

Empirical analysis of socioeconomic factors affecting sports activities in three countries : US, France, and Japan

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Empirical analysis of socioeconomic factors affecting sports activities in three countries: US, France, and Japan

Masrul ALAM[†]

Abstract

Recent studies have revealed that sporting activities can improve people's physical and psychological well-being. The ways in which people live daily life have been changing, reflecting technological development, which has produced more sedentary employment. Therefore, the importance of physical activity for people's health has been growing.

For this study, we used individual data from a nationwide internet survey that examined daily sport activities in three economically developed countries: the US, France, and Japan. We investigated important socioeconomic factors that influence their participation. By comparing the estimation results of a probit model, we analyzed trends in the three countries.

Results revealed similar and different socioeconomic factors affecting sports participation frequency in the three countries. In the US and France, adults aged 20–59 years old tend to do sporting activities more. By contrast, elderly Japanese people tend to do sports more actively than others. Moreover, high education attainment, high income, and good customs for health are positively correlated with the level of sport activity. Geographical and cultural characteristics can affect the popularity of sports activities.

1 . Introduction

Sports campaigns began in many advanced countries several decades ago, promoting ideas such as “Sport for All” to encourage people to take part in sports. The campaign had a significant and positive influence on sport participation by the general public. As a result, the number of participants who attend sport activities has increased greatly in European countries (Gratton and Taylor, 2000). These countries designed sport policy programs to raise levels of participation in sports and other physical activities (Green and Collins, 2008).

Nevertheless, this development has become stagnant in several countries. In the US, for example, the sports activity rate has decreased from the 1990s to 2000s (Sporting Goods

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Manufacturing Association, 2004). The trend of the stagnation for sports participation can present a severe social problem if there is no adequate policy action to address the situation. Some studies have found evidence for a negative impact of physical inactivity on a person's subjective well-being (Downward et al., 2011, 2012).

The frequency of sports participation is constrained mainly by the prevailing socioeconomic environment. Earlier studies have shown that gender, age, employment status, and time availability are related to the degree of participation of sporting activities (Lera-Lopez and Rapun-Garate, 2001). However, few reports describe studies particularly addressing similarities and differences of socioeconomic factors affecting sports participation frequency among developed countries.

Based on the background related to this problem, this study was conducted to examine important socioeconomic factors that influence sports participation of people in three countries (the US, France, and Japan). Similarities and differences are then compared among them. These countries, located on different continents, are representative of particular cultural backgrounds and social customs. From comparison of econometric model results, we identified trends in the countries and assessed some factors influencing sports participation.

The paper contents are the following. Section 2 presents a description of the outlines of some earlier studies. Section 3 explains the datasets used and the analytical framework. Section 4 summarizes *t*-test results related to the differences of daily activity times of doing sport activities. Estimated results derived from econometric analyses that have used a probit model or random intercept model are discussed. Section 5 presents the conclusions derived from analyses.

2 . Previous research

The model presented by Becker (1964) presents decision-making related to non-work activities from the viewpoint of labor and leisure choice. Fundamentally, people are involved in the production of their own health through some activities such as doing sports during leisure time. The SLOTH framework suggested by Cawley (2004), which puts Becker's model into practice, illustrates decisions about how to allocate time to maximize utility subject to budget, time, and biological constraints (Humphreys & Ruseski, 2006). The SLOTH term is an acronym for activities to which individuals allocate their time: S represents time spent sleeping; L represents time spent at leisure, O represents time spent at paid work; T represents time spent in transportation; and H represents time spent at home production, or unpaid work. Participation in physical activity such as sporting activity is included in L. Time spent in sedentary leisure activities such as watching television or playing computer games is also included in L (Humphreys and Ruseski, 2006).

Several researchers have examined the socioeconomic factors of sport participation. According to the Department for Culture, Media & Sport (DCMS) (2010) in the UK, which used a national survey of culture, leisure, and sport, participation in cultural and sporting activities tends to be much more common among higher level socioeconomic groups, even in the wealthiest areas of England. For example, educational attainment positively affects the degree of sport activities.

Regarding the relation between income and sports participation, Downward et al. (2009) and Breuer et al. (2010) reported that higher income is associated with participation in sports activities. Lower income often poses a barrier to sports participation. However, several studies have demonstrated that no clear relation exists between sports activity and income level (Gratton and Taylor, 2000; Humphreys and Ruseski, 2011). Eberth and Smith (2010) demonstrated that working is negatively correlated to sports involvement.

Kokolakakis et al. (2012, 2014) classified factors affecting sports participation into three categories: socio-demographic, economic, and other important covariates. Both studies showed that age is negatively correlated with sports participation. However, Stamatakis and Chaudhury (2008) presented a contrary result of positive impact of age.

In addition, gender is an important factor influencing sports participation. Consensus holds that men, in general, participate more in sporting activities than women do (Humphreys and Ruseski, 2006; Lera-Lopez and Rapun-Garate, 2007). Kokolakakis et al. (2012) pointed out that gender differences of sports participations can be attributed to differences in family responsibilities as well as differences related to behavior, social expectations, and work. Household structure such as marital status and the number of family members also affects sports participation. Married people and people with more family members generally participate less in sport activities (Eberth and Smith, 2010; Fridberg, 2010).

