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(Citation)
スポーツ産業学研究,27(1):1_31-1_35

(Issue Date)
2017

(Resource Type)
journal article

(Version)
Version of Record

(URL)
https://hdl.handle.net/20.500.14094/90005989

スポーツ産業学研究，Vol.27，No.１（2017），31 ～ 35.

ウォーキングによる環境保全効果の認知と歩行時間との関連†

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Association between Walking Time and Perceived Benefit of Energy Conservation Due to Walking†

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Abstract

The purpose of this study was to investigate whether the perceived benefits of walking, especially in regard to energy conservation, was related to daily physical activity. Participants（n=1,062）completed questionnaires assessing socio-demographic factors, walking time, and perceived benefits of walking consisting of 7 factors including energy conservation. Multivariate logistic regression models were used to estimate multivariable-adjusted odds ratios（AOR），95% confidence intervals（95%CI）and P for linear trends. The adjusted odds ratios indicated that there was an association between walking time and perceived benefit of walking for energy conservation, suggesting that the perception of ecological sustainability might be effective for promoting physical activity.

Key words : Physical Activity, Perceived Benefits, Attitude to Health, Health Promotion

1. Introduction

The Toronto Charter for physical activity[1] stated physical activity as a powerful investment not only in health, but also in the economy and sustainability. Moreover, previous studies have suggested that eco-friendly attitude might be related to physical activity behavior[2)3)]. Recognition of walking benefits for ecological sustainability may promote one's physical activity level in daily life. Our colleague developed a scale that can assess perceived benefits from walking. This scale consisted of 7 factors, one of whom focused especially on "energy conservation"[4)]. Therefore, the purpose of this study was to investigate whether the perceived benefits of walking especially on energy conservation might be related to walking time.

†原稿受付　2016年７月15日　　原稿受諾　2016年10月６日
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2. Methods

2.1 Participants

An internet-based cross-sectional survey was conducted in August 2013 by a Japanese Internet-Research service company. The company was able to select specific sociodemographic groups from registered population according to requirements of each survey ordered. The present study targeted adults aged between 20 to 59 years. The participants in the present study were stratified into 2 job groups (No full-time worker and Full-time worker) and allocated equally into the groups. In all, randomly-selected 5,076 adults stratified by job status from the database were invited to participate in this survey. Of these, 1,062 individuals (40.3±10.4 years) answered the survey questions online (response rate: 20.9%). The characteristics of respondents are presented in **Table 1**. The study received prior approval from the Ethics Committee of the Waseda University, Japan (2013-047).

Table 1 Socio-demographic Characteristics of Respondents (n=1,062)

	Participants of this study	
	n	%
Gender		
Male	525	49.4
Female	537	50.6
Age group		
20-29	226	21.3
30-39	296	27.9
40-49	273	25.7
50-59	267	25.1
Marital status		
Unmarried	470	44.3
Married	592	55.7
Job Status		
No full-time worker	531	50.0
Full-time worker	531	50.0
Level of education		
Junior high/high school	534	50.3
2-year college	225	21.2
4-year college/graduate school	303	28.5
Household income		
<5,000,000 yen	546	51.4
<10,000,000 yen	428	40.3
≥10,000,000 yen	88	8.3

2.2 Measurements

Perceived benefits of walking (Appendix 1)

The scale consists of 21 items in 7 factors; 'mental health; MH', 'physical health; PH', 'approval from others; AO', 'energy conservation; EC', 'social connection; SC', 'positive mind setting; PS', 'fulfil leisure interests; FI'[4]. The participants were asked to rate the likelihood of these benefits expected results of walking on a Likert scale of 1 (Strongly disagree) to 5 (Strongly agree). The scale indicated the acceptable validity (GFI=0.94, AGFI=0.92, RMSEA=0.06) and the test-retest reliability (r=0.74, p<0.001). The variables of perceived benefits were divided into tertiles as low, middle, and high groups.

Walking Time

Walking Time was measured by using short version of the International Physical Activity Questionnaire (IPAQ-SV)[5]. The test-retest reliability (r=0.72-0.93), and criterion validity (r=0.39) of the Japanese version of the IPAQ-SV are good and acceptable.[6] The total number of minutes per week on walking was calculated. This outcome variable was dichotomized into <150 minutes and ≥150 minutes, according to previous studies[7)-9)].

Socio-demographic factors

In the present study, the socio-demographic variables obtained from the research company included sex, age (categorized as 20-29, 30-39, 40-49, and 50-59 years), marital status (classified as married and unmarried), job status (classified as full-time and not full-time employment), educational level (categorized as junior high and high school graduation, two years' college degree or equivalent, and four years' college or higher degree), and household

