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RELATIONSHIPS AMONG RESIDENCE ENVIRONMENT AND INDIVIDUAL LEVELS OF EXERCISE IN THE REPUBLIC OF KOREA

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ABSTRACT

The present study explored the relationship among urban and rural residence living and level of exercise in the Republic of Korea. The study analysed the data from the 2012 Korean Survey of Citizens' Sports Participation project with a total of 4,479 males and 4,521 females participating. The sampling method used the square root of the proportional allocation design with clustering and stratifications in such way that the survey sampled represented all the people of the Republic of Korea. Multivariate logistic regression analyses were carried out to examine whether residence was related to frequency, intensity, time and duration of exercise, adjusting for the covariate age. The results show that Korean women in rural areas had lower levels of exercise than their urban counterparts in terms of frequency, time, duration and intensity of the exercise. However, there was little or no relationship among exercise levels and place of residence among Korean men. In addition, Korean men and women in rural areas had lower levels of access to "systematic fitness management", such as fitness instructors and exercise facilities.

***Key words*:** Exercise; Republic of Korea; Residential area.

INTRODUCTION

Exercise has been shown to impact a variety of health outcomes (Andersen *et al*., 2000; Manson *et al*., 2002). For example, the risk for a number of medical outcomes including cardiovascular disease, type 2 diabetes, obesity and other chronic conditions can be reduced by regular exercise. As a result, national organisations continue to promote public awareness of the benefits of regular exercise (US Department of Health and Human Services, 2010). Additionally, the World Health Organization named proper diet and regular exercise as public health priorities (World Health Organization. 2014). For this purpose, the area of systematic fitness management has also flourished. Examples of systematic fitness management include training in private or national facilities, such as an institute, gym or field with a certified instructor, educator, or trainer.

Due to urbanisation, there have been a number of changes in infrastructure, land use, transportation planning and urban design to public environments (Popkin, 2001; Popkin, 2002). In many developing countries, including China, individuals living in urban areas have higher

rates of individuals that are overweight and obese compared to individuals living in non-urban environments (Caballero, 2001; Lee, 2004; Popkin & Gordon-Larsen, 2004). In spite of this, few studies have considered the links between exercise and urbanisation (Ojiambo *et al*., 2012). Similarly, little work has systematically explored the independent effect of urbanisation on exercise patterns of adults in countries undergoing transition (Popkin *et al*., 1995; Lambert *et al*., 2001).

PURPOSE OF RESEARCH

Most studies on urbanisation classify regions as urban areas by using a simple urban-rural dichotomy in spite of the fact that more detailed classifications are available and have been successfully used in research (McDade & Adair, 2001). Recent findings on the effects of urbanisation on exercise have been mixed. For example, Assah *et al*. (2011) reported that living in urban areas was associated with lower rates of exercise compared to rural areas. However, Short *et al*. (2014) reported that people who lived outside urban areas had a higher risk of being sedentary. A Korean study has yet to examine the relationship between urbanisation and exercise. Hence, the goal of the present study was to explore whether exercise was related to urbanisation in the Republic of Korea.

METHODS

Ethical approval

The details of the data collection procedure are described elsewhere (Korea Ministry of Culture, Sports and Tourism, 2012). As the survey did not collect any private information, such as names, social security numbers or the exact home address, an ethics committee approval was not required. All the study procedures were approved by the Korea Ministry of Culture, Sports and Tourism on 9 September 2013.

Participants

This study used data from the nationwide Korean Survey on Citizens' Sports Participation conducted by the Korea Ministry of Culture, Sports and Tourism. A total of 4,479 males and 4,521 females participated in the survey. The questionnaire-based interview for each participant was conducted by well-trained personnel and each subject filled in the questionnaire during the interview. The sampling method used the square root of the proportional allocation design within clustering and stratifications for the survey sampling to represent the population of the Republic of Korea. The data of a nationally representative sample of participants were collected and analysed. The characteristics of participants are shown in Table 1.

Dependent variables

Urbanisation was determined by classifying regions from their name designations into either urban ("Dong") or rural ("Eup" or "Myeon") in Korean address designations. "Dong" usually denotes addresses with modern buildings, stores and apartments, whereas "Eup" or "Myeon" are usually for areas surrounded by rice paddies, farms and mountainous areas. Based on responses, participants were divided into 1 of 2 subgroups: [1] urban (reference) or [2] rural.