Furthermore, the effect of the supply of sports facilities should not be disregarded. Generally speaking, good sports facilities prompt sports participation of local residents to a great extent. The frequency of doing sports is often reduced by the inavailability of sports facilities (Wicker et al., 2009, 2012).¹⁾

Based on these points, the study examines the effect of some demographic variables (gender, educational background, and household structure) and economic variables (income and job status) on sports activities using econometric analysis, assuming that a definite relation exists among them.

1) Halmann et al. (2012) examined the importance of sports facilities for predicting participation in sports activities at the municipal level in Germany. Humphreys and Ruseski (2007) also showed that government spending affects sports involvement and physical activities in the US. Pascual et al. (2012) reported that the availability of sports and recreational facilities is a good predictor of the physical activity level of residents of Madrid, Spain.

3 . Data and analytical framework

3.1 Dataset

In this study, large micro-datasets were collected from nationwide international surveys. The setting of surveys was organized by NTT Com Research. All samples in the US, France, and Japan were collected via internet surveys. The surveys, sponsored by the Japanese Society for the Promotion of Science (JSSP), were implemented during 2012-2013 for a research project that investigates the socioeconomic determinants of subjective well-being.

The surveys elicited ample information related to individuals' subjective assessments of their own well-being, personal traits, demographic, and socioeconomic status, and the frequency and duration time of several types of daily recreational activities. Many of them are adequate to examine the socioeconomic factors affecting sports activities.

The surveys are presented in Table 1. In the case of Japan, to ensure that the sample was representative of the actual population, our research group constructed targeted proportions of 15 population groups in advance, which corresponded to a matrix of five age groups (20s, 30s, 40s, 50s, and 60s) and three household income classes (3 million yen or less, 3-6 million yen, and 6 million yen or more). Then we collected survey responses until we obtained the numerical targets. In contrast, for the US and France, we simply collected survey forms, with 1,000 respondents in each country. We did not modify the sample distribution based on official statistics. Therefore, one must be careful when making comparisons between the estimated results for Japan and those for the other two countries (Yagi, Urakawa, and Yonezaki, 2016).²⁾ We conducted an empirical analysis of the relation between socioeconomic status and sports activity, controlling for several important variables that apparently affect sports activities.

3.2 Variables

Dependent variable

The benefits of sports participation for people have become widely recognized during the last decade. In the Council of Europe, sports are regarded as all forms of physical activity which, through casual or organized participation, aim at expressing or improving physical fitness and mental wellbeing, forming social relations or obtaining results in competition at all levels.

For this study, based on the survey responses, we used a dummy variable for sports participation as the dependent variable. For the questionnaire, respondents were asked to report their frequency of doing sports during the prior year. Eight categories were related to the frequency

2) Yagi et al. (2016) examined the state of happiness of workers by job status with emphasis on the aspirations of workers using the same nationwide surveys.

Table 1: Outline of the international surveys

	Japan	US	France
A. Title of survey	Survey of living environment in the region and sense of happiness		
B. Time period of survey	Oct. 1, 2013–Oct. 31, 2013	Aug. 1, 2012–Aug. 31, 2012	Aug. 1, 2012–Aug. 31, 2012
C. Survey method	The survey was organized by NTT Com Research using various internet survey companies in the US and Europe. All samples were collected via internet panels with multiple sources. Each respondent was verified as unique via IP address.		
D. Sample controls	Sampling for the data for Japan was controlled so that the age distribution and income distribution of the survey are close to real distributions.		
E. Sample size	6,491	1,001	1,049
F. Response rate	It was not easy to calculate the response rate in such survey because the respondents were recruited through banner advertisements. Non-responses are not registered.		

of sports activities: (1) 1–4, (2) 5–9, (3) 10–19, (4) 20–39, (5) 40–99, (6) 100–199, (7) over 200 days per year, and (8) no activity. According to the framework of Coordinated Monitoring of Participation in Sports (COMPAS) in the UK, active involvement in sports activity signifies participation in sports activities at the frequency of at least a few days per week. Therefore, we set a dummy variable as showing a value of one for people who engage in sports activity more than once a week. Additionally, we used a dummy variable showing the participation of more than once a month for sports activities for comparison.

Independent variables

To examine factors affecting sports activities, we used dummy variables related to gender, household structure, age class, educational background, job status, income level and other data. The explanatory variables that are expected to influence sports activities were selected based on a theoretical model and empirical results of previous studies. For gender, a female dummy was made. For the age group, young (under 40s), adult (40s, 50s) and old dummy (60s and more) variables were set according to the respondents' age levels.

Regarding household structure, spouse, household information related to the spouse, children, and living with parents were used and set using dummy variables: marital status (spouse), child in household, and living with parents (variable respectively equal to 1 if married, having children, and living with parents).³⁾

Furthermore, the perceived neighborhood safety level can be a determinant factor of sports activity participation (Beenackers et al., 2011). Therefore, we used a dummy variable reflecting regional safety based on responses related to the public security conditions of their resident areas.

