The Determinants of Sports Activity Expenditure among Koreans: An Empirical Analysis Using the Tobit Model

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Abstract

This study examines the factors influencing daily sports expenditure using data from the 2023 National Daily Sports Survey conducted by the Ministry of Culture, Sports and Tourism (MCST) in Korea. The study addresses the issue of censored data using a Tobit regression model, with 48.8% of respondents reporting zero spending on sports activities. The results indicate that while there are differences across activities, an increase in household income, employment status, educational attainment, membership of sports clubs, and use of paid facilities is associated with a significant rise in sports expenditure. Moreover, awareness of local sports facilities and engagement in regular, extended exercise sessions also contribute to an increase in spending. Regional variations in spending patterns are evident, with regions outside Seoul displaying higher expenditure. These findings emphasise the necessity for a comprehensive approach to public health and sports policies, encompassing infrastructure improvements, financial incentives, and awareness campaigns, to foster a more active and healthy society.

Key words: daily sports participation; sports expenditure; tobit regression model; marginal effect; daily sports policy

Introduction

Engaging in daily sports activities has become increasingly recognized as essential for enhancing overall well-being and quality of life. Numerous studies also investigate whether daily sports can enhance welfare, demonstrating that regular participation in sports and exercise significantly improves health-related quality of life (Chou et al., 2012; Eime et al., 2010; Yazicioglu et al., 2012). As sports participation increases, the expenses associated with sports activities also rise. Until the COVID-19 pandemic, Koreans' spending on sports activities had been consistently increasing along with the sports participation rate. In 2022, the consumption level returned to nearly the same level as in 2019, but in 2023, it is showing signs of slowing down slightly (MCST, 2023).

Daily sports participation has gained more academic focus recently due to its potential to improve overall health, particularly cardiovascular conditions in the elderly. Previous medical literatures suggest that moderate-intensity sports, such as aerobics, muscle-strengthening activities, and flexibility exercises, can improve physical health and manage risks (Bravata et al., 2007; Haskell et al., 2007; Nelson et al., 2007). Daily sports participation benefits not only the elderly but also enhances general health conditions for younger generations (Beunen et al., 2004; Colley et al., 2011;

Pate et al., 2000; Lee et al., 2021; Beak et al., 2018).

In Korea, the rising interest in daily sports on international level has shifted national attention towards increasing participation in daily sports activities. As of 2023, the daily sports participation rate in Korea about 62.4%, a significant increase from 60.1% in 2020 (MCST, 2023). In terms of participation rate, top 3 ranking daily sports are Walking (37.2%), Climbing (17.3%), and Bodybuilding (16.3%), followed by Swimming (7.7%), Golf (7.1%), Futsal (6.7%), Gymnastics (6.1%), and Yoga, Pilates, and Tae Bo (5.7%). It indicates a rising trend in both academic and social interest in daily sports.

As academic and social interest in daily sports continues to grow, numerous studies in the social sciences have examined the socio-economic factors that influence daily sports participation and expenditure, utilizing socio-economic variables (Lera-López & Rapún-Gárate, 2005; Thibaut et al., 2017). Individuals who engage in sports spend money on equipment and supplies necessary for participation, as well as membership fees for exercise facilities, including fitness centers. Actually, the spending of an individual on sports is influenced by a number of factors, including personal and socioeconomic characteristics, facility use characteristics, and exercise participation characteristics. Therefore, research that considers these factors provides valuable insights into the economic, social, and individual impacts of sports spending, and can inform policy decisions related to sports activities.

This study differs in that it focuses on expenditures related to sports activities, rather than the day of participation. Furthermore, it examines the factors influencing these expenditures at personal, daily sports facility, and participation characteristics. This focus is driven by economic perspectives and data utilization. From an economic perspective, analyzing the economic factors related to physical activity participation allows us to understand the determinants of economic factors associated with physical activity participation, providing more concrete and practical policy implications for increasing individuals' expenditure on physical activity compared to merely analyzing participation. In terms of data utilization, the National

Daily Sports Survey data provides detailed information on individual characteristics, enabling a comprehensive analysis of the factors influencing spending on physical activity. This approach enhances our understanding of the economic aspects of physical activity and ensures that the manuscript clearly articulates these reasons to justify the focus on spending.

In line with the aforementioned, this study employed the 2023 National Daily Sports Survey data provided by Ministry of Culture, Sports and Tourism (MCST) of Korea to identify the determinants of daily sports expenditure with the expenditure of daily sports participation as the dependent variable. Because 48.8% of people had zero expenditure on daily sports activities, this study utilized a Tobit regression model, which is appropriate for a censored data such as expenditures of daily sports participation.

The findings of this study indicate that, while there are variations across activities, individuals with higher incomes, stable employment, educational attainment, and membership in sports clubs tend to allocate a greater proportion of their expenditure towards sports. Furthermore, individuals who utilize paid facilities and are aware of sports facilities in their residential area tend to increase their expenditure on sports. The frequency and duration of exercise also have a significant impact on sports expenditure. These findings suggest that policies aimed at improving facility accessibility and promoting sports club membership can increase daily sports expenditure, thereby fostering healthier lifestyles. Furthermore, support for low-income and unemployed groups and educational initiatives emphasizing the benefits of exercise are crucial. Regional differences in spending patterns suggest the need for localized strategies to effectively promote sports participation.

This study is organized as follows. Chapter 2 introduces comprehensive trends of Korea's current daily sports and previous literature focusing on determinant of daily sports decision. Chapter 3 describes the data and explains the econometric model. Chapter 4 presents the analysis results. Finally, conclusions and policy implications are derived in Chapter 5.

Current State of Korea and Literature Review

The Current State of Korea

In Korea, the "National Sports Participation Survey" approved by Statistics Korea is used to assess the current status of citizens' participation in daily sports activities. The survey began in 1991, and since 2015, it has been conducted annually. The survey closely examined the actual conditions and demands of the nation's sports activities. The results are used as basic data to create an environment that promotes participation in sports activities, encourages national participation in daily sports, and maximizes satisfaction by developing sports policies. The survey targeted South Korean citizens aged 10 and older, and the results are announced every January. The survey covered health and fitness status, sports activities and conditions, and participation in sports activities. The content of the survey included daily sports participation rate, participation rate by sport, utilization rate of sports facilities, reasons for using sports facilities and preferences, and experiences of participating in sports activities.

As mentioned in the introduction, interest in sports activities has steadily increased in Korea, whit it becoming a fundamental aspect of daily life. In Korea,

the participation rate in daily sports, defined as the percentage of individuals who engage in sports activity at least once a week for a minimum of 30 minutes or more per activity, has increased from 59.2% in 2017 to 62.4% in 2023 (MCST, 2023). This rate continued to increase until 2019, after which there was a brief dip in 2020 due to the impact of the COVID-19 pandemic.

However, it has rebounded. There has been a notable increase in participation in physical activities, particularly in walking (37.2%), climbing (17.3%), and bodybuilding (16.3%). Overall, there is a discernible trend toward a greater prevalence of solitary sports, such as swimming, gymnastics, and yoga, compared to sports that involve a group of people, such as soccer or badminton.

