Asian Journal of Applied Economics Vol. 31 No. 1 (January-June 2024): 81-105
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ISSN: 2985-1610 (Online)

Received: 25 October 2023
Received in revised form: 15 February 2024
Accepted: 11 March 2024

Effect of Sports Participation on Subjective Well-Being: Instrumental Variable Results from Microdata

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Abstract

Policymakers worldwide have increasingly recognized the importance of sports participation, believing it enhances people's quality of life, overall social welfare, and life satisfaction. This study utilizes individual-level data from Taiwan's "Exercise Current Situation Survey" in 2019 to investigate the impact of sports participation on subjective well-being. We propose an individual's perceptions of the government's promotion of sports and the adequacy of sports facilities as instrumental variables (IVs), and a two-stage Poisson regression (2sPR) model is employed for analysis. The results indicate that sports participation has a significantly positive effect on personal subjective well-being. Regressions by gender revealed that men derive more well-being from sports participation than women do. Body mass index (BMI) and years of schooling have a positive and significant influence on subjective well-being. Conversely, respondents' age, urbanization, and health status exhibit significant negative effects.

Keywords: happiness; instrumental variables; sports participation; subjective well-being
JEL Codes: C36; D60; I18; L83

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1. Introduction

A major policy goal of many government authorities is to increase participation in sports to promote health, reduce obesity prevalence, enhance work efficiency, alleviate medical burdens, and improve people's subjective well-being. The benefits of regular physical activity are extensively documented in clinical and public health literature, encompassing a reduced risk of chronic diseases, lower stress and depression levels, and increased emotional well-being, energy levels, self-confidence, and satisfaction with social activity (Humphreys et al., 2014; Lechner, 2009).

Encouraging mass participation in sports is a critical public policy issue. Schoppe et al. (2004), in their research compiling biomedical literature, data from MEDLINE, PubMed, and CINAHL databases, and articles and policy documents published worldwide since 1966, found that policymakers globally have implemented various plans to boost participation in sports activities to enhance people's well-being[1]. Additionally, at the 73rd session of the UN General Assembly in 2018, the Division for Inclusive Social Development of the United Nations Educational, Scientific and Cultural Organization (2018) proposed the use of sports as a means to promote education, health, development, and peace, advocating for national policies and government-led efforts to encourage exercise behaviors and sports activities for welfare enhancement. The attention given to sports activities by leaders of various countries and the widespread adoption of sports policies underscore the significance of exercise behaviors in modern society.

In Taiwan, the government has made a commitment to implementing sports policies. They allocate funds for sports facilities, constructing sports centers with gymnasiums, various types of courts (e.g., basketball, tennis, badminton), and swimming pools across various administrative regions since 2001 to promote citizens' exercise habits. Particularly, the Taipei City Government has encouraged other administrative regions to expedite the construction of sports facilities. Figure 1 illustrates the funding provided for sports by both central and local governments in Taiwan from 2009 to 2017. The upward trend in government funding for sports reflects the growing emphasis on exercise behavior.

Despite many policy targets and discussions, there have been few studies using large-scale data analysis to examine whether or not sport participation has a positive impact on the overall well-being of individuals. The literature also tends only to focus on aggregate sports participation and does not allow for the frequency and intensity of participation. Therefore, this paper seeks to rectify this gap in the literature. Another challenge in establishing a link between sport participation and well-being is controlling for the endogeneity of sport participation in the well-being equation. In this study, IVs are proposed and 21,503 valid samples from Sports Survey Database (SSD) in Taiwan were employed to cope with the endogenous problem. We used an individual's perceptions of the government's promotion of exercise behavior and adequacy of sports facilities as the IVs for analysis. Previous studies have highlighted the problem of an uneven distribution of sports facilities

[1] Specific explorations include promoting health, fighting obesity, and curbing crime. The research results revealed the similarities in the methods and approaches adopted by countries in formulating and implementing national sports policies.

(e.g., Ruseski et al., 2014). Individuals in the same subarea may live at varying distances from the same sports facility; however, they are included in the same distance grouping, which results in measurement errors. In this study, a questionnaire survey on the extent of individuals' feelings was used to avoid the problem of measurement errors.

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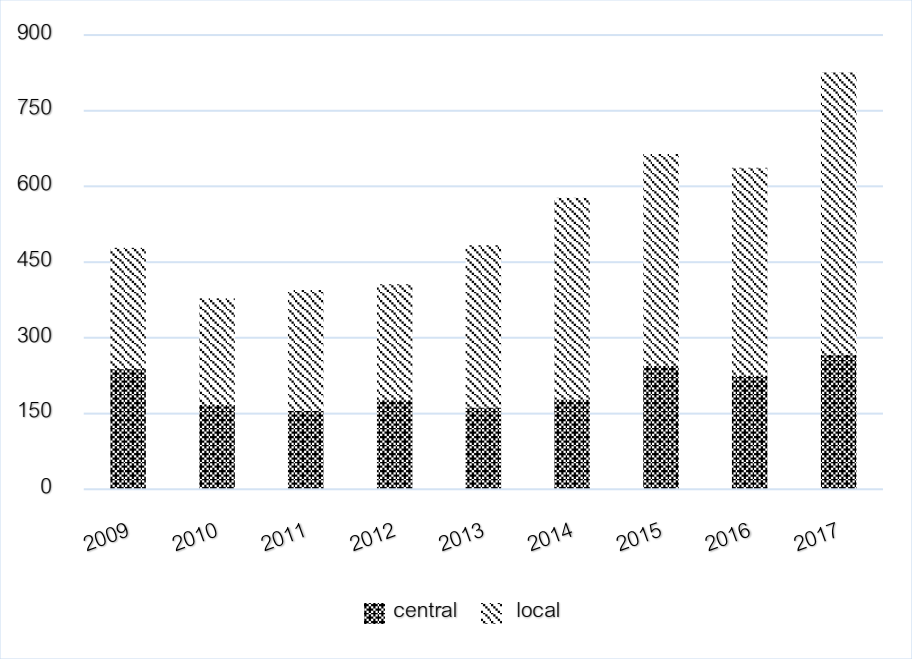

Figure 1: Funding allocations for sports by the central and local governments in Taiwan from 2009 to 2017 (unit: USD $1 million).
Source: Sports Administration (2019). 2019 Exercise Current Situation Survey. Taipei: Ministry of Education.

A growing body of literature is emerging on the benefits of sport participation for well-being in economics. In recent years, scholars have delved into the economic determinants of well-being, conducting in-depth explorations using the concept of utility from neoclassical economics. Individual well-being is a significant concern, and the increase in government plans and funding for sports facility construction has heightened people's health awareness. Consequently, individuals have begun to prioritize issues such as health and posture, leading to an increased demand for exercise. The research findings on the influence of sports participation on people's well-being also carry policy implications.