Table 1. **CHARACTERISTICS OF PARTICIPANTS**

Variables		Male (n=4,479)	Female (n=4,521)
Age (years)	Urban	40.29±18.02	41.55±18.58
	Rural	46.45±18.45	48.01±18.49
Residence	Urban	3,041 (67.89)	3,078 (68.08)
	Rural	1,438 (32.11)	1,443 (31.92)
Systematic fitness management	No	4,200 (93.77)	4,339 (95.97)
	Yes	279 (06.23)	182 (04.03)
Exercise frequency	None	2,061 (46.01)	2,564 (56.71)
	2/3 X per month	290 (06.47)	140 (03.10)
	1 X a week	505 (11.27)	231 (05.11)
	2 X a week	366 (08.17)	290 (06.41)
	3 X a week	420 (09.38)	484 (10.71)
	4 X a week	203 (04.53)	193 (04.27)
	5 X a week	284 (06.34)	310 (06.86)
	6 X a week	120 (02.68)	99 (02.19)
	Every day	230 (05.14)	210 (04.64)
Exercise time (min)	None	2,061 (46.01)	2,564 (56.71)
	Under 59	249 (05.56)	361 (07.98)
	60–119	1,200 (26.79)	1,236 (27.34)
	120–179	632 (14.11)	256 (05.66)
	Over 180	337 (07.52)	104 (02.30)
Exercise duration (months)	None	2,061 (46.01)	2,564 (56.71)
	Under 23	540 (12.06)	598 (13.23)
	24–47	789 (17.62)	692 (15.31)
	48–71	492 (10.98)	354 (07.83)
	72–95	119 (02.66)	72 (01.59)
	Over 96	478 (10.67)	241 (05.33)
Exercise intensity	Almost sedentary	2,061 (46.01)	2,564 (56.71)
	Low level	361 (08.06)	446 (09.87)
	Middle level	1,603 (35.79)	1,339 (29.62)
	High level	454 (10.14)	172 (03.80)

Data: mean±standard deviation OR number (%)

Independent variables

"Systematic fitness management" was determined with the following question: "Do you systematically manage your fitness based on science"? The response options were, [1]=yes and [2]=no. "Exercise frequency" was evaluated using the following question: "In the last month, for how many days did you exercise for more than 30 minutes? Please do not include walking in your leisure time". Response options were as follows: [1]=0; [2]=2 or 3 times per month; [3]=once a week; [4]=twice a week; [5]=3 times a week; [6]=4 times a week; [7]=5 times a week; [8]=6 times a week; and [9]=every day.

"Exercise time" was assessed using the following question: "For how many minutes did your exercise routine last"? Response options were as follows: [1]=0; [2]=under 59 minutes; [3]=60-119 minutes; [4]=120-179 minutes; and [5]=over 180 minutes. The question, "For how many months have you kept up your regular exercise"?, was used to establish the "duration of exercise". Response options were as follows: [1]=0; [2]=under 23 months; [3]=24-47 months; [4]=48-71 months; [5]=72-95 months; and [6]=over 96 months. "Exercise intensity" was determined by the question, "How do you feel about exercise intensity"? The response options were: [1]=almost sedentary; [2]=low-level intensity; [3]=midlevel intensity; and [4]=high-level intensity.

Covariate variables

The age of the participants, as defined by the Korean Survey on Citizens' Sports Participation, was used without modifications.

Statistical analysis

The results are presented as mean±SD. Multivariate logistic regression analyses were performed to examine whether residence was related to the frequency, intensity, time and duration of exercise, adjusting for the covariate age for gender-specific data (male and female). The analyses were performed using SAS version 9.2 (SAS Institute, Cary, NC, USA). Statistical significance was set at $p<0.05$.

RESULTS

The results of the multivariate logistic regression analyses (odds ratio and 95% confidence interval) are shown in Table 2 and is presented on the next page. The results show that Korean women in rural areas had lower levels of exercise than their urban counterparts in terms of frequency, time, duration and intensity of the exercise. However, there was little or no relationship among exercise levels and place of residence among Korean men. In addition, Korean men and women in rural areas had lower levels of access to "systematic fitness management", such as fitness instructors and exercise facilities.

DISCUSSION

This study examined the relationship between urbanisation and exercise in the Republic of Korea. The results show that both Korean men and women in rural areas had lower systematic fitness management. Also, in rural areas, Korean women had lower exercise levels than women in urban areas, but there was little or no relationship between exercise and residence, namely

whether in urban or rural areas, for Korean men.

Investigators have argued that household and neighbourhood factors are important indices of social class to consider (Krieger & Fee, 1994). In large samples of adolescents, researchers found that access to play areas and equipment was associated with higher rates of exercise (Sallis *et al*., 2000). That is, Korean men and women in rural areas, as opposed to urban areas, had lower levels of exercise as reasonable environments, such as a good facility or instructors for exercise or training, were not available. This may be due to the high competitiveness of fitness centres and trainers in urban area, whereas there is a lack of adequate number of fitness centres and trainers in rural areas.