As the number of people participating in sports activities continues to grow, so does the expenditure in this sector. As of 2023, the average monthly expenditure on sports activities in Korea had reached $53(KRW 70,507), up from $43(KRW 56,755) in 2017(MCST, 2023). The average monthly expenditure on sports activities rose to $59 (KRW 78,214) in 2019, dipped to $44 (KRW 58,515) in 2020 due to the COVID-19 pandemic, and then recovered to $58 (KRW 77,135) in 2022, showing a level of expenditure comparable to that observed in 2019.
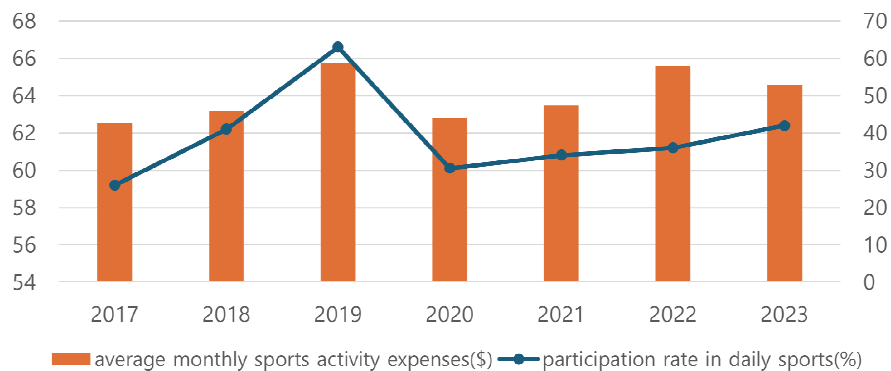

Figure 1. Trends of average monthly expenditure ($) and participation rate (%) in daily sports

Note: Based on average exchange rate from Bank of Korea for March 2024 (1$=1,331 KRW)

Literature Review

A multitude of factors affect the expenditure of sports activity participation. Previous studies have indicated that a number of factors, such as gender, age, income, employment status, urban area location, education, and membership in a sports club, significantly influence the expenditure of sporting activities.

The primary factors influencing the expenditure of sports activity can be delineated as follows. First of all, gender and age have been shown to be an important determinant of the expenditure of sports activity. Multiple studies reveal that males spend a greater proportion of their disposable income on sports activities than females (Eakins, 2016; Lera-López & Rapún-Gárate, 2005; Løyland & Ringstad, 2009; Scheerder et al., 2011; Thibaut et al., 2016; Wicker et al., 2010). And there is a negative correlation between age and the expenditure of sports activity has been observed in several studies (Lera-López & Rapún-Gárate, 2007; Løyland & Ringstad, 2009). This indicates that as individual age, their expenditure on sports activity tends to decrease.

Secondly, education attainment and income have also been demonstrated to have a positive impact on sports activity expenditure. Higher levels of education are associated with higher levels of expenditure on sports activity (Lera-López & Rapún-Gárate, 2005; 2007; Scheerder et al., 2011; Thibaut et al., 2016). Moreover, income has also been found to have a significant positive effect on sports activity expenditure (Eakins, 2016; Task et al., 1994; Thibaut et al., 2017; Elasri-Ejjaberi et al., 2020).

Third, empirical evidence indicates that urbanization levels have a negative effect on sports expenditures (Eakins, 2016; Thibaut et al., 2014). Therefore, it is necessary to consider environmental factors such as urbanization levels as influencers of sports expenditures.

Fourth, membership in a sports club is another factor influencing sports expenditure. Individuals who belong to sports clubs are more likely to purchase sports equipment than non-members (Taks et al., 1999; Thibaut et al., 2014). This indicates that sports club members are more likely to spend more on sports than non-members.

This study analysed the influencing factors on sports

Table 1. Literature on Sports expenditure

Valuable	Author(year)
Age	Lera-López and Rapún-Gárate(2007) Løyland and Ringstad(2009)
Gender	Eakins(2016) Lera-López and Rapún-Gárate(2005) Løyland and Ringstad(2009) Scheerder et al.(2011) Thibaut et al.(2016) Wicker et al.(2010)
Education	Lera-López and Rapún-Gárate(2005)(2007) Scheerder et al.(2011) Thibaut et al.(2016)
Income	Eakins(2016) Task et al.(1994) Thibaut et al.(2017) Elasri-Ejjaberi et al.(2020)
Urban	Eakins(2016) Thibaut et al.(2014)
Membership in a sports club	Taks et al.(1999) Thibaut et al.(2014)

expenditures based on the socioeconomic characteristics of individuals participating in sports, including education, income, employment status, urbanization (residence), membership in a sports club, and recognition of sports facilities in residential areas. Additionally, demographic characteristics such as gender, age, and marital status, and facility use characteristics such as the use of paid facilities (public, private, and other facilities), and participation characteristics such as the frequency of participation and the duration of exercise, were incorporated into the empirical analysis.

Data and Model Specification

This study estimated the determinants of expenditure for daily sports participation using data from the 2023 National Daily Sports Survey retrieved from MCST (2023). The actual survey period for the 2023 National Sports Participation Survey used in this study was from August 29, 2023, to November 3, 2023, and the reference period for the survey was one year, from August 29, 2022, to August 28, 2023. The survey was conducted through 1:1 household visit interviews using a structured questionnaire. The target population was citizens aged 10 and above as of 2023, and the sample was extracted through Stratified Multi-Stage Cluster Sampling.

Table 2 provides summary of statistics. After eliminating non-responses, total 8,923 out of 9,000 samples are used in the analysis. The dependent variable in the determinants of daily sports is the expenditure on physical activity, which is defined the consumption of daily sports participation (10 thousand KRW per week). Mean of expenditure on daily sports participation per week is 1.233, and 48.78% (4,353) of total respondents indicate that they had not incurred any expenditure on daily sports participation.

Secondly, the explanatory variables used in the analysis broadly classified into three categories such as personal characteristics, facility characteristics, and participation characteristics. Within personal category, there are variables such as *age*, *age*^{2}, gender (*male*), *Marital_Status* (*marry*), average monthly household income in millions of KRW (*income*), employment status (*job*), *occupation*, residence (*urban*), *region*, education level (*education)*, membership in a sports club (*membership*). recognition of sports facilities in residential areas (*access_facility*) and paid public, private, and other facilities (*paid_facility*) are one of the facility category's variables. The *frequency* and *duration* are variables under the participation category.

In detail, in terms of individual, respondents ranged in *age* from 10 to 89 years. The reason for including age^2 is that there may be a parabolic relationship between expenditure and age. Gender (*male*) is a dummy variable that equals 1 if male and 0 if female, and the proportion of males in estimation was 50.04% (4,465). Furthermore, 61.29% (5,469) of respondents were married. Mean of *income* (average monthly household income in millions of KRW) is 4.518. Additionally, 5,722 respondents (64.13%) are currently employed, and 6,909 respondents (77.43%) lived in *urban* areas. The respondents' occupations are divided into 13 categories: Manager 94 respondents (1.05%), Professionals and Related Workers 420 respondents (4.71%), Clerks 1,558 respondents (17.46%), Service Workers 1,357 respondents (15.21%), Sales Workers 954 respondents (10.69%), Agriculture, Forestry, and Fisheries Skilled Workers 235 respondents (2.63%), Craft and Related Trades Workers 401 (4.49%), Plant and Machine Operators and Assemblers 264 respondents (2.96%), Elementary Workers 438 respondents (4.91%), Armed Forces 1 respondents (0.01%), Household 1,276 respondents (14.3%), Student 1,340 respondents (15.02%), No occupation/etc. 585 respondents (6.56%). The largest number of respondents reside in Gyeonggi, with 1,227 respondents (13.75%). Seoul follows with 1,019 respondents (11.42%), while Gyeongnam (611 respondents, 6.84%), Busan (607 respondents, 6.80%), Incheon (563 respondents, 6.31%), and Gyeongbuk (540 respondents, 6.05%) each account for a notable proportion of respondents as well. The remaining respondents were from Daegu (512 respondents, 5.74%), Chungnam (495 respondents, 5.55%), Jeonbuk (444 respondents, 4.98%), Jeonnam (440 respondents, 4.93%), Chungbuk (428 respondents, 4.80%), Gwangju