3) Married couples, large families, and living with parents were assumed to have less time for participating in sports (Wichstrøm and Wichstrøm, 2008; Pawlowski and Breuer, 2011).

Similarly, dummy variables related to socioeconomic factors such as income level, educational attainment and job status were set. As explained previously, income and education statuses are regarded as having a strong positive relation to sports involvement (Downward et al., 2009; Breuer et al., 2010).

Lera-Lopez and Rapun-Garate (2007) reported less sports participation among certain occupational categories. For example, Downward and Riordan (2007) and Eberth and Smith (2010) showed negative association of prolonged working with sports participation. In these analyses, we consider the following types as labor status: manager, permanent worker, contract employee, part-time worker, self-employed, and unemployed. For income, a dummy variable showing above average household income was set as a standard. The observations used for these empirical analyses were 1,001 (508 women, 493 men) in the US, 1,041 (551 women, 490 men) in France, and 6,491 (2,557 women, 3,934 men) in Japan.

3.3 Descriptive analysis

Basic characteristics of the sample of each country are presented in Table 2. Apparently men engage in sports activities more than women in each country, with the highest proportion in France (23%). Among household characteristics, about two-thirds of households have children. Few of them live with their parents.

The table presents several facts, such as that the US has the highest ratio of both men and women who work as managers. Working as a contract employee is predominant among French people. For Japan, the percentages of having a spouse, having children, living with parents, achieving higher educational degree (college degree), and living well (eating breakfast/ no smoking) are higher than those in other countries. Among the three countries, Japan has the lowest proportion of people who are involved in sports activities.

Figure 1(a) – Figure 1(c) respectively show percentages of successive sports participation (more than once a month), particularly addressing the roles of job status and gender gaps in the three countries. The study particularly focuses on the category of labor status where sample size surpass 30.

In the US, men showed higher proportions for all job statuses of working (manager, permanent worker, contracted worker, part-time worker, self-employed, and non-work), (Figure 1(a)). Particularly, male manager's high participation in sport activity is prominent.

In France (Figure 4-1(b)), similar characteristics are apparent from those of the US. Male regular workers tend to participate in sports activities more, whereas male non-regular workers who work as contracted worker or part-time worker tend to do sports less. French women who are categorized as regular employees do not necessarily show active involvement in sporting activities.

Table 2: Descriptive statistics of the samples (US, France, and Japan)

	US			France			Japan		
	Female (508)	Male (493)	Gender gap	Female (551)	Male (490)	Gender gap	Female (2557)	Male (3934)	Gender gap
[Leisure-time activities (dummy)]									
Doing sports (once a week and more)	0.15	0.22 ***		0.17	0.23 ***		0.11	0.14 ***	
Doing sports (once a month and more)									
[Age class (dummy)]									
young	0.44	0.33		0.40	0.38		0.42	0.28	
adult	0.42	0.39		0.43	0.38		0.46	0.43	
elderly	0.14	0.27 ***		0.17	0.24 ***		0.12	0.29 ***	
[Household type (dummy)]									
having a spouse	0.54	0.53		0.49	0.57 ***		0.64	0.69 ***	
having a child	0.72	0.66		0.72	0.65		0.82	0.87 ***	
living with parents	0.09	0.10		0.08	0.07		0.18	0.21 ***	
[Educational attainment (dummy)]									
college degree	0.35	0.42 **		0.32	0.30		0.35	0.61 ***	
[Income (dummy)]									
high income (above average)	0.38	0.47 ***		0.16	0.18		0.35	0.38 **	
[Job status (dummy)]									
manager	0.06	0.08		0.02	0.04 **		0.01	0.05 ***	
permanent worker	0.27	0.40 ***		0.39	0.50 ***		0.20	0.54 ***	
contracted employee	0.01	0.03 **		0.09	0.06		0.07	0.06	
part-time worker	0.23	0.25		0.22	0.28 **		0.22	0.08	
self employed	0.07	0.10 *		0.05	0.03		0.04	0.12 ***	
nonwork	0.35	0.17		0.22	0.11		0.44	0.19	
[Personal behavior (dummy)]									
breakfast	0.81	0.79		0.87	0.80		0.90	0.89	
no smoking	0.72	0.70		0.68	0.68		0.86	0.72	

*p<0.1; **p<0.05; ***p<0.001

In addition, Japan's case is presented in Figure 1(c). Studies in Japan have revealed differences in the average level of worker satisfaction by gender and labor status after controlling for other important covariates (Sano and Ohtake, 2007; Okunishi, 2008). However, there is no remarkable disparity regarding the degree of sports participation between male and female among Japanese persons. For all labor statuses, men's participation surpasses women's participation, but that difference is not so large, and might not reflect gender differences in the burden of housework that regular employees must confront. However, regarding non-regular workers such as contracted employees and part-time employees, both men and women tend to engage less in sports activities.

