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Factors Associated with Older Adult's Exercise Self-Efficacy: Basis for Exercise Program in Bincheng District of Binzhou City, China

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Abstract:
Various chronic diseases are prevalent with the aging population. It is common among older individuals to have decline in movements that often lead to diminish inclination and capacity to exercise. Hence, this study sought to determine the influencing factors concerning older adults' exercise as to socio-clinical factors and environmental factors, and their relationship with the older adults' self-efficacy for exercise (OD-SEE) score. The socio-clinical factors referred to their intrinsic determinants such as age, sex, highest educational attainment, family monthly income, family type, morbidity, and body mass index classification. Environmental factors referred to their extrinsic determinants such as social support system and physical environment. An analytical cross-sectional study design was employed to 383 respondents in Bincheng District of Binzhou City, China using OD-SEE scale survey tool. Results show that in terms of socio-clinical factors, variables age, highest educational attainment, family monthly income, and family type exhibited significant differences. Variance was also observed in terms of the social support system. Thereby, findings of this study provide a solid foundation and baseline to standardize future exercise self-efficacy intervention programs among the senior citizens not only in this locale in China, but even in Asian countries with similar characteristics.

Keywords: exercise self-efficacy, older adults, influencing factors, baseline

1. INTRODUCTION

High global inactivity rate is a common public health concern among the aging population. It is common among older adults to have decline in movements that often lead to diminish inclination and capacity to exercise. Self-efficacy for exercise, on the other hand, was reported as the key indicator among older adults to reduce the higher risks of chronic diseases (Dawe et al., 2024). However, according to the national cross-sectional survey conducted by Su et al., (2022), the prevalence of chronic diseases in China was 81.1% (95% CI 80.9-81.2), representing 179.9 million Chinese older adults. The prevalence increased with aging and peaked at 80 to 84 years old (87.2, 95% CI 86.7-87.7). Hypertension, heart disease, cerebrovascular disease, gastrointestinal ulcers, arthritis and chronic nephritis were among the top prevalent chronic diseases affecting the Chinese older adults (Chen et al., 2024). The most common multimorbidities with combination of two chronic diseases was hypertension and heart conditions and the most common comorbidities were hypertension, heart diseases and diabetes (Chen et al., 2024).

Various influencing factors were identified with physical inactivity among older adults. A study of Sullivan et al., 2017, categorized them into three barriers such as demographic (e.g. older male is more likely to have low self-efficacy to exercise; feeling tired and fatigue associated with age), environmental (e.g. weather, scenery, etc.) and psychosocial (e.g. fear, embarrassment, low self-efficacy). A study of Baert et al., (2011) classified the barriers as intrapersonal (e.g. low expectations), interprofessional (lack social support), and community (e.g. expenses, inaccessibility). In this study, the researchers will focus on two distinctive factors, categorized into socio-clinical factors and environmental factors to exercise.

Meanwhile, according to Zhan & Zhu, (2018) reported that the Chinese government took an active role in providing physical activity (PA) with a total of 44 related policies but mainly focused on environmental-related aspects. The study also mentioned various older adult exercises such as aerobic exercise, aquatic exercise, Diabolo exercise, Baduanjin, Chanwuyi, elastic band resistance exercise, tennis, cyber-golfing, dancing, gait training, home-based exercise, moderate-intensity exercise, kick shuttlecock, light volleyball, Qigong, strength exercise, Tai Chi, Ving Tsun, walking, and yoga. All these exercises provide benefits to the older adults. For instance, Baduanjin is a form of a complete set of qigong exercises to improve body awareness and balance that involve meditation, breathing, body posture and gentle movement (Zhan and Zhu, 2018). Apparently, "regular exercise" in this study refers to any exercise performed by the older people that involve scheduling, planning, repetition, and structuring to improve health (Toros et al., 2023). It is considered regular exercise when it is consistent and continuously performed as per schedule (Toros et al., 2023).

On the other hand, the researchers recognize diversity of older adult self-efficacy for exercise (OD-SEE) and their individuality (Zhan & Zhu, 2018). Self-efficacy is defined as a person's confidence in their ability to perform a task (Picha & Howell, 2018; Bandura, 1997). It constitutes an integral part of human behavior within Social Cognitive Theory (SCT), which suggests that individual cognition, behavior and environment are all interdependent factors that shape our actions (Lee 2008). While external factors undoubtedly play a significant role in influencing our conduct, self-efficacy refers to an individual's belief in their own ability to successfully accomplish a given task when faced with challenges. In this current study, OD-SEE refers to how confident the older adults are to exercise three times per week for 20 minutes despite experiencing barriers such as bad mood, feeling tired, did not enjoy the exercise, too busy for exercise, and feeling pain when exercising (Dawe et al., 2024; Resnick & Jenkins, 2000; van Stralen et al., 2009; Lee et al., 2009, Bandura, 1997). A study of Picha & Howell, (2018) has shown that older adults with high self-efficacy to exercise were quick to engage on new sets of exercises. However, those with low self-efficacy were quick to quit and more likely to disengage when the routine exercise becomes difficult (Picha & Howell, 2018). Thereby, this research will focus on two aspects concerning socio-clinical factors (intrinsic factors) and environmental factors (extrinsic factors). Socio-clinical factors concerns those factors which emanate on persons' intrinsically such as age, sex, education, income, family type (if living alone or living with one, two, or three generation), body mass index classification (BMI-underweight <18.5; Normal range 18.5 to 24.9; 25 to 29.9; Overweight, Class I Obesity 30 and above, as well as morbidity. Environmental factors, on the other hand, involve two elements such as the influence of social support system and physical environment. Social support system refers to that social connectedness for older adults (like for example support of family, friends, healthcare professionals, and community-based organization for elderly/senior club) to motivate them to exercise. It was reported that older adults who receive social support from family and friends and those who join senior clubs tend to engage more on exercise-related

activities or community-based exercise (Lee and Fan 2023; Stolarz et al, 2022; Chaudhury et al, 2016). Physical environment refers to access to exercise facilities such as recreational walking, biking lanes, (Lee and Fan 2023; Inoue et al., 2011).