Table 2. **MULTIVARIATE LOGISTIC REGRESSION ANALYSES FOR RESIDENCE IN RELATION TO FREQUENCY, INTENSITY, TIME AND DURATION OF EXERCISE AMONG KOREAN MALES AND FEMALES**

Variables		Urban (reference) vs. Rural					
		Males (n=4,479)			**Females** (n=4,521)		
		OR	95% CI	p-Value	OR	95% CI	p-Value
Systematic fitness management	No	Ref.			Ref.		
	Yes	**0.729**	**0.550-0.967**	**0.028***	**0.604**	**0.421-0.865**	**0.006****
Exercise frequency	None	Ref.			Ref.		
	2/3 X per month	0.950	0.727-1.242	0.708	1.322	0.929-1.880	0.121
	1 X a week	0.863	0.696-1.071	0.182	**0.704**	**0.518-0.956**	**0.025***
	2 X a week	1.067	0.841-1.354	0.594	0.983	0.756-1.277	0.898
	3 X a week	0.855	0.678-1.078	0.185	**0.611**	**0.487-0.766**	**<0.001*****
	4 X a week	0.947	0.695-1.290	0.731	0.723	0.520-1.005	0.053
	5 X a week	0.789	0.596-1.044	0.097	**0.710**	**0.544-0.925**	**0.011***
	6 X a week	0.678	0.444-1.036	0.073	0.949	0.622-1.447	0.807
	Every day	1.230	0.927-1.632	0.151	**1.391**	**1.041-1.859**	**0.026***
Exercise time (minutes)	None	Ref.			Ref.		
	Under 59	0.939	0.707-1.247	0.665	0.812	0.637-1.035	0.092
	60–119	**0.801**	**0.684-0.938**	**0.006****	**0.838**	**0.722-0.972**	**0.012***
	120–179	1.187	0.982-1.435	0.078	0.848	0.639-1.125	0.252
	Over 180	0.917	0.716-1.176	0.496	0.774	0.504-1.189	0.242
Exercise duration (month)	None	Ref.			Ref.		
	Under 23	0.971	0.784-1.203	0.787	0.932	0.765-1.136	0.486
	24–47	0.903	0.754-1.082	0.269	**0.715**	**0.593-0.864**	**<0.001****
	48–71	0.903	0.730-1.116	0.345	0.995	0.786-1.259	0.964
	72–95	0.996	0.672-1.477	0.984	0.974	0.597-1.591	0.917
	Over 96	0.910	0.735-1.127	0.387	**0.683**	**0.510-0.914**	**0.010****
Exercise intensity	Almost sedentary	Ref.			Ref.		
	Low level	**0.774**	**0.605-0.989**	**0.040***	**0.720**	**0.575-0.901**	**0.004****
	Middle level	0.926	0.803-1.067	0.285	0.902	0.781-1.041	0.158
	High level	1.061	0.848-1.328	0.604	**0.610**	**0.420-0.885**	**0.009****

OR: Odds Ratio; CI: Confidence Interval; *p<0.05, **p<0.01, ***p<0.001; tested by multivariable logistic regression analysis after adjusting for age

Also, even though in some cities there are many places to exercise, people do not know how to exercise or participate in fitness programmes or have a chance to be involved in health programmes as there is lack of information, leadership for sport and adequate instructors. The results of the present study replicated findings from other national cross-sectional studies showing that people living in rural areas had lower systematic fitness management, as well as lower rates of exercise with respect to frequency, intensity and duration (King *et al*., 2000; Brownson *et al*., 2001; Parks *et al*., 2003). According to the Korea Community Health Survey, people living in rural communities had lower rates of walking and higher obesity rates. In this survey in the Republic of Korea, people living in urban areas used public transportation more and walked more due to frequent traffic jams.

Conversely, due to the fact that public transportation in rural areas is not as developed as it is in urban areas, people living in rural areas often used their own car reducing the number who walked. Moreover, there is a tendency for elderly people to live in rural areas and young people to live in urban areas further explaining the exercise discrepancy between the two living environments (Korea Centre for Disease Control and Prevention, 2013). The Korea National Health Insurance Service reported that women living in rural areas were exposed to higher rates of obesity due to income (Korea National Health Insurance Service, 2005). This is consistent with the finding that income affects health management rates of Korean women in such a way that they are more interested in health compared to men in rural areas. According to the survey, health management rates were lower in rural than in urban areas among men.

The reasons for contrasting findings regarding the extent of physical exercise between women from rural areas and those from urban areas is not clear. It can be speculated that in Korean culture, particularly in the rural areas and on farms, men are usually in charge of physical work, such as moving heavy loads and splitting firewood, whereas women are in charge of household chores, such as cooking and cleaning. Because of this, women in rural areas may have lower levels of exercise than they otherwise would. But this is only conjecture, and the specific reasons behind this finding are not known. Well-designed studies need to be undertaken in order to determine the individual effects of the residence area on levels of exercise, particularly among women.

The current work has two major limitations. Firstly, this study did not measure the exercise level of the subjects directly, but did so through a self-reported survey. Therefore, future research should aim to improve on this research design by measuring exercise levels directly. Secondly, the current work utilised the data of a cross-sectional survey, thus only the correlation between residence area and exercise could be assessed and not a cause and effect analysis. Nevertheless, by investigating a large and nationally representative sample in the Republic of Korea, the findings could be compared to other research findings with the theme of exercise and residence environment with respect to gender.

CONCLUSION

The present findings show that there were no gender difference in fitness management, but Korean women in rural areas performed lower levels of exercise than women in urban areas. Also, both men and women in rural areas did not access systematic fitness management, such as training by instructors and exercising in special facilities, resulting in lower exercise levels

that may have a bearing on fitness levels and health conditions.

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