

# THE CHOICE PREFERENCES OF SPORTS AND FITNESS SERVICE IN TAIWANESE OLDER ADULTS

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## Abstract

In the aged society of Taiwan, more and more elderly people are expected to actively participate in various physical activities to implement the goal of successful aging. In the design of sports and fitness service and center, sports facility operators should pay attention to the older adult-friendly environment design and import exercise equipment for older adults to increase the exercise motivations and reduce exercise risks. In order to respond the demand of older adults, we used the Choice Experiment model to establish a hypothesized experiment design in which data on the sports and fitness service and environment preferences of Taiwanese older adults were collected. The number of samples is 380. The empirical results show that most respondents are willing to pay extra for a variety of senior services to enjoy a better and safer sports and fitness experience. Gym manufacturers can plan alternative fitness services and products, which will be of greater help to encourage the elderly to engage in regular fitness exercises. Keyword: Older Adults, Sports and Fitness Service, Choice Experiment Method.

## INTRODUCTION

Advances in medical welfare and improvements in public health, safety, and nutritional conditions have extended life expectancy. In most Asian countries, the increase in life expectancy and severe decline in birth rate have accelerated the population aging trend. In Taiwan, because of declining birth rate and increased life expectancy, Taiwan was projected to become a super-aged society by 2026 and older adults are estimated to account for 41.2% of the total population by 2065 [1].

World Health Organization (WHO) proposed an active aging policy framework for ensuring the healthy and positive aging of older adults in 2002. The framework was developed progressively based on the concepts of successful aging, productive aging, and healthy aging, and it aims to establish a positive aging experience. Accordingly, the public health policies of various countries focus on and encourage older adults to proactively engage in physical activities to achieve successful aging [2]. The literature has indicated that encouraging older adults to engage in regular physical activities or exercises can help to reduce the risk of cardiovascular diseases, diabetes, osteoporosis, psychological disorders, and cognitive decline. This reduces the frequency of hospital visits, reduces geriatric health risks, improves life satisfaction, prevents social problems, and lowers the burden on the society; consequently, these trends directly or indirectly create national wealth and substantially improve older adults' health and sense of well-being [3, 4]. However, according to the Global Health Risks Report released by the WHO, insufficient physical exercise ranks fourth among the main causes of death worldwide. More than 3.2 million

people die annually because of factors related to insufficient physical exercise. Insufficient physical exercise accounts for 21% to 25% of the risk of breast cancer and colorectal cancer, 27% of the risk of diabetes, and 30% of the risk of ischemic heart diseases; it has been listed by the WHO as the greatest public health problem of the 21st century.

In recent years, studies on older adult behavior during physical activity have attracted academic attention. Most studies have focused only on the motivation and rationale of older adults who engage in physical activities [2, 5, 6, 7, 8] and the benefits of physical activities [9, 10]. Relative to the literature on the exercise motivation and benefits of older adults, few studies have examined the attributes and infrastructure considerations related to the choice of physical activity for older adult exercises and health services [11, 12]. Accordingly, this study would investigate the needs and preferences of older adults in Taiwan who engage in physical activity to propose suggestions for government and sport facility operators with respect to the planning and development of older adult sports and fitness service and centers.

Consumer preference evaluation is generally divided into revealed preference (RP) and stated preference (SP) methods. SP methods are mainly used to investigate uncertain results; they examine consumer choice by considering combinations of attributes and associated levels of a hypothesized market to determine consumer preference (Louviere et al., 2000). Relative to RP data, which are limited to the presentation of existing conditions, SP data allow for the discussion of possibilities presented by new policies or plans in a hypothesized scenario [13]. Therefore, SP methods were deemed more suitable for the

present study, which discusses the sports and fitness service needs and preferences of older adults who pay for exercise. The choice experiment (CE) model, which is an SP prediction method, employs a hypothesized market to investigate the potential results of a target market and collect participant preference data. In contrast to the contingent valuation method, the CE model explores individual attributes and evaluates the value of multiple environmental attributes to increase its statistical stability [14]. Given that sports and fitness services for older adults should consist of multiple dimensions, the CE model was employed to develop multi-attribute utility functions and predict the choice behavior of older adults who exercise and their willingness to pay for services. With the proactive engagement of older adults in sports and fitness activities, numerous countries have established senior gyms for older adults. In this study, the CE model was used to establish a hypothesized experiment design in which data on the sports and fitness service and environment preferences of Taiwanese older adults were collected.