4 . Estimation Results

4.1 *t*-test

To ascertain the main factors affecting sports participation in the three countries (US, France and Japan), *t*-tests were conducted. Table 3 presents results for women and men. Dummy variables that represent successive sports activities were defined as the situation in which respondents engage in sports activities at least 40 days per year.

Figure 1(a): Percentage of successive sports participation by job status in the US

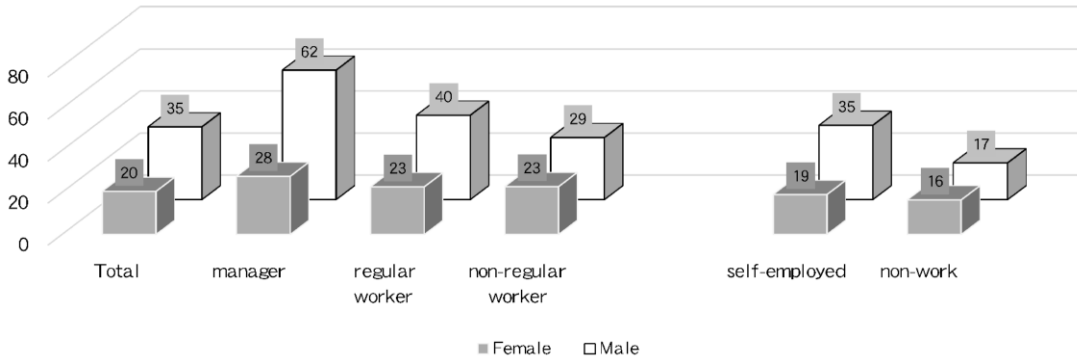


Figure 1(b): Percentage of successive sports participation by job status in France

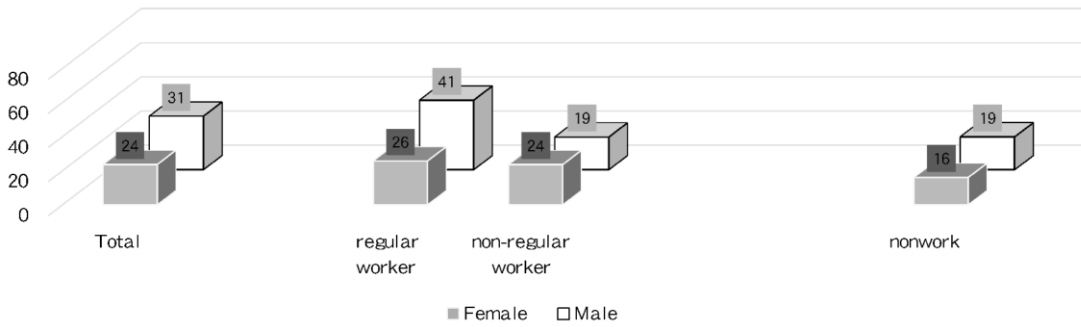
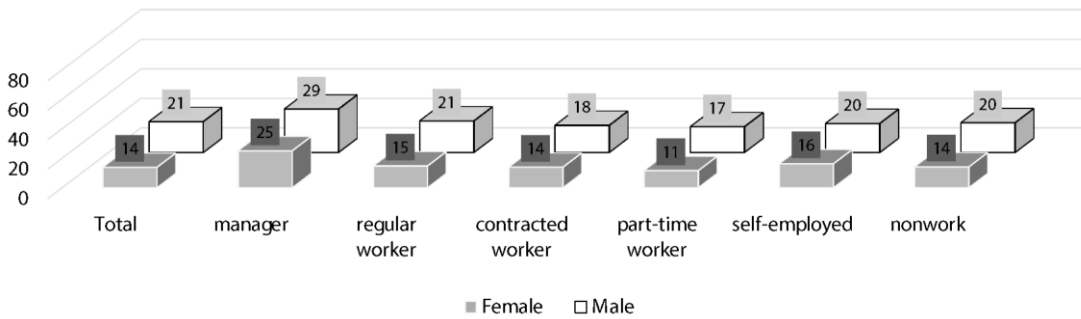


Figure 1(c): Percentage of successive sports participation by job status in Japan



Looking at the numerical values of Table 3, several points are clearly confirmed. First, the college degree dummy is positively correlated to sports activities in all countries except for men in the US. A higher level of education engenders greater awareness of the benefits and importance of successive sports activities. The education level also implies habits acquired as a student, during which time access to facilities is easy and inexpensive (Kokolakakis et al., 2012).

