living in communities in Korea found that muscle strength of the hands and arms as measured from handgrip strength was correlated with cognitive function as assessed by Mini-Mental State Examination scores with statistical significance [9]. Similarly, reduction in handgrip strength and muscle mass leads to sarcopenia, increases risk of falls, decreases the ability to perform responsibilities and contributes to physical disability, thus causing anxiety and depression in older people [16].

The findings concur with a study into information, falls and the reduced ability to perform activities of daily living of older people, which found their primary cause to be loss of muscle mass, which caused depression and reduced quality of life in older people [13]. In particular, reduced ability to perform activities of daily living contributed to older people being unable to socialize and these limitations impact quality of life. Furthermore, a supporting study found that handgrip strength was correlated with activities of daily living [17]. A past international study found that ADL and IADL were correlated with handgrip strength in persons older than 75 years [18]. These findings are consistent with the study by Taekema (2010) [19], which stated that handgrip strength was correlated with lower ADL scores in people who were 85 years old. However, a study found no differences in basic activities of daily living (ADL) and instrumental activities of daily living (IADL) in older people with and without sarcopenia [20], and a study into correlations among depression, fatigue, and physical performance of older people with osteoarthritis of the knee found that depression had a positive correlation with physical performance to a low degree.

While conducting literature review on studies on factors correlated with cognitive function and depression in older people, many correlated factors were found, such as genetics; family history of illness; gender, whereby females were found to experience imbalances in neurotransmitters in the brain, hormones, and stress in life events and the environment more than males; family upbringing style; cognitive processes in individuals; personality; physical illnesses; and even narcotic use. Thus, it cannot be concluded that handgrip strength is correlated with cognitive function and depression in older people.

Older people experience physical, psychological, and psychosocial changes that impact their health status. Therefore, efforts to delay deterioration and promote health are necessary, and these include appropriate diet, sufficient rest, relaxation activities, and appropriate exercise. Exercising to increase muscle strength in the hands and arms is method important to the health of older people, as exercise improves the function of the respiratory, circulatory, muscular, skeletal, and nervous systems. Sonsompan (2018) [21] stated that exercising to increase muscle strength of the hands and arms can help prevent forgetfulness and depression in older people and, therefore, older people should exercise to increase muscle strength of the hands and arms by squeezing their hands regularly at least three times per week at 20-30 minutes per session in order to improve health and delay deterioration caused by physical and psychological changes.

Older people experience physical, psychological, and psychosocial changes that impact their health status. Therefore, using handgrip strength assessment as a component of health assessments in older people, since the methodology involved is not complicated and can promote interest in older people in taking care of their own health. Personnel responsible for screening and organizing activities for promoting the health of older people should possess excellent knowledge and expertise in the use of various tools in order to ensure screening precision and produce good outcomes from activities when health professionals are screening if health problems in older people are particularly encountered in any area, perhaps older people facing the same problems can be appointed to attend activities at the same time in order to enable focused problem-solving for older people in a manner that accurately deals with the problems that occurred.

References

[1] World health organization. (2021). Decade of Healthy Ageing 2021 – 2030. WHO Regional Office for Europe Retrieved May 13, 2021, from https://www.euro.who.int/en/health-topics/Life-stages/healthy-ageing

[2] Tramontano, A., Veronese N., Sergi, G., et al. (2017). Prevalence of sarcopenia and associated factors in the healthy older adults of the peruvian andes. Arch Gerontol Geriatrict; 68:49-54.

[3] Hirani, V., Blyth, F., Naganathan, V., et al. (2015). Sarcopenia is associated with incident disability, institutionalization, and mortality in community-dwelling older men: The concord health and ageing in men project. JAMDA, 16(7): 607-613.

[4] Carmeli, E., Imamb, B., & Merrickc, J. (2012). The relationship of pre-sarcopenia (low muscle mass) and sarcopenia (loss of muscle strength) with functional decline in individuals with intellectual disability (ID). Arch Gerontol Geriatrict, 55: 181-185.