Considering the endogeneity of sports participation in decision-making, the government's promotion of sports participation was used as a unique IV for analyzing individual perceptions. The weak instrument test supports the validity of this IV. The analysis results indicated that the happy scores of respondents with exercise habits were 0.15-0.17 higher than those of respondents without sports participation. This increase is nearly four times that obtained without considering endogeneity. Therefore, the contribution of this study is threefold. First, the results indicate that the more an individual participates in sports, the higher is their increase in well-being. From a policy standpoint, governments should implement policies to promote sports participation to enhance citizens' well-being and increase social welfare. Second, the U-shaped relationship between age and well-

being was also confirmed in our study. Third, the evidence that a younger, well-educated female who lives in a big city was happy was found, and ignoring endogeneity may lead to serious errors.

2. Literature Review

"Subjective Well-being" (SWB) is a complex emotion that plays a critical role in human life, referring to a subjective state pursued by everyone. Wilkening et al. (1982) defined it as encompassing "individuals' satisfaction and feelings about life in general, various life domains, and perceptions of the individuals' environment and psychological state." Duncan (2005) pointed out that recent research in economics, sociology, and psychology has ignited interest in human subjective well-being, extending to social policy research and analysis. Duncan found that exploring the roots of well-being is key to improving people's welfare in a democratic system. Consequently, many studies have quantitatively explored the determinants of personal well-being. Researchers on SWB have considered not only personal characteristics such as age, gender, and education level but also other factors like salary (Brown et al., 2008), marital status (Vanassche et al., 2013), and leisure activities (Brajša-Žganec et al., 2011). The present study focused on the influence of exercise behavior on SWB

Research on subjective well-being (SWB) has developed rapidly in recent years, particularly in the fields of psychology and economics. However, few studies have focused on the relationship between sports participation and SWB. Most of these studies have indicated that participation in sports activities has a positive effect on mental health. Zhang and Chen (2019) analyzed the relationship between exercise and happiness by reviewing the literature and existing evidence. They found a positive relationship between exercise and happiness among a wide range of people from various countries and regions. Fararouei et al. (2013) used the OLS method to analyze the relationship between exercise and well-being based on data regarding the demographics, educational status, and health of female middle school students aged 11 to 19 years. Their results indicated an inverse relationship between students' well-being and their weight, and a positive relationship between students' well-being and their physical activities. Thus, healthy behavior is an important determinant of well-being. Chang et al. (2019) explored the influence of various levels of regular exercise on the health-related quality of life (HRQOL) of Taiwanese residents during 2006–2014 using data from the Landseed Integrated Outreaching Neighborhood Screening study. The empirical results obtained using the linear mixed model confirmed a positive relationship between regular exercise behaviors and the HRQOL of Taiwanese residents. Therefore, a significantly positive relationship exists between regular exercise and HRQOL.

Many European studies have used two-stage IV regression to explore the influence of exercise behavior on people's well-being, aiming to determine the relationship between exercise and well-being. Wicker and Frick (2015) used the generalized method of moments to analyze data from the "Eurobarometer Survey Series," conducted biennially in 28 European countries and sponsored by the Commission of the European

Communities. Their empirical results indicated that moderate-intensity exercise had a positive effect on respondents' SWB, whereas vigorous-intensity exercise had a negative effect. Using cross-sectional survey data from the "Eurobarometer Survey Series" conducted in 28 European countries in 2013, Wicker and Frick (2017) employed the 2SLS method to explore the effect of different intensities of physical activity on the SWB of two adult groups: those aged 18 to 64 years and those aged over 65 years. Their results indicated that light-intensity exercise, including walking, and vigorous-intensity activities significantly increase the SWB of the 18 to 64-year-old group; however, moderate-intensity exercise has a negative effect on their SWB.

Ruseski et al. (2014) indicated that global sports policies emphasize the promotion of sports activities. This emphasis has inspired research in epidemiology, public health, economics, and sports participation. They analyzed data collected from a census conducted in Rheinberg, Germany, through computer-assisted telephone interviewing (CATI) with 1,943 respondents. For data analysis, they used the ordinary least squares (OLS) method, the two-stage least squares (2SLS) method, and the distance a respondent had to travel to reach a sports facility as an IV. The empirical results indicated that, after controlling for demographics and personal characteristics, people who participated in sports activities had a higher sense of well-being than those who did not. Moreover, a U-shaped relationship was found between age and self-evaluated well-being: people's sense of well-being decreases gradually as they grow older but then increases after a certain age.

Forrest and McHale (2011) also used the distance a respondent has to travel to reach a sports facility as an IV to analyze the relationship between sports participation and well-being among British adults. Whether a respondent could reach a sports facility from their home within 20 minutes was used as an IV. The OLS method and two-step treatment effects model were employed for data analyses. The results indicated that British women living close to sports facilities were more likely to participate in sports activities and had a higher sense of subjective well-being than those living farther away. The researchers of the aforementioned studies used the distance from home to the sports facility to represent the accessibility of the facility, exploring the influence of sports participation on subjective well-being.

In the United States, the Centers for Disease Control and Prevention established the Behavioral Risk Factor Surveillance System (BRFSS) in 1984 to promote disease prevention and citizen health. This health-related telephone survey system collects information on health-related risk behaviors and chronic health conditions of American residents. Huang and Humphreys (2012) conducted an IV estimation using data from BRFSS surveys and County Business Patterns from 2005 to 2008. Their results indicated that the higher the number of sports venues available in a county, the more likely individuals are to participate in sports activities and the higher their life satisfaction. Both men and women can obtain happiness from participating in sports activities; however, men appear to derive more happiness from these activities than women do.

Collins et al. (2018) recruited 514 students from a university in the northeastern United States to conduct surveys using the online survey software SurveyMonkey and paper questionnaires. They used Spearman's rank correlation and ANOVA for data analysis. The results indicated that individuals who have

engaged in regular physical activities since their youth or adolescence have better physical and mental health in adulthood than those who have not. Moreover, physical activities can prevent obesity and obesity-related health problems.

Sports activities are often regarded as an educational process in terms of social and cultural exchange and can enhance personal well-being. Many countries have begun to study the influence of sports participation on the well-being of college students. Gatab and Pirhayti (2012) divided 80 male students from Iran's Payame Noor University into experimental and control groups, performing independent sample t-tests. The results indicated that exercise increases students' well-being. Alemdag et al. (2016) proposed that happiness is a personal goal for people living in a highly demanding society. Although various behaviors can make people feel happy, many believe that physical exercise is an important factor influencing happiness. Using a sample of 312 college students from Karadeniz Technical University, they conducted a questionnaire survey on exercise using an SWB scale and applied one-way ANOVA, the Kruskal-Wallis H test, the t-test, and chi-squared distribution as research methods. The results indicated that college students who actively participated in sports activities had higher SWB than those who did not. Additionally, body mass index (BMI), sports facilities, and family members' participation in sports activities were determinants of college students' participation in sports activities and influenced their SWB.