In view thereof, findings of this study provides a baseline data on the senior exercise self-efficacy score and its relationship with the influencing factors such as socio-clinical factors (intrinsic) and environmental (extrinsic- social support system and physical environment) aspects. Furthermore, it could provide direction to address the gap as a basis in drafting future standardized exercise programs for the Chinese older adults.

2. STUDY OBJECTIVES

2.1. General Objective

The study sought to determine the factors influencing exercise self-efficacy among the older adults in Binzhou City as a basis for designing an Exercise Program

2.2. Specific Objectives

Specifically, this study aimed:

1. To determine the influencing factors concerning exercise among the respondents as to socio-clinical and environmental factors;
2. To determine the respondents' self-efficacy for exercise score using the OD-SEE scale.
3. To determine the relationship between the respondents' self-efficacy for exercise score and its different influencing factors.

3. REVIEW OF RELATED LITERATURE

3.1. Older adults' inactivity rate

The World Health Organization (2022) declared that there was a 5% increase in the level of physical inactivity from 2010 to 2022. This will continuously increase and is projected to rise by 2030 at 32% in women and 32% in men. Population aging refers to the proportion of the old-age population increasing as compared to the overall population, which goes along with the changes in the age structure.

China has the largest population of older people in the world and has entered this aging society since 2000 (Li et al., 2022; Wang & Zhou, 2020). Despite the Chinese government's efforts in providing various policies (Zhan & Zhu, 2018) on physical activity, it was reported that there is an increasing trend of physical inactivity among Chinese adults aged 45 years old and above from 2010 to 2018 (Zhang et al., 2023). The Chinese government provided physical activity programs with a total of 44 related policies that focus particularly on environmental-related aspects. However, more than one-fifth of older adults are unable to participate or achieve the suggested physical activity programs (Zhan & Zhu, 2018). Therefore, exploring the influencing factors that could elevate the level of older adults' exercise self-efficacy would be crucial and more targeted and structured exercise promotional strategies could be developed in the future to improve the health of the older adults' population.

3.2. Prevalence of common morbidities among older adults in the world and in China

A national cross-sectional study conducted by Su et al., (2022) revealed the epidemic characteristics of Chinese older adults' chronic diseases aged 60 and older. There were a total of 224, 640 elderly participants in the survey, wherein the national prevalence of any chronic diseases was 81.9% (95% Cl 80.9-81.2), and representing 179.9 million older adults with chronic conditions. In terms of demographics, it was identified as prevalent in women (84.2, 84-84.4), residing in rural (82.6, 82.4-82.8)

with ethnic minorities (82.2, 81.5-82.8). Multimorbidities status of the older adults in China reported by Yan et al., (2019) reported that out of 11 698 aged over 60 years, 69.13% was the prevalent rate of chronic disease from 2015. Top ranked were arthritis or rheumatism with 38.50%, followed by hypertension having 26.42%, gastrointestinal system diseases (24.53%). Hypertension, heart diseases and diabetes were as the most common comorbidities (Chen et al., 2024) which were risk factors of inactivity.

3.3. Older adult's exercises and impact of self-efficacy to exercise in China

Proper exercise can reduce the degree of related-chronic conditions among older adults and delay the development of the ailments (Chen et., 2023; Chen, et al., 2022) However, because the physical conditions of the older individuals gradually decline with the growth of age, their physiological functions and various physical quantities are not as good as before, physical fitness is significantly decreased, fitness ability is decreased, the ability to bear the risk of exercise is reduced (McAuley et al., 2011), if on the basis of this age co-suffering from chronic diseases such as hypertension, diabetes and other cardiovascular diseases, the ability to bear the risk of exercise will be lower. Therefore, self-efficacy to exercise plays a pivotal role to the health of older adults (Chen et., 2023; McAuley et al., 2011; Grembowski et al., 1993). Self-efficacy is defined as a person's confidence in their ability to perform a task (Picha & Howell, 2018; Bandura, 1997). Studies reported a positive effect of self-efficacy to physical exercise such as sport participation on the level of subjective well-being and health promotion behavior of Chinese older adults (Chen et. 2023; Chen, et al., 2022). Self-efficacy has a beneficial impact on health behavior and health status on older adults, whereas those with high self-efficacy had lower health risk behaviors on exercise and with better health (Chen et., 2023; McAuley et al., 2011; Grembowski et al., 1993).

Zhan & Zhu, (2018) reported various older adults' exercises such as aerobic exercise, aquatic exercise, Diabolo exercise, Baduanjin, Chanwuyi, elastic band resistance exercise, tennis, cyber-golfing, dancing, gait training, home-based exercise, moderate-intensity exercise, kick shuttlecock, light volleyball, Qigong, strength exercise, Tai Chi, Ving Tsun, walking, and yoga. All these exercises provide benefits to the older adults.

