

# Regular Leisure-Time Physical Activity Is Positively Associated With Happiness Occurrence Among Young Adults In Taiwan

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## Research Article

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# Abstract

**Background:** This study aims to examine the relationship between regular leisure-time physical activity (LTPA) and happiness among young adults in Taiwan.

**Methods:** A cross-sectional nationwide study was conducted, and data derived from the National Physical Activity Survey in Taiwan 2020 were reviewed. The participants included 5,611 men and 5,029 women, aged 23 to 44 years. Each participant completed a computer-assisted telephone interviewing with a standardized, structured questionnaire including sociodemographic characteristics, LTPA behavior, self-reported health status, and self-evaluations (comprising height, body weight, and happiness).

**Results:** By using multiple regression, after potential confounders adjustment, we observed that regular LTPA was significantly associated with happiness scores for men ( $\beta = 0.043$ ,  $p = 0.001$ ) and women ( $\beta = 0.050$ ,  $p < 0.0001$ ). Furthermore, multiple logistic regression results indicated that with the non-regular LTPA as a baseline, significant associations were observed both for men (odds ratio [OR] = 1.410, 95% CI: 1.173-1.693,  $p < 0.0001$ ) and women (OR = 1.424, 95% CI: 1.169-1.735,  $p < 0.0001$ ) at regular LTPA.

**Conclusions:** The current study suggested that regular LTPA, potentially improve the occurrence of happiness among young men. Moreover, this positive effect of regular LTPA was observed for the occurrence of happiness in young women.

## 1. Introduction

Physical activity (PA) is an essential factor in the prevention and management of mental disorders, such as depression, anxiety, and posttraumatic stress disorder. PA also delays the onset of dementia and can help individuals maintain a healthy weight [1–5]. However, physical inactivity has increased, resulting in a growth in the global burden of noncommunicable diseases [6].

The main cause of the global burden of disease is poor mental health and low happiness [7]. Happiness generally refers to the positive mental or emotional states of joy and satisfaction [8, 9], and it has become a public health priority in some countries, as evidenced in a WHO report. The WHO indicated that countries such as the United Kingdom, France, and Canada have complemented measures of population and development, such as gross domestic product [10], with happiness indices.

Although studies in several countries have demonstrated that PA for leisure is more strongly associated with mental health than with other domains, these studies have not explored the definition of happiness [11–13]. In addition, few studies have investigated the mechanism of the relationship among different types of PA (i.e., work related, leisure-time, household), PA intensity (i.e. sedentary, light, moderate, and vigorous), and happiness [14]. Therefore, this study evaluated the relationship between regular leisure-time PA (LTPA) and happiness on the basis of other studies.

## 2. Material And Methods

## 2.1. Study sample and data collection procedure

Cross-sectional nationwide data were obtained from the National Physical Activity Survey in Taiwan (NPAST) of children and adolescents (aged 13–17 years), adults (aged 18–64 years), and older adults (aged 65 years and older) conducted by the Sports Administration of the Ministry of Education of Taiwan. Participants were recruited using random digit dialing to collect a proportionate stratified sample based on multiple factors (e.g., age, gender, and geographic location) and in accordance with the procedure described by Ku et al. [15]. Citizens aged over 13 years from 22 cities and counties in Taiwan were selected as participants. The sample size of each city and county was determined by the proportion of its population to the population of Taiwan. The total sample size was 25,526 in 2020, with a sampling error of 3–5% and a 95% confidence interval (CI), which allowed for a sufficient sample size and statistical power. Computer-assisted telephone interviewing (CATI) was conducted from August to October 2020. To ensure the quality of the data, a group of well-trained and experienced interviewers were employed to conduct CATI. Data on sociodemographic characteristics (i.e., age, gender, education, and occupation), LTPA behavior, self-reported health status, self-evaluations (e.g., height, weight, and happiness), and zip code of residence were collected. A total of 10,802 young adults (aged 23–44 years) were enrolled. The participants were informed of the objectives, procedures, and contents of this study. This study was conducted in accordance with the Declaration of Helsinki, and all procedures were approved by the Institutional Review Board of Fu Jen Catholic University in Taiwan (FJU-IRB C109085). Oral consent was given before the interviews. All information was contained in a deidentified secondary data set and was released for public research purposes.