Cheon and Lim (2020) conducted a questionnaire survey on exercise participation frequency, self-esteem, stress, depression, school satisfaction, and current happiness levels using a sample of 11,132 students from the 2016 Korean Education Statistics Yearbook. They used factor analysis to identify the factors influencing happiness and performed a structural equation model (SEM) on the collected data. The results indicated that the frequency of exercise among Korean students was an important factor influencing their happiness. Zayed et al. (2018) examined the life satisfaction, mental health, and BMI of 320 employees of Sultan Qaboos University. The results indicated that those with more active participation in sports had a higher level of mental health and were generally more satisfied with their lives compared to those with less active participation in sports.

3. Research methods

3.1 Empirical model

We used questionnaire data from the Current Situation of SSD in Taiwan as the research sample (Sports Administration, 2019). After effective screening, the final valid sample size was 21,503. An empirical model based on that of Huang and Humphreys (2012) was developed for this study, focusing on the influence of sports participation on subjective well-being. The level of perceived happiness was used as the explanatory variable. Because the level of perceived happiness represents discontinuous count data, Poisson regression (PR) was used to conduct an empirical analysis to explore the influence of sports participation on people's subjective well-being. The probability function of the Poisson distribution for the level of well-being perceived by respondent i (Yi) is expressed as follows:

$$\text{Prob}(\text{Y}_i = \text{y}_i|\text{X}_\text{i}) = \frac{\exp^{(-\lambda_i)}\lambda_i{}^{y_i}}{y_i!}, \quad (1)$$

where yi is a specific counting value for and λ is the average and variance of the level of perceived subjective well-being. Next, a generalized linear model that formulates the relationship between the unique parameter λ of the attribute data and the explanatory variable X was developed. The developed model can be expressed as follows:

$$\lambda_i = \exp(\mu_0 + X_i'\beta), \quad (2)$$

where λ_i represents respondent i's perceived subjective well-being, is a constant, and β is the parameter matrix to be estimated.

$$X_i'\beta = \alpha Exercise_i + \gamma_1 BMI_i + PI_i{}'\gamma_2 + \gamma_3 HS_i + \varepsilon_i , \quad (3)$$

In the regression model, the dependent variable is the subjective well-being reported by respondent i for the past year. This study uses survey data from government units, and three existing variables related to well-being were selected for robustness testing, if the data restrictions allowed.

The first variable is the level of unhappiness, which measures the degree of unhappiness in life as assessed by the respondents. The question is, "Do you think your life is happy?" The answers use a Likert scale where 1 to 5 represent very happy, happy, ordinary, unhappy, and very unhappy, respectively.

The second variable is the happy score, defined as the respondent's self-assessed happiness score for the past year. The question is, "Please rate your well-being in the past year on a scale of 0-100. How would you rate yourself?" The answer ranges from a minimum of 0 to a maximum of 100.

The third variable is the self-evaluation of happiness. The happy scale is classified by the respondent's self-rated happiness score: 1 to 5 represent the least happy to the happiest, with the scale defined as follows:1 to 5 are the least happy to the happiest (1=0~59 points, 2=60~69 points, 3=70~79 points), 4=80~89 points, 5=90~100 points).

The main explanatory variable $Exercise_i$ indicates respondent i's personal sports participation. The aforementioned variable is a dummy variable of whether the respondent engages in exercise behaviors other than labor practices such as housework and occupation-related work. Other control variables include the respondent's physical indicator (BMI_i), personal information (PI_i), and health status (HS_i). The physical indicator is respondent i's BMI (BMI_i). The personal information matrix includes respondent i's gender, age, age quadratic term (Age^2), education years (Education_year), occupation category (Work), and whether the respondent lives in a municipality (Smunicipality). The health status is the degree of unhealthiness (Unhealthy_degree) evaluated

by respondent i personally. The notations α and γ_i (i = 1, 2, 3) represent the parameter and vector to be estimated, and ε_i is the error term.

Because exercise behavior depends on individual decisions, it is affected by many factors, potential endogenous problems emerge, and the possibility of a causal relationship with the dependent variables in this article cannot be ruled out. Consequently, we propose that the government's level of effort to promote exercise behavior as an IV. Encouraging individuals to participate in sports activities can directly affect sports participation; however, such encouragement does not directly affect personal subjective well-being. In addition, because sports participation is a dummy variable and not a general continuous variable, a general linear model cannot be used for analysis. To avoid the estimation errors caused by data types and endogeneity, the empirical model of Kropfhäußer and Sunder (2015) was used as a reference for this study. First, a Probit model was adopted. This model is expressed in equation (4). The concept of sports accessibility was then used to correct the measurement errors of variables used in previous studies. Subsequently, the extent to which respondents believed that the government has promoted exercise behavior was used as an IV (Z_i) to measure whether the respondent would participate in sports activities. Finally, the estimated value of $\widehat{\text{Exercise}}_\iota$ was substituted into equation (5) for IV regression.

$$Exercise_i = \Pi Z_i + \beta_1 BMI_i + \beta_2 PI_i + \beta_3 HS_i + v_i \,, \quad (4)$$

$$X_i'\beta = \alpha \widehat{Exercise}_\iota + \gamma_1 BMI_i + PI_i'\gamma_2 + \gamma_3 HS_i + \varepsilon_i. \quad (5)$$

The effectiveness of the IV regression depends on the explanatory power of the IV and must conform to two hypotheses, namely instrument exogeneity and instrument relevance. The parameter Z_i is related to the change in $Exercise_i$; thus, Z_i can be used to predict $Exercise_i$. The parameter Z_i is unrelated to the change in u_i; thus, Z_i meets the exogenous condition of the IV. When first-stage regression is used to predict $\widehat{\text{Exercise}}_\iota$ and the endogenous variable is replaced in the second regression, the endogenous problem in the correlation between the IV and dependent variable does not occur.

Instrument Relevance ： corr (Z_i, $Exercise_i$) ≠ 0, (6)

Instrument Exogeneity ： corr (Z_i, u_i)=0. (7)

We used the F-statistic of the result of the first-stage regression to test the level of effort involved in the government's promotion of exercise behavior. This factor was then used as an IV. Stock et al. (2002) used the concentration parameter (μ^2) as an indicator to measure the intensity of the following IV: $\mu^2 = \Pi' Z' Z \Pi / \sigma_v^2$ (σ_v^2 is the variance of the error term v). The useful explanation of μ^2 is expressed using F-statistic and the hypothesis test of the F-statistic, namely H_0: there is a problem of weak IVs [Π = 0 in equation (4)]. In the case that only one IV is used, and when the test statistic of the null hypothesis (i.e., F-statistic) is greater than 8.96,

the null hypothesis of weak IV can be rejected, which indicates that the weak instrument problem does not occur in the estimation model. The F-statistic used in the first stage of the weak instrument test is expressed as follows:

$$F \cong 1 + \frac{\Pi' Z' Z \Pi / \sigma_v^2}{K} \cong 1 + \mu^2 / K. \quad (8)$$

3.2 Survey method, sample span, and descriptive statistics

This study was based on Taiwan's "Current Situation of Year 2019 SSD." The respondents of this survey were Taiwanese citizens aged 13 years or older from 22 counties and cities. According to the latest population statistics compiled by the Department of Household Registration, Ministry of the Interior, Taiwan, "stratified proportional random sampling" was used to complete sample collection according to the population proportion of each township and city district. Telephone interviews and computer-assisted telephone interviewing (CATI) were employed. Qualified interviewees were those who matched the criteria and were the first respondents to answer the phone.