Table 3: *t*-test of sports activities and socioeconomic variables in the US, France, and Japan

Variables	Successive sports activities								
	USA			France			Japan		
	1	0	t value	1	0	t value	1	0	t value
Female									
[Age class (dummy)]									
young	17.6%	12.6%	1.57	20.3%	14.3%	1.85 *	7.9%	13.3%	-4.26 ***
adult	12.7%	16.3%	-1.13	13.6%	19.0%	-1.67 *	12.6%	9.7%	2.33 **
elderly	12.3%	15.2%	-0.63	16.0%	16.8%	-0.21	15.8%	10.4%	2.87 ***
[Household type (dummy)]									
having a spouse	15.1%	14.4%	0.21	17.0%	16.4%	0.17	11.9%	9.5%	1.90 *
having a child	14.6%	15.3%	-0.21	16.8%	16.3%	0.14	11.4%	9.3%	1.33
living with parents	8.3%	15.4%	-1.32	16.4%	20.5%	-0.70	9.0%	11.5%	-1.55
[Educational attainment (dummy)]									
college degree	20.9%	11.5%	2.87 ***	21.9%	14.2%	2.27 **	13.5%	9.7%	2.95 ***
[Income (dummy)]									
high income (above average)	14.5%	14.9%	-0.13	20.7%	15.9%	1.09	14.8%	9.0%	4.50 ***
[Daily habits (dummy)]									
eating breakfast	16.3%	8.2%	2.05 **	17.2%	13.5%	0.79	11.5%	7.1%	2.13 **
no smoking	15.1%	13.9%	0.35	17.9%	14.2%	1.07	11.1%	10.4%	0.41
Male									
[Age class (dummy)]									
young	33.9%	15.2%	4.87 ***	31.4%	18.4%	3.33 ***	14.7%	13.7%	0.78
adult	18.0%	23.7%	-1.51	20.5%	24.9%	-1.11	14.1%	13.9%	0.19
elderly	11.2%	25.3%	-3.44 ***	15.0%	25.9%	-2.48 **	13.1%	14.3%	-0.98
[Household type (dummy)]									
having a spouse	20.2%	23.0%	-0.78	20.3%	27.3%	-1.81 *	14.3%	13.2%	0.90
having a child	22.1%	20.4%	0.44	20.1%	29.1%	-2.24 **	14.0%	14.1%	-0.12
living with parents	20.9%	27.1%	-0.99	25.0%	23.1%	0.24	15.8%	13.5%	1.73 *
[Educational attainment (dummy)]									
college degree	23.7%	19.9%	1.00	29.0%	20.9%	1.94 *	15.2%	12.1%	2.69 ***
[Income (dummy)]									
high income (above average)	21.9%	21.2%	0.20	25.0%	22.9%	0.42	16.6%	12.4%	3.72
[Daily habits (dummy)]									
eating breakfast	21.0%	23.5%	-0.56	23.5%	22.2%	0.27	14.7%	8.5%	3.46 ***
no smoking	18.9%	27.5%	-2.15 *	23.3%	23.3%	0.00	15.1%	11.0%	3.38 ***

Second, in the case of the US and France, younger people tend to participate more in sports activities. As people grow older, biological and physical limitations restrict the preference for the sports participation. However, in the case of Japan, older women participate more in sports. Greater experience with age and available leisure time is regarded as positively affecting sports participation.

Third, regarding the level of household income, the case of Japanese women showed a positive impact on sports participation. People from high income households might put themselves in a position of indirectly purchasing free time for doing sports through contracting for homemaking services (Kokolakakis et al., 2012).

To clarify the characteristics of sports participation in three countries, econometric analyses using probit analysis and random intercept regression were applied as described in the next section.

4.2 Probit analysis

Table 4(a), Table 4(b), and Table 4(c), respectively show probit estimation results for socio-economic factors affecting sports activities in three countries (US, France and Japan) by gender. Probit estimation results revealed similar and different socioeconomic factors affecting sports participation frequency in the three countries.

For the US (Table 4(a)), people who follow a sensible diet such as eating breakfast regularly tend to participate in sports activities continuously. Female college graduates and men in high-income households participate actively in sports. Women who live with parents participate less in sports activities.

For women in France (Table 4(b)), a significant positive relation was found for a college degree and eating breakfast. Living with parents was found to be negatively and significantly related to sports participation, similarly to the US. Men who have higher income, eat breakfast, and avoid smoking were found to have high involvement in sports activities. Compared to self-employed people, contracted employees, part-time worker, and non-work were found to have a negative association with sports participation. Differences in the degree of leisure time availability by labor status are regarded as affecting the estimation results presented above.

For women in Japan (Table 4(c)), a significant positive relation was found for a college degree and eating breakfast. In addition, having a child was found to have a positive and significant effect on sports participation. This is a specific trend among the three countries. Men who have higher household income, eat breakfast, and do not smoke respectively showed high involvement in sports activities. In addition, compared to self-employed people, part-time workers were found to have a negative association with sports participation. The most distinguishing characteristic is the effect of the age-group dummy. Different from the other two countries, younger people in Japan do not actively participate in sports activities. Time and budget constraints that many people of younger generations confront might affect the estimation results.

4.3 Random intercept model

To ascertain whether the superiority of resident areas will affect community residents' degree of sports participation, or not, we estimated the random intercept model as well as the normal discrete choice model. We assumed that, according to regional differences of environmental factors by province level, the impacts of socioeconomic variables on sports participation would change. By considering this region-specific effect, the study aims at drawing pure effects of socioeconomic factors to the greatest extent possible. As a dependent variable, the frequency of sports participation per year is used.