### BENEFITS AND INFLUENTIAL FACTORS RELATING TO EXERCISE ENGAGEMENT FOR OLDER ADULTS

Multiple studies have explored the health benefits of exercise engagement for older adults, including the reduction of disease-related risks; prevention of fall and disabilities; enhancement of muscle strength, balance, and walking speed; and promotion of independent living among older adults [15, 16]. The psychological benefits of exercise for older adults include reduced depression, alleviation of tension and anger, and improved confidence and life satisfaction [9, 10, 15, 16, 17]. Furthermore, exercise engagement provides older adults with opportunities to socialize and interact with other members of society, which increases their interpersonal engagement and helps them to maintain their social connections [16]). Active exercise engagement enables older adults to maintain their physical and psychological health, retain social connections, and engage in productive activities; these factors are crucial in helping them to achieve successful aging [5].

Despite the positive effects of exercise on older adults' physical, psychological, and social health, the proportion of older adults who exercise remains low [18] (Patel et al., 2013). This has prompted scholars to examine the exercise motivations and difficulties of older adults. [7] divided the factors influencing older adults' exercise engagement into intrinsic factors (e.g., physical and psychological conditions and personal interest) and external environmental factors (e.g., cost, family, and cultural factors). Their study combined expert questionnaires with multiple-criteria decision analysis and the analytic hierarchy process to explore the reasons why older adults in Taiwan engage in exercise. Their results revealed that psychological conditions, physical conditions, and enjoyment were the three key factors that influenced older adults' exercise engagement. The external environment for exercise influenced personal exercise preferences of older adults. The operators should enhance the external environment of sports and fitness facilities to motivate older adults to exercise [7].

In addition to interpreting the exercise engagement behavior of older adults in terms of physical and psychological health or obstacles, several studies have explored the effect of sports infrastructure on the exercise engagement of older adults. These studies have reported that sports infrastructure has a positive influence on older adults' exercise intention, frequency, and duration. The factors related to this influence include the space, location, exercise facilities, and accessibility of the

infrastructure; the distance between the home or workplace of older adults and the infrastructure; the prices charged for the use of infrastructure facilities; the esthetics of the infrastructure; and the types of exercise options provided by the infrastructure [12, 19, 20, 21]. [22] reported that among older adults in Taiwan, the obstacles to exercise engagement mainly comprise the lack of exercise facilities, lack of recreational concepts, and lack of information on exercise activities.

In summary, exercise has a crucial and positive influence on the physical health of older adults. The psychological and social benefits that older adults derive from engaging in exercise improve their quality of life and sense of well-being. Additionally, exercising plays a key role in successful aging. However, the aging population has a low proportion of individuals who exercise and is also characterized by poor health conditions. To effectively increase exercise engagement among older adults, the government can implement policies to subsidize the construction of exercise facilities, encourage older adults to engage in various exercise activities, and establish sports and fitness services and facilities that meet various needs of older adults by considering their physical activity service preferences.

### EMPIRICAL MODELS

#### Choice Experiment Method

The choice experiment (CE) method is based on Lancaster's consumer choice and random utility model, which holds that consumer utility does not come from the product itself, but from various attributes that make up the product [23, 24]. Random utility model can be used to explain various observed choice behaviors. This model assumes that when consumers make a specific choice, the utility obtained by this choice is relatively higher than other choices. That implicit consumer chooses the option with the highest utility [25]). Since the utility of an individual cannot be observable, it is regarded as a random variable. Assuming that the respondents have similar preference patterns, such as CL model, the utility of respondents  $i$  for option  $j$  can be expressed as follows by random utility function [26, 27]:

$$U_{ij} = V_{ij} + \varepsilon_{ij} \quad (1)$$

$$V_{ij} = X'_{ij}\beta \quad (2)$$

In equation (1),  $U_{ij}$  is the utility function of  $i$ th respondent the  $j$  attribute of the senior sport and fitness service, and  $i=1, \dots, N$ ;  $j=1, \dots, J$ .  $V_{ij}$  is possible factors that affect utility, such as various attributes of options.  $\varepsilon_{ij}$  is error items or randomly unobservable items. Equation (2) shows that  $V_{ij}$  is a linear combination of explanatory variables ( $X$ ), which can be observable attributes in options or characteristics of decision makers themselves.  $\beta$  is the coefficient to be estimated, representing the marginal utility of attributes.