The survey period was from August to October 2019. The collected data included respondents' subjective well-being, personal information, health status, sports participation, and environmental factors related to sports in the previous year. A sample of 25,740 respondents was interviewed. In Taipei City, New Taipei City, Taichung City, Tainan City, Kaohsiung City, and Taoyuan City, at least 1,510 respondents were interviewed. In each of the remaining 15 counties and cities, at least 1,067 respondents were interviewed, with a sampling error of ±3% at the 95% confidence level. In Lianjiang County, at least 385 respondents were interviewed, with a sampling error of ±5%.

After analyzing the final data and eliminating results that lacked necessary information due to respondents' refusal to answer or the presence of outliers, the valid sample size was 21,503.

The dependent variables were the individual's personal subjective well-being in the previous year. The first item asked respondents to characterize their unhappiness using absolute ratings from 1 to 5. The second item asked respondents to self-evaluate their happiness scores for the previous year on a scale of 0–100 points. The third item asked respondents to characterize their well-being using absolute scores from 1 to 5. The main explanatory variable was whether the respondents usually engaged in exercise behaviors (dummy variable). Many studies have indicated that participation in sports activities positively influences the perception of well-being and mental health (Zhang & Chen, 2019; Huang & Humphreys, 2012); therefore, the estimated effect of sports activities was expected to be positive.

Forrest and McHale (2011) used the distance from city hall to sports facilities and the number of sports facilities in a county as an IV for analysis. However, sports facilities may be distributed unevenly over a wide area, leading to individuals in the same subarea living at varying distances from the same sports facility, thus resulting in measurement errors. In this study, a questionnaire survey of individuals' data was used to avoid this problem.

We used an individual's perceptions of the government's promotion of sports (EI_frequency) and the adequacy of sports facilities (SF_Adequacy) as the IVs. The former variable was evaluated based on respondents' answers to the question regarding the intensity of the local county or city government's promotion of sports. The higher the score, the more the respondent perceived the government's promotion of exercise behavior. The latter variable was based on respondents' perception of the adequacy of sports facilities. The higher the score, the more the respondent perceived the government's provision of sports facilities.

The control variables included BMI, personal information, and health status of the respondents. The BMI variable represented the respondents' personal BMIs. According to the empirical results of Kropfhäußer and Sunder (2015), a respondent's BMI is expected to be significantly positively correlated with their SWB. The respondents' personal information included gender, age, education level, occupation, and place of residence.

Inglehart (2002) indicated that a significant difference exists between the happiness levels of men and women in the contemporary world, with the SWB of women being higher than that of men. The global women's movement has continuously promoted gender equality, producing considerable positive effects. This movement has not only improved the status of women but also enhanced their SWB. Therefore, women are expected to have a higher sense of well-being than men.

The descriptive statistics of the variables adopted in this study were based on the "Current Situation of Year 2019 SSD" and used to conduct empirical analysis. The final valid sample size was 21,503. Three dependent variables of well-being were considered: Unhappy_degree, Happy_score, and Happy_scoredegree. The average unhappiness score of the respondents was 2.06, which lies between the happy and neutral categories. A total of 60.4% of the respondents were "satisfied," 22.2% were "very satisfied," and 1.6% were "very dissatisfied." The average Happy_score and Happy_scoredegree values were 74.07 and 3.34 points, respectively, for the previous year. We analyzed the relationship between Happy_scoredegree and age. As displayed in Figure 2, a U-shaped relationship was identified between well-being and age, which is consistent with the empirical results of Kropfhäußer and Sunder (2015).

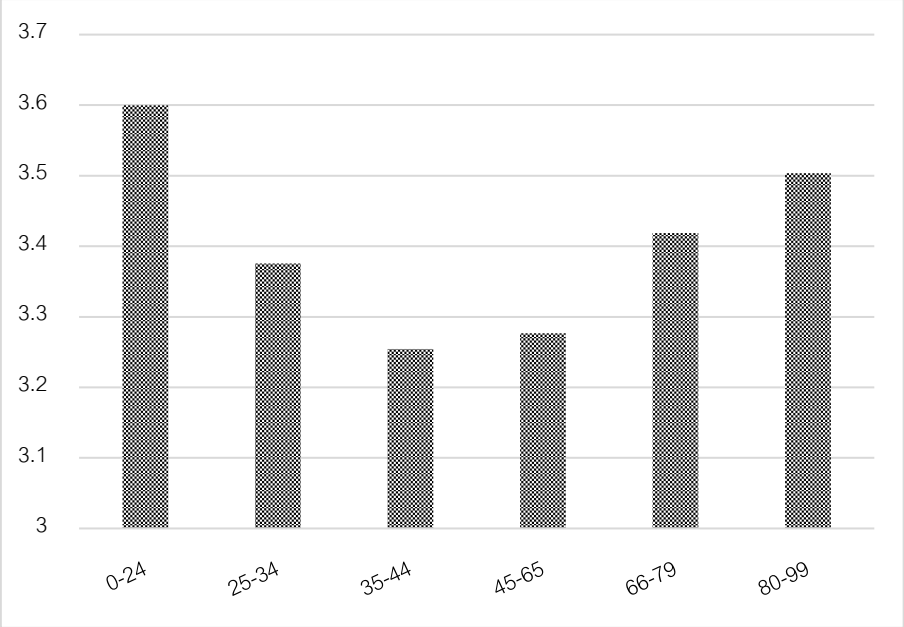

Figure 2: Distribution of Happy_scoredegree by age group.

According to the collected data, nearly 80% of the respondents engaged in exercise habits other than performing housework outside working hours. The average value of the IV, namely the government's level of effort in promoting exercise behavior (EI_frequency), was 3.27, indicating that respondents perceived local governments in their counties or cities occasionally or frequently provided sports information. Another IV, the adequacy of sports facilities (SF_Adequacy), had an average value of 3.55, indicating that respondents perceived local governments provided sports facilities sufficiently.

The survey respondents comprised 45% men and 55% women. The average age of the respondents was 53.74 years; their average number of years of schooling was 12.32 years; their average height was 162.74 cm; and their average weight was 62.81 kg. Approximately 36% of the respondents lived in Taipei City, New Taipei City, Taoyuan City, Taichung City, Tainan City, or Kaohsiung City. Retirees accounted for 24.7% of the research sample, housewives for 19.1%, blue-collar workers for 17%, white-collar workers for 10.8%, and people with other professions for less than 10%. The respondents reported an average unhealthiness level of 2.30, which lies between the healthy and neutral categories. The descriptive statistics of each variable are listed in Table 1.