Table 5(a) presents estimation results of random intercept models on sports participation in the US. For both men and women, results show that a higher education level is related to higher

Table 4(a): Probit estimation of socioeconomic factors on doing sports (US)

[Dependent variable] Doing sports (dummy)	Female (n=508)			Male (n=493)		
	<i>Coef.</i>	<i>s.e</i>	<i>p value</i>	<i>Coef.</i>	<i>s.e</i>	<i>p value</i>
[Age class (dummy)] (ref: elderly)						
young	0.269	0.187	0.152	0.998	0.201	0.000 ***
adult	0.094	0.183	0.609	0.384	0.165	0.020 **
[Household type (dummy)]						
having a spouse	-0.184	0.147	0.209	0.028	0.156	0.859
having a child	0.002	0.136	0.991	-0.001	0.149	0.997
living with parents	-0.433	0.227	0.056 **	-0.504	0.248	0.042 **
[Regional environment (dummy)]						
regional security	0.242	0.952	0.800	2.296	1.090	0.035 **
[Educational attainment (dummy)]						
college degree	0.397	0.134	0.003 ***	0.319	0.137	0.020 **
[Income (dummy)]						
high income (above average)	0.235	0.146	0.107	0.234	0.150	0.118
[Job status (dummy)] (ref: self employed)						
manager	0.467	0.325	0.150	-0.094	0.264	0.723
permanent worker	0.245	0.210	0.244	0.059	0.201	0.770
contracted employee	0.301	0.732	0.681	-0.290	0.411	0.480
part-time worker	0.116	0.205	0.572	0.163	0.212	0.443
nonwork	-0.044	0.188	0.817	-0.362	0.220	0.099 **
[Daily habits (dummy)]						
eating breakfast	0.617	0.157	0.000 ***	0.603	0.153	0.000 ***
no smoking	-0.220	0.142	0.122	-0.358	0.146	0.014 **
Constant	-0.565	0.783	0.471	-2.146	0.875	0.014
Log likelihood	-310.09			-269.66		

Table 4(b): Probit estimation of socioeconomic factors on doing sports (France)

[Dependent variable] Doing sports (dummy)	Female (n=551)			Male (n=490)		
	<i>Coef.</i>	<i>s.e</i>	<i>p value</i>	<i>Coef.</i>	<i>s.e</i>	<i>p value</i>
[Age class (dummy)] (ref: elderly)						
young	0.150	0.197	0.447	0.144	0.224	0.521
adult	0.001	0.181	0.996	-0.362	0.203	0.075 *
[Household type (dummy)]						
having a spouse	-0.153	0.130	0.236	0.107	0.146	0.463
having a child	0.079	0.131	0.545	-0.210	0.140	0.136
living with parents	-0.488	0.230	0.034 **	-0.045	0.300	0.881
[Regional environment (dummy)]						
regional security	1.417	1.027	0.168	0.763	1.138	0.503
[Educational attainment (dummy)]						
college degree	0.239	0.125	0.056 **	0.214	0.142	0.131
[Income (dummy)]						
high income (above average)	0.145	0.166	0.383	0.308	0.181	0.089 *
[Job status (dummy)] (ref: self employed)						
manager	0.208	0.487	0.669	0.443	0.414	0.284
permanent worker	-0.026	0.220	0.907	-0.300	0.320	0.348
contracted employee	0.140	0.269	0.604	-0.721	0.387	0.062 *
part-time worker	0.040	0.246	0.870	-0.811	0.350	0.021 **
nonwork	-0.133	0.239	0.578	-1.026	0.342	0.003 ***
[Daily habits (dummy)]						
eating breakfast	0.919	0.175	0.000 ***	0.422	0.155	0.006 ***
no smoking	0.082	0.124	0.508	0.233	0.133	0.081 **
Constant	-1.692	0.791	0.033	0.140	0.901	0.876
Log likelihood	-348.69			-281.13		

 (Note) * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 4(C): Probit estimation of socioeconomic factors on doing sports (Japan)

[Dependent variable] Doing sports (dummy)	Female (n=2557)			Male (n=3934)		
	<i>Coef.</i>	<i>s.e</i>	<i>p value</i>	<i>Coef.</i>	<i>s.e</i>	<i>p value</i>
[Age class (dummy)] (ref: elderly)						
young	-0.671	0.087	0.000 ***	-0.227	0.071	0.001 ***
adult	-0.483	0.085	0.000 ***	-0.357	0.062	0.000 ***
[Household type (dummy)]						
having a spouse	-0.073	0.075	0.329	0.011	0.055	0.839
having a child	0.220	0.069	0.001 ***	0.054	0.062	0.385
living with parents	0.065	0.074	0.380	-0.006	0.055	0.913
[Regional environment (dummy)]						
regional security	-0.067	0.387	0.864	0.323	0.307	0.292
[Educational attainment (dummy)]						
college degree	0.167	0.055	0.003 ***	0.209	0.043	0.000 ***
[Income (dummy)]						
high income (above average)	0.223	0.064	0.000 ***	0.253	0.052	0.000 ***
[Job status (dummy)] (ref: self employed)						
manager	-0.333	0.298	0.264	0.173	0.095	0.069 *
permanent worker	0.113	0.113	0.316	0.033	0.066	0.611
contracted employee	-0.046	0.135	0.733	0.132	0.102	0.194
part-time worker	-0.142	0.114	0.213	-0.015	0.092	0.866 **
nonwork	-0.001	0.110	0.989	0.179	0.078	0.021 **
[Daily habits (dummy)]						
eating breakfast	0.341	0.090	0.000 ***	0.454	0.069	0.000 ***
no smoking	0.167	0.075	0.026 **	0.173	0.046	0.000 **
Constant	-0.398	0.328	0.224	-0.843	0.255	0.001
Log likelihood	-1,668.85			-2,614.45		