3.5. Influencing factors affecting the physical exercise among older adults in China

The factors that affect the physical exercise of the elderly mainly include individual factors, social development factors and demand factors. Individual factors include not only basic demographic factors such as age and gender, but also individual ability factors such as education level, occupation and income. Studies have shown that older men were much more active than women in the 1990s, even though many older women had never been physically active in any form. In recent years, it has been found that older women have more free time after retirement than before, and more women tend to participate in sports activities (Sun et al., 2017); Due to the lack of health awareness among the older adults with relatively low education level, their enthusiasm to participate in physical exercise is affected (Lee et al., 2018).

3.5.1. Individual factors or Intrinsic factors

The level of exercise self-efficacy in older adults' hypertensive patients may be related to age, education level, regular exercise and family income. Lee Qin et al. (Lee 2017) showed that the older the patients, the more accumulated disease intolerance, plus most of the older persons suffer from chronic diseases, the exercise ability of the patients is weakened, resulting in the decline of their own exercise self-

efficacy. AlmutaryH et al., (2020) showed that the education level was positively correlated with the exercise self-efficacy of patients, which may be because patients with low education level had a poor cognition of the disease due to the limited knowledge level, and their understanding of the health education content of medical staff was beyond their ability to accept. It was suggested that the treatment plan should be based on the self-efficacy theory. The design should meet the needs of patients, but also consider their level of education, so as to enhance patients' confidence in exercise. Lee Dan's research (Lee 2008) found that patients with regular exercise habits experienced the benefits of exercise to them, and were able to clearly understand the actual level of their own exercise, and then could stick to exercise.

3.5.2. Environmental factors or Extrinsic factors

The extrinsic condition that causes motive is inducement. Studies have found that health promotion and disease prevention are the primary motivation for the older people to take physical exercise. They want to reduce diseases and improve physical fitness and life quality through physical fitness (Wang 2018); Chinese older people have a strong understanding of the fitness function of sports, and most of them mainly aim at improving health, treating diseases and social communication (Zhang, 2018).

3.5.2.1. Social Support System

It mainly includes social support and family support. Chen Jiaojiao et al. (Chen 2018) found through their study that social support for older adult patients with hypertension has a significant impact on exercise self-efficacy. Sun Lan et., al. (Sun 2021) showed that the guidance of family doctors can set different exercise programs according to the specific conditions of patients, which is conducive to enhancing patients' exercise self-confidence.

A large number of studies have shown that there are many factors influencing sports behavior. Sports motivation (Ye 1999), social support (Huang 2019) and exercise facilities (Zhang 2008) are all correlated with sports behavior, and exercise self-efficacy is one of the important predictors of sports behavior. Therefore, the formation of sports behavior is a comprehensive problem involving individuals, interpersonal environment and social environment. The research of Yang Weiwei et al. showed that in Baduanjin (Chinese Qigong) exercise, patients communicate with each other and get emotional support from peers, thus increasing patients' enthusiasm to participate in sports and improving self-efficacy. In China, through questionnaire surveys and experimental study, Chen Jiaojiao et al. (Chen 2018) found that social support for elderly patients had a significant impact on exercise self-efficacy. This study reveals the factors influencing the exercise self-efficacy of the older adults, and provides a theoretical basis for promoting the exercise participation of the older people.

In foreign countries, many scholars also pay attention to exercise self-efficacy and its influencing factors in older adult patients with hypertension. For example, Bandura et al. (Bandura 1997) proposed the self-efficacy theory, arguing that self-efficacy is an important factor affecting individual behavior. Chen, Y et al. (Chen 2018) found that the self-efficacy level of the older adult is closely related to sports participation, mental health and other aspects through questionnaire survey and experimental research. Frensham et al. (Frensham 2019) explored the effects of exercise self-efficacy, social support, and health beliefs on exercise behavior in elderly patients through a longitudinal study. The results showed that exercise self-efficacy, social support and health beliefs were important factors in predicting exercise behavior in elderly patients with hypertension.

3.5.2.2. Physical Environment

Physical environment refers to access to exercise facilities such as recreational walking, biking lanes, (Lee and Fan 2023; Inoue et al., 2011). A study of Lee and Fan, (2023) reported that neighborhood environment is correlated with self-efficacy in older adults and has a positive effect on their physical activity. It was found out that walkability, convenience, better infrastructure and safety of the environment have a positive correlation to increase physical activity among participants (Pan et al, 1997). Older adults have more leisure time; however, the health problems must also be taken into consideration for having less activity. The accessibility of physical activity facilities and walk able and safe environment would be taken into consideration among policy makers.

3.6. Future research perspectives

In view thereof, focusing on the influencing factors that may be correlated to the level of exercise self-efficacy among Chinese older adults would be very crucial due to this age group becoming the largest population in China (Li et al., 2022; Wang & Zhou, 2020). Thereby, with the aging of the population, the incidence of chronic diseases in the older adult is increasing, which brings a heavy burden to the society and the family. This paves a way to explore the influencing factors that may be correlated to their level of exercise self-efficacy among the older adult in China. The confidence of the elderly in performing exercises and the underlying factors are very essential in drafting future intervention or developing standardized exercise programs for the Chinese older adults which are noteworthy for future research.

