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Original Article

Differences in Self-Rated Health and Physical Activity due to Education Level among Koreans: Understanding Implications of Physical Education

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Abstract

Background: We aimed to explore the effect of education levels on self-rated health and physical activity (PA) and to provide basic data for developing interventions based on physical education to improve the quality of life among Koreans.

Methods: The 2019 Community Health Survey data were selected through primary and secondary phylogenetic extraction. The survey was conducted among Korean adults aged ≥19 years (n=229,099), in 2019, using an electronic questionnaire. The education levels were classified into eight groups: uneducated, Seodang/Hanhak (traditional Korean school), elementary school, middle school, high school, college (2 or 3 years), university (4 years), and post-graduate or higher. In this study, the effect of participants' education levels on self-rated health levels and PA was investigated (the PA subdimensions were: the number of days of vigorous PA, moderate-intensity PA, walking, and flexibility exercises).

Results: 1) Regarding self-rated health, significant differences according to education level were recorded (P<0.001), with higher education levels leading to higher averages. 2) Regarding PA, significant differences according to education level were revealed, and the number of days of vigorous PA, walking, and flexibility exercise (P<0.001) increased with higher education levels. Moreover, the university (4 years) group reported the highest average. However, the middle school group reported the highest average for the number of days of moderate-intensity PA (P<0.001), and the average number of days decreased as the education level increased after middle school.

Conclusion: Education plays an important role in maintaining health, and practicing appropriate PA contributes to one's quality of life.

Keywords: Community health survey; Education level; Physical activity; Physical education

Introduction

The Spartan and the Athenian eras laid the foundation for modern public education. During those times, physical education was the most important aspect for war and, therefore, comprised a major part of the educational curriculum (1). Physical education consequently became a stable component of public education, but its importance has not yet been recognized compared

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to other subjects. However, with the increased interest in "health and well-being" in the 21st century, the importance of physical education within the educational field was also highlighted (2). It is, therefore, essential to examine the effectiveness of public education by verifying the effect of high-quality education on health and physical activity.

Education level is an important predictor of socioeconomic status. Existing literature includes several published studies on the relationship of education with income levels (3-4). Similarly, studies have reported associations between education levels and various health factors (5-6). Existing literature that investigated the relationship between physical education and socioeconomic status has reported significant results (7-8).

Self-rated health is a valid and easy-to-administer measure of health (9). Increased education levels are associated with higher self-rated health levels. However, these studies were limited due to their restricted examination of specific educational levels or ages (10-11). Additionally, several study findings could not be generalized due to their small sample sizes. Therefore, research findings with larger sample sizes, having higher representativeness, are required to maximize the merits of self-rated health as a variable and to overcome the limitations of previous studies.

Physical activity has been a topic of constant discussion in health studies, physical education, and related subjects. In physical education, physical activity particularly indicates academic identity. Several existing studies have suggested that education is strongly correlated with physical activity, particularly in physical education (12-13). Furthermore, studies examining the relationship of education or education level with physical activity have reported significant results in specific age groups (under 45 years old versus over 45 years old) (14).

Existing studies on physical activity can be classified as follows based on the sample size: individual, specific group, organization/region, and large-scale or national level (15). Of these, large-scale or national level research on physical activity aims to facilitate policy changes and to create an environment for increased engagement in physical activities. Thus, a nationwide research is appropriate due to the strong policy implications of "education level" being addressed, which can aid in the improvement of the overall and physical educational environment based on the level of physical activity.

This study, therefore, employed the data from the 2019 Community Health Survey—a nationwide survey by the Korean government targeting Koreans aged ≥19 years—to mitigate the limitations of the existing studies. We aimed to investigate the relationship of education levels with self-rated health levels and physical activity, and to provide basic data for developing interventions based on physical education that contributes to the improvement of quality of life.