Table 1: Definitions and descriptive statistics of the variables adopted in this study (*N* = 21,503)

Dependent Variables	Definitions	Mean	Std.	Min	Max
Unhappy_degree	Unhappy degrees respondents feel in their lives (1=very happy, 2=happy, 3=neutral, 4=unhappy 5=very unhappy)	2.06	0.87	1	5
Happy_score	Respondents' self-rated happy scores for the previous year (0-100 points)	74.07	15.73	0	100
Happy_ scoredegree	Degrees of respondents' self-rated happy scores for the previous year (1=0-59, 2=60-69, 3=70-79, 4=80-89, 5=90-100)	3.34	1.24	1	5
Main variable					
Exercise	Whether the respondents have exercise behaviors	0.80	0.40	0	1
Instrumental variable					
EI_ frequency	How frequently the local governments provide information about publicity or promotion of sports through any channels	3.27	1.08	1	4
SF_Adequacy	How adequately the local governments provide sports facilities	3.55	0.93	1	5
Body Information					
BMI	Respondent's weight (kg) divided by the square of height (meters)	23.63	3.50	15.06	58.82
Underweight	Is the respondent underweight? (BMI $<$ 18.5, 1=Yes, 0=No)	0.05	0.21	0	1
Moderate	Is the respondent normal-weight? (18.5 $\leqq$ BMI $<$ 24, 1=Yes, 0=No)	0.53	0.50	0	1
Overweight	Is the respondent overweight? (24 $\leqq$ BMI $<$ 27, 1=Yes, 0=No)	0.27	0.44	0	1
Obese	Is the respondent obese? (BMI $\geqq$ 27, 1=Yes, 0=No)	0.15	0.36	0	1
Personal Information					
Gender	Respondent's gender, 1=male, 0=female	0.45	0.50	0	1
Age	Respondent's age	53.74	16.72	13	99
Education_year	Respondent's years of schooling [Elementary school and below=6, Junior high school=9, General and vocational high school (threejunior)=12, Junior college=14, University=16, Master=18, Doctoral=22]	12.32	3.59	6	22
Height	Respondent's height (cm)	162.74	8.20	98	193
Weight	Respondent's weight (kg)	62.81	11.75	30	170

Dependent Variables	Definitions	Mean	Std.	Min	Max
Smunicipality	Whether the respondent lives in the six municipalities (1=Taipei City, New Taipei City, Taoyuan City, Taichung City, Tainan City, Kaohsiung City, Others=0)	0.36	0.48	0	1
Respondent's occupation					
White collar (workers have jobs in offices, banks etc. rather than jobs working in factories, building things etc.)		0.108	0.311	0	1
Government employees		0.054	0.226	0	1
Blue collar (workers do physical work, rather than working in offices)		0.170	0.376	0	1
Store owner/supervisor (above the deputy general level)		0.051	0.219	0	1
Professional (license holder: lawyer / accountant / physician / nurse /architect / commissioner)		0.041	0.198	0	1
Student		0.055	0.228	0	1
Housewife		0.191	0.393	0	1
Retirees		0.247	0.431	0	1
Self-employed		0.037	0.189	0	1
Unemployed		0.042	0.200	0	1
Other		0.004	0.064	0	1

Respondent's place of residence									
Keelung City	0.042	0.200	0	1	Chiayi City	0.040	0.196	0	1
Taipei City	0.061	0.240	0	1	Chiayi County	0.040	0.196	0	1
New Taipei City	0.060	0.238	0	1	Tainan City	0.060	0.237	0	1
Taoyuan City	0.061	0.239	0	1	Kaohsiung City	0.060	0.237	0	1
Hsinchu City	0.042	0.200	0	1	Pingtung County	0.043	0.203	0	1
Hsinchu County	0.044	0.204	0	1	Penghu County	0.039	0.194	0	1
Miaoli County	0.042	0.201	0	1	Yilan County	0.041	0.199	0	1
Taichung City	0.060	0.237	0	1	Hualien County	0.043	0.202	0	1
Changhua County	0.041	0.198	0	1	Taitung County	0.044	0.205	0	1
Nantou City	0.040	0.197	0	1	Kinmen County	0.044	0.205	0	1
Yunlin County	0.039	0.193	0	1	Lianjiang County	0.015	0.122	0	1

Health Status					
Unhealthy_degree	Respondents self-rated unhealthy degree (1=very healthy, 2=healthy, 3=normal, 4=unhealthy, 5=very unhealthy)	2.30	0.92	1	5

4. Empirical results

4.1 Comparisons

Sports participation is an endogenous decision. To avoid estimation errors caused by endogeneity problems, IVs are used to perform a further regression for estimating the influence of sports participation on people's subjective well-being. Table 2 presents the results for analyzing the influence of sports participation on well-being using the Poisson Regression (PR) model and Two-stage Poisson Regression. The regression analyses were conducted according to the three well-being indicators. Models (1)-(3) represent the Poisson regression results for all respondents. Models (4)-(6) and models (7)-(9) represent the Two-stage Poisson regression results for instrumental variables, which are perceptions of the government's promotion of sports and the adequacy of sports facilities, respectively. The models above can be compared to determine the differences in the effects of models on sports participation.

The analysis results are listed in Table 2. The results of the Durbin–Wu–Hausman test for models (4)-(9) were significant (e.g., $\chi 2$ is 194.98 for model 4); thus, the null hypothesis that no endogeneity exists was rejected (i.e., H0: The OLS regression estimation coefficients are consistent). Consequently, estimation must be conducted using a two-stage IV regression to verify the results. In this study, we used the Cragg–Donald Wald F test. In the case of models (4)-(9), the weak instrument F test indicated that all the F statistics were significant, the null hypothesis of weak IVs was rejected and the applicability of the IVs used in this study was verified.[2]

All the estimated coefficients of the main explanatory variable, namely sports participation, were significant. The regression for the unhappiness index is significantly negative [models (1), (4), and (7)], and the regression for the remaining well-being indices is significantly positive. The results above indicate that exercise behaviors increased the respondents' well-being. This empirical result is consistent with the results of previous studies (Zhang & Chen, 2019; Fararouei et al., 2013). Thus, participation in sports activities has a positive effect on well-being. The results obtained with model (5), when endogeneity was considered, indicate that the well-being score of the respondents with exercise behaviors was 0.16 points higher than that of the respondents without exercise behaviors. This difference in well-being was only 0.043 points (nearly four times lower than the aforementioned value) when endogeneity was not considered in model (2) (Table 2). This result indicates the necessity of considering endogeneity. Ignoring the endogeneity of explanatory variables may lead to biases in the model results.

[2] The estimation results of two-stage ordinary least squares (2SLS) regressions are included in the Table A.1 of Appendix for robustness checks.