3.7. Theoretical framework and Conceptual Framework

Self-efficacy was proposed by the famous psychologist Bandura (Bandura 1997) from Stanford University in 1977. Bandura believed that a person's self-efficacy is different in different fields. It is easily influenced by the environment, but also influenced by the subjective cognition of the individual. Research shows (Banik 2018) that the measurement of self-efficacy should be related to the context of the relevant behavior. Bandura (Tucker 2020) defined self-efficacy as one's ability and confidence to perform sports in an obstacle situation. The theoretical basis of this study is the “self- efficacy” theory of Bandura as mentioned above. Which mainly involve intrinsic (individual) and extrinsic (environmental) factors as shown below that may affect the self-efficacy of an individual in certain aspects. This theory constitutes constructs of human behavior within Social Cognitive Theory (SCT). This paradigm suggests that the behavior (self-efficacy for exercise) that shapes the person’s actions is interdependent with individual factors (intrinsic) and environmental factors (extrinsic) (Lee 2008). While external factors undoubtedly play a significant role in influencing our conduct, self-efficacy refers to an individual's belief in their own ability to successfully accomplish a given task when faced with challenges (Dawe et al., 2024; Resnick & Jenkins, 2000).

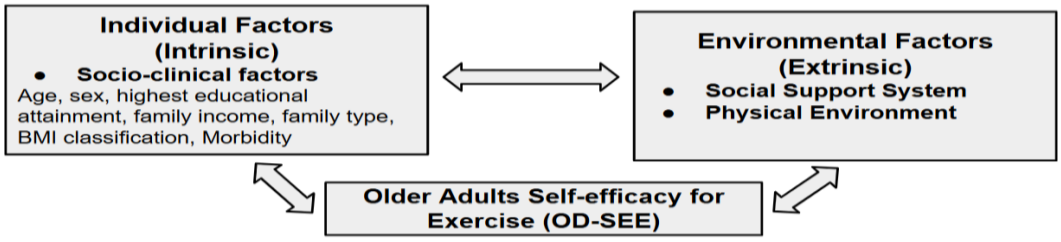

Figure 1: Theoretical Framework of the study based on Social Cognitive Theory (SCT) of Bandura

3.8. Conceptual Framework

The input-output process of this study begins with exploring the influencing factors such as the socio-clinical factors and environmental factors.

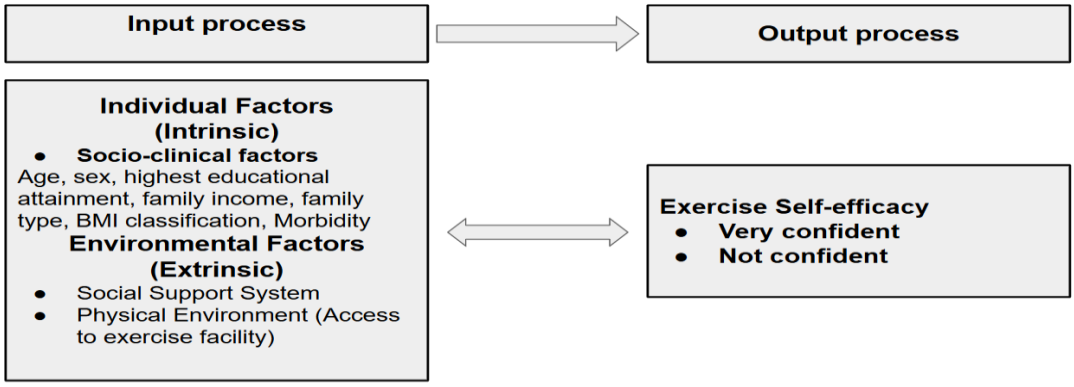

Figure 2: Conceptual Framework of the Study

4. METHODS

4.1. Study Design and Locale

This study employed an analytical cross-sectional design which aimed to measure the OD-SEE score and identify the influencing factors (socio-clinical, and environmental- social support system and physical environment). In an analytical sense, this study sought to determine the relationship between OD-SEE score and the influencing factors to exercise.

This study was conducted at Community Health Centers (CHC) in Bincheng District, Binzhou City, Shandong Province. Similar to the rest of the country and province, Binzhou is experiencing an acceleration of the aging process. According to the local health commission as of the end of 2022, the permanent population of Bincheng District is 631,800 with 117, 578 (18.61%) were over 60 years old. The CHC caters health services for older adults which made the suitable entry point to recruit participants and conduct the study.

4.2. Study Participants

4.2.1. Sample Size and Sampling

There were 117, 578 senior citizens residing at Bincheng District, Binzhou City, Shandong Province in China taken from the local health commission records. Employing a Raosoft Calculator application, the sample size of 383 was computed with 95% confidence level and 5% margin of error.

Convenience sampling technique was the selection method used in this study wherein recruitment of study participants was continued on CHCs located at Bincheng District until the required sample size (n=383) was reached. Moreover, this selection process involved recruiting study participants based on their availability, willingness, or easy access or contact on a practical level, in this case on CHCs in the district constantly visited by elderly in the place for free consultation and other health related activities intended for older adults.

4.2.2. Inclusion and Exclusion Criteria

Individuals aged 60 years or older with unimpeded communication and have agreed and signed the info-

rmed consent was included in the study. However, older adults who were experiencing critical or severe conditions, those who were diagnosed with dementia and related conditions, those with severe comorbidities that affect the ability to exercise were excluded in the study.

4.3. Research Instruments

The survey questionnaire consisted of 14 items with two parts: Part I comprised the influencing factors such as socio-clinical (7-item) and environmental factors (2-item); Part II was a 5-item S-SEE validated survey tool adapted from Dawe et al., (2024) version taken from the original version from the 9-item SEE scale of Resnick & Jenkins, (2000).