Table 2. Summary Statistics

Variable		Description	Mean	Std. dev.
Dependent Variable	Daily sports expenditure	Consumption of daily sports participation per week (unit 10,000 KRW)	1.234	2.209
Independent Variable	Personal characteristic			
	Age	Age	46.109	18.962
	Age^2	Square of Age/100	24.855	17.658
	Male	Male=1, Otherwise=0	0.500	0.500
	Marital Status	Marital Status=1 if married	0.613	0.487
	Income	Average Monthly Household Income in millions of KRW	4.518	1.867
	Job	Job=1 if employed, Otherwise=0	0.641	0.480
	Occupations	No occupation / Household / Student	0.359	0.480
		Manager	0.011	0.102
		Professionals and Related Workers	0.047	0.212
		Clerks	0.175	0.380
		Service Workers	0.152	0.359
		Sales Workers	0.107	0.309
		Agriculture, Forestry, and Fisheries Skilled Workers	0.026	0.160
		Craft and Related Trades Workers	0.045	0.207
		Plant and Machine Operators and Assemblers	0.030	0.169
		Elementary Workers	0.049	0.216
		Armed Forces	0.000	0.011
	Residence	Residence=1 if Urban Areas, Otherwise=0	0.774	0.418
	Region	Seoul	0.114	0.318
		Busan	0.068	0.252
		Daegu	0.057	0.233
		Incheon	0.063	0.243
		Gwangju	0.045	0.208
		Daejeon	0.045	0.208
		Ulsan	0.039	0.194
		Sejong	0.023	0.149
		Gyeonggi	0.138	0.344
		Gangwon	0.045	0.208
		Chungbuk	0.048	0.214
		Chungnam	0.055	0.229
		Jeonbuk	0.050	0.217
		Jeonnam	0.049	0.217
		Gyeongbuk	0.061	0.238
		Gyeongnam	0.068	0.252
		Jeju	0.031	0.172
	Education	Education years(year)	12.638	3.110
	Membership	Membership in a sports club Membership=1 if a member, Otherwise=0	0.119	0.324
	Facility characteristic	Access Facility	Recognition of sports facilities in residential areas Access Facility=1 if recognized, Otherwise=0	0.914	0.281
		Paid_facility	Paid facility=1 if paid public, private, and other Facilities; Otherwise=0	0.610	0.488
	Participation characteristic	Frequency	Exercise frequency per week (times)	1.958	1.899
		Duration	Exercise duration per week (hour)	0.945	0.948

Note : 1) Authors' calculations based on MCST (2023)
2) Observations 8,923
3) The 'Armed Forces' category within the occupations variable has only 1 respondent, so the mean is calculated as 0.00011207, which is denoted as 0.000

(405 respondents, 4.54%), Gangwon (405 respondents, 4.54%), Daejeon (404 respondents, 4.53%), Ulsan (349 respondents, 3.91%), Jeju (273 respondents, 3.06%), and Sejong (202 respondents, 2.26%). The age at graduation (*education*) ranged from a minimum of 0 to a maximum of 22, with a mean of 12.638.

The total of 1,066 respondents (11.95%) indicated that they are members of a sports club (*membership).* Furthermore, in terms of sports facility characteristics, the proportion of respondents who are aware of the accessibility of facilities (*access facility*) is significantly high at 91.38%, with approximately 61.00% (5,443 respondents) using *paid facilities*. Lastly, in terms of participation characteristics, the mean frequency of daily sports among respondents was 1.958 times per week, while the mean time spent per exercise per week is 0.945 (about 1 hour).

To estimate the determinants of expenditures on daily sports participation using aforementioned variables, this study utilizes the Tobit regression, which is censored regression model proposed by Tobin (1958). The Tobit model offers a more refined analysis of relationships in censored data, which OLS regression is unable to address. OLS estimates the average effect of predictors on observed outcomes, but it neglects censored observations, which can lead to biased results.

The Tobit model corrects this by including both censored and uncensored data. The marginal effects of the Tobit model provide insights that include the impact of predictors on the latent variable, the probability of being uncensored, and the expected value of being uncensored observations. This results in a more comprehensive and accurate interpretation. In the OLS model, the coefficient value represents the marginal effect directly.

However, in the Tobit model, the coefficient does not directly represent the marginal effect. In contrast, the marginal effect is calculated by multiplying the coefficient by the probability that the dependent variable will be observed due to a change in the independent variable. This reflects both the change in the average value and the probability of occurrence (Greene, 2003).

In Tobit regression, observations below or above a certain threshold are not discarded but are instead considered as being at the threshold value. This provides a more accurate and efficient estimation than simply ignoring or trimming these censored observations. The model assumes that there is a latent variable (y_i^*) that follows a linear model and is subject to censoring. The observed data is then viewed as this latent variable, censored whenever it crosses the predefined limits. The following equations (1) to (3) represent the main research regression model.

$$y_i^* = X_i\beta + \varepsilon_i \ \ where \ \varepsilon_i \sim N(0, \sigma^2), \ \ i = 1, 2, ..., n \quad (1)$$

First of all, in Equation (1), y_i^* is the latent dependent variable expressed as the expenditure on daily sports activities. X_i is a vector of the independent variable that affects the expenditure of daily sports participation. The explanatory variables are the observed variables that are expected to affect the dependent variable, including personal characteristics– *age*, *age²*, gender (*male*), *marital status* (marry), *income*, employment status (*job*), *occupation*, residence (*urban*), *region*, *education*, sports club member (*membership*)–, daily sports facility characteristics– *access facility*, *paid facility*–, the participation characteristic–*frequency*, *duration*–. And β is the coefficients, ε_i is the error term, which is normally distributed with mean 0 and variance (σ^2)

The dependent variable (y_i) is observed if its value is greater than zero, otherwise it is not observed and is censored to zero. Therefore, the independent variable (y_i) equals the latent variable y_i^* when latent variable y_i^* is positive, but it is censored at zero otherwise refer to Equation (2).

$$y_i = \begin{cases} y_i^* & if \ y_i^* > 0 \\ 0 & if \ y_i^* \leq 0 \end{cases} \quad (2)$$

The expectation value of the potential dependent variable (y_i^*) in Equation (2) is given by equation (3).

$$E(y_i^* | y_i^* > 0) = X_i'\beta + \sigma \frac{\Phi_i(x_i'\beta/\sigma)}{1 - \Phi_i(x_i'\beta/\sigma)} \quad (3)$$

In this context, $\Phi_i(\cdot)$ represents the probability density function (PDF) of the standard normal distribution, while $\Phi_i(\cdot)$ denotes its cumulative distribution function (CDF). To estimate the parameters like the coefficient (β) and variance (σ^2) in the Tobit model using maximum likelihood estimation (MLE), one must first construct a combined likelihood function that accounts for both censored and uncensored observations. This function is then transformed into a log-likelihood function, and an optimization algorithm is employed to find the parameter values that maximize this log-likelihood. This approach ensures that the estimates properly consider the censoring of the dependent variable, offering a robust method for analyzing such data.

Moreover, Equation (4) shows the Marginal effects in the Tobit model to estimate the impact of changes in the independent variables (x_i) on the expected value of the dependent variable (y^*). This is because in the results of a linear regression model, the coefficient value represents the marginal effect of a change in the independent variable on the mean value of the dependent variable. However, in the Tobit model, the coefficient captures two simultaneous effects: the change in the mean value of the dependent variable and the change in the probability of observing that value (Greene, 2003).

$$E(y) = \Pr(y^* \le 0) \times 0 + \Pr(y^* > 0) \times E(y^*|y^* > 0)$$
$$= \Pr(y^* > 0) \times E(y^*|y^* > 0) \qquad (4)$$

Estimation Results

Tables 3 and 4 present the Tobit estimation results and its marginal effects. From the bottom of table 3, the estimated value of variance (σ^2) is statistically significant (p-value<0.001), indicating that the Tobit model is statistically valid. The effect of the independent variable is the effect on the amount of expenditure on physical activity, which can be summarized as follows, focusing on the statistically significant results.

Table 3 presents the estimation results for the determinants of daily sports expenditure using OLS and two Tobit models. Model (1) provides a preliminary analysis using OLS estimation, identifying significant predictors of daily sports expenditure, such as *marital status* (marry), average monthly household income in millions of KRW (*income*), employment status (*job*), *education*, membership in a sports club (*membership*), *paid facilities*, exercise *frequency*, and exercise *duration*. However, due to the limitations of the OLS model in handling censored data, where a substantial number of observations record zero expenditures on sports, these estimates may be biased.

