

# Associations of Physical Activity with Perception of Stress and Self-rated Health in Korean Female Students with Early Menarche

Hyun-Jin Kwon<sup>1</sup>, Jung-Woo Oh<sup>2</sup> and Han-Nah Yang<sup>3\*</sup>

<sup>1</sup>School of Kinesiology, University of Michigan, US

<sup>2</sup>Health and Exercise Science, Institute of Sports Science, Seoul National University, Korea

<sup>3</sup>Department of Adapted Physical Education, Division of Education, Baekseok University, Korea;  
hannah@bu.ac.kr

## Abstract

The purpose of this study was to investigate the association between regular Physical Activity (PA), perception of stress, and self-rated health in Korean female students with early menarche based on the 10th (2014) Korea Youth Risk Behavior Web-based Survey (KYRBS) data, targeting a total of 1,845 female students. In order to analyze the relationship between PA, perception of stress, and self-rated health, we performed complex sample design logistic regression to calculate Odds Ratio (OR) and Confidence Interval (CI) after adjusting for school grades, depression, academic achievement, suicidal ideation, current smoking, current alcohol consumption, and family socio-economic status. The results of this study were as follows. The female students who did not participate in regular physical activity showed higher OR values in the perception of stress and lower OR values in the self-rated health variable compared to participants in regular physical activity. These findings suggest that encouraging to participate in regular PA would be effective stress management and self-rated health improvement to female students with early menarche.

**Keywords:** Korean Female Students with Early Menarche, KYRBS, Perception of Stress, Regular Physical Activity, Self-rated Health

## 1. Introduction

Since the early menarche means the beginning of menstruation and the gate from girl to lady, it generally starts with congratulations of family. But a premature early menarche makes embarrassed both to themselves and parents. It is known that the period of early menarche for females is dependent on various factors such as obesity, genetic factor, and eating habits so has lately received the attention because it becomes faster than before over the world<sup>1</sup>.

Most of all a person who experienced physical changes due to the second sex characteristics feels a burden enough by itself and get the stress<sup>2</sup>, so it is reported that too early sexual improvement is generally vulnerable to the

health than the case of starting adolescence in the normal period. Especially, people with early menarche receive a strong stress by causing a considerable depression<sup>3</sup> and may have a negative effect on individual emotional and behavioral developments<sup>4-9</sup>. Besides, because early menarche is closely related to diseases such as obesity<sup>10</sup>, Type II diabetes<sup>11,12</sup>, and asthma<sup>13</sup> etc., the health management of female students with early menarche is urgent.

To improve a mental health by physical activities is proved through various preceding studies<sup>14-16</sup> but there is few studies for the physical activity to manage a mental health of female students in early menarche and the recognition for the importance of their physical activities is very deficient. Therefore, using raw data collected from the 10th (2014) Korea Youth Risk Behavior Web-based Survey

\*Author for correspondence

(KYRBS) which can represent the characteristics of Korea adolescents, this study had analyzed the relationship of physical activity participation for female students in early menarche, perception of stress, and the self-rated health. Based on the result of this study, it provides as the basic data for a health management of female students with early menarche.

## 2. Materials and Methods

### 2.1 Subjects

This study used the 10th Korea Youth Risk Behavior Web-based Survey (KYRBS) data, conducted in 2014. The KYRBS is a government approved statistical survey that has been conducted annually since 2005 by the Ministry of Education, Ministry of Health and Welfare, and Korea Centers for Disease Control and Prevention (KCDC) to monitor the prevalence of the health-related risk behaviors among the Korean adolescents<sup>17</sup>.

The population for this survey was conducted on 74,167 students at 800 middle and high-schools (400 middle schools, 400 high schools), and a total of 72,060 students completed the full questionnaire (the rate of response: 97.2%). Early menarche timing was assessed by the age onset of menstruation, the questionnaire is “When did you have your first menstruation?” And, we selected 1,845 students who were onset of menarche before 5<sup>th</sup> grade, on the basis of the average age of menarche as 11.7 years<sup>17</sup> and 12 years<sup>1,18</sup>. The other exclusion criteria were: no experience of menarche and age at menarche  $\geq$  5th.