Self-efficacy for Exercise (SEE) Scale, which was intended particularly for older adults, is unidimensional consisting of 11-point likert scale (0-10) that measures how confident the older adults are to exercise three times per week for 20 minutes. The study participants choose a number between 0 and 10 with 0 as "not confident", while 10 represent "very confident". Scores between 0 and 10 represent varying degrees of confidence. This means that if a study participant who gives a 9 is slightly less confident than someone who gives a 10, and so on. It has a Cronbach's Alpha of 0.88 and a Composite Reliability of 0.89.

The survey tool underwent validation by a psychometrician to ensure whether it meets what it claimed to measure in the study specific objectives. Then, it underwent pilot testing for 52 older adults that were homogenous to the characteristics of target respondents. Then, the English version of the questionnaire was translated to the Chinese version and then back translated to English after pilot testing of the OD-SEE scale Chinese version. After testing the internal consistency, it shows stronger reliability with a Cronbach's Alpha of 0.901 wherein a score greater than 0.70 indicate reliability (Taber, 2017).

4.4. Research Procedures

4.4.1. Recruitment Process

The study participants were recruited on CHCs in Bincheng District, Binzhou City, Shandong Province in China. An approval to conduct the study was secured in the District Office, wherein the researcher teams sought assistance for contact details of CHC's representative during recruitment of the study participants. Poster Ads were posted on CHCs' bulletin boards to invite the qualified target study participants based on the inclusion criteria. The poster ads contained the title of the study, its objectives and expected duration to answer the questionnaire. There were assigned research assistants near the bulletin boards or conspicuous area where the CHCs provided in scouting the older adults in participating in the survey.

The research team comprised two (2) research assistants, who were students majoring in clinical medicine in class 2023. The research assistants are in clinical medicine professional learning, with strong literature information collection ability, good analysis and processing skills and with good communication, strong organizational and coordination skills. Their participation in the research was purely voluntary but with simple token of appreciation through monetary allowances for travel, accommodation, food, and communication expenses that incur during the conduction of the study. The research assistant will be trained by the researchers to standardize the data collection process.

3.4.2. Data Collection Process

Data collection for the questionnaire was conducted onsite on CHCs. The researcher team provided assistance and guidance to the older adults when responding to the interview, if necessary especially for those with poor eyesight or tremors in holding a pen. The researcher assistants were tasked to double ch-

eck if all the question items were accounted for during the interview.

4.5. Ethical Considerations

Social surveys should never deceive the rights and interests of respondents by saying that surveys were beneficial to social development. Human rights should be respected. Thus, both approval of the institution Ethics Review Committee (in the Philippines) and Ethics Review Committee in the country of origin (China) were secured before the conduction of the study with the ERC protocol no. 2025-MPH-Student-009 and 2025-L006, respectively. Informed consent was secured to the respondents before the conduction of this study. Participants were entitled to withdraw anytime in participating in the study. Taking part in this study was entirely voluntary. The data acquired from the study participants was treated with utmost confidentiality and were utilized only in this study alone. The data collected were kept securely and accessible only to the researcher involved in the study. Gathered data will be kept for three years and will be discarded properly by shredding them. The respondents were given access to the post survey results upon request.

5. STATISTICAL ANALYSIS OF DATA

The statistical analysis software SPSS 23.0 was used for the data conversion. Percentage, mean and standard deviation were used to summarize the influencing factors which include the socio-clinical, environmental factors and the OD-SEE scores (Lee and Fan, 2023).

In analyzing the relationship of OD-SEE score with the influencing factors, test of normality was first carried out for the selection of parametric or non-parametric test. After performing the Kolmogorov-Smirnov, significant p-values of <0.05 were obtained on all the variables, which indicate not normal distribution. Thus, Kruskal-Wallis test, non-parametric tests were employed in the statistical analysis of data. Kruskal-Wallis test is a non-parametric test that determines statistically differences between two or more groups of an independent variable. Post-hoc test was carried out for the variables with statistical significant difference with *p* value of <0.05 and a 5% margin of error from the independent variables (age, highest educational attainment, family monthly income, family type) with the OD-SSE as the dependent variable. Mann-Whitney U test was performed to compare two (e.g. variable-sex, morbidity, social support system) independent groups to determine if there were differences between them.

The effect size (r) is computed manually by dividing the Z with the square root of N. Classification of effect size (r) starts from “small effect size” which is <0.10, “medium effect size” which is 0.30-0.49, and “large effect size” which is 0.50 and above.

6. RESULTS

6.1. Respondents’ influencing factors as to socio-clinical factors and environmental factors

6.1.1. Socio-clinical factors

Table 1 shows that among the 383 respondents, 50.9% (n=195) age ranged fall under 71-80 years old, 54.3% (n=208) are females, 63.4% (n=243) completed the middle school, 55.9% (n=214) with family monthly income of 2000-5000 (in Yuan), and 6.8% (n=26) living alone; while 76.8% living with direct descendants (one generation).

In terms of body mass index (BMI), 44.1% (n=169) have normal weight, however, more than half having abnormal weight such as overweight and obese are 47.5% (n=182), while 8.4% (n=32) are stunted. In terms of morbidity, 39.7% have one chronic ailment, 16.2% (n=62) suffer with co-morbidities, while the remaining 44.1% (n=44.1) have no ailments. Hypertension, as the topmost

morbidity with 29% (n=111), followed by diabetes mellitus with 17.8% (n=68), coronary disease (25.6%, n=98), Hashimoto (0.5%, n=2), and other ailments such as arthritis, asthma and hyperthyroidism having the same distribution of 0.3% (n=1).