(Note) *p<0.1; **p<0.05; ***p<0.01

participation in sports activities. Healthy habits such as eating breakfast are also important. However, living with parents is associated with less likelihood of sports participation.

For women, higher household income was associated with more participation. However, no significant relation to household income was found for men. Rather, the subjective evaluation of regional safety affected participation in sports activities by men. In addition, younger men tend to participate in sports more. Regarding working status, nonworking people do not become involve in vigorous sports activities.

For women in France (Table 5(b)), a significant positive relation was found for sports participation, a college degree and eating breakfast. In addition, living with parents was negatively and significantly related to sports participation, as results also showed for the US. Men who have a higher income, eat breakfast, and avoid smoking respectively showed high involvement in sports activities. Compared to self-employed people, contracted employees, part-time worker and non-work were found to have a stronger negative association with sports participation. The differences might reflect the degree of leisure time availability by labor status, as explained in probit estimation results.

For women and men in Japan (Table 5(c)), significant positive relations to sports participation were found, respectively, with a college degree, higher household income, and eating breakfast.

Table 5(a): Random intercept estimation of socioeconomic factors on doing sports (US)

[Dependent variable] Frequency of sports activity	Female (n=508)			Male (n=493)		
	<i>Coef.</i>	<i>s.e</i>	<i>p value</i>	<i>Coef.</i>	<i>s.e</i>	<i>p value</i>
[Age class (dummy)] (ref: elderly)						
young	0.097	0.066	0.144	0.308	0.061	0.000 ***
adult	0.033	0.065	0.617	0.131	0.054	0.054 *
[Household type (dummy)]						
having a spouse	-0.062	0.051	0.222	0.000	0.048	0.992
having a child	0.004	0.047	0.926	0.005	0.046	0.911
living with parents	-0.153	0.080	0.056 *	-0.149	0.077	0.053 *
[Regional environment (dummy)]						
regional security	0.111	0.333	0.739	0.677	0.320	0.035 **
[Educational attainment (dummy)]						
college degree	0.136	0.046	0.003 ***	0.100	0.042	0.018 **
[Income (dummy)]						
high income (above average)	0.084	0.051	0.096 *	0.079	0.047	0.091
[Job status (dummy)] (ref: self employed)						
manager	0.132	0.097	0.176	-0.033	0.079	0.672
permanent worker	0.082	0.073	0.262	0.008	0.063	0.892
contracted employee	0.103	0.240	0.667	-0.098	0.127	0.439
part-time worker	0.044	0.073	0.547	0.042	0.067	0.526
nonwork	-0.018	0.066	0.792	-0.141	0.071	0.045 **
[Daily habits (dummy)]						
eating breakfast	0.228	0.056	0.000 ***	0.203	0.049	0.000 ***
no smoking	-0.076	0.049	0.122	-0.108	0.044	0.015 **
Constant	0.272	0.274	0.321	-0.138	0.258	0.593
Log likelihood	-326.42			-283.65		

(Note) *p<0.1; **p<0.05; ***p<0.01

Table 5(b): Random intercept estimation of socioeconomic factors on doing sports (France)

[Dependent variable] Doing sports	Female (n=551)			Male (n=490)		
	<i>Coef.</i>	<i>s.e</i>	<i>p value</i>	<i>Coef.</i>	<i>s.e</i>	<i>p value</i>
[Age class (dummy)] (ref: elderly)						
young	0.052	0.071	0.467	0.039	0.073	0.592
adult	0.000	0.066	0.995	-0.128	0.067	0.055 *
[Household type (dummy)]						
having a spouse	-0.055	0.047	0.237	0.029	0.048	0.540
having a child	0.030	0.047	0.520	-0.066	0.045	0.144
living with parents	-0.179	0.083	0.031 **	0.003	0.097	0.975
[Regional environment (dummy)]						
regional security	0.506	0.371	0.173	0.133	0.483	0.784
[Educational attainment (dummy)]						
college degree	0.086	0.045	0.055 *	0.064	0.046	0.163
[Income (dummy)]						
high income (above average)	0.053	0.060	0.375	0.094	0.057	0.096 *
[Job status (dummy)] (ref: self employed)						
manager	0.065	0.161	0.689	0.105	0.110	0.343
permanent worker	-0.010	0.079	0.895	-0.067	0.091	0.459
contracted employee	0.046	0.097	0.635	-0.215	0.119	0.072 *
part-time worker	0.012	0.089	0.890	-0.240	0.105	0.022 **
nonwork	-0.048	0.086	0.577	-0.324	0.103	0.002 ***
[Daily habits (dummy)]						
eating breakfast	0.343	0.062	0.000 ***	0.149	0.052	0.004 ***
no smoking	0.029	0.045	0.520	0.080	0.044	0.069 **
Constant	-0.108	0.284	0.703	0.608	0.364	0.095
Log likelihood	-365.99			-294.98		