Methods

Participants

The Community Health Survey has been annually conducted since 2008, targeting adults aged ≥19 years, based on their Korean resident registration. The 2019 Community Health Survey used recently started making their raw data public. The survey was conducted in collaboration with the Korea Centers for Disease Control and Prevention (KCDCP), local governments, public health centers, and responsible universities to produce regional health statistics, standardized survey indicators, and performance systems (16). Primary sampling was conducted using probability proportional phylogenetic sampling, while considering the size and number of households based on the house type. Secondary extraction was performed by identifying the number of households at the sampling point, utilizing phylogenetic analysis. The extracted sample included a total of 229,099 surveys. Figure 1 presents the flow diagram for the data extraction process, and Table 1 lists the participants' characteristics.

Table 1: The general participant characteristics

Variables	*Categories*	*N*	*%*
Gender	Male	102,572	44.8
	Female	126,527	55.2
Age (yr)	19–29	23,383	10.2
	30–39	26,712	11.7
	40–49	35,911	15.7
	50–59	44,171	19.3
	60–69	44,941	19.6
	>70	53,981	23.6
Education level	Uneducated	14,221	6.2
	Seodang/Hanhak (Traditional Korean school)	314	0.1
	Elementary school	39,979	17.5
	Middle school	26,369	11.5
	High school	65,466	28.6
	College (2 or 3 years)	25,059	10.9
	University (4 years)	49,765	21.7
	Post-graduate or higher	7,703	3.4
	Declined to answer or do not know	223	0.1
Self-rated health	Very good	10,590	4.6
	Good	67,216	29.3
	Average	102,443	44.7
	Poor	39,229	17.1
	Very poor	9,604	4.2
	Declined to answer or do not know	17	0.0
Number of days of vigorous physical activity (days/week)	None	175,208	76.5
	1	10,317	4.5
	2	10,449	4.6
	3	11,494	5.0
	4	4,666	2.0
	5	8,161	3.6
	6	2,680	1.2
	7	5,917	2.6
	Declined to answer or do not know	207	0.1
Number of days of moderate-intensity physical activity(days/week)	None	144,305	63.0
	1	10,202	4.5
	2	15,096	6.6
	3	18,618	8.1
	4	7,246	3.2
	5	15,268	6.7
	6	5,037	2.2
	7	13,147	5.7
	Declined to answer or do not know	180	0.1
Number of days of walking(days/week)	None	52,261	22.8
	1	9,756	4.3
	2	17,308	7.6
	3	25,377	11.1
	4	13,228	5.8
	5	31,395	13.7
	6	11,743	5.1
	7	68,006	29.7
	Declined to answer or do not know	25	0.0
Number of days of flexibility exercise(days/week)	None	111,472	48.7
	1	9,306	4.1
	2	18,023	7.9
	3	24,472	10.7
	4	8,573	3.7
	5 or more	57,232	25.0
	Declined to answer or do not know	21	0.0