The Tobit Model (2), which adjusts for the censored nature of the dependent variable, reveals that average monthly household income in millions of KRW (*income*), employment status (*job*), *education*, and membership in a sports club (*membership*) have positive effects on sports expenditure. The Tobit model highlights that access to *paid facilities* significantly increases spending, underscoring the importance of facility availability in promoting sports participation. Furthermore, exercise *frequency*, and *duration* of sports activities are significant, suggesting that more frequent and longer participation is associated with higher expenditures.

In contrast, age, gender (*male*), and residence (*urban*) have no statistically significant effect in either model. Regarding *marital status*, the OLS model indicates single individuals spend more on sports than those who are married, although this effect is not observed in the Tobit model. Interestingly, the Tobit model shows that access to facilities is associated with increased sports spending, an effect not observed in the OLS model, suggesting that the OLS regression model may not fully capture the truncation of the dependent variable. Therefore, this study presents supplementary results using the Tobit model as the baseline model, with Model (3) further separating out the regional and occupational variables to refine the analysis.

Tobit Model (3) incorporates additional occupational and regional controls, providing a more nuanced understanding of expenditure patterns that align with

Table 3. Estimate Results: Determinant of Daily Sports Expenditure

Determinant of Daily Sports Expenditure		Model (1) OLS	Model (2) Tobit	Model (3) Tobit
Age		-0.008	-0.030	-0.025
		(0.009)	(0.019)	(0.019)
Age^2		0.004	-0.009	-0.010
		(0.009)	(0.020)	(0.019)
Male		-0.001	0.039	0.062
		(0.040)	(0.071)	(0.073)
Marital status (=1, marry)		-0.181***	0.005	0.006
		(0.058)	(0.113)	(0.110)
Income		0.171***	0.241***	0.242***
		(0.018)	(0.027)	(0.027)
Job (=1, employed)		0.160***	0.230**	-
		(0.049)	(0.094)	-
Occupations	Manager			1.251**
				(0.493)
	Professionals and Related Workers			1.519***
				(0.222)
	Clerks			0.352***
				(0.121)
	Service Workers			0.175
				(0.116)
	Sales Workers			0.422***
				(0.130)
	Agriculture, Forestry, and Fisheries Skilled Workers			-0.284
				(0.220)
	Craft and Related Trades Workers			-0.082
				(0.177)
	Plant and Machine Operators and Assemblers			-0.201
				(0.205)
	Elementary Workers			-0.385**
				(0.172)
	Armed Forces			4.449***
				(0.211)
Residence (=1, urban areas)		-0.059	-0.011	0.014
		(0.046)	(0.081)	(0.090)
Region	Busan			0.766***
				(0.153)
	Daegu			0.237
				(0.170)
	Incheon			0.293*
				(0.162)
	Gwangju			1.329***
				(0.201)

Determinant of Daily Sports Expenditure	Model (1) OLS	Model (2) Tobit	Model (3) Tobit
Daejeon			0.614***
			(0.219)
Ulsan			0.066
			(0.178)
Sejong			0.940***
			(0.250)
Gyeonggi			0.341**
			(0.143)
Gangwon			-0.244
			(0.177)
Chungbuk			0.153
			(0.189)
Chungnam			0.636***
			(0.171)
Jeonbuk			0.752***
			(0.197)
Jeonnam			1.459***
			(0.216)
Gyeongbuk			0.151
			(0.161)
Gyeongnam			0.754***
			(0.155)
Jeju			0.139
			(0.301)
Education	0.078***	0.118***	0.083***
	(0.009)	(0.017)	(0.018)
Membership (=1, sports club member)	1.066***	1.637***	1.557***
	(0.092)	(0.103)	(0.102)
Access Facility (=1, Awareness)	-0.015	1.008***	1.143***
	(0.056)	(0.184)	(0.182)
Paid Facility (=1, Paid)	0.846***	2.559***	2.535***
	(0.047)	(0.095)	(0.098)
Frequency	0.047***	0.311***	0.289***
	(0.012)	(0.021)	(0.021)
Duration	0.530***	1.030***	0.985***
	(0.044)	(0.062)	(0.059)
variance (σ^2)		7.240***	6.898***
		(0.413)	(0.385)
Constant	-1.405***	-5.914***	-6.158***
	(0.179)	(0.392)	(0.412)
Observations	8,923	8,923	8,923
R-squared	0.297	0.167	0.176
Log-Likelihood	-18,161	-12,716	-12,576

Note: 1) Robust clustered standard errors in parentheses.
    2) *** $p<0.01$, ** $p<0.05$, * $p<0.1$
    3) In reporting the results of the R-squared, the Tobit model presents the pseudo-R-squared.

previous studies. The results show that factors such as *income*, *education*, membership in a sports club (*membership*), and use of *paid facilities,* as well as recognition of sports facilities in residential areas (*access facility*) and *frequency* and *duration* of exercise are consistent with those estimated in Model (2).

Specifically, higher *income* and *education* levels correlate with increased sports expenditure, supporting the findings of Eakins (2016) and Thibaut et al. (2017), who emphasize the role of financial resources and educational attainment in driving sports participation. Employment status (*Job*) also significantly affects spending, with employed individuals investing more in sports, consistent with Taks et al. (1999) and Thibaut et al. (2014), who link occupational factors to sports expenditures. Furthermore, *membership* in a sports club leads to higher spending, as noted by Taks et al. (1999), indicating that organized sports participation fosters greater investment in sports activities. The use of *paid facilities* and *access* to local sports facilities further boost spending, reinforcing the importance of facility availability highlighted by Eakins (2016). Additionally, individuals who exercise frequently and for extended periods are more likely to spend more on sports.

However, *Age*, gender (*male*), *marital status* (marry), and residence (*urban*) are not statistically significant, contrasting with some earlier studies, such as those by Scheerder et al. (2011), suggesting that these factors may be less influential in the current context or overshadowed by socioeconomic variables. This analysis underscores the multifaceted nature of sports expenditure determinants and highlights the importance of targeted interventions to enhance sports participation.

Furthermore, to provide insight into the influence of region of residence, Model (3) is expanded to include respondent's region (default = Seoul) as an additional variable. *Income*, *education*, and use of *paid facilities,* as well as recognition of sports facilities in residential areas (*access facility*) and *frequency* and *duration* of exercise exhibit results consistent to Model (2). In terms of *Occupation,* respondents with Managers, Professionals and Related Workers, Clerks, Sales Workers, and Armed Forces occupations spend more on sports activities than those with no occupation,

household, and student, while Elementary Workers show a statistically significant opposite result.

In terms of region, respondents who live in Busan, Incheon, Gwangju, Daejeon, Sejong, Gyeonggi, Chungnam, Jeonbuk, Jeonnam, and Gyeongnam show a significant positive effect compared to respondents who live in Seoul, indicating that daily sports spending varies by region. This finding contrasts with studies suggesting that urban areas, like Seoul, typically have higher sports expenditures due to greater access to facilities and higher income levels (Eakins, 2016; Thibaut et al., 2014). The positive effect observed in these regions may reflect localized factors such as community sports initiatives, cultural differences in sports participation, or regional policies promoting physical activity, underscoring the need to consider regional characteristics in understanding sports expenditure patterns.

The results of the marginal effect estimation based on the Tobit model (3) are shown in Table 4. This study estimates the marginal effects to determine the influence of the explanatory variables on the sports expenditure because the coefficients estimated in Tobit regression model cannot be directly interpreted in terms of the amount of change. Marginal effects refer to the change in the dependent variable resulting from a one-unit change in the independent variable. The Tobit regression model, being a nonlinear model, does not allow the estimated original regression coefficients to be interpreted as marginal effects in the same way as those in a linear regression model.