Table 2　The association between perceived benefits of walking and walking time

	Group	Walking Time				AOR	95%CI	P for linear trend
		<150mins/week		≥150mins/week				
		N	%	N	%			
Mental Health (MH)	Low	195	18.4	54	5.1	1		<0.001
	Mid	345	32.5	101	9.5	1.169	0.74–1.85	
	High	242	22.8	125	11.8	1.630	1.01–2.63	
Physical Health (PH)	Low	120	11.3	26	2.4	1		<0.001
	Mid	386	36.3	123	11.6	1.432	0.83–2.47	
	High	276	26	131	12.3	1.579	0.88–2.83	
Approval from Others (AO)	Low	154	14.5	70	6.6	1		0.025
	Mid	265	25	99	9.3	0.686	0.44–1.08	
	High	363	34.2	111	10.5	0.551	0.33–0.92	
Energy Conservation (EC)	Low	257	24.2	67	6.3	1		0.019
	Mid	119	11.2	58	5.5	2.305	1.47–3.63	
	High	406	38.2	155	14.6	2.571	1.63–4.05	
Social Connection (SC)	Low	137	12.9	61	5.7	1		0.070
	Mid	251	23.6	104	9.8	0.784	0.49–1.25	
	High	394	37.1	115	10.8	0.479	0.28–0.84	
Positive Mind Setting (PS)	Low	247	23.3	82	7.7	1		0.723
	Mid	45	4.2	24	2.3	1.246	0.67–2.32	
	High	490	46.1	174	16.4	0.990	0.60–1.63	
Fulfil Leisure Interests (FI)	Low	258	24.3	89	8.4	1		0.061
	Mid	270	25.4	70	6.6	0.805	0.49–1.33	
	High	254	23.9	121	11.4	1.124	0.71–1.79	

Adjustment variables: Sex, Age, Marital status, Job status, Education level, and Household income

income（categorized as less than 5 million yen, 5–10 million yen, and over 10 million yen）.

2.3　Statistical Analyses

The data were analyzed from 1,062 adults who provided complete information for the study variables. The descriptive statistics were used to analyze the distribution of socio-demographic factors. Multivariate logistic regression models was used to estimate multivariable-adjusted odds ratios（AOR）, 95% confidence intervals（95%CI）, and P for linear trend. The statistical analyses were performed using SPSS version 20.0 for Windows（SPSS Inc., Chicago, IL, USA）for the other analyses. The statistical significance level was $p < 0.05$.

3.　Results

As shown in **Table 2**, the logistic regression revealed the significant relations between walking time and factors of perceived benefits from walking except SC, PS, and FI. Of these, MH, PH, and EC showed positive relation to walking time, that is the people with higher perception of benefit on MH, PH, and EC showed higher prevalence of the recommended walking time. On the other hand, the people with higher perception of benefit on AO showed

lower prevalence of the recommended walking time.

4. Discussion

In this study, we found results that walking time was positively associated with MH, PH, and EC and negatively associated with AO.

According to Ferrier et al.[10] who used outcome expectancy scale which consisted of mental and physical benefits, the participants with more positive outcome expectations engaged in significantly more physical activity. Our observations on MH and PH are consistent with their hypothesis.

According to Dlugonski & Motl[11], the result of social support from family and friends was not associated with physical activity. And also, Kochi et al.[4] showed no significant relation to walking time on AO factor. This can be one of the explanation for our observation in AO.

The best of our knowledge, the association of perceived energy conservation as benefit of walking and walking time has not been reported. The major finding of this study was that the benefit of energy conservation due to walking was significantly associated with walking time. This finding suggests that enhancing perception on energy conservation benefits of walking might promote walking behavior. According to previous study[2], eco-friendly attitude has a potential influence on active commuting. Thus, the understanding of walking benefits for energy conservation may be useful to promote physical activity through walking mobility.

The limitations of this study was that the study has a limited ability to obtain representative samples because it relies on an internet-based survey. Thus, the results in the present study may be less applicable to general population, especially those who do not have a habit of using the Internet. In the future investigation, it will be necessary to consider the objectively assessed measures on physical activity and more specific sampling for expected results. Moreover, using interventional studies to provide evidence on the directions of causality can be considered.

5. Conclusion

The finding of this study was the association between walking time and the perceived benefit of energy conservation due to walking, indicating that the perception on ecological sustainability might be effective for promoting physical activity.

Acknowledgements

This work was supported by Grant-in-Aid for Scientific Research from Japan Society for the Promotion of Science (15K01571).

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Appendix 1　Perceived benefits of walking

Subtypes	Items
Mental Health	When I walk, I feel released depressive feelings
	When I walk, I feel released stress
	When I walk, I am in better feelings
Physical Health	When I walk, I can prevent diseases
	When I walk, I can be better physical condition and fitness
	When I walk, I can have appetite
Approval from Others	When I walk, other people recognize me
	When I walk, other people respect me
	When I walk, other people compliment me
Energy Conservation	When I walk, it can contribute to reducing CO_2 emissions
	When I walk, it can contribute to saving money
	When I walk, it can contribute to power saving
Social Connection	When I walk, the opportunity to talk with others increases
	When I walk, the opportunity to have relationship with others increases
	When I walk, the opportunity to spend time with family and friends increases
Positive Mind Setting	When I walk, I can find a new goal
	When I walk, I can enhance my everyday life
	When I walk, I can be positive to my life
Fulfil Leisure Interests	When I walk, I can spread my range of activity
	When I walk, I can find what I enjoy
	When I walk, I can increase to spend time for myself