Table 1.1 Frequency and percentage distribution of the respondents' influencing factors as to socio-clinical (n=383)

Socio-clinical factors	Variables	n	%
Age *(in years)*	60-70	139	36.3
	71-80	195	50.9
	>81	49	12.8
Sex	Male	175	45.7
	Female	208	54.3
Highest Educational Attainment	Primary School	54	14.1
	Middle School	243	63.4
	Bachelor	62	16.2
	Post Graduate	24	6.3
Family Monthly Income *(in Yuan)*	<2000	86	22.5
	2000-5000	214	55.9
	>5000	83	21.7
Family type *(Living with direct descendants)*	One generation	294	76.8
	Two generation	31	8.1
	Three generation	32	8.4
	Living alone	26	6.8
BMI	Underweight (below 18.5)	32	8.4
	Normal weight (18.5-24.9)	169	44.1
	Overweight (25.0-29.9)	139	36.3
	Obesity (30.0 and above)	43	11.2
Number of ailments	One ailment only	152	39.7
(Morbidity)	Two or more ailments	62	16.2
	No ailment	169	44.1
Type of ailments	Hypertension	111	29.0
(Morbidity-can choose multiple responses)	Diabetes Mellitus	68	17.8
	Coronary disease	98	25.6
	Hashimoto	2	0.5
	Arthritis	1	0.3
	Asthma	1	0.3
	Hyperthyroidism	1	0.3
n- frequency; %- percentage, BMI- Body Mass Index			

6.1.2. Environmental factors

Table 1.2 shows that out of 393 respondents, 97.7% (n=374) declared that their families are their greatest social support system for exercise, followed by friends (36.6%, n=140), health professionals (36.3%, n=139), gym instructors or coach (15.1%, n=58), senior club or organization (8.4%, n=32). In terms of the number of social support systems, findings show that despite 6.8% (n=26) of them living alone, 100% of the respondents revealed they have a social support system, whereas 69.7% (n=267) of the older adults have at least two support systems for exercise. However, 11.5% (n=44) of them reported no access to exercise facilities. Apparently, more than half of them declared that the exercise facilities were near their home (59.5%; n=228), and within their respective residences (29%; n=111).

Table 1.2 Frequency and percentage distribution of the respondents' influencing factors as to environmental (n=383)

Environmental factors	Variables	n	%
Social Support System *(Can choose multiple responses)*	Family	374	97.7
	Friends	140	36.6
	Health Professionals	139	36.3
	Gym instructors/coach	58	15.1
	Senior club/organization	32	8.4
Number of Social Support System *(e.g. from family, friends, health professionals, coach, club)*	one support system	72	18.8
	two support system	267	69.7
	three support system	42	11.0
	four support system	2	0.5
Access to exercise facility	Within home	111	29.0
	Near home	228	59.5
	None at all	44	11.5
n- frequency; %- percentage			

6.2. Respondents' Self-Efficacy for Exercise

Table 2 shows that the older adults' self-efficacy for exercise ranged from (X=5.7, SD=1.6 to X=6.4, SD=1.70). If the mean scores were rounded off to a whole number, 6 out of 10, would indicate low confidence for exercise due to bad mood as the primary barrier, followed by feeling tired, did not enjoy the exercise, too busy for exercise, and feeling pain when exercising.

Table 2: Descriptive statistics of self-efficacy for exercise among older adults (n=383)

How confident are you right now that you could exercise three times per week for 20 minutes if:	Mean (X)	Std. Deviation (SD)
1. Feeling pain when exercising	6.4	1.7
2. Did not enjoy the exercise	6.2	1.5

3. Too busy for exercise	6.3	1.6
4. Feeling tired	5.9	1.5
5. Bad mood	5.7	1.6

0 as not confident; 10 as very confident

6.3. Relationship of the Respondents' Self-Efficacy for Exercise with the influencing factors

After employing the Kruskal Wallis test, variables age (H (2) = 92.8, p=0.000), highest educational attainment (H (3) = 29.2, p=0.000), family monthly income (H (2) = 27.3, p=0.000), and family type (H (3) = 19.9, p=0.000) obtained significant p value of <0.05. This means that the four independent variables exhibited differences in terms of the OD-SEE.

Post hoc test was performed to further compare pairs of groups to pinpoint the exact groups that differ. This is to evaluate the differences between variables age, highest educational attainment, family monthly income, and family type for the OD-SEE. The test revealed significant differences in the OD-SEE scores on the following variables: **age group between** 60 to 70 years old and >80 years old, as well as 71-80 years old and >80; but insignificant difference observed on 60-70 years old and 71-80 years old; statistically significant differences found on the **highest educational attainment group** between primary school and bachelor, primary school and post-graduate, primary school and middle school. However, there are no significant differences existing between bachelor and postgraduate; bachelor and middle school; post graduate and middle school; variances observed on **family monthly income (in Yuan)** between <2000 and >5000, likewise between <2000 and 2000-5000. But, there is no significant difference exists between >5000 and 2000-5000; likewise, significant differences found with **family type** between living with direct descendants on three generation and two generation, as well as, three generation and one generation; but not significant on the following: three generation and living alone, living alone and two generation, living alone and one generation, two generation and one generation (See Appendix F for the Post-Hoc test results).