The marginal effect of *income* is 0.111. This means that for every 1 million won increase in household income, weekly expenditure on sports activities increases by KRW 1,110. Similarly, employed individuals, including manager, professional and related workers, clerks, sales workers, and military personnel are estimated to spend KRW 6,290, KRW 7,850, KRW 1,610, KRW 1,950, and KRW 28,940 more per week on sports activities than those without jobs (household, student, and no occupation / etc.) respectively, while elementary workers are estimated to spend KRW 1,620 less. The marginal effect of *education* is estimated to be 0.038. This implies that those with one more year

Table 4. Marginal Effects

Determinant of Daily Sports Expenditure		Model (3) Marginal Effect
Age		-0.012
		(0.009)
Age^2		-0.005
		(0.009)
Male		0.028
		(0.033)
Marital status (=1, marry)		0.003
		(0.051)
Income		0.111***
		(0.012)
Occupation	Manager	0.629**
		(0.276)
	Professionals and Related Workers	0.785***
		(0.125)
	Clerks	0.161***
		(0.056)
	Service Workers	0.079
		(0.052)
	Sales Workers	0.195***
		(0.061)
	Agriculture, Forestry, and Fisheries Skilled Workers	-0.121
		(0.091)
	Craft and Related Trades Workers	-0.036
		(0.077)
	Plant and Machine Operators and Assemblers	-0.086
		(0.087)
	Elementary Workers	-0.162**
		(0.070)
	Armed Forces	2.894***
		(0.184)
Residence (=1, urban areas)		0.006
		(0.041)
Region	Busan	0.346***
		(0.070)
	Daegu	0.101
		(0.073)
	Incheon	0.125*
		(0.070)
	Gwangju	0.637***
		(0.102)
	Daejeon	0.272***
		(0.100)
	Ulsan	0.027
		(0.074)

Determinant of Daily Sports Expenditure	Model (3) Marginal Effect
Sejong	0.432***
	(0.122)
Gyeonggi	0.146**
	(0.061)
Gangwon	-0.098
	(0.070)
Chungbuk	0.064
	(0.080)
Chungnam	0.283***
	(0.077)
Jeonbuk	0.339***
	(0.091)
Jeonnam	0.708***
	(0.111)
Gyeongbuk	0.063
	(0.068)
Gyeongnam	0.340***
	(0.070)
Jeju	0.059
	(0.128)
Education	0.038***
	(0.008)
Membership (=1, sports club member)	0.714***
	(0.045)
Access Facility (=1, Awareness)	0.524***
	(0.083)
Paid Facility (=1, Paid)	1.162***
	(0.043)
Frequency	0.133***
	(0.009)
Duration	0.452***
	(0.026)
Observations	8,923

Note: 1) Marginal Effect measures at mean value of variable of Model (3) in Tables 3.

    2) dy/dx is for discrete change of dummy variable from 0 to 1.

of education are estimated to spend KRW 380 more per week on sports activities. The marginal effect of being a member of sports club is 0.714, indicating that club members spend KRW 7,140 more per week on sports activities than non-members.

In addition, the recognition of sports facilities in residential areas (*access facility*) has a marginal impact of 0.524, meaning that people who already recognize the sports facility spend KRW 5,240 more per week on sports than people who did not. The marginal effect of usage of *paid facility* is 1.162, implying that people who go to paid facility spend KRW 11,620 more per week on sports activities than people who do not. Moreover, it is estimated that the *frequency* and *duration* of exercise have marginal effects of 0.133 and 0.452, respectively. It indicates that those who

exercise more times per week and an extra hour a week pay KRW 1,330 and KRW 4,520 more per week on sports activities. Lastly, respondents in Busan (KRW 3,460), Incheon (KRW 1,250), Gwangju (KRW 6,370), Daejeon (KRW 2,720), Sejong (KRW 4,320), Gyeonggi (KRW 1,460), Chungnam (KRW 2,830), Jeonbuk (KRW 3,390), Jeonnam (KRW 7,080), and Gyeongnam (KRW 3,400) spend more per week on sports activity than those in Seoul.

The following Tables 5 and 6 present the results of the Tobit model and marginal effects analyzed by splitting the sample based on the respondents' top 5 daily sports activities among the survey responses. The top 5 daily sports are walking and jogging (walking) with 1,697 responses (27.37%), followed by fitness and bodybuilding (fitness) with 859 (13.87%), golf with 374 (6.04%), swimming with 373 (6.02%), and climbing with 344 (5.55%). As evidenced by the subsample results, the coefficients and significance for each variable are distinct from those observed in the full sample.

The analysis reveals several significant factors influencing daily sports expenditure. The results indicated that golf and climbing expenditures have nonlinear relationship with with *age*. For golf, there is a positive relationship with age, as older individuals initially increase their spending, but the effect diminishes as age continues to increase, reflected in the negative coefficient for age squared. Conversely, climbing shows a negative effect with but a positive squared effect, indicating a more complex relationship where younger individuals spend less on climbing, but expenditure stabilizes or increases slightly with age. With regard to the variable of gender (*Male*) and *marital status*, only golf exhibits a significantly negative coefficient, indicating that female and unmarried individuals spend more their expenditure than male and married counterparts. *Income* is a crucial determinant across all sports, except fitness, highlighting the role of financial capacity in facilitating participation in activities. This suggests that higher income levels significantly increase expenditure in these areas and

reflects the ability of higher-income individuals to access more expensive sports facilities and equipment.

Spending patterns by activity are different across *occupations* groups, highlighting how occupational roles influence leisure activities and spending priorities. Managers spend more on climbing, Professionals and Related Workers and Sales Workers spend more on walking and climbing than the comparison group (no occupations, household, and student), while Service Workers spend less on swimming and Agriculture, Forestry, and Fisheries Skilled Workers spend less on fitness and golf. Also, Plant and Machine Operators and Assemblers are spending more on walking and less on swimming than the comparison group, while Elementary Workers are spending less on golf and more on climbing. For Armed Forces occupations, the sample size is 1, so results are only presented for walking. *Education* level also shows a positive correlation with expenditure in only walking group, suggesting that individuals with higher education levels are more aware of the health benefits and are more inclined to invest in walking activities, especially those that are easily accessible in their daily lives.

Sports club membership (*membership*) has a significant effect on spending in sports except for swimming, highlighting the role of structured environments in promoting regular participation and increased spending. *Access facility* is only determinant of expenditures on walking and climbing, indicating that both sports have an incentive to spend by being in accessible locations. Paid facility use is another major determinant, leading to significant increases in expenditure, and is estimated to have a negative impact, especially in golf, where the cost of specialized facilities and equipment is relatively high and important.

Exercise *frequency* and *duration* are also positively associated with daily sports expenditure. More frequent and longer exercise sessions correlate with higher spending, as these activities often require additional resources and commitment. This relationship is evident in fitness, swimming, and climbing, where the duration of activity has a substantial impact on expenditure. In

Table 5. Estimate Results: Determinant of Daily Sports Expenditure by Top 5 Daily Sports