### 2.2 Definition of Variables

#### 2.2.1 Dependent Variables

##### 2.2.1.1 Perception of Stress

The perception of stress was measured using the following question: “In general, how much stress do you feel?” and the response options were ① very much, ② much, ③ a little, ④ little, and ⑤ never. According to the responses, we classified into the following two groups for bivariate logistic regression analyses: ①  $\geq$  much, and ②  $\leq$  a little.

##### (2) Self-related health

The self-rated health was measured using the following question: “In general, how do you think your current health status?” and the response options were ① very good, ② good, ③ fair, ④ poor, and ⑤ very poor. According to the responses, we classified into the following two groups

for bivariate logistic regression analyses: ①  $\geq$  good, and ②  $\leq$  fair.

#### 2.1.2 Independent Variables

##### 2.1.2.1 Regular Physical Activity (PA)

Regular PA was evaluated using the following three questions and responses. The frequency of moderate intensity PA measured using the following question: “In the last week, on how many days did you do in 30 minutes or more of physical activity that increased your heart rate or breathing rate?”, and the frequency of vigorous intensity PA measured using the following question: “In the last week, on how many days did you do in 20 minutes or more of physical activity that got into a perspiration or breathless such as jogging, soccer, basketball etc.?”, and the response options ranged from ① none to ⑥ more than 5days per week. Also, last question is: “In the last week, on how many days did you do exercise to strengthen or tone your muscle, such as push-ups, sit-ups, or weight lifting etc.?”, and the response options ranged from ① none to ⑧ 7days per week.

Using the above three questions and responses, practicing regular PA was defined as follows: vigorous PA  $\geq$  3days/week, moderate PA  $\geq$  5 days/week, or strength training  $\geq$  3 days/week. The regular PA was categorized into “practices regular PA” and “does not practice regular PA.”

### 2.3 Statistical analysis

According to the KYRBS was designed as a complex sample, the relevant primary sampling units, stratification, and sample weights were taken into account in the data analysis. The sociodemographic characteristics data were weighted to provide national estimates and using the bivariate logistic regression was conducted to examine the odds ratios (OR) and 95% confidence intervals (CI) of association with PA, Perception of stress and self-related health on female students with early menarche. The OR values were expressed on two models: unadjusted and adjusted value. Adjusted OR and CI values were calculated after adjusting covariate variables (school grades, depression, academic achievement, suicidal ideation, current smoking, current alcohol consumption, and family socio-economic status) to minimize the influence of confound factors.

The collected data was analyzed using SPSS (version 21.0; SPSS Inc., Chicago, IL) and  $p < 0.5$  was considered statistically significant.

### 3. Results

#### 3.1 Characteristics of the Participants

The general characteristics of subjects are indicated in Table 1. They are 1,845 female middle and high school students who are 12–18 years old and 829 people (43.0%)

**Table 1.** General characteristics of study participants

Variables	Female students (n = 1,845)
Age (years)	15.33 ±1.75
Height (cm)	159.62 ±5.27
Weight (kg)	55.04 ±7.65
Body mass index (kg/m <sup>2</sup> )	21.58 ±2.69
School grade	
7th	260 (13.0)
8th	268 (14.6)
9th	301 (15.4)
10th	283 (16.0)
11th	378 (20.6)
12th	355 (20.5)
Academic achievement	
High	227 (12.8)
Middle high	453 (24.1)
Middle	454 (25.1)
Middle low	452 (24.2)
Low	259 (13.9)
Depression	
No	1,154 (62.6)
Yes	691 (37.4)
Suicidal ideation	
No	1,459 (79.2)
Yes	386 (20.8)
Family socio-economic status	
Very rich	114(6.8)
Rich	409(21.7)
Average	873(47.6)
Poor	329(12.2)
Very poor	120(6.7)
Current alcohol consumption	
No	1,488 (80.9)
Yes	357 (19.1)

(Continued)