Table 5(c): Random intercept estimation of socioeconomic factors on doing sports (Japan)

[Dependent variable] Doing sports	Female (n=2557)			Male (n=3934)		
	<i>Coef.</i>	<i>s.e</i>	<i>p value</i>	<i>Coef.</i>	<i>s.e</i>	<i>p value</i>
[Age class (dummy)]						
young	-0.257	0.033	0.000 ***	-0.087	0.027	0.001 ***
adult	-0.188	0.032	0.000 ***	-0.136	0.024	0.000 ***
[Household type (dummy)]						
having a spouse	-0.025	0.028	0.360	0.006	0.021	0.792
having a child	0.081	0.025	0.001 ***	0.021	0.024	0.370
living with parents	0.025	0.028	0.365	-0.002	0.021	0.909
[Regional environment (dummy)]						
regional security	-0.034	0.148	0.818	0.106	0.130	0.416
[Educational attainment (dummy)]						
college degree	0.062	0.021	0.003 ***	0.079	0.017	0.000 ***
[Income (dummy)]						
high income (above average)	0.083	0.024	0.001 ***	0.096	0.020	0.000 ***
[Job status (dummy)] (ref: self employed)						
manager	-0.123	0.110	0.266	0.064	0.036	0.077 *
permanent worker	0.043	0.042	0.309	0.013	0.025	0.609
contracted employee	-0.017	0.051	0.731	0.051	0.039	0.191
part-time worker	-0.051	0.043	0.230	-0.007	0.035	0.844
nonwork	-0.001	0.041	0.985	0.067	0.029	0.022 **
[Daily habits (dummy)]						
eating breakfast	0.121	0.032	0.000 ***	0.172	0.026	0.000 ***
no smoking	0.061	0.028	0.028 **	0.066	0.018	0.000 ***
Constant	0.369	0.124	0.003	0.192	0.105	0.068
Log likelihood	-1,751.53			-2,742.62		

*p<0.1; **p<0.05; ***p<0.01

After controlling other important covariates, living with parents was not significantly related to sports participation, which differs from the US. Non-smoking men showed high involvement in sports activities. In addition, compared to probit estimation results, the negative part-time worker effect disappeared. Non-work just showed a positive association with sports participation. However, accurate identification is necessary to assess differences shown by retirement and unemployment situations. Differences in the respective amounts of leisure time availability by labor status are expected to affect results suggested by probit estimations.

5 . Conclusion and discussion

The study examined socioeconomic factors related to the degree of sports participation in the US, France, and Japan, representing countries of three continents: North America, Europe, and Asia. As a conclusion, the main results are summarized.

First, in all three countries, men basically participate more in sports activities than women do. Next, the results of probit estimations and random intercept estimations exhibited both similar and different socioeconomic factors affecting sports participation frequency in the three countries. In the US and France, adults aged 20–59 years old tend to do sporting activities more. By

contrast, elderly Japanese people tend to do sports more actively than others. Increasing age contributes to reducing sports involvement in the US and France, but in the case of Japan, elderly people tend to do more sports activities, perhaps reflecting the existence of prolonged work that Japanese laborers are now confronting.

Moreover, higher education attainment is an important factor for all three countries that is positively related to people's involvement in sports activities. Particularly, US people with low educational level have unusually less sport participation based on the estimation results. Higher income and good health habits also support sports participation in France and Japan, but less so in the US.

Living with parents constrains opportunities for sports participation, but no negative effect of living with parents was found for Japan. In addition, working as self-employed (reference group in the econometric models) tends to lead people to participate in sports more than working in some other status in the US and France. These estimation results might reflect geographical and cultural characteristics, which can affect the popularity of sports activities. However, these results underscore the importance of sports policies encouraging active sports participation by residents.

This study has several limitations. First, the socioeconomic factors set as independent variables are limited to the responses given to survey questionnaires. For example, it is apparently important to investigate the effects of costs for using sports facilities neighborhoods and their accessibility.

Second, sports participation itself might cause a change in socioeconomic status such as income level (Hyytinen and Lahtonen, 2013). In the analysis, in order to deal with the possibility of causality problem between income and sports participation, several instrumental variables estimations were conducted based on Huang and Humphreys (2012). The study employed dummy variables such as respondents' subjective evaluations for their communication skills and regional safety as the candidates of instrumental variables. As a result, Hausman test showed the endogeneity of SESs on sports participation hasn't sufficiently been confirmed. However, this result is based on the single year survey, so applying econometric approaches such as panel data analysis is our future research task.

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