Determinant of Daily Sports Expenditure		Total	Walking	Fitness	Golf	Swim	Climbing
Age		-0.025	-0.016	0.013	0.358**	-0.019	-0.195**
		(0.019)	(0.027)	(0.036)	(0.161)	(0.050)	(0.084)
Age^2		-0.010	0.000	-0.045	-0.313*	0.012	0.171**
		(0.019)	(0.027)	(0.038)	(0.166)	(0.060)	(0.076)
Male		0.062	0.193	0.039	-1.046*	0.234	-0.037
		(0.073)	(0.144)	(0.145)	(0.596)	(0.226)	(0.254)
Marital status (=1, marry)		0.006	-0.137	0.123	-2.413***	0.277	-0.161
		(0.110)	(0.189)	(0.181)	(0.632)	(0.223)	(0.356)
Income		0.242***	0.092**	0.059	0.662***	0.202**	0.298***
		(0.027)	(0.042)	(0.040)	(0.128)	(0.084)	(0.113)
Occupations	1	1.251**	0.086	1.773	-0.705	0.486	1.443*
		(0.493)	(1.290)	(1.361)	(0.490)	(1.020)	(0.842)
	2	1.519***	0.787*	0.984	0.316	-0.282	1.938**
		(0.222)	(0.468)	(0.919)	(0.354)	(0.542)	(0.789)
	3	0.352***	-0.133	0.673	-0.007	-0.403	0.064
		(0.121)	(0.269)	(0.814)	(0.239)	(0.359)	(0.505)
	4	0.175	0.228	0.718	0.039	-0.565**	0.253
		(0.116)	(0.193)	(0.912)	(0.243)	(0.270)	(0.377)
	5	0.422***	0.356*	0.526	0.140	-0.321	0.693**
		(0.130)	(0.204)	(0.854)	(0.278)	(0.281)	(0.345)
	6	-0.284	-0.328	-0.121	-0.927*	-0.242	0.491
		(0.220)	(0.369)	(2.107)	(0.554)	(0.614)	(0.512)
	7	-0.082	-0.162	-1.798*	0.321	-0.187	0.138
		(0.177)	(0.480)	(1.041)	(0.280)	(0.473)	(0.493)
	8	-0.201	0.780*	1.289	-0.518	-1.285*	0.689
		(0.205)	(0.456)	(1.495)	(0.371)	(0.775)	(0.425)
	9	-0.385**	0.002	1.815	-0.966**	-0.815	1.072**
		(0.172)	(0.199)	(1.450)	(0.457)	(0.581)	(0.464)
	10	4.449***	6.049***				
		(0.211)	(0.297)				
Residence (=1, urban areas)		0.014	0.345**	-0.141	-0.114	-0.086	-0.193
		(0.090)	(0.168)	(0.160)	(0.533)	(0.174)	(0.247)
Region	Busan	0.766***	0.504	1.677	0.601*	0.409	-2.442***
		(0.153)	(0.315)	(1.059)	(0.314)	(0.289)	(0.804)
	Daegu	0.237	0.161	1.086	-0.543*	-0.461	-2.480***
		(0.170)	(0.268)	(1.178)	(0.308)	(0.295)	(0.728)
	Incheon	0.293*	0.677**	0.742	-0.263	-0.288	0.064
		(0.162)	(0.292)	(1.138)	(0.318)	(0.454)	(0.450)
	Gwangju	1.329***	1.381***	4.364***	-0.378	0.349	0.063
		(0.201)	(0.359)	(0.988)	(0.348)	(0.406)	(0.468)
	Daejeon	0.614***	0.756**	3.290**	-0.250	-1.095***	0.455
		(0.219)	(0.314)	(1.552)	(0.538)	(0.300)	(0.596)
	Ulsan	0.066	-0.343	-0.461	-0.281	0.156	-1.597**
		(0.178)	(0.436)	(1.102)	(0.330)	(0.401)	(0.776)

Determinant of Daily Sports Expenditure		Total	Walking	Fitness	Golf	Swim	Climbing
	Sejong	0.940***	1.967***	2.184	0.892	0.216	-1.890*
		(0.250)	(0.524)	(1.781)	(0.685)	(0.411)	(1.101)
	Gyeonggi	0.341**	0.177	2.926**	-0.562**	-0.056	-0.447
		(0.143)	(0.253)	(1.177)	(0.274)	(0.414)	(0.457)
	Gangwon	-0.244	0.266	0.815	-1.219***	-0.053	0.547
		(0.177)	(0.363)	(2.232)	(0.395)	(0.642)	(0.397)
	Chungbuk	0.153	-0.779	2.029*	-0.306	0.070	-0.243
		(0.189)	(0.482)	(1.157)	(0.528)	(0.333)	(0.473)
	Chungnam	0.636***	0.552	2.287*	-0.476	-0.701**	-0.047
		(0.171)	(0.342)	(1.236)	(0.350)	(0.326)	(0.560)
	Jeonbuk	0.752***	1.008***	2.151*	-0.543	-0.640	-0.661
		(0.197)	(0.374)	(1.228)	(0.335)	(0.702)	(0.873)
	Jeonnam	1.459***	1.070***	4.621***	-0.449	-0.497	0.008
		(0.216)	(0.351)	(1.086)	(0.333)	(0.380)	(0.528)
	Gyeongbuk	0.151	0.047	0.102	-0.820**	0.012	-1.003
		(0.161)	(0.279)	(1.158)	(0.347)	(0.342)	(0.648)
	Gyeongnam	0.754***	0.646**	1.474	0.238	0.419	-1.503**
		(0.155)	(0.317)	(1.339)	(0.292)	(0.306)	(0.754)
	Jeju	0.139	-0.254	0.336	0.931	0.687	-8.812***
		(0.301)	(0.391)	(1.820)	(0.672)	(0.531)	(1.333)
Education		0.083***	0.052*	0.065	0.207	0.062	-0.089
		(0.018)	(0.030)	(0.044)	(0.140)	(0.054)	(0.061)
Membership (=1, sports club member)		1.557***	3.815***	1.441***	2.155***	0.560	0.829**
		(0.102)	(0.344)	(0.250)	(0.536)	(0.342)	(0.360)
Access Facility (=1, Awareness)		1.143***	0.560***	-0.220	-1.493	0.140	2.029**
		(0.182)	(0.203)	(0.701)	(1.168)	(0.379)	(0.831)
Paid Facility (=1, Paid)		2.535***	0.513***	1.529***	-5.727***	1.200*	8.041***
		(0.098)	(0.161)	(0.273)	(1.615)	(0.643)	(1.618)
Frequency		0.289***	0.045	0.168**	0.008	0.156**	0.719**
		(0.021)	(0.037)	(0.070)	(0.178)	(0.073)	(0.281)
Duration		0.985***	0.173	0.795***	1.082***	0.838***	0.512***
		(0.059)	(0.173)	(0.177)	(0.300)	(0.319)	(0.097)
variance (σ^2)		6.898***	3.941***	3.264***	14.410***	1.938***	2.327***
		(0.385)	(0.498)	(0.318)	(2.331)	(0.425)	(0.772)
Constant		-6.158***	-2.910***	-1.437	-5.733*	-1.505	-6.178*
		(0.412)	(0.754)	(1.247)	(3.109)	(1.096)	(3.219)
Observations		8,923	1,695	859	374	373	344
Pseudo R-squared		0.176	0.101	0.073	0.079	0.051	0.191
Log-Likelihood		-12,576	-1,926	-1,665	-1,007	-652.7	-459.3

Note: 1) Robust clustered standard errors in parentheses.
2) *** $p<0.01$, ** $p<0.05$, * $p<0.1$
3) Occupations are categorized as follows: 1 Manager; 2 Professionals and Related Workers; 3 Clerks; 4 Service Workers; 5 Sales Workers; 6 Agriculture, Forestry, and Fisheries Skilled Workers; 7 Craft and related Trades Workers; 8 Plant and Machine Operators and Assemblers; 9 Elementary Workers, 10 Armed Forces

addition, for golf, a relatively high-cost sports activity, frequency was not significant but was estimated to be persistent once started. With regard to the regional variables (*region*), it can be determined that there are different levels of expenditure associated with various sports activities in comparison to Seoul, indicating relative interest or participation in sports activities. For example, walking tends to be more participation among respondents living in Incheon, Gwangju, Daejeon, Sejong, Jeonbuk, Jeonnam, Gyeongnam tends to engage more than those living in Seoul.

In conclusion, the Tobit estimate results indicate that the factors influencing daily sports expenditure vary significantly by sport type, demographic characteristics, occupation, and region. The key determinants of daily sports expenditure include income, sports club membership, paid facility use, exercise frequency, and duration. These findings underscore the necessity of considering occupational and regional differences when designing strategies to promote sports participation, as these factors significantly influence expenditure patterns across different sports activities. It is, therefore, incumbent upon policymakers and sports organizations to take these diverse influences into account in order to develop programs and initiatives that effectively increase participation and address the unique needs of various demographic and regional groups.