In summary, the Kruskal Wallis test and pairwise comparison give the impressions in terms of the statistically significant variances found on the four variables as follows: older adults fall under age ranged of 60 to 70 years old and 71-80 years old are more likely confident to exercise three times per week for 20 minutes than 81 years old and above; respondents that obtain middle school, bachelor and postgraduate degree are more likely confident to have self-efficacy for exercise than those who completed primary schooling; seniors having family monthly income of <2000 Yuan have less likely to have self-efficacy for exercise than those with 2000-5000 Yuan or more; those living with direct descendants on three generation are less likely to have self-efficacy for exercise than those living with one and two generation.

Table 3.1 Influencing factors (Socio-clinical Factors and Environmental Factors) and its relationship to the OD-SEE for three or more groups (n=383)

Socio-clinical factors	Variables	n	df	Mean Rank	X^2	*P value*
Age (in years)	60-70	139	2.0	196.05	92.8	*0.000*
	71-80	195		223.82		
	>81	49		53.91		

Highest Educational Attainment	Primary School	54	3.0	120.9	29.2	*0.000*
	Middle School	243		209.1		
	Bachelor	62		181.2		
	Post Graduate	24		207.1		
Family Monthly Income (in Yuan)	<2000	86	2.0	140.3	27.3	*0.000*
	2000-5000	214		231.9		
	>5000	83		189.1		
Family type (Living with direct descendants)	One generation	294	3.0	201.7	19.9	*0.000*
	Two generation	31		201.5		
	Three generation	32		113.3		
	Living alone	26		168.3		
BMI	Underweight	32	3.0	186.1	4.2	*0.242*
	Normal weight	169		180.2		
	Overweight	139		204.8		
	Obesity	43		201.4		
Number of ailments	One ailment only	152	2.0	199.0	1.4	*0.505*
(Morbidity)	Two or more ailments	62		180.2		
	No ailment	169		190.0		
Environmental factors						
Social Support System	one support system	72	3.0	198.5	2.6	*0.462*
	two support system	267		192.7		
	three support system	42		172.7		
	four support system	2		271. 50		
Access to exercise facility	Within home	111	2.0	200.7	1.2	*0.536*
	Near home	228		190.0		
	None at all	44		180.5		

n= sample size, df means degree of freedom, X^2 means chi-square test statistic; Statistically significant at p-value <0.05

The Mann-Whitney U test which was utilized to detect variance in the OD-SEE scores according to the available groups revealed significant differences in self-efficacy among those supported by their friends and no support from friends (U=19915, Z=2.788, *P=0.005, r*=0.142*)*, those who found support from health professionals (e.g. doctors, nurses, nutritionist, etc.) and those who were not (U=11930, Z=-4.834, *P= 0.005, r*=0.25*)*. Table 3.2 shows that older adults with friend support in performing exercise activities will be more likely to achieve. On the other hand, with support of the health professionals are

less likely attainable in terms of older adults' self-efficacy. Classification of effect size (r) starts from "small effect size" which is <0.10, "medium effect size" which is 0.30-0.49, and "large effect size" which is 0.50 and above. Therefore, this indicates that both have just a small effect size on the OD-SEE scores.

Table 3.2 Influencing factors (Socio-clinical Factors and Environmental Factors) and its relationship to the OD-SEE score for two unpaired groups (n-383)

Socio-clinical factors	Variables		Mean Rank Square	Mann-Whitney U test	Z-score	*P value*	Effect size (r)
Sex	Male	-	189.01	18722.5	0.485	*0.628*	-
	Female		194.51				
Number of ailments	Hypertension	Yes	195.75	15,512	0.434	*0.672*	-
		No	190.47				
(Morbidity)	Diabetes Mellitus	Yes	34.91	28.0	-0.302	*0.841*	-
		No	41.00				
	Coronary disease	Yes	192.68	14,032	0.071	*0.943*	-
		No	191.76				
	Hashimoto	Yes	289.00	575	1.244	*0.213*	-
		No	191.49				
	Arthritis	Yes	171.50	170.5	-0.186	*0.893*	-
		No	192.05				
	Asthma	Yes	123.5	122.5	-0.621	*0.642*	-
		No	192.18				
	Hyperthyroidism	Yes	232.5	231.5	0.367	*0.789*	-
		No	191.99				
Environmental factors							
Social Support System	Family	Yes	191.93	1657	-0.078	*0.938*	-
		No	194.83				
	Friends	Yes	212.75	19915	2.788	*0.005*	0.14
		No	180.05				
	Health Professionals	Yes	155.83	11930	-4.834	*0.000*	0.25
		No	212.61				
	Gym instructors/coach	Yes	205.99	10236.5	1.046	*0.295*	-
		No	189.50				
	Senior club/ organization	Yes	192.98	5647.5	0.053	*0.958*	-
		No	191.91				
Statistically significant at p-value <0.05							

7. DISCUSSION

A growing aging population in several parts of the world is a public health concern. Chronic conditions such as hypertension, cardiovascular diseases, diabetes mellitus, etc. become more of a concern in what we call the aging society. China has no exemption. This current study investigated the influencing factors concerning exercise self- efficacy among older adults. We examined the seniors' influencing factors involving the socio-medical, social support system and access to exercise facilities. To characterize the sample older adult population in Bincheng District, Binzhou City, Shandong Province, a total of 383 responded to the survey. Mostly half of the respondents are females, aged 71-80 years old, and completed at least the middle school with a family monthly income of 2000-5000 (in Yuan). More than half of them were living directly within one generation and only 6.8% were living alone. This is indicative that the majority of Asian countries practices close family ties (Park, 2021). Apparently in China, parents believe that there are no boundaries even extended up to three generations wherein parents believe they have control over the life of their adult children (Tang et al. 2019; Chen et al., 2011).