## 2.2. Variables

The following demographic characteristics were recorded: age, gender, education level, occupation, and self-reported health status. The participants were divided into age groups of 18–24, 25–29, 30–34, 35–39, and 40–44 years, and in terms of education level, they were divided into elementary school or lower, junior or senior high school, and college or higher groups. Occupation was categorized as white collar, government servant, blue collar, owner or manager, specialist, student, housewife, retired, freelancer, unemployed, and other. Self-reported health status was categorized as excellent, fair, and poor.

Anthropometric variables were obtained from the participants' self-reported height and weight, and body mass index (BMI,  $\text{kg}/\text{m}^2$ ) was calculated. Weight classes were defined in accordance with the classification system of the Taiwan Ministry of Health and Welfare Health Promotion Administration as follows: underweight ( $\text{BMI} < 18.5 \text{ kg}/\text{m}^2$ ); normal weight ( $18.5 \leq \text{BMI} < 24 \text{ kg}/\text{m}^2$ ); overweight ( $24 \leq \text{BMI} < 27 \text{ kg}/\text{m}^2$ ); and obese ( $\text{BMI} \geq 27 \text{ kg}/\text{m}^2$ ) [16].

## 2.3. LTPA

Questions were posed during CATI to determine whether the participants engaged in regular or nonregular LTPA. First, the participant's engagement in LTPA was determined by asking, "Have you engaged in LTPA in the past month?" Second, if the participant answered affirmatively, the frequency and duration of LTPA

were determined by asking, “How many times do you engage in LTPA per week?” and “How many minutes do you usually spend at a time?” Third, the intensity of LTPA was assessed by the participants’ descriptions of their breathing and sweating in their response to the question “When you are engaging in LTPA, you usually feel...” The participants selected one of the following responses: “No changes in my breath and sweating,” “I breathe faster but do not sweat,” “I breathe normally but sweat,” and “I breathe quickly and sweat.” If a participant indicated that they usually breathe quickly and sweat, their LTPA was considered to be of a moderate intensity. Finally, the regular and nonregular LTPA groups were defined on the basis of the following conditions. (1) Regular LTPA group: participants who reported breathing quickly and sweating while engaging in 150–300 minutes of moderate-intensity LTPA or 75–150 minutes of vigorous LTPA per week; (2) nonregular LTPA group: the rest of the participants.

## 2.4. Happiness

Studies have offered a range of definitions for happiness and its determinants [17–20]. Several methods are used to measure happiness, such as the Oxford Happiness Inventory [21] and the Satisfaction with Life Scale [22]. These methods usually consist of a single-item (i.e., “All things considered, in general, how happy would you say you are?”) to measure happiness in the LTPA domain [23–28]. This item has been validated [29, 30] and tested for its temporal stability (test–retest reliability;  $r = 0.86$ ; [31]). In the 2020 NPAST, happiness was measured using this item and scored on a 5-point scale from 1 (*very unhappy*) to 5 (*very happy*). To collect binary data, the respondents were dichotomized into “happy” (i.e., *very happy*, *happy*, and *fair*) and “unhappy” (i.e., *unhappy* and *very unhappy*) groups in accordance with the protocol used in another study [32].

## 2.5. Statistical analysis

Data were analyzed using SAS (version 9.4, SAS Institute, Cary, NC, United States). Continuous variables were analyzed using Student’s t-test, and categorical variables were analyzed using the chi-squared test. A multiple linear regression analysis with happiness score as the dependent variable was performed to examine the association between regular LTPA and happiness scores after adjustment for potential confounders. Adjusted odds ratios (ORs) with 95% CIs for happiness were calculated from unconditional logistic regression models for regular LTPA. In this study, the test values were presented as means  $\pm$  standard deviations or frequency (%), and the results were evaluated using a two-tailed test, with statistical significance at  $p < 0.05$ .