In the CE model, the error term  $\varepsilon_{ij}$  in equation (1) is made to obey Gumbel type 1 extreme value distribution, and assuming that the choice of respondent  $i$  is  $Y_i$ , the probability of  $Y_i=j$  can be rewritten in the form of conditional Logit (CL) model as follows:

$$\text{Prob}(Y_i = j) = \frac{\exp(X'_{ij}\beta)}{\sum_{j=1}^J \exp(X'_{ij}\beta)} \quad (3)$$

The specific coefficient of attribute can be estimated by CL model in equation (3). In addition, when the monetary attribute is included in explanatory variables, other non-monetary attribute variables can be used to obtain the implicit price or

willingness-to-pay [28, 29]. That is, dividing the coefficient estimate of a non-monetary attribute by the coefficient estimate of a monetary attribute can be expressed as follows:

WTP = -(βnon-monetary attribute/βmonetary attribute) (4)

Choice Experiment Design

The CE method employs a hypothesized scenario to obtain the preference data of participant in regard to various attributes. This method may be used with price attributes (i.e., means of payment) to predict the value of nonmarket goods and the willingness of consumers to pay for specific attributes [27]. The CE method requires researchers to design choices based on characteristics or attributes that participants may potentially consider during the decision-making process. Subsequently, the researchers must determine and operate various combinations of attributes and associated levels to establish various hypothetical alternatives. These choices are randomly combined into choice sets for participant selection finally. In an experiment design, the combination of attributes and standard levels yields numerous choice items, thus the implementation of choice selection in questionnaire interviews is difficult. To reduce the number of choice items while ensuring statistical accuracy, numerous studies have suggested the employment of a fractional factorial design, which hypothesizes

that specific cross-multiply items can be ignored to reduce the number of combination item outputs for participant selection [11, 30, 31]. For the design of choice sets, most studies have adopted the design principle of providing three items in each choice set. Each set should consist of one status-quo option for comparative purposes and two randomly-arranged hypothesized items [29, 32]. To increase response efficiency, some studies used graphics to present the differences between attributes and standard levels [29, 32, 33]. During the interview process, the participants were required to complete a questionnaire related to the research topic, provide their demographic information, and participate in multiple rounds of choice experiments. During each round, the participants were required to select one item from a choice set containing three items. In estimating the utility functions of CL, this study adopted four essential attributes of senior sports and fitness service programs (i.e. Xij in equations (3) and (5)), including senior exercise equipment, senior exercise courses, senior exercise professional instructors, exercises science and technology auxiliary system. Because the above attributes are all important service contents when choosing fitness services, this study expects that these attributes have a positive impact on the utility of older people to use fitness services, and help to enhance the overall service experience and feeling. Detailed variable definitions are shown in Table 1.

Table 1: Attributes and level values of senior sports and fitness service programs




Attributes	Illustrations	Levels	Variable Name
Senior sports and fitness equipment	Intensive sports and fitness equipment designed for Senior people is provided in the exercises ground.	1. Provide sports and fitness equipment specially designed for Senior people 2. Current situation: Only provide fitness equipment suitable for all ethnic classes.	FAC
Senior sports and fitness course	Design group Senior sports and fitness courses for seniors, such as fall prevention, muscle strength strengthening exercise for the elderly, balance training, etc.	1. Provide senior sports and fitness courses 2. Current situation: no senior sports and fitness courses.	CORS
Professional instructors for senior sports and fitness	There are professional sports and fitness instructors or coaches for the elderly to guide the senior to carry out senior sports and fitness, such as exercises instructors for the elderly, professional rehabilitation personnel, physiotherapists, etc.	1. Has professional instructors for senior sports and fitness 2. Current situation: no professional instructors for senior sports and fitness	STAFF
Exercises science and technology auxiliary system	Introduce intelligent system to help provide exercise prescription, record exercise training procedures and results, and have exercise database to provide long-distance exercise guidance training videos and pictures.	1. Has exercises science and technology auxiliary system 2. Current situation: no exercises science and technology auxiliary system	TEC
Extra charge	If you go to a commercial gym or a national sports center, the fee is NT\$100/person. How much extra money are you willing to pay to increase the above services or products for senior exercises and sports?	1. No extra charge (status quo) 2. NT\$100/time/person 3. NT\$200/time/person 4. NT\$300/time/person 5. NT\$400/time/person 6. NT\$500/time/person	PAY