**Table 1.** Continued

Variables	Female students (n = 1,845)
Current smoking	
No	1,680 (90.8)
Yes	165 (9.2)
Regular physical activity	
No	1,248 (68.2)
Yes	597 (31.8)
Perception of stress	
No	922 (49.7)
Yes	923 (50.3)
Self-rated health	
No	750 (41.6)
Yes	1,095 (58.4)

1) mean + SD or Values are N (%), 2) Percentage have been weighted

of middle school students and 1,016 people (57.1%) of high school students indicating 15.33 years old ± 1.74 of average age, 159.62 cm ± 5.27 of average height, and 55.04 kg ± 7.65 of average weight. The distribution of academic achievements were 12.8% in high, 24.1% in middle high, 25.1% in middle, 24.2% in middle low, and 13.9% low suggesting the highest distribution in Middle, 37.4% for feeling depression, and 20.8% for representing suicidal ideation.

In addition, the family socio-economic status showed 47.6% of the highest distribution in average in order of high (21.7%), poor (12.2%), very poor (6.7%), and very high (6.8%). The current alcohol consumption of subjects was 19.1% and the current smoking was shown in 9.2%. The participation in the regular physical activity was represented in 31.8%, in 50.3% for perception of stress, and in 58.4% for self-rated health.

#### 3.2 Relationship between the Participation in a Regular Physical Activity and the Perception of Stress

Table 2 represents the relationship between the participation in a regular physical activity and the perception of stress through the odds ratio. Based on students who participate in a regular physical activity, the odds ratio of the perception of stress was 1.244 times for students who did not participate in a regular physical activity in Model 1. Model 2 indicated the same with Model 1 and its odds ratio was 1.359 times.

### 3.3 Relationship between the participation in a regular physical activity and the self-rated health

Table 3 represents the relationship between the participation in a regular physical activity and the self-rated health through the odds ratio. Based on students who participate in a regular physical activity, the odds ratio of the self-rated health was 0.752 times for students who did not participate in a regular physical activity in Model 1. Model 2 indicated the same with Model 1 and its odds ratio was 0.751 times.

## 4. Discussion

Using the raw data of the 10<sup>th</sup> (2014) Korea Youth Risk Behavior Web-based Survey (KYRBS), this study was implemented to analyze the relationship between the participation in a regular physical activity and the perception of stress and

**Table 2.** Association between regular PA and perception of stress

	Female students	
	Model 1	Model 2
	OR(95% CI)	
Physical activity		
Yes	Reference	Reference
No	1.244(1.046–1.481)	1.359(1.115–1.657)

OR, Odds Ratio; CI, 95% Confidence interval OR have been weighted.  
Model 1: No adjusted

Model 2: Adjusted for school grade, depression, academic achievement, suicidal ideation, current smoking, current alcohol consumption, and family socio-economic status

**Table 3.** Association between regular PA and self-rated health

	Female students	
	Model 1	Model 2
	OR(95% CI)	
Physical activity		
Yes	Reference	Reference
No	.752(.607–.933)	.751(.598–.943)

OR, Odds Ratio; CI, 95% Confidence interval OR have been weighted.  
Model 1: No adjusted

Model 2: Adjusted for school grade, depression, academic achievement, suicidal ideation, current smoking, current alcohol consumption, and family socio-economic status

self-rated health for Korean female students who have the early menarche. As a result of investigating the recognition rates of stresses and self-rated health from study subjects, we could confirm that the recognition rate of stresses from female students with early menarche (50.3%) was 10% higher than 37.0% the stress rate of Korea adolescents (30.8% for males and 43.7% for females). Also the recognition rate of self-rated health (58.4%) for female students was considerably lower than 71.0% the rate of Korea adolescents (75.5% for males and 66.0% for females)<sup>17</sup>. In addition, as a result of analyzing stresses for adolescents of 4 countries in Korea, USA, Japan, and China, the perception of stress of Korea adolescents demonstrated the highest rate<sup>19</sup>, so it emphasizes once more that Korea adolescents has a serious perception of stress. An accurate comparison is not available as yet because investigation of real situation and its related studies are deficient for the stress of female students who have early menarche, but we could estimate that their stress levels are in serious states through this study result, so it is urgent to prepare a plan for this stress management.