## 3. Results

Table 1 presents the demographic characteristics of the participants. A total of 10,802 young adults were dichotomized into groups in terms of frequency, intensity, and time of engagement in LTPA. Over 20% of the participants were classified into the regular LTPA group; this group exhibited a higher proportion of men (65.5%), normal weight (56.9%), and higher levels of education (78.6% holding a college degree or higher). Approximately 0% were retired, and 85.0% self-reported that they were in excellent or good health.

Except for BMI, significant differences were observed across all demographic characteristics between the two groups.

Table 1  
Demographic characteristics

Variables	LTPA Status		<i>p</i> -value
	Regular LTPA ( <i>n</i> = 2,592)	Non-regular LTPA ( <i>n</i> = 8,210)	
Age (y)			< 0.0001*
18-24	809 (31.20%)	1598 (19.50%)	
25-29	480 (18.50%)	1412 (17.20%)	
30-34	443 (17.10%)	1429 (17.40%)	
35-39	403 (15.50%)	1880 (22.90%)	
40-44	457 (17.60%)	1891 (23.00%)	
Gender (% men)	1,698 (65.5%)	4,001 (48.7%)	< 0.0001*
Height (cm)	169.26±8.68	165.75±8.31	< 0.0001*
Body weight (kg)	66.49±13.26	63.80±14.07	< 0.0001*
BMI (kg/m <sup>2</sup> )	23.08±3.55	23.07±4.05	0.960
Obese Status (%)			< 0.0001*
Underweight	184 (7.10%)	737 (9.00%)	
Normal weight	1475 (56.90%)	4285 (52.20%)	
Overweight	485 (18.70%)	1598 (19.50%)	
Obese	353 (13.60%)	1230 (15.00%)	
Education (%)			< 0.0001*
Elementary school or lower	2 (0.10%)	30 (0.40%)	
Junior or senior school	553 (21.40%)	2547 (31.10%)	
College or higher	2035 (78.60%)	5608 (68.50%)	
Occupation (%)			< 0.0001*
White collar	588 (22.80%)	2033 (24.90%)	

Abbreviations: BMI, body mass index; LTPA, leisure-time physical activity.

\**p* < 0.05.

<sup>a</sup>Values expressed as means ± standard deviation for continuous variables.

<b>Variables</b>	<b>LTPA Status</b>		<b><i>p</i>-value</b>
Government servant	228 (8.80%)	497 (6.10%)	
Blue collar	380 (14.70%)	1970 (24.10%)	
Owner/manager	139 (5.40%)	337 (4.10%)	
Specialists	289 (11.20%)	812 (10.00%)	
Student	616 (23.90%)	895 (11.00%)	
Housewife	80 (3.10%)	641 (7.90%)	
Retired	1 (0.00%)	13 (0.20%)	
Free lancer	104 (4.00%)	248 (3.00%)	
Jobless	119 (4.60%)	636 (7.80%)	
Other	36 (1.40%)	78 (1.00%)	
Self-reported health status (%)			< 0.0001*
Excellent or good	2185 (85.00%)	6071 (75.50%)	
Fair	103 (4.00%)	520 (6.50%)	
Very bad or poor	282 (11.00%)	1449 (18.00%)	
Abbreviations: BMI, body mass index; LTPA, leisure-time physical activity.			
* $p < 0.05$ .			
<sup>a</sup> Values expressed as means $\pm$ standard deviation for continuous variables.			