Table 2: Estimation results of overall data

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Poisson Regression			Two-stage Poisson Regression (IV: government's level of effort for promoting sports)			Two-stage Poisson Regression (IV: Adequacy of sports facilities)		
VARIABLES	unhappy_degree	happy_score	happy_scoredegree	unhappy_degree	happy_score	happy_scoredegree	unhappy_degree	happy_score	happy_scoredegree
exercise	-0.067***	0.043***	0.064***	-0.30***	0.16***	0.29***	-3.09***	1.53***	2.81***
	(0.012)	(0.0021)	(0.010)	(0.036)	(0.0058)	(0.027)	(0.24)	(0.041)	(0.20)
Constant	0.34***	4.50***	1.54***	0.53***	4.40***	1.34***	3.00***	3.18***	3.00***
	(0.068)	(0.011)	(0.053)	(0.075)	(0.012)	(0.058)	(0.097)	(0.016)	(0.075)
Other control var.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Work	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
First stage	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
EI_ frequency				0.0291***	0.0298***	0.0298***			
SF_Adequacy							0.0055*	0.0061**	0.0061**
Observations	20,916	20,662	20,662	20,377	20,141	20,141	19,768	19,582	19,582
LR	952.09***	9301.71***	1263.86***	965.98***	9468.28***	1317.18***	1008.33***	9476.16***	1342.03***
D-W-H χ2 test				194.9765***	239.5586***	281.1668***	517.7999***	477.5261***	513.5750***
Cragg-Donald Wald F statistic				132.87***	138.01***	138.01***	3.435	4.184	4.184

Notes: (a) *** denotes significance at the 1% level, ** denotes significance at the 5% level, and * denotes significance at the 10% level. (b) Standard errors are in parentheses.

To distinguish the effects of sports participation on each gender (Table 3), we conducted regression on all the samples, the samples provided by the men only, and the samples provided by the women only, the results of the main variables of sports participation are consistent with Table 2. For the BMI, the regression for the unhappiness index was negatively significant [models (1), and (4)], and the regression for the remaining well-being indices was positively significant. Thus, the degree of happiness increased with an increase in BMI. This result is consistent with the empirical results of Kropfhäußer and Sunder (2015). This result indicates that an increase in BMI increases happiness and decreases unhappiness to a greater extent in men than in women. The years of schooling exhibited a similar effect to the BMI. The regression for the unhappiness index was negatively significant [models (1), and (4)], and the regression for the remaining well-being indices was positively significant. This result indicates that people with a higher level of education have higher subjective well-being (significantly positive correlation), which is consistent with the results of Witter et al. (1984). In the case of models (2) and (5), each additional year of schooling increased the happiness scores of men and women by 0.0036 and 0.0011 points, respectively. This result indicates that education level has a stronger influence on the well-being of men than on the well-being of women.

The negative effect of age on the happiness indices indicates that well-being decreases as people become older. To observe the nonlinear relationship between age and well-being, we used the square term of Age. The obtained empirical results are consistent with those of Ruseski et al. (2014) and indicate that a U-shaped relationship exists between age and self-rated well-being, the respondents aged 49–50 years had the lowest subjective well-being. This finding is similar to that of Blanchflower & Graham (2020), who performed a study on people from 167 countries from 2005 to 2019 and found that the respondents aged 55 years had the lowest subjective well-being. Models (1)-(6) exhibited the same effects for the estimated coefficients. The estimated coefficients for women were greater than those for men, which indicated that women are more worried about aging than men. The negative correlation between the urbanization index and the well-being indices indicates that people living in municipalities have a lower sense of well-being than people living in other regions do. This result is consistent with those of Morrison and Weckroth (2018). In the case of models (5)-(6), the regressed urbanization indicators for the female respondents had a consistently negative and significant relationship with those for all the respondents. By contrast, in the case of models (1)-(3), the regressed urbanization indicators for all the respondents had no significant relationship with those for the men. In model (5), the well-being score of women living in municipalities was 0.015 points lower than that of women living in other places. A consistently negative correlation was observed between the degree of unhealthiness and the well-being index coefficient, which indicates that respondents who believe that they are less healthy have lower well-being. Finally, the relationship between genders and the well-being indices indicates that men have lower well-being than women, which is consistent with the results of Inglehart (2002)

Table 3: Estimation results of Poisson Regression

	(1)	(2)	(3)	(4)	(5)	(6)
	Male			Female		
VARIABLES	unhappy_degree	happy_score	happy_scoredegree	unhappy_degree	happy_score	happy_scoredegree
exercise	-0.068***	0.045***	0.055***	-0.065***	0.040***	0.066***
	(0.019)	(0.0033)	(0.016)	(0.016)	(0.0028)	(0.013)
bmi	-0.0059***	0.0028***	0.0042**	-0.0058***	0.0017***	0.0030*
	(0.0022)	(0.00038)	(0.0018)	(0.0020)	(0.00034)	(0.0016)
education_year	-0.00058	0.0036***	0.0078***	0.00097	0.0011***	0.0035*
	(0.0025)	(0.00041)	(0.0020)	(0.0025)	(0.00041)	(0.0019)
age	0.0093***	-0.0055***	-0.0097***	0.011***	-0.0061***	-0.010***
	(0.0029)	(0.00048)	(0.0022)	(0.0030)	(0.00050)	(0.0023)
age2	-0.000092***	0.000053***	0.000094***	-0.00011***	0.000064***	0.00011***
	(0.000027)	(4.6e-06)	(0.000021)	(0.000029)	(4.8e-06)	(0.000022)
smunicipality	0.015	-0.0040	-0.014	0.035***	-0.015***	-0.029***
	(0.015)	(0.0026)	(0.012)	(0.014)	(0.0023)	(0.011)
unhealthy_degree	0.14***	-0.080***	-0.14***	0.14***	-0.070***	-0.13***
	(0.0076)	(0.0014)	(0.0069)	(0.0068)	(0.0012)	(0.0059)
Constant	0.42***	4.45***	1.46***	0.31***	4.52***	1.56***
	(0.100)	(0.017)	(0.079)	(0.097)	(0.016)	(0.075)
Work	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,438	9,400	9,400	11,478	11,262	11,262
LR	452.26***	4923.11***	633.24***	498.99***	4376.20***	622.47***

Notes: (a) *** denotes significance at the 1% level, ** denotes significance at the 5% level, and * denotes significance at the 10% level. (b) Standard errors are in parentheses.