Based on Table 5, this study explores the marginal effects of determinants on daily sports expenditure, expressed in monetary terms (KRW) using the Tobit model across top 5 sports activities: walking, fitness, golf, swimming, and climbing. The results reveal significant variations by explanatory variable (refet to Table 6).

The relationship between *age* and sports expenditure shows significant nonlinear patterns in golf and climbing. In golf, as age increases, expenditure initially rises by approximately KRW 3,280 per day, but this effect diminishes by about KRW 2,870 per day as individuals reach older ages. This indicates that older individuals initially spend more on golf but spending decreases after a certain age. In contrast, climbing shows a negative effect with age, reducing spending by KRW 1,130 per day, while the squared effect of

KRW 1,000 per day suggests that expenditure stabilizes or slightly increases as individuals age further.

Gender (*Male*) and *Marital status* significantly affect golf expenditure. Unmarried individuals spend approximately KRW 22,150 more per day than married individuals, and females spend about KRW 9,600 more per day than males. These findings suggest that demographic factors play an essential role in determining spending patterns in specific sports.

Income is a crucial determinant of sports expenditure across most activities. Overall, each increase in income by one million KRW results in an increase of about KRW 1,110 in daily sports expenditure. The effect is particularly strong for golf, where spending increases by KRW 6,080 per day, and swimming, where spending increases by KRW 1,900 per day. This reflects the ability of higher-income individuals to engage in more costly sports that require access to facilities and equipment.

Occupational differences (*Occupation)* significantly influence sports spending patterns. Professionals and related workers exhibit higher spending, with an increase of KRW 7,850 per day across all sports. In climbing, professionals spend about KRW 12,760 more per day, while sales workers increase their expenditure by KRW 3,850 per day. Conversely, elementary workers spend less on fitness but more on climbing, highlighting the impact of occupational roles on leisure choices and expenditure.

For *Residence*, the marginal effect in the base model was not significant, but the value of 0.124 in the walking group suggests that respondents living in urban areas are willing to pay KRW 1,240 per day for walking activities compared to those who do not. And higher education levels are associated with increased sports expenditure, particularly in walking, where spending increases by KRW 190 per day. This suggests that educated individuals are more likely to invest in accessible activities like walking, likely due to greater awareness of the health benefits of regular physical activity.

Membership in sports clubs significantly boosts expenditure across most sports. Overall, members spend approximately KRW 7,140 more per day, with a

Table 6. Marginal Effects by Top 5 Daily Sports

Determinant of Daily Sports Expenditure		Total	Walking	Fitness	Golf	Swim	Climbing
Age		-0.012	-0.006	0.011	0.328**	-0.018	-0.113**
		(0.009)	(0.010)	(0.031)	(0.147)	(0.047)	(0.049)
Age^2		-0.005	0.000	-0.039	-0.287*	0.011	0.100**
		(0.009)	(0.010)	(0.033)	(0.152)	(0.056)	(0.045)
Male		0.028	0.069	0.033	-0.960*	0.220	-0.022
		(0.033)	(0.051)	(0.124)	(0.540)	(0.211)	(0.148)
Marital status (=1, marry)		0.003	-0.049	0.106	-2.215***	0.261	-0.094
		(0.051)	(0.068)	(0.156)	(0.571)	(0.210)	(0.206)
Income		0.111***	0.033**	0.050	0.608***	0.190**	0.173***
		(0.012)	(0.015)	(0.034)	(0.115)	(0.077)	(0.062)
Occupation	1	0.629**	0.030	-0.575	0.472	1.644	0.894
		(0.276)	(0.461)	(0.384)	(1.002)	(1.272)	(0.571)
	2	0.785***	0.323	0.276	-0.269	0.900	1.276**
		(0.125)	(0.220)	(0.310)	(0.511)	(0.834)	(0.526)
	3	0.161***	-0.044	-0.006	-0.382	0.613	0.032
		(0.056)	(0.088)	(0.205)	(0.334)	(0.734)	(0.253)
	4	0.079	0.082	0.033	-0.531**	0.654	0.130
		(0.052)	(0.071)	(0.209)	(0.248)	(0.828)	(0.194)
	5	0.195***	0.133*	0.121	-0.305	0.477	0.385**
		(0.061)	(0.079)	(0.241)	(0.264)	(0.773)	(0.180)
	6	-0.121	-0.104	-0.742*	-0.230	-0.109	0.264
		(0.091)	(0.109)	(0.417)	(0.580)	(1.883)	(0.282)
	7	-0.036	-0.053	0.280	-0.179	-1.542*	0.070
		(0.077)	(0.153)	(0.245)	(0.449)	(0.895)	(0.251)
	8	-0.086	0.319	-0.428	-1.160*	1.186	0.383
		(0.087)	(0.214)	(0.302)	(0.636)	(1.388)	(0.237)
	9	-0.162**	0.001	-0.771**	-0.757	1.684	0.631**
		(0.070)	(0.069)	(0.340)	(0.518)	(1.360)	(0.268)
	10	2.894***	4.663***				
		(0.184)	(0.303)				
Residence (=1, urban areas)		0.006	0.124**	-0.121	-0.104	-0.081	-0.112
		(0.041)	(0.060)	(0.137)	(0.490)	(0.164)	(0.144)
Region	Busan	0.346***	0.166	0.544*	0.393	1.474	-1.119***
		(0.070)	(0.106)	(0.283)	(0.277)	(0.910)	(0.333)
	Daegu	0.101	0.049	-0.463*	-0.428	0.940	-1.128***
		(0.073)	(0.081)	(0.263)	(0.272)	(1.015)	(0.299)
	Incheon	0.125*	0.234**	-0.228	-0.270	0.636	0.045
		(0.070)	(0.102)	(0.276)	(0.420)	(0.975)	(0.319)
	Gwangju	0.637***	0.563***	-0.326	0.335	4.027***	0.045
		(0.102)	(0.161)	(0.298)	(0.391)	(0.863)	(0.332)
	Daejeon	0.272***	0.266**	-0.217	-0.976***	2.987**	0.338
		(0.100)	(0.114)	(0.464)	(0.255)	(1.387)	(0.451)
	Ulsan	0.027	-0.091	-0.244	0.149	-0.380	-0.866**
		(0.074)	(0.111)	(0.285)	(0.383)	(0.914)	(0.374)
	Sejong	0.432***	0.905***	0.817	0.206	1.942	-0.968**
		(0.122)	(0.299)	(0.642)	(0.395)	(1.614)	(0.447)
	Gyeonggi	0.146**	0.054	-0.478**	-0.053	2.640**	-0.295
		(0.061)	(0.076)	(0.235)	(0.392)	(1.037)	(0.303)
	Gangwon	-0.098	0.083	-0.985***	-0.050	0.700	0.410