[5] Pengchan, W. (2019). Older people care principle: "stop falls, forgetfulness, and depression, and promote good meals". Documents from the National Academic Meeting on Promoting Health in Older People 2017. Retrieved January 1, 2019, from https://www.hfocus.org/content/2017/08/14433

[6] Thanasuppakorn, P., Wongsutthilert, A., Chaidee, Panyamana, WA, Thararam S. (2018). Questionnaire for screening SARC-F sarcopenia correlations with physical performance and handgrip strength in Thai older people. Burapha Journal of Medicine, 5 (2), 87-93.

[7] Sombuntanon, W., Thiangtham, S. (2018). Factors Correlated with the Activities of Daily Living of Older People in Communities with Low Handgrip Strength. Songklanagarind Journal of Nursing, 38 (2), 110-123.

[8] Rute, E., Propper, Stephen, D., Christman, & Keri, A. Phaneuf. (2005) A mixed-handed advantage in episodic memory: A possible role of interhemispheric interaction. Memory & Cognition, 33 (4), 751-757.

[9] Jeong, S., & Kim, J. (2018). Prospective Association of Handgrip Strength with Risk of New-Onset Cognitive Dysfunction in Korean Adults: A 6-Year National Cohort Study. The Tohoku Journal Of Experimental Medicine, 244(2), 83-91. doi: 10.1620/tjem.244.83

[10] Takata, Y., Ansai, T., Soh, I., Kimura, Y., Yoshitake, Y., Sonoki, K., & Takehara, T. (2008). Physical fitness and cognitive function in an 85-year-old community-dwelling population. Gerontology, 54(6), 354-360. doi: 10.1159/

[11] Ramnath, U., Rauch, L., Lambert, E. V., & Kolbe-Alexander, T., L. (2018). The relationship between functional status, physical fitness and cognitive performance in physically active older adults: A pilot study. Plos One, 13(4), e0194918-e0194918. doi: 10.1371/journal.pone.0194918

[12] Palacheewa, KT. (1997). Model of teaching for early childhood education. Bangkok: Edison Press Product.

[13] Tramontano, A., Veronese, N., Sergi, G., et al. (2012). Prevalence of sarcopenia and associated factors in the healthy older adults of the peruvian andes. Arch Gerontol Geriatrict, 68: 49-54.

[14] Lynette, L., & Craft, Frank, M. (2004). The Benefits of Exercise for the Clinically Depressed, 2004; 6(3): 104–111. doi: 10.4088/pcc.v06n0301

[15] Anandhi, D., Gokila, D., and Sivakumar, VPR. (2018). Comparison of Tasks Exercise Versus Resistance Exercise to Improve Grip Strength and Hand in Elderly. Journal of Physiotherapy Research, 2:1-5.

[16] Hairi, NN., Cumming, RG., Naganathan,V., et al. (2010). Loss of muscle strength, mass (Sarcopenia), and

quality (specific force) and its relationship with functional limitation and physical disability: The concord health and ageing in men project. J Am Geriatrict Soci, 58(11): 2055-62. doi:10.1111/j.1532-5415.2010.03145.x

[17] Oppewal, A., Hilgenkamp, TIM., Wijck, Rv, et al. Physical fitness is predictive for a decline in daily functioning in older adults with intellectual disabilities: Results of the HA-ID study. Res Dev Disability, 2014:35 2299-315.

[18] Rantanen, T., Avlund, K., Suominen, H., et al. (2002). Muscle strength as a predictor of onset of ADL dependence in people aged 75 years. Aging Clin Exp Res, 14(3 Suppl): 10-5.

[19] Taekema, DG., Gussekloo, J., Maier AB, et al. (2010). Handgrip strength as a predictor of functional, psychological and social health. A prospective population-based study among the oldest old. Age and Ageing, 39: 331-7.

[20] Bahat, G., Saka, B., Tufan, F., et al. (2010). Prevalence of sarcopenia and its association with functional and nutritional status among male residents in a nursing home in Turkey. Aging Male, 13 (3): 211-214.

[21] Sonsompan, R. (2019). Promotion guidelines for depression prevention in older people in Khon Buri, Nakhon Ratchasima. Health Research and Development, Nakhon Ratchasima Public Health Office; 4(1): 77-89.