Table 4: Estimation results of Two-stage Poisson Regression (IV: government's level of effort for promoting sports)

	(1)	(2)	(3)	(4)	(5)	(6)
	Male			Female		
VARIABLES	unhappy_degree	happy_score	happy_scoredegree	unhappy_degree	happy_score	happy_scoredegree
exercise	-0.32***	0.17***	0.32***	-0.29***	0.15***	0.28***
	(0.055)	(0.0088)	(0.041)	(0.048)	(0.0076)	(0.035)
bmi	-0.0090***	0.0045***	0.0073***	-0.0079***	0.0028***	0.0051***
	(0.0022)	(0.00039)	(0.0018)	(0.0021)	(0.00035)	(0.0016)
education_year	-0.00074	0.0037***	0.0076***	0.0017	0.0011**	0.0034*
	(0.0025)	(0.00042)	(0.0020)	(0.0025)	(0.00042)	(0.0020)
age	0.015***	-0.0086***	-0.015***	0.015***	-0.0082***	-0.014***
	(0.0030)	(0.00051)	(0.0024)	(0.0032)	(0.00052)	(0.0024)
age2	-0.00013***	0.000076***	0.00013***	-0.00015***	0.000079***	0.00014***
	(0.000028)	(4.7e-06)	(0.000022)	(0.000030)	(4.9e-06)	(0.000023)
smunicipality	0.023	-0.0076***	-0.020*	0.042***	-0.018***	-0.034***
	(0.015)	(0.0026)	(0.012)	(0.014)	(0.0023)	(0.011)
unhealthy_degree	0.095***	-0.056***	-0.095***	0.098***	-0.049***	-0.088***
	(0.011)	(0.0019)	(0.0093)	(0.0098)	(0.0017)	(0.0079)
Constant	0.66***	4.33***	1.22***	0.49***	4.42***	1.38***
	(0.11)	(0.019)	(0.087)	(0.11)	(0.017)	(0.081)
Work Dummy	Yes	Yes	Yes	Yes	Yes	Yes
First stage	(4)	(5)	(6)	(7)	(8)	(9)
EI_ frequency	0.0264***	0.0268***	0.0268***	0.0317***	0.0325***	0.0325***
Observations	9,214	9,182	9,182	11,163	10,959	10,959
LR	464.32***	5021.24***	661.87***	502.82***	4476.21***	651.00***
D-W-H χ2 test	93.9480***	113.7632***	140.6122***	102.8316***	129.9191***	144.9492***
Cragg-Donald Wald F statistic	50.36***	51.86***	51.86***	85.36***	88.81***	88.81***

Notes: (a) *** denotes significance at the 1% level, ** denotes significance at the 5% level, and * denotes significance at the 10% level. (b) Standard errors are in parentheses.

The empirical results of two-stage Poisson regression (2sPR) in Table 4 are consistent with the results of PR in Table 3. Both these results indicate that sports participation has a positive influence on the degree of well-being perceived. All the coefficients of sports participation were significant. These coefficients had a significantly negative relationship with the unhappiness index [models (1), and (4)] but a significantly positive relationship with the happiness indices. People with an exercise habit exhibited a higher happiness index and lower unhappiness index than people without such a habit. This result supports those of previous studies that have indicated that an exercise habit can increase well-being (Wicker & Frick, 2015; Chang et al., 2019) and the effect is greater for male than for female.

Table 4 models (1)-(6) indicate that all the estimated effects for men were consistently greater than those for women. Considering the samples of the men only in model (5) and the samples of the women only in model (8), the happiness score of men engaging in exercise behaviors was 0.17 points higher than that of men not exhibiting these behaviors. Moreover, the happiness score of women engaging in exercise behaviors was 0.15 points higher than that of women not engaging in these behaviors. The aforementioned results are consistent with those of Huang and Humphreys (2012), who indicated that men obtain a greater sense of well-being from sports participation than women do.

4.3 Robustness Checks: IVs Regressions

For the robustness checks, we further used the adequacy of sports facilities a respondent perceived (SF_Adequacy) as the IV for the regressions of subjective well-being. The results of 2sPR are listed in Table 5. The first-stage relationship between respondents' perception of sports facilities and their sports participation is consistent and significant.

The upper part of Table 4 tabulates in columns (1) to (6) the results from estimating equation (5) for regressions of the 2sPR model. Again, we do find a statistically significant correlation between individual subjective well-being and sports participation in all regressions. The coefficients of sports participation are significantly and negatively related to the unhappiness index [models (1), and (4)] but they are significantly and positively related to happiness indices. The coefficients of males and females reveal the gender difference of the sports participation effect on SWB. The results reinforce previous findings

Table 5: Estimation results of Two-stage Poisson Regression (IV: Adequacy of sports facilities)

	(1)	(2)	(3)	(4)	(5)	(6)
	Male			Female		
VARIABLES	unhappy_degree	happy_score	happy_scoredegree	unhappy_degree	happy_score	happy_scoredegree
exercise	-3.06***	1.60***	2.87***	-3.12***	1.48***	2.76***
	(0.35)	(0.061)	(0.29)	(0.33)	(0.056)	(0.27)
bmi	-0.036***	0.019***	0.032***	-0.036***	0.016***	0.029***
	(0.0041)	(0.00071)	(0.0034)	(0.0039)	(0.00065)	(0.0031)
education_year	-0.0023	0.0046***	0.0092***	-0.00065	0.0018***	0.0046**
	(0.0025)	(0.00042)	(0.0020)	(0.0026)	(0.00043)	(0.0020)
age	0.055***	-0.030***	-0.053***	0.058***	-0.028***	-0.052***
	(0.0059)	(0.0010)	(0.0049)	(0.0059)	(0.00099)	(0.0046)
age2	-0.00039***	0.00021***	0.00038***	-0.00043***	0.00021***	0.00038***
	(0.000044)	(7.4e-06)	(0.000035)	(0.000044)	(7.3e-06)	(0.000034)
smunicipality	0.080***	-0.039***	-0.077***	0.10***	-0.047***	-0.087***
	(0.017)	(0.0029)	(0.014)	(0.016)	(0.0026)	(0.012)
unhealthy_degree	-0.28***	0.14***	0.25***	-0.29***	0.13***	0.26***
	(0.049)	(0.0085)	(0.041)	(0.046)	(0.0079)	(0.037)
Constant	3.39***	2.89***	-1.32***	2.99***	3.26***	-0.80***
	(0.36)	(0.063)	(0.30)	(0.31)	(0.052)	(0.24)
Work Dummy	Yes	Yes	Yes	Yes	Yes	Yes
First stage	(4)	(5)	(6)	(7)	(8)	(9)
SF_Adequacy	-0.0005	-0.0009	-0.0009	0.0096**	.01140***	.01140***
Observations	8,993	8,954	8,954	10,775	10,628	10,628
LR	481.37***	5045.63***	685.27***	528.42***	4449.89***	651.00***
D-W-H χ2 test	230.5388***	227.8866***	242.6305***	290.0492***	252.1945***	272.0454***
Cragg-Donald Wald F statistic	0.014	0.043	0.043	5.437	7.507	7.507

Notes: (a) *** denotes significance at the 1% level, ** denotes significance at the 5% level, and * denotes significance at the 10% level. (b) Standard errors are in parentheses.

Furthermore, we included a respondent's perceptions of the government's promotion on sport and the adequacy of sports facilities at the same time as instrumental variables (IVs), and the results are reported in Table 6. All Cragg-Donald Wald F statistics reject the null hypothesis of the instrumental variable being is weak. For example, the value of F is 55.55 in Model 1, and so the instrumental variable is valid and the 2sPR model is supported. The main results indicate that sports participation increases individual subjective well-being. For the other control variables, an interesting finding in age indicates that a U-shaped relationship exists between age and SWB. The negative coefficient of the age and positive coefficient of the quadratic term of age corresponds to the empirical results of Huang and Humphreys (2012). In our estimation in model 2 of Table 6, the lowest SWB was exhibited by the respondents aged roughly 54 years. The result is similar to those of PR (49–50 years) and Blanchflower and Graham (2020; 55 years).