Determinant of Daily Sports Expenditure		Total	Walking	Fitness	Golf	Swim	Climbing
		(0.070)	(0.116)	(0.305)	(0.607)	(1.946)	(0.299)
	Chungbuk	0.064	-0.183*	-0.264	0.067	1.798*	-0.165
		(0.080)	(0.100)	(0.451)	(0.316)	(1.007)	(0.322)
	Chungnam	0.283***	0.185	-0.407	-0.642**	2.037*	-0.033
		(0.077)	(0.118)	(0.298)	(0.292)	(1.087)	(0.390)
	Jeonbuk	0.339***	0.377**	-0.462	-0.588	1.911*	-0.422
		(0.091)	(0.151)	(0.284)	(0.626)	(1.078)	(0.521)
	Jeonnam	0.708***	0.406***	-0.385	-0.460	4.278***	0.005
		(0.111)	(0.143)	(0.285)	(0.347)	(0.968)	(0.371)
	Gyeongbuk	0.063	0.014	-0.684**	0.012	0.086	-0.605
		(0.068)	(0.082)	(0.288)	(0.324)	(0.973)	(0.369)
	Gyeongnam	0.340***	0.221**	0.212	0.403	1.289	-0.830**
		(0.070)	(0.111)	(0.260)	(0.295)	(1.176)	(0.379)
	Jeju	0.059	-0.069	0.854	0.665	0.284	-1.389***
		(0.128)	(0.103)	(0.630)	(0.519)	(1.551)	(0.316)
Education		0.038***	0.019*	0.056	0.190	0.058	-0.052
		(0.008)	(0.011)	(0.037)	(0.129)	(0.050)	(0.034)
Membership (=1, sports club member)		0.714***	1.369***	1.235***	1.978***	0.528*	0.482**
		(0.045)	(0.123)	(0.211)	(0.494)	(0.317)	(0.205)
Access Facility (=1, Awareness)		0.524***	0.201***	-0.188	-1.370	0.132	1.179**
		(0.083)	(0.073)	(0.601)	(1.073)	(0.356)	(0.462)
Paid Facility (=1, Paid)		1.162***	0.184***	1.311***	-5.258***	1.130*	4.673***
		(0.043)	(0.058)	(0.229)	(1.448)	(0.607)	(0.760)
Frequency		0.133***	0.016	0.144**	0.007	0.147**	0.418***
		(0.009)	(0.013)	(0.060)	(0.163)	(0.069)	(0.149)
Duration		0.452***	0.062	0.682***	0.993***	0.789***	0.298***
		(0.026)	(0.062)	(0.154)	(0.271)	(0.297)	(0.058)
Observations		8,923	1,695	859	374	373	344

Note: 1) Marginal Effect measures at mean value of variable of in Tables 5.
      2) dy/dx is for discrete change of dummy variable from 0 to 1.
      3) Occupations are categorized as follows: 1 Manager; 2 Professionals and Related Workers; 3 Clerks; 4 Service Workers; 5 Sales Workers; 6 Agriculture, Forestry, and Fisheries Skilled Workers; 7 Craft and related Trades Workers; 8 Plant and Machine Operators and Assemblers; 9 Elementary Workers, 10 Armed Forces

particularly strong effect in golf, where spending increases by KRW 19,780 per day. In walking, membership increases spending by KRW 13,690 per day, highlighting the role of structured environments in encouraging regular participation and higher spending.

Access to and use of *paid facilities* are major determinants of sports expenditure. *Access* to facilities increases spending by KRW 5,240, KRW 2,010, and KRW 11,790 in overall, walking, and climbing, respectively. *Paid facility* use significantly boosts spending, increasing expenditure by KRW 11,620 per

day across all sports, with a notable effect in fitness, where spending increases by KRW 13,110 per day. However, in golf, paid facility uses decreases spending by KRW 52,580 per day, likely due to the high costs of specialized facilities and equipment.

Exercise *frequency* and *duration* are positively correlated with sports expenditure. More frequent and longer sessions are associated with higher spending, particularly in fitness, where duration increases spending by KRW 6,820 per day. In golf, longer sessions increase expenditure by KRW 9,930 per day, while in swimming, the duration boosts spending by

KRW 7,890 per day. This pattern reflects the additional resources required for longer and more frequent participation in sports.

Regional variations in sports expenditure (*Region*) highlight differences in local preferences and access to sports facilities. Residents of Gwangju spend approximately KRW 40,270 more per day on swimming, while those in Jeonnam show a similar increase of KRW 42,780 per day. Conversely, regions like Daejeon and Jeju exhibit lower expenditures in golf and climbing compared to Seoul, with reductions of KRW 9,760 and KRW 13,890 per day, respectively. These findings suggest that localized factors, such as community initiatives and cultural differences, significantly influence sports participation and spending patterns.

The marginal effects analysis reveals that the determinants of daily sports expenditure vary significantly by sport type, demographic factors, occupation, and region. Key drivers of spending include income, sports club membership, facility access, exercise frequency, and duration. Occupational and regional differences also play important roles, emphasizing the need for tailored strategies to promote sports participation. These strategies should account for the diverse influences across different groups and regions to effectively encourage increased engagement in sports activities.

Conclusion

The aim of this study is to identify and analyze the determinants of expenditure on daily sports participation among individuals using data from the 2023 National Daily Sports Survey of MCST. This study employs Tobit regression model to investigate how various socio-economic, facility- related, and participation-specific factors affect how much people spend on sports activity. The findings of this research provide valuable insights for policymakers and stakeholders to develop effective strategies that promote increased spending on sports activities, thereby enhancing public health and well-being.

The findings of Tobit regression indicate that income, employment status, education level, membership in a sports club, facility access, frequency, and length of exercise are important factors that affect sports expenditure. In particular, the marginal effect of income reveals that a 1 million won increase in household income results in an additional KRW 1,110 spent on sports weekly. Employed individuals such as managers, professionals, clerks, sales workers, and military personnel, exhibit significantly elevated levels of expenditure on sports in comparison to those who are unemployed, thereby substantiating the correlation between occupational status and sports expenditure. For each additional year of education increases weekly sports spending by KRW 380, highlighting the role of education in fostering sports participation. Moreover, individuals who are members of sports clubs spend an average of KRW 7,140 more per week than non-members, which underscores the impact of club membership on spending. Access to sports facilities and the use of paid facilities have a notable influence on spending, with recognized local facilities contributing an additional KRW 5,240 per week and paid facility use adding KRW 11,620 to weekly expenditure. Exercise frequency and duration also have a positive effect on spending, with more frequent and prolonged exercise leading to increased expenditure.

The results emphasize the role that socioeconomic variables and facility accessibility play in encouraging increased participation in sports. In particular, people who are employed, have higher education, have higher incomes, and belong to sports clubs are more likely to spend money on sports. Moreover, the availability of paid facilities significantly increases expenditures, thereby highlighting the crucial role of facility availability in influencing expenditure on sport activities.

Based on the results of this analysis, policymakers and stakeholders can derive several important implications. First, considering that an increase in household income leads to increased spending on sports activities, it is necessary to implement economic policies aimed at raising income levels, along with policies that provide incentives for sports activities. For example, programs that support sports activities for

low-income households can encourage increased participation in sports as household income rises.

Second, employment status has been found to have a positive impact on sports activity expenditure. This suggests a correlation between employment stability and participation in sports activities. Therefore, policies that promote job creation and stability can serve as an indirect means to encourage sports participation. Specifically, providing sports facilities within workplaces or promoting sports programs for employees can encourage those who are employed to participate more in sports activities.

Third, higher levels of education are associated with greater expenditure on sports activities. This may be related to the recognition of the importance of sports through education. Hence, it is necessary to strengthen educational programs that emphasize the importance of sports and health within the school curriculum, and to support lifelong education programs that help adults recognize the importance of sports.

Fourth, being a member of a sports club and using paid facilities have been found to significantly impact sports activity expenditure. This indicates that sports club membership and the use of paid facilities are important factors in promoting sports participation. Therefore, policies that encourage sports club membership and make paid facilities more accessible are needed. For instance, the government or local authorities could subsidize the cost of sports club memberships or the use of paid sports facilities.

In conclusion, this study shows that household income, employment status, education level, sports club membership, and the use of paid facilities are important factors influencing expenditure on sports activities. An inferred implications underscore the necessity for a multifaceted approach to public health and sports policies. This approach should include the improvement of infrastructure, the provision of financial incentives, and the enhancement of awareness regarding the benefits of sports. By comprehending the diverse factors that drive sports expenditure, stakeholders can design more effective strategies to foster an active and healthy society.

However, this study has several limitations. The data utilized in this study are not panel data, which constrains the capacity to derive inferences based on long-term trends. Furthermore, the effects of types of sports activities and seasonal variations could not be adequately examined due to constraints in the survey data. Future research should consider developing panel data to capture individual characteristics over time, thereby enabling a more comprehensive analysis of sports expenditure patterns. Moreover, estimating expenditure by specific sports activities and controlling for seasonal variations during survey responses could provide more accurate results by reflecting changes in physical activity participation. These improvements would enhance the understanding of sports expenditure determinants and offer more precise recommendations for promoting sports participation.

Author Contributions

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