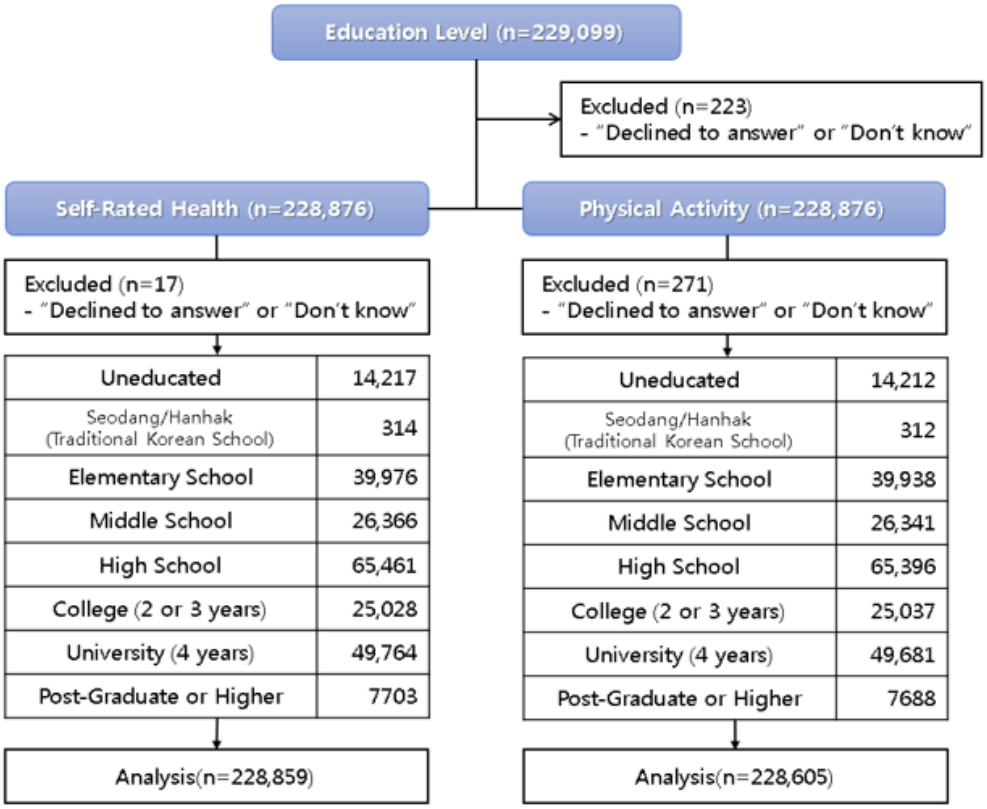

Fig. 1: Flow diagram of the data extraction process

Survey methods and items

The survey was conducted electronically (Computer Assisted Personal Interviewing) from August 16, 2019 through October 31, 2019. Target individuals were surveyed by a trained surveyor, who visited the selected households with a laptop equipped with the survey program. For data verification and quality control, data from those who completed the survey were re-extracted and telephonic verification was performed. The surveys with inconsistent data were subsequently corrected, and the revised results were reported to the KCDCP. Ethical approval was waived for this study as the 2019 Community Health Survey data did not include any private identifier information, such as home addresses, telephone numbers, and social security numbers.

Education level

Education level was defined using all statuses such as graduation, completion, dropout, and attending/leaving school, while the qualification levels were classified as uneducated, Seodang/Hanhak, elementary school, middle school, high school, college (2 or 3 years), university (4 years), and post-graduate or higher.

Number of days of vigorous physical activity

Vigorous physical activity refers to a high-intensity physical exercise. Here, vigorous physical activity included activities such as running (jogging), mountain climbing, rapid cycling, vigorous swimming, soccer, basketball, skipping rope, squash, singles tennis, and carrying heavy objects. Participants responded regarding the number of days of vigorous physical activity by answering the question, "In the past week, how many days did you engage in vigorous physical activity for over 10 minutes that made your body stiffer or more breathless than usual?" Response options included 1) none, 2) 1 day, 3) 2 days, 4) 3 days, 5) 4 days, 6) 5 days, 7) 6 days, and 8) 7 days.

Number of days of moderate-intensity physical activity

Moderate-intensity physical activity was defined as occupational and physical activities such as swimming, doubles tennis, volleyball, badminton, table tennis, and carrying light objects. Walking was excluded from this part of the survey. Participants responded regarding the number of days of moderate-intensity physical activity by answering the question, "In the past week, how many days did you engage in moderate-intensity physical activity for over 10 minutes that made your body stiffer or more breathless than usual?" Response options included 1) none, 2) 1 day, 3) 2 days, 4) 3 days, 5) 4 days, 6) 5 days, 7) 6 days, and 8) 7 days.

Number of days of walking

Walking practice was defined as walking for: 1) commuting to and from school, 2) movement, and 3) exercise. Participants responded regarding the number of days of walking by answering the question, "In the past week, how many days did you walk for at least 10 minutes at a time?" Response options included 1) none, 2) 1 day, 3) 2 days, 4) 3 days, 5) 4 days, 6) 5 days, 7) 6 days, and 8) 7 days.

Number of days of flexibility exercise

Flexibility exercise was defined as physical activities such as stretching and bare-handed gymnastics, and it was evaluated using the question, "In the past week, how many days did you perform flexibility exercises such as stretching or bare-handed gymnastics?" Response options included 1) none, 2) 1 day, 3) 2 days, 4) 3 days, 5) 4 days, 6) 5 days or more.

Self-rated health

Self-rated health levels were determined by posing the question, "How do you usually feel about your health?" Participants responded using a 5-point Likert scale ranging from 1 (very good) to 5 (very bad). However, scoring was reverse coded for convenient interpretation. Thus, very bad and very good were assigned 1 and 5 points, respectively, so that higher average scores indicated higher self-rated health levels.

Statistical analysis

A one-way analysis of variance was performed, using SPSS Windows 23.0 (IBM Corp., Armonk, NY, USA) to compute the descriptive statistics and to explore the differences between self-rated health levels and physical activity according to education levels. For this purpose, data with responses of "declined to answer or do not know" on self-rated health and education levels (n=240) and physical activity (n=271) were excluded. Post-hoc verification was performed using Dunnett's T3 test. Statistical significance was set at $P<0.05$.

Results

Self-rated health according to education level

Table 2 presents the results for self-rated health levels according to the various education levels.

Table 2: Self-rated health levels according to educational level

Dependent variable	*Education level*	*M±SD*	*F*	*Post-hoc (Dunnett T3)*
Self-rated health	Uneducated (a)	2.35±0.91	5825.260***	c>a, b
	Seodang/Hanhak (b)	2.46±0.93		d>a, b, c
	Elementary school (c)	2.68±0.91		e>a, b, c, d
	Middle school (d)	2.96±0.85		f>a, b, c, d, e
	High school (e)	3.23±0.81		g>a, b, c, d, e, f
	College (2 or 3 years; f)	3.41±0.76		h>a, b, c, d, e, f
	University (4 years; g)	3.48±0.77		
	Post-graduate or higher (h)	3.50±0.77		

Note. ***$P<0.001$; tested by one-way analysis of variance; M±SD=Mean±Standard Deviation

The findings reflect a significant difference in self-rated health levels according to varying education levels (P<0.001). Moreover, the highest average score for self-rated health was reported among post-graduate or higher education levels. It transpired that these average scores increased with the level of education. The post-hoc test revealed significant differences among all groups, except 1) between uneducated and Seodang/Hanhak groups, and 2) between the 4-year university and graduate school or higher groups.

Physical activity according to education level

Table 3 presents the results of physical activity according to the level of education. There was a significant difference in physical activity (the number of days of vigorous physical activity, moderate-intensity physical activity, walking, and flexibility exercise), according to education level (P<0.001).

Table 3: Physical activity according to educational level

Dependent variable(day/week)	*Education level*	*M±SD*	*F*	*Post-hoc (Dunnett T3)*
Number of days of vigorous physical activity	Uneducated (a)	0.30±1.20	526.523***	c>a, b
	Seodang/Hanhak (b)	0.24±0.99		d>a, b, c
	Elementary school (c)	0.53±1.56		e>a, b, c, d
	Middle school (d)	0.67±1.69		f>a, b, c, d, e
	High school (e)	0.86±1.79		g>a, b, c, d, e, f
	College (2 or 3 years; f)	0.98±1.81		h>a, b, c, d, e, f, g
	University (4 years; g)	1.00±1.77		
	Post-graduate or higher (h)	1.09±1.78		
Number of days of moderate-intensity physical activity	Uneducated (a)	0.90±1.95	155.319***	c>a, b
	Seodang/Hanhak (b)	0.70±1.77		d>a, b, c
	Elementary school (c)	1.32±2.26		e>a, b, c, d, f, g
	Middle school (d)	1.44±2.31		f>a, b, c
	High school (e)	1.52±2.27		g>a, b, c
	College (2 or 3 years; f)	1.46±2.14		h>a, b, c
	University (4 years; g)	1.45±2.07		
	Post-graduate or higher (h)	1.52±2.06		
Number of days of walking	Uneducated (a)	2.93±2.93	506.151***	c>a, b
	Seodang/Hanhak (b)	2.86±2.98		d>a, b, c
	Elementary school (c)	3.49±2.89		e>a, b, c
	Middle school (d)	3.80±2.78		f>a, b, c, d
	High school (e)	3.86±2.70		g>a, b, c, d, e, f
	College (2 or 3 years; f)	3.92±2.61		h>a, b, c, d, e, f
	University (4 years; g)	4.22±2.53		
	Post-graduate or higher (h)	4.25±2.49		
Number of days of flexibility exercise	Uneducated (a)	0.82±1.66	1349.183***	c>a, b
	Seodang/Hanhak (b)	0.94±1.73		d>a, b, c
	Elementary school (c)	1.37±2.00		e>a, b, c, d
	Middle school (d)	1.86±2.16		f>a, b, c, d
	High school (e)	2.13±2.16		g>a, b, c, d, e, f
	College (2 or 3 years; f)	2.13±2.09		h>a, b, c, d, e, f, g
	University (4 years; g)	2.23±2.08		
	Post-graduate or higher (h)	2.45±2.04		

Note. ***P<0.001; tested by one-way analysis of variance; M±SD=Mean±Standard Deviation

The highest average number of days for vigorous physical activity, walking, and flexibility exercise was reported at the post-graduate or higher education level. Conversely, the lower the education level, the lower the average number of days. However, the highest average number of days for moderate-intensity physical activity was reported at the middle school education level, and the average number of days decreased with increases in education levels. Furthermore, the post-hoc test recorded significant differences in the number of days of physical activity between all groups, except between the groups of 1) uneducated and Seodang/Hanhak (for all types of physical activity); 2) college, university and post-graduate or higher (for moderate-intensity physical activity); 3) middle school and high school (for walking); 4) university and post-graduate or higher (for number of days of walking); and 5) high school and college (for flexibility exercises).

Discussion

Self-rated health according to education level

We found that participants' self-rated health levels increased with their concomitant education levels. This finding is consistent with most previous studies. A Canadian study reported higher self-rated health levels among tertiary-educated adults than secondary-educated adults (11). Similarly, in a Swiss study, adults who had received tertiary education reported higher self-rated health levels than those who had only primary education (17). Moreover, studies also reported close associations between various health factors and education levels in addition to self-rated health levels. Another study reported racial differences in education and socioeconomic status due to the faster functional decline in Black patients with peripheral artery disease, compared with White patients (5). Children's physical and mental health status is based on their socioeconomic status, including parents' educational level and income (18). However, it is noteworthy to understand that groups with higher education levels typically have more economic flexibility. Furthermore, a previous study on older African American adults suggests that, in addition to educational achievements, economic burdens also have a significant effect on self-rated health levels (10).

A gender difference was observed in the self-rated health levels among Spanish adults with lower education; this finding was attributed to the employment insecurity and family conditions of women with lower educational accomplishments (19). Thus, education levels positively affect self-rated health levels, which are also related to the higher economic level in groups with higher education levels. This is because individuals with higher education levels are more economically stable and can positively influence their subjective health levels by engaging in affordable physical activities. Therefore, a mutual bidirectional relationship exists between higher education levels and economic abundance, where the achievement of one factor results in the attainment of the other.

It follows that self-rated health levels are influenced by education and economic levels. A study among adults from 29 countries revealed a positive relationship between subjective socioeconomic status and health (subjective health and psychological well-being) (20). Moreover, among health factors, self-rated health levels were closely related with subjective socioeconomic status. Additionally, countries with a higher GDP per capita report higher average subjective socioeconomic levels, which is consistent with the current study's results. Contradictorily, existing research findings suggest that self-rated health levels can only be improved by increasing education levels. A study among older adults in the United States indicates that the effect of formal education levels on self-rated health levels was moderated by lifelong learning activities (11). Thus, despite lower levels of normative education, it is possible to increase the self-rated health levels by participating in continuous educational activities. Therefore, following the above-mentioned discussion, it can be assumed that the education level and economic leeway influence each other in

the determination of individuals' self-rated health levels.

Physical activity according to education level

Our results regarding physical activity according to education level reveal that physical activities increase in most subdimensions concomitantly with increases in education levels. However, for the middle school education level, moderate-intensity physical activity reported the highest average number of days. This finding is consistent with several published studies. A Korean study reported a significant correlation between socioeconomic status (SES) and physical activity, with adults having lower education indicating lower levels of physical activity (14). Moreover, some age groups (<45 years old), reported higher physical activity among those having secondary education than those with higher education, which supports the findings of the current study.

Another study found that the education level affects the amount of time allotted for specific physical activities, and a positive correlation was observed between education levels and physical activities during leisure time (21). Additionally, some studies demonstrated a significant increase in the physical activities of a group receiving physical education (12-13). However, future longitudinal studies should examine whether the strong effects of receiving physical education persist in respect of physical activity across adulthood. Conversely, findings regarding the positive effect of physical education on academic achievement in schools have led to changes in many educational fields. School-based physical activity positively affects academic achievement among American students and predicts improvement in socioeconomic status (8). In summary, higher education levels positively affect self-rated health levels and physical activity. Moreover, the intensity of this effect may indicate gender, income, racial, or ethnic differences, which provide important basic data for developing a health maintenance system for all groups of the society (22).

Strengths, limitations, and future studies

This study had several limitations. First, despite the large-scale sample recruited for the current study, the nationality of the participants was restricted to South Koreans. These findings may, therefore, not be generalizable to the populations of other countries. Thus, future research studies should recruit research participants from various countries. Second, this study employed the data collected from the 2019 Community Health Survey data, conducted by the Korean government annually; it is a national statistical measure, and its statistical value is noteworthy. However, we only used data from one year of the Survey; long-term effects can, therefore, not be predicted. It consequently is essential to conduct a longitudinal study with several years' data to estimate the long-term effects of education level upon physical activity. Third, various structural relationships between the variables could be predicted during this study, but not all of them were revealed. Moreover, existing literature discusses the positive effect of various physical activities on self-rated health levels (23).

Thus, it is necessary to explore the structural relationship between education level, subjective health level, and physical activity in future studies. Fourth, although this study aimed to predict future directions, no concrete conclusion has been arrived at regarding the effect of physical education. Therefore, it is essential to explore the specific effects of physical education on self-rated health levels and participation in physical activity through further research. Fifth, this study verified the educational effect, but it was not possible to verify the effect of education and physical education through lifelong learning as our study only examined education during school age.

However, this study's findings provide basic data for future research on managing individual quality of life by exploring the relationship between lifelong learning, self-rated health level, and physical activity. Sixth, this study derived its results from a large-scale national survey. This limits the individual context for understanding the findings. Therefore, future research requires an in-depth approach, using qualitative research methods.

Conclusion

The results indicate: 1) The post-graduate or higher education levels reported the highest average self-rated health. 2) The average number of days for vigorous physical activity, walking practice, and flexibility exercise was the highest among those with a post-graduate or higher education level, and the average number of days increased with the education level. However, the average number of days for moderate-intensity physical activity was the highest at the middle school education level, and this particular average decreased when the education level increased post middle school.

Thus, it was confirmed that higher education levels lead to more positive self-rated health levels and physical activity practices. This suggests that education plays a role in improving health and participation in physical activity, which contributes to quality of life. Moreover, it emphasizes the necessity to expand the role of physical education to positively affect health and physical activity. Furthermore, amidst the current attention given to health and well-being, the role of lifelong education is also important for the regular maintenance of health and physical activity among adults.

Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Conflict of interest

The authors have no conflicts of interest to declare.

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