According to the design procedure of CE [34], the first part of the questionnaire includes sports and fitness experiences and participation motivations, the second part is the program combination of CE, and the third part is the demographic

variables. The second part is the most important program combination of CE, which investigates interviewees' preferences for sports and fitness service programs, including selected focus attributes and different level values, as shown in Table 1. This

study is designed with the CE method in the stated preference. Through the arrangement of the above attributes and horizontal values, a total of  $2^4 \times 6 = 96$  programs can be produced in service programs. Too complicated questionnaires cause difficulty to fill in and answer questions. In order to reduce the burden of respondents in the actual investigation, this study adopts the orthogonal design method to reduce 96 combinations to 12 combinations of alternative plans and a status quo plan, delete 14 unreasonable plans, and generate 52 choice sets through permutation and combination. To ensure the credibility of permutation changes in choice sets, each respondent is required to choose one answer from two alternative plans and a status quo plan (see Table 2). Therefore, each questionnaire includes four choice sets, and there are thirteen versions of questionnaires.

**Table 2. An example of a choice set for the sports and fitness service of older adults**

Choice Set 1	Alternative 1	Alternative 2	Status Quo
Senior sports and fitness equipment	No	Provide Senior sports and fitness equipment	No
Senior sports and fitness course	No	Provide senior sports and fitness course	No
Professional instructors for senior sports and fitness	No	No	No
Exercises science and technology auxiliary system	 Provide science and technology auxiliary system	 No	 No
Extra charge (NT\$ /time/person)	200 /TWD/ time/ person	400 /TWD/ time/ person	0 /TWD/ time/ person
Choice one of three options	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## DATA

### Sampling Methods

Based on the interview of the initial questionnaire to modify the questionnaire, the formal questionnaires were investigated from March to May 2021. The questionnaire survey method is face-to-face interview. The subjects of the research are the senior people who have participated or are currently participating in the sports and fitness services, including commercial gym (or fitness centers) and national sports centers built and operated by the local governments. Many studies have different definitions of senior. Some studies define the elderly population as over 55

years old [35], while others define the elderly population as over 65 years old [36]. We collected a total sample numbering 403 respondents. After the incomplete questionnaires were removed, there are 380 valid questionnaires according for 94.3% of the total questionnaires. This research is to conduct research on the demand and preferences of sports and fitness services for the elderly. Considering the physical fitness and physical function factors, most of the elderly exercise group will start planning and participating in fitness and sports from the middle-aged stage. The age of the senior respondents in this study is over 55 years old.

### Descriptive Statistics

In the sample interviewed in this study, the gender is 196 women, accounting for 51.6% of the total sample. In age distribution, 143 (37.6%) of 55-59 years old and 104 (27.4%) of 60-64 years old were the majority. In terms of education level, high school is the majority (36.1%), followed by colleges and universities (34.2%), and only 17.9% below junior high school. Compared with the results of “Senior Citizen Conditions Survey 2017” conducted by Taiwan’s Ministry of Health and Welfare, only 2.41% of the population aged 55-64 had a graduate school or above, while the proportions of junior colleges, universities, and high schools were 18.18% and 28.24%, respectively. According to the survey data, it is found that the education level of the elderly group who participates in fitness and sports is higher. In terms of personal average monthly income, 42.4% of the interviewees had an average monthly income of NT\$20,001~40,000, followed by NT\$40,001~60,000 (20.3%). In terms of occupation distribution, industry and commerce (19.2%) are the most, followed by service industry (18.2%). 51.6% of the respondents considered their health to be healthy, followed by normal (37.1%).

There were 78.7% respondents who had the exercise habits, and the number of exercise per week is 3 ~ 4 times (accounting for 32.4%), while 30.0% exercised almost every day. Regarding the number of weekly exercised in the commercial gyms or civic sports centers that required payment, 64.2% of the respondents go there at least once a week, including 64.2% of the respondents visited at least once a week, including 8.4% who went almost every day and 20.3% who went 3-4 times a week. By the frequency of weekly exercises and willingness to pay to exercise, those who are willing to go to commercial sports and fitness venues or civic sports centers are mostly active and regular sports groups. The exercises motivation of senior people is leisure (44.5%), followed by fun (42.6%), keeping fit (42.1%), interpersonal communication (41.8%) and doctor's advice (39.7%), and weight loss is the least (20.5%). In terms of acceptable expenditure per month for sports and fitness, NT\$1,001~1,500 (30.3%) was the most, followed by NT\$1,000 (28.2%).