Table 2 presents a comparison of the happiness scores between the young adults in the regular LTPA and nonregular LTPA groups. In terms of gender, a significant difference was observed between the LTPA status and happiness of men in two age groups (18–24 and 30–34 years;  $p < 0.05$ ) and that of women aged 25–39 years. A significant difference was observed between LTPA status and happiness in the 18–24 and 30–34 age group ( $p < 0.005$ ) when the groups were pooled.

Table 2  
Happiness scores of Taiwanese young adults in regular and non-regular LTPA groups

Variables	LTPA Status		<i>P-value</i>
	Regular LTPA	Non-regular LTPA	
<b>Men (n = 5,611 )</b>			
18-24	4.02 ± 0.53	3.88 ± 0.64	< 0.0001*
25-29	3.80 ± 0.75	3.84 ± 0.64	0.341
30-34	3.95 ± 0.59	3.74 ± 0.82	< 0.0001*
35-39	3.82 ± 0.69	3.78 ± 0.73	0.497
40-44	3.75 ± 0.75	3.76 ± 0.71	0.943
<b>Women (n = 5,029 )</b>			
18-24	4.05 ± 0.56	3.99 ± 0.54	0.131
25-29	3.96 ± 0.41	3.83 ± 0.60	0.001*
30-34	3.92 ± 0.46	3.81 ± 0.69	0.017*
35-39	3.91 ± 0.62	3.76 ± 0.72	0.004*
40-44	3.86 ± 0.61	3.80 ± 0.68	0.246
<b>Total (n = 10,640 )</b>			
18-24	4.03 ± 0.54	3.94 ± 0.60	< 0.0001*
25-29	3.85 ± 0.66	3.84 ± 0.62	0.624
30-34	3.94 ± 0.56	3.78 ± 0.75	< 0.0001*
35-39	3.86 ± 0.66	3.77 ± 0.73	0.018*
40-44	3.80 ± 0.70	3.78 ± 0.69	0.721
Abbreviations: LTPA, leisure-time physical activity.			
* <i>p</i> < 0.05.			

Table 3 presents the results of the comparison of happiness between young adults in the regular and nonregular LTPA groups. A significant difference in happiness was observed between men and women in both the regular LTPA and nonregular LTPA groups, but this difference was across different age groups ( $p < 0.05$ ). However, a significant difference in happiness was observed between two age groups of men in the both regular LTPA and nonregular LTPA groups (18–24 and 30–34 years). A significant difference in happiness was observed between two ages groups of women in both the regular LTPA and nonregular

LTPA groups (30–34 and 35–39 years). In addition, in both the regular LTPA and nonregular LTPA groups, unhappiness was more prevalent than happiness. Moreover, when the groups were pooled, the results indicated a significant difference in happiness among three age groups in both the regular LTPA and nonregular LTPA groups (18–24, 30–34, and 35–39 years).

Table 3  
Prevalence of happiness and unhappiness in Taiwanese young adults in regular and non-regular LTPA groups

Variables		LTPA Status		<i>p-value</i>
		Regular LTPA	Non-regular LTPA	
<b>Men (n = 5,611)</b>				
18-24	Happy	36 (6.50%)	101 (12.50%)	< 0.0001*
	Unhappy	517 (93.50%)	704 (87.50%)	
25-29	Happy	52 (16.90%)	100 (12.90%)	<i>0.087</i>
	Unhappy	256 (83.10%)	676 (87.10%)	
30-34	Happy	35 (11.30%)	127 (19.30%)	<i>0.002*</i>
	Unhappy	274 (88.70%)	530 (80.70%)	
35-39	Happy	34 (14.20%)	150 (17.30%)	<i>0.246</i>
	Unhappy	206 (85.80%)	716 (82.70%)	
40-44	Happy	41 (15.00%)	165 (20.00%)	<i>0.066</i>
	Unhappy	232 (85.00%)	659 (80.00%)	
<b>Women (n = 5,029)</b>				
18-24	Happy	16 (6.30%)	51 (6.50%)	<i>0.911</i>
	Unhappy	239 (93.70%)	737 (93.50%)	
25-29	Happy	16 (9.50%)	89 (14.30%)	<i>0.099</i>
	Unhappy	153 (90.50%)	532 (85.70%)	
30-34	Happy	11 (8.60%)	127 (16.90%)	<i>0.017*</i>
	Unhappy	117 (91.40%)	624 (83.10%)	
35-39	Happy	17 (10.40%)	162 (17.10%)	<i>0.032*</i>
	Unhappy	146 (89.60%)	784 (82.90%)	
40-44	Happy	22 (12.70%)	170 (16.40%)	<i>0.220</i>
	Unhappy	151 (87.30%)	867 (83.60%)	
<b>Total (n =10,639)</b>				

