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The relationship between body shape perception and health behaviors among Korean normal-weight adolescents using Korea Youth Risk Behavior Web-Based Survey

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Inappropriate adolescent health behavior can be influenced by the negative impact of physical and mental health promotion. Obesity influences subjective improper weight perception. This study aimed to verify Korean normal-weight adolescents' subjective experience of weight control, mental health, physical activity, and subjective status based on their body mass index (BMI). As a result, efforts to control weight appeared less in normal-weight boys. Thin girls were less likely to carry out 60 min of physical activity 7 or 5 days per a week. Obese boys were less likely to carry out vigorous physical activity 3 days per a week. Normal-weight girls were less likely to practice muscular strength training 3 days per a week. Thin boys and thing girls were less likely to practice regular physical activity, and less likely to practice at the rate stipulated in the sedentary behavior guideline. In conclusion, boys and girls with inappropriate weight perception reported feeling stressed and depressed, and reported subjective sleep fulfillment, perceived subjective happiness, and perceived subjective health.

Keywords: Korean adolescent behavior, Subjective body shape perception, Normal weight adolescent, Inappropriate weight control, Physical activity

INTRODUCTION

Adolescent health is an important issue that has implications for adult health. Analyzing adolescent health behaviors is a social-scientifically meaningful approach to understanding healthy growth. Improper health behavior during the adolescent period can have negative impacts on physical and mental growth. Korea, the United States, the United Kingdom, and Japan all follow the World Health Organization guidelines for healthy behavior. According to these guidelines, there has been an increase in the adolescent obesity rate (Dave and Rashad, 2009).

In a report that deals with 200 countries from 1975 to 2016, there has been an increase in BMI among children and adolescents in most high-income countries, and this trend is set to accelerate in some parts of Asia (NCD Risk Factor Collaboration, 2016). In Korea, obesity is defined by a body mass index (BMI) above 25 kg/m^2. Adult BMI is not comparable to adolescent BMI because BMI is calculated using an age-specific percentile. According to the Standard Growth Chart for Children and Adolescents, published by the Korea Centers for Disease Control and Korean Pediatric Society (2007) and calculated using BMI across one age group, the 0 to 5th percentile is defined as underweight, the 5th to 85th percentile as normal weight, the 85th to 95th percentile as overweight, and the 95th to 100th percentile as obese (Barlow et al., 2007).

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The report states that obesity in 12- to 18-year-old adolescents has increased to 12.7%. The average BMI among middle and high school students was 20.7 kg/m^2, and the Korea Youth Risk Behavior Web-based Survey (KYRBWS) in 2014 reports the BMI for the obese and nonobese groups as being 27.0 kg/m^2 and 19.9 kg/m^2 respectively. Following classification criteria, which were defined based on BMI, over 80% of adolescents are of normal weight. This result offers some explanation for the increase in student obesity across elementary, middle, and high school, which grew from 14.3% in 2010 to 15.3% in 2013 to 15% in 2014 (Griffiths et al., 2006; Korean Ministry of Education, 2014; Song et al., 2019). However, previous studies have focused primarily on health behaviors and related factors in overweight and obese adolescents, and there has been little investigation into the health behaviors of normal-weight adolescents, who make up over 70% of all adolescents.

Inappropriate subjective weight perception is linked with behavior designed to control weight (Idema et al., 2019), and one study reported that many normal-weight adolescents perceive their body shape inaccurately and do inappropriate weight loss behaviors to remedy the perceived abnormality (Viner et al., 2006). Adolescent interest about appearance, weight, and body shape and obese in normal weight, and underweight adolescent although they have not had overweight and preference a very slim body shape ideally (Addo et al., 2019). Inappropriate overweight perception among adolescents has fluctuated in 33 European and North American national survey results between 2002 and 2014; it has increased in males across 21 countries, most significantly in Russia, Estonia, and Latvia. In surveys conducted in the United Kingdom, France, Germany, Norway, and Scotland, the correlation between overweight perception and dissatisfaction has also increased (Whitehead et al., 2017). Inappropriate weight control behavior among normal-weight adolescents is enacted in pursuit of a slim body shape, which causes feelings of inferiority and low self-esteem with regards to school life and appearance, and has a negative effect on students' adjustment to school life, class activity, and peer relationships (Hoare et al., 2019).

Furthermore, regarding adolescent health behaviors across the world, mental health ought to be taken into account. In adolescents aged 15 to 19, depression and anxiety manifest markedly in late adolescence (Beauchamp et al., 2018). Obesity is related to the effect of stress on cognitive ability, academic achievement, psychological adjustment, and mental health promotion sequentially (Graf et al., 2005). Adolescent stress management is also a pressing research issue for understanding healthy growth. Weight and obesity are concerned a low level of perception for subjective health status in measuring a feeling of happiness (Doll et al., 2000). Male adolescents tend to underestimate their weight, whereas female adolescents tend to overestimate their weight. Owing to this, there is a high risk of depression among adolescents (Sutaria et al., 2019). Therefore, a social environment should be cultivated whereby appropriate health behaviors and decisions can take place.

With regards to adolescent health behaviors, as short sleep and poor sleep duration were associated with obesity relevant factors in adolescents (Chaput and Dutil, 2016). Previous studies provided evidence that starting school earlier had positive effects on adolescent health (Watson et al., 2017). Sedentary behavior is an example of physical inactivity that is also related to obesity.

However, this focus on obese and overweight adolescents overlooks those normal-