## EMPIRICAL RESULTS

The number of samples is 380. Since each questionnaire includes four choice sets, there will be 1520 observations. Table 3 presents the estimated results of Conditional Logit (CL) model. As shown in Table 3, the four attributes of FAC, CORS, STAFF, and TEC were all statistically significant, and the estimated coefficients were positive. Showing that the older adults had a higher preference for these alternative sports and fitness services. The coefficient of “extra charge” is negative and significant at the 1% level, indicating that older adults will derive a lower utility from the sports and fitness if the fee of sports and fitness increases. For the welfare analysis of



willingness to pay, this results of Equation (4) were showed that he respondents are willing to pay the highest fee for conducting the professional instructors for senior sports and fitness (STAFF) (NT\$203/ time/person) to improve the positive effect of sports and fitness, followed by providing senior course (NT\$160/time/person), exercises science and technology auxiliary system (NT\$124/time/person) and the sports and fitness equipment for senior (NT\$105 /time/person). This result shows that the senior group obviously pays more attention to software services such as professional guidance, course design, and technological assistance systems than the improvement of various facilities.

Table 3. The willingness to pay results for the attributes of the sports and fitness services for older adults

Attributes & Variables	Coefficient	T value	WTP (TWD/ frequency/ person)
FAC	0.495***	6.42	105.051
CORS	0.753***	9.62	159.866
STAFF	0.958***	11.49	203.359
TEC	0.586***	7.40	124.406
PAY	-0.005***	-16.78	-
Log likelihood	-1461.155		
Number of obs.	1520		
AIC	2932.3		

Note1: \*, \*\* and \*\*\* denote significance at the 10%, 5% and 1% levels, respectively.
Note2: “-” represents the group probability parameter standardized to 0 to facilitate the identification of parameter estimation.

CONCLUSION

In order to provide sports and fitness services and facilities that are tailored to the needs of older adults, we used the CE model to establish a hypothesized experiment design in which data on the sports and fitness service and environment preferences of Taiwanese older adults were collected. In estimating the utility functions of CL, this study adopted four essential attributes of senior sports and fitness service programs, including senior exercise equipment, senior exercise courses, senior exercise professional instructors, exercise science and technology auxiliary system. The number of samples is 380. This study uses CL to estimate the utility function of sports and fitness services for older adults, and explores their willingness-to-pay for the attributes of sports and fitness services.
For the estimated results of CL, the four attributes of professional instructors, courses, exercises science and technology auxiliary system, and sports equipment for senior were all statistically significant, and the estimated coefficients were positive. The results of the empirical analysis showed that the WTP value of individual attribute, calculated by the coefficient values obtained from the results of the empirical analysis, were NT\$203 for the professional instructors, NT\$160 for senior course, NT\$124 for exercises science and technology auxiliary system, and NT\$105 for the sports and fitness equipment for senior. Among these alternative attribute, the WTP value of the professional instructors and senior courses were higher, indicating that the older respondents thought that

the most important sports and fitness service was professional instructor and senior courses to practice correct and safe sports behaviors, followed by exercises science and technology auxiliary system and facilities and equipment. This result shows that the senior group obviously pays more attention to software services such as professional instructors, senior courses, than the hardware facilities and technology equipment, such as technological assistance systems and the sports and fitness equipment for senior.
In Taiwan, providers of exercise and fitness services for older adults are generally classified as government-funded nonprofit fitness clubs or commercial fitness clubs (i.e., fitness centers). [37] reported that nonprofit health and fitness services for older adults are managed collaboratively by local governments and private operators to promote health care programs for older adults and to provide exercise guidance. These programs and services are largely combined with various aspects of life and mainly aimed at encouraging older adults to complete the required amount of exercise through group participation. However, these types of exercise only provide preventive effects for general diseases, and they do not require a specific amount of exercise to be performed or provide clear health benefits. [22] revealed that the increasing population of older adults in Taiwan has led to an increase in the number of older adults who engage in exercise and fitness activities to achieve successful aging; thereby, the older adult exercise and fitness market has been receiving increasing attention.
On the basis of the results, we proposed the suggestion to government and sport facility operators with respect to the planning and development of older adult exercise services and environments. When choosing sports and fitness services, compared with the improvement of various facilities and the technological assistance systems, the general elderly group obviously pays more attention to professional instructors and senior courses. Therefore, in the service design of fitness exercises for the elderly, fitness service operators should give priority to the professional instructors of elderly exercise, and design exercise courses with a suitable intensity for older adults.

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