Abbreviations: LTPA, leisure-time physical activity.

\**p* < 0.05.

Variables		LTPA Status		<i>p-value</i>
		Regular LTPA	Non-regular LTPA	
18-24	Happy	52 (6.40%)	152 (9.50%)	<i>0.010*</i>
	Unhappy	756 (93.60%)	1441 (90.50%)	
25-29	Happy	68 (14.30%)	189 (13.50%)	<i>0.679</i>
	Unhappy	408 (85.70%)	1208 (86.50%)	
30-34	Happy	46 (10.50%)	254 (18.00%)	< 0.0001*
	Unhappy	391 (89.50%)	1154 (82.00%)	
35-39	Happy	51 (12.70%)	313 (17.30%)	<i>0.025*</i>
	Unhappy	351 (87.30%)	1500 (82.70%)	
40-44	Happy	63 (14.10%)	335 (18.00%)	<i>0.051</i>
	Unhappy	383 (85.90%)	1525 (82.00%)	
Abbreviations: LTPA, leisure-time physical activity.				
* <i>p</i> < 0.05.				

Table 4 presents the results of the multivariate regression analysis of the relationship between regular LTPA and happiness scores. The results indicated a positive association between regular LTPA and happiness ( $p < 0.05$ ). However, after adjustment for age, BMI, self-reported health status, occupation, and education, the regression coefficients of each variable decreased (men,  $\beta = 0.043$ ; women,  $\beta = 0.050$ ; total,  $\beta = 0.043$ ).

Table 4  
Multivariate regression analysis of the association between regular LTPA and happiness scores

Variables	Model 1 (unadjusted)			Model 2 (adjusted <sup>a</sup> )		
	$\beta$	SE	<i>p-value</i>	$\beta$	SE	<i>p-value</i>
<b>Men</b>						
Regular LTPA	0.067	0.023	< 0.0001*	0.043	0.022	0.001*
Non-regular LTPA	Ref.	–	–	Ref.	–	–
<b>Women</b>						
Regular LTPA	0.065	0.022	< 0.0001*	0.050	0.022	< 0.0001*
Non-regular LTPA	Ref.	–	–	Ref.	–	–
<b>Total</b>						
Regular LTPA	0.063	0.016	< 0.0001*	0.043	0.016	< 0.0001*
Non-regular LTPA	Ref.	–	–	Ref.	–	–
Abbreviations: LTPA, leisure-time physical activity; SE, standard error.						
* $p < 0.05$ .						
<sup>a</sup> Adjusted for age, obese status, self-reported health status, occupation, and education.						

In the multivariate analysis (Table 5), regular LTPA was most strongly associated with increased happiness, and the significant associations were observed in men, women, and total participants ( $p < 0.05$ ). However, after adjustment for age, BMI, self-reported health status, occupation, and education, the associations between happiness and each variable were strong (men, OR = 1.41; women, OR = 1.424; total, OR = 1.392).