In terms of clinical factors, more than half of the respondents have abnormal weight with 47.5% being overweight (BMI=25.0-29.9) or obese (BMI= 30 and above), while 8.4% are stunted (BMI= below 18.5). The older adults (39.7%) reported to have chronic ailments such as hypertension, diabetes mellitus, coronary disease, Hashimoto, arthritis, asthma and hyperthyroidism. Similar findings reported that Chinese older adults suffered from hypertension, coronary diseases, cerebrovascular disease, arthritis, and chronic nephritis are the common and top prevailing conditions, while the most common comorbidities are hypertension, heart conditions and diabetes mellitus (Chen et al, 2024).

In this study, all the respondents declared that they have a social support system concerning exercise from family, friends, health professionals, gym coach, and senior club or organization intended for the older adults. Family, as their topmost social support system for exercise with 97.7% was reported by the respondents followed by their friends and health professionals, gym coach and senior club, wherein 69.7% (n=267) of the older adults have at least two support systems in this endeavor. However, 11.5% of them reported no access to exercise facilities. While, more than half of them declared that the exercise facilities were near their home and within their respective residences with 59.5% and 29%, respectively.

In this study, the OD-SEE mean scores fell only around 6 which is indicative of less confidence for exercise contributed by bad mood as the main barrier, followed by feeling tired, did not enjoy the exercise, too busy for exercise, and feeling pain when exercising. Related study reported that lack of time is one of the challenging aspects of exercising (You et al., 2021).

The variables age (H (2) = 92.8, p=0.000), highest educational attainment (H (3) = 29.2, p=0.000), family monthly income (H (2) = 27.3, p=0.000), and family type (H (3) = 19.9, p=0.000) obtained significant p value of <0.05 when tested with Kruskal Wallis test. This means that the four independent variables exhibited statistically significant differences in terms of senior self-efficacy for exercise. Post-hoc test was carried out to compare pairs of groups and the results show that older adults fall under the age range of 60 to 70 years old and 71-80 years old are more confident to exercise three times per week for 20 minutes than those on their 81 years old and above. The aging population, apparently vulnerable to various physiological changes such as loss of bone mass which decreases the body strength and highly susceptible to various diseases and injuries wherein feeling fatigue and very tired are associated with age (Sullivan et al, 2017). Meanwhile, respondents who completed their middle school, bachelor and postgraduate degree are more likely to have self-efficacy for exercise than those who completed primary

schooling; seniors with a family monthly income of <2000 Yuan have less likely to have self-efficacy for exercise than those with 2000-5000 Yuan or more. Similar studies found that age, education and income are associated with exercise self-efficacy (Zapata-Lamana et al., 2021; Clark et al., 1995). In this present study, it was revealed that elders living with direct descendants of one or two generations are more likely to have self-efficacy for exercise than three generations. Elderly people living with their children, which is a common scenario that lineal relatives by blood are living together. Typically, Chinese traditional cohabitation culture is often seen with four generations living together under the same roof (Wang et al., 2021). However, the family-level changes from multigenerational living to alternative living arrangements wherein living alone or living with spouse only was becoming prominent nowadays. Evidence through action of the Chinese government stepping-in on elderly care responsibilities was carried out by providing reforms in healthcare, pension and other healthy agenda for older adults (Zhao, 2023). Possibly, this could be the reason behind why older adults are more likely to have self-efficacy to exercise living together with one or two generations than with those living with three generations. Moreover, a study of Jiang, et al., (2024) reported that older adults who constantly received financial support and frequent emotional communication in the previous year have positive self-rated health.

Employing Mann-Whitney U test, variance on support of friends (U=19915, Z=2.788, *P=0.005, r*=0.142*)* and health professionals (U=11930, Z=-4.834, *P= 0.005, r*=0.25*)* were established. This means that older adults are more likely confident in performing exercise activity with the support of their friends. On the other hand, they are less likely to carry out exercises with health professionals' support. A study revealed that ageist attitudes exist which potentially can elevate internalisation of negative effects of stereotyping, prejudice and discrimination against older adults that may lead to negative care outcomes (Heyman et al., 2020). Heyman and colleagues concluded in their study that both healthcare professionals and older patients held ageist attitude (e.g. providing impression of discrimination to older people that they are social burden and incompetent; ageist language may include phrases and words such as "geezer", "elderly", "senior", "senile", "old school", more neutral and acceptable descriptive term such as "older people", "older adult" help in addressing stereotyping). A study of Crutzen et al., (2022) revealed that health professionals have significantly negative perceptions towards older individuals than the general population. The scepticism of older adults on health professionals could be brought by this so-called ageism.

8. CONCLUSIONS AND RECOMMENDATIONS

It can be concluded in this study that the 383 Chinese older adults rated their self-efficacy for exercise 6 out of 10 on the 11-point scale. Hence, they needed a boost to overcome barriers due to bad mood, feeling tired, not enjoying the exercise, too busy for exercise, and feeling pain when exercising. Findings showed that OD-SSE scores could be challenged or summoned by both intrinsic factors (age, educational attainment, family monthly income, and family type) and extrinsic factors (social support system, health professionals and friends).

Thereby, findings of this study could be a basis for a multifaceted exercise program intended not only among older adults in Bincheng District, Binzhou City, Shandong Province, but could cover the entire Chinese older adult community and among Asian countries having the same sentiments and characteristics, as well.

Limitation of this study: This study is limited only with the older adults in Bincheng District, Binzhou

City, Shandong Province China; hence, in future studies could broaden the scope of the research locale.

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