Table 6: Estimation results of Two-stage Poisson Regression (IVs: government's level of effort for promoting sports & Adequacy of sports facilities)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Overall			Male			Female		
VARIABLES	unhappy_degree	happy_score	happy_scoredegree	unhappy_degree	happy_score	happy_scoredegree	unhappy_degree	happy_score	happy_scoredegree
exercise	-0.33***	0.17***	0.32***	-0.35***	0.19***	0.34***	-0.31***	0.16***	0.30***
	(0.039)	(0.0063)	(0.029)	(0.060)	(0.0096)	(0.045)	(0.052)	(0.0084)	(0.039)
Constant	0.55***	4.39***	1.33***	0.69***	4.31***	1.21***	0.50***	4.41***	1.36***
	(0.077)	(0.013)	(0.060)	(0.12)	(0.019)	(0.090)	(0.11)	(0.018)	(0.083)
Work Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
First stage	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
EI_frequency	0.0268***	0.0275***	0.0275***	0.0251***	0.0256***	0.0256***	0.0287***	0.0294***	0.0294***
SF_Adequacy	0.0002	0.0009	0.0009	-0.0048	-0.0050	-0.0050	0.0036	0.0055	0.0055
Observations	19,316	19,137	19,137	8,800	8,769	8,769	10,516	10,368	10,368
LR	893.35***	8665.82***	1224.04***	433.77***	4638.14***	627.64***	462.01***	4052.80***	591.80***
D-W-H χ2 test	193.5870***	251.1500***	291.7779***	50.8959***	65.2477***	83.1324***	132.2933***	174.4106***	193.5080***
Cragg-Donald Wald F statistic	55.547***	58.345***	58.345***	22.105***	22.992***	22.992***	35.657***	38.047***	38.047***
Hansen-J statistic	158.382***	118.845***	112.785***	109.558***	95.866***	87.006***	74.735***	48.581***	48.006***

Notes: (a) *** denotes significance at the 1% level, ** denotes significance at the 5% level, and * denotes significance at the 10% level. (b) Standard errors are in parentheses.

5. Conclusion and Discussion

Exercise behavior is beneficial for improving people's quality of life and promoting health, and it is essential for a happy life. Additionally, participation in sports develops communication and cooperation skills and provides opportunities for society to improve overall social welfare and people's satisfaction with life. Individual data from Taiwan's "Current Situation of Year 2019 SSD" were used in this study to explore the influence of sports participation on subjective well-being. The Poisson Regression (PR) model, Probit model, and two-stage IV method were used for analysis.

This study found significant and consistent empirical evidence that, in addition to reducing obesity and improving health, sports participation increases personal subjective well-being. The results support previous studies indicating that sports participation increases well-being (e.g., Zhang & Chen, 2019; Huang & Humphreys, 2012). Robustness checks were conducted separately for men and women. Interestingly, the gender difference in the effect of participating in sports activities on SWB reveals that men obtain a greater sense of SWB from sports participation than women do, whether endogeneity was considered or not.

Exercise behaviors depend on individual decisions and are influenced by individual characteristics. Therefore, potential endogeneity causes estimation errors when analyzing the effect of sports participation on personal subjective well-being. We used respondents' perceptions of the accessibility of sports facilities as IVs to address this issue. IV first-stage regression results show that people's exercise habits are affected by the government's level of effort in promoting sports and the adequacy of sports facilities.

It is imperative for the government to actively promote physical activity to enhance public health and subjective well-being. This can be achieved through various means, such as providing more sports facilities and venues, organizing sports events and community outreach programs, and fostering a culture of physical activity in schools and workplaces. Through these initiatives, the government can establish an environment that encourages and supports healthy lifestyles, thereby increasing the populace's motivation and willingness to participate in physical activity.

Finally, from an economic viewpoint, subjective well-being appears to be highly correlated with personal income. Higher income leads to greater satisfaction of material needs and an increased level of well-being. This hypothesis has been supported by many relevant studies (Diener et al., 1999; Cummins, 2000). However, due to the limitations of the questionnaire used in this study, data on other personal statuses could not be collected. Thus, suggestions for future research are as follows. First, including more personal demographic variables like income, marital status, race, etc. Second, needs-based perspectives posit that sports participation is most likely to be satisfying and to facilitate SWB when they fulfill fundamental psychological needs (Newman et al., 2014). Therefore, the question of the mechanism by which sport participation affects SWB is unsettled in the literature and is an important issue. Third, the researcher could consider the possibility that seeking subjective well-being and need fulfillment across numerous life domains is more beneficial than seeking concentrated need fulfillment in one domain (e.g., seeking mastery only at work or in sports participation). This idea has been raised recently in the literature on balanced need satisfaction

(Milyavskaya et al., 2009). Addressing these questions would help further clarify the types of leisure participation that are most likely to enhance SWB.

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Appendix Table A.1 Estimation results of Two-stage ordinary least squares (2SLS)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Overall			Male			Female		
VARIABLES	unhappy_degree	happy_score	happy_scoredegr	unhappy_degree	happy_score	happy_scoredegre	unhappy_degree	happy_score	happy_scoredegr
exercise	-0.15***	3.10***	0.20***	-0.15***	3.13***	0.17***	-0.14***	2.94***	0.21***
	(0.015)	(0.27)	(0.021)	(0.023)	(0.42)	(0.032)	(0.019)	(0.34)	(0.028)
bmi	-0.012***	0.18***	0.013***	-0.012***	0.20***	0.014***	-0.012***	0.13***	0.010***
	(0.0017)	(0.031)	(0.0025)	(0.0026)	(0.048)	(0.0037)	(0.0023)	(0.041)	(0.0034)
education_year	0.00062	0.16***	0.018***	-0.0016	0.26***	0.025***	0.0020	0.083	0.012***
	(0.0020)	(0.037)	(0.0029)	(0.0029)	(0.054)	(0.0041)	(0.0028)	(0.051)	(0.0041)
male [c]	0.11***	-2.88***	-0.24***	-	-	-	-	-	-
	(0.013)	(0.24)	(0.019)	-	-	-	-	-	-
Constant	1.27***	88.3***	4.43***	1.42***	84.3***	4.14***	1.22***	90.3***	4.55***
	(0.079)	(1.44)	(0.11)	(0.12)	(2.17)	(0.17)	(0.11)	(1.98)	(0.16)
Work	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	20,916	20,662	20,662	9,438	9,400	9,400	11,478	11,262	11,262
R-squared	0.130	0.132	0.129	0.131	0.141	0.137	0.129	0.123	0.120

Notes: (a) *** denotes significance at the 1% level, ** denotes significance at the 5% level, and * denotes significance at the 10% level. (b) Standard errors are in parentheses. (c) Other control variables age, square term of age, smunicipality, and unhealthy_degree are included in the regressions. These results also reinforce previous findings.