Table 5

**Multivariate logistic regression analysis of the association between regular LTPA and happiness**

Variables	Model 1 (unadjusted)			Model 2 (adjusted <sup>a</sup> )		
	OR	95% CI	<i>p</i> -value	OR	95% CI	<i>p</i> -value
<b>Men</b>						
Regular LTPA	1.571	1.323-1.866	< 0.0001*	1.410	1.173-1.693	< 0.0001*
Non-regular LTPA	Ref.	–	–	Ref.	–	–
<b>Women</b>						
Regular LTPA	1.592	1.318-1.923	< 0.0001*	1.424	1.169-1.735	< 0.0001*
Non-regular LTPA	Ref.	–	–	Ref.	–	–
<b>Total</b>						
Regular LTPA	1.557	1.371-1.767	< 0.0001*	1.392	1.218-1.592	< 0.0001*
Non-regular LTPA	Ref.	–	–	Ref.	–	–
Abbreviations: CI, confidence interval; LTPA, leisure-time physical activity; OR, odds ratio.						
* <i>p</i> < 0.05.						
<sup>a</sup> Adjusted for age, obese status, self-reported health status, occupation, and education.						

## 4. Discussion

This study evaluated the association between regular LTPA and happiness. The results indicated a positive association between regular LTPA and happiness. In addition, regular LTPA compared with non-regular LTPA group was most strongly associated with increased happiness, and happiness was associated with gender (men, women, and total).

Studies on the association between happiness and LTPA in young populations have yielded similar results. Rasmussen and Laumann [33] evaluated PA using a single item and indicated that PA was positively associated with happiness in young adults (mean age = 24.86 years) [34]. The study revealed that PA is positively correlated with well-being and that the correlation is specific to walking and vigorous PA [28]. In addition, research involving college students [35] has indicated that PA frequency was positively associated with happiness. The FITT (frequency, intensity, time, and type) of the LTPA covariates used to adjust the association between PA and happiness must be acknowledged.

Because this study had several limitations, the results should be interpreted carefully. First, because this study used a secondary database, other potential confounding factors, such as chronic diseases or mental disorders, could not be investigated. Future research should investigate other key variables and

eliminate potential confounding factors. Second, this study adopted a cross-sectional design; therefore, the lack of longitudinal data challenges the inference of the causal relationship. Third, although this study examined LTPA, most of the participants were highly active in society. Therefore, their levels of work-related PA may also be higher than those of other ages, which may have affected the results of this study. Therefore, different correlation variables should be considered for different age groups.

## 5. Conclusion

This study demonstrated that regular LTPA were key factors affecting happiness. LTPA is essential for relaxation. For young adults, regular LTPA is crucial to mental health. Therefore, they should engage in higher-intensity LTPA for longer periods of time. Further research is required to determine whether different FITTs of PA are more effective predictors of happiness than LTPA for young adults; such research can also identify the type of PA that is most effective in increasing happiness.

## Abbreviations

BMI: body mass index; CATI: computer-assisted telephone interviewing; CI: confidence interval; FITT: frequency, intensity, time, and type; LTPA: leisure-time physical activity; NPAST: National Physical Activity Survey in Taiwan; OR: odds ratio; PA: physical activity; WHO: World Health Organization.

## Declarations

### Ethics approval and consent to participate

This study was conducted with a secondary database provided by the Sports Cloud: Information and Application Research Center of Sports for All, Sport Administration, Ministry of Education in Taiwan. All consents obtained from the study participants were written prior the data collection. This study's design and analysis procedure was approved by the Ethical Committee of Fu Jen Catholic University (FJU-IRB C109085).

### Consent for publication

Not applicable.

### Availability of data and materials

The data that support the findings of this study are available from [the Sports Cloud: Information and Application Research Center of Sports for All, Sport Administration, Ministry of Education in Taiwan] but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of [the Sports Cloud: Information and Application Research Center of Sports for All, Sport Administration, Ministry of Education in Taiwan].

## Competing interests

The authors declare that they have no competing interests.

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## Authors' contributions

CCH participated in the design, conducted the statistical analyses, interpreted the data, drafted and revised the manuscript. The author has read and agreed to the published version of the manuscript.

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