In addition, a person who experienced an early physiological change than his or her friends may consider a bad health, so it has recommended that the management is required due to emotional and psychological issues like easy depressions or aggressive behaviors<sup>20</sup>.

From the relationship between the participation in a regular physical activity and the perception of stress and self-rated health which is the main result of this study, a regular physical activity had a negative correlation with perception of stress and a positive correlation with the self-rated health. Like various preceding studies, this has the same result that a physical activity is very effective on the positive mental health and the self-rated health<sup>21-23</sup>. It can be interpreted that subjects of this study who are female students with early menarche had a positive effect through physical activities by turning into more active in physical<sup>24</sup>.

Because stresses are related to a poor self-rated health<sup>25</sup>, it could be also considered that the perception of stress and self-rated health simultaneously represented a positive result through physical activities.

## 5. Limitation and Conclusion

Using the statistical data that can represent Korea adolescents, this study is meaningful to figure out the perception of stress and self-rated health and to analyze the association with a regular physical activity which is not actively studied in domestic yet. However, this study has a



couple of limitations. Firstly, it is difficult to clearly suggest a causal relationship between independent variables and dependent variables because KYRBS is the cross-sectional data. Secondly, because the survey content is restrictive in case of physical activity which is the independent variable of this study, it was insufficient to systematically analyze by dividing the strength and type of physical activities. So the future study suggests to analyze in accurate and precise and to obtain reliable results by using test materials which can quantify physical activities or through its interventions, when analyzing the effect of physical activity on the perception of stress and self-rated health for female students in early menarche.

Therefore, the conclusions of this study are as following. Firstly, female students with early menarche in middle and high school who aren't participating in regular physical activities had higher stress recognition than other students who had a regular physical activity. Secondly, female students with early menarche in middle and high school who aren't participating in regular physical activities had lower the self-rated health than other students who had a regular physical activity. So it should emphasize the participation in regular physical activities for female students who experienced early menarche because of it is very effective on the management of stresses and self-rated health. Hence, the program development and popularization for appropriate physical activity will be necessary to cause interests for this.

## 6. References

1. Park MJ, Lee IS, Shin EK, Joung H, Cho SI. The timing of sexual maturation and secular trends of menarchial age in Korean adolescents. *Korean J Pediatr*. 2006; 49(6):610–6.
2. Caspi A, Moffitt TE. Individual differences are accentuated during periods of social change: the sample case of girls at puberty. *Journal of personality and social psychology*. 1991; 61(1):157–68.
3. Cavanagh S, Riegle-Crumb C, Crosnoe R. Early pubertal timing and girls' academic careers. *Social Psychology Quarterly*. 2007; 70(2):186–98.
4. Graber JA, Seeley JR, Brooks-Gunn J, Lewinsohn PM. Is pubertal timing associated with psychopathology in young adulthood?. *Journal of the American Academy of Child and Adolescent Psychiatry*. 2004; 43(6):718–26.
5. Mendle J, Turkheimer E, Emery RE. Detrimental psychological outcomes associated with early pubertal timing in adolescent girls. *Developmental review*. 2007; 27(2):151–71.
6. Deng F, Tao FB, Wan YH, Hao JH, Su PY, Cao YX. Early menarche and psychopathological symptoms in young Chinese women. *Journal of women's health*. 2011; 20(2):207–13.
7. Lee SH, Lee SH. Relationships between menarche, emotional and behavioral traits in middle school girls. *Journal of Emotional and Behavioral Disorders*. 2010; 26(1):163–80.
8. Mrug S, Elliott MN, Davies S, Tortolero SR, Cuccaro P, Schuster MA. Early puberty, negative peer influence, and problem behaviors in adolescent girls. *Pediatrics*. 2014; 133(1):7–14.
9. Negriff S, Susman EJ. Pubertal Timing, Depression, and Externalizing Problems: A Framework, Review, and Examination of Gender Differences. *Journal of Research on Adolescence*. 2011; 21(3):717–46.
10. Wilson DA, Derraik JGB, Rowe DL, Hofman PL, Cutfield WS. Earlier menarche is associated with lower insulin sensitivity and increased adiposity in young adult women. *PloS one*. 2015; 10(6):e0128427.
11. Lim JS, Lee HS, Kim EY, Yi KH, Hwang JS. Early menarche increases the risk of Type 2 diabetes in young and middle-aged Korean women. *Diabetic Medicine*. 2015; 32(4):521–25.
12. Mueller NT, Duncan BB, Barreto SM, Chor D, Bessel M, Aquino EM, Pereira MA, Schmidt MI, Earlier age at menarche is associated with higher diabetes risk and cardiometabolic disease risk factors in Brazilian adults: Brazilian Longitudinal Study of Adult Health (ELSA-Brasil). *Cardiovascular diabetology*. article 22. 2014; 13(1).
13. Lieberoth S, Gade E, Kyvik KO, Backer V, Thomsen SF. Early menarche is associated with increased risk of asthma: Prospective population-based study of twins. *Respiratory medicine*. 2015; 109(5):565–71.
14. Fondell E, Lagerros YT, Sundberg CJ, Lekander M, Balter O, Rothman KJ, Balter K. Physical activity, stress, and self-reported upper respiratory tract infection. *Medicine and science in sports and exercise*. 2011; 43(2):272–9.
15. McPhie ML, Rawana JS. The effect of physical activity on depression in adolescence and emerging adulthood: a growth-curve analysis. *Journal of adolescence*. 2015; 40:83–92.
16. Lopes AA, Lantz B, Morgenstern H, Wang M, Bieber BA, Gillespie BW, et al. Associations of self-reported physical activity types and levels with quality of life, depression symptoms, and mortality in hemodialysis patients: the DOPPS. *Clinical journal of the American Society of Nephrology*. 2014; 9(10):1702–12.
17. Ministry of Education, Ministry of Health and Welfare, Korea Centers for Disease Control and Prevention. The Statistics of the 10th Korea Youth Risk Behavior Web-Based Survey (KYRBS) in 2014.

18. Vaughan EB, Van Hulle CA, Beasley WH, Rodgers JL, D'Onofrio BM. Clarifying the associations between age at menarche and adolescent emotional and behavioral problems. *Journal of youth and adolescence*. 2015; 44(4):922–39.
19. National Youth Policy Institute. Korea Youth Index Survey–Investigation of international comparison for youth health (comparing 4 countries of Korea, USA, Japan, and China). 2010.
20. Lee OS, Park TJ. A study on the knowledge and experience about menarche of girls in elementary and middle school. *The Medical Journal of Inje University*; 1998; 5:141–66.
21. Forsyth A, Williams P, Deane FP. Physical activity, but not fitness level, is associated with depression in Australian adults. *The Journal of sports medicine and physical fitness*. 2015; 55(7-8):845–54.
22. Kwo HJ, Cho KO, Oh JW, Lee O, Kim YS. Association between levels of physical activity and self-rated health in Korean adolescents: the 2009 Korea Youth Risk Behavior Web-based Survey. *The Korean Journal of Physical Education*. 2012; 51(5):253–61.
23. Oh JW, Kwon HJ, Song BK, Lee O, Kim YS. Associations between physical education class and perceived stress in Korean adolescents: The Eighth Korea Youth Risk Behavior Web-based Survey 2012. *The Korean Journal of Physical Education*. 2013; 52(3):171–82.
24. Barr-Anderson DJ, Neumark-Sztainer D, Schmitz KH, Ward DS, Conway TL, Pratt C, et al. But I like PE: Factors associated with enjoyment of physical education class in middle school girls. *Research quarterly for exercise and sport*. 2008; 79(1):18–27.
25. Weyers S, Peter R, Boggild H, Jeppesen HJ, Siegrist J. Psychosocial work stress is associated with poor self-rated health in Danish nurses: a test of the effort-reward imbalance model. *Scandinavian journal of caring sciences*. 2006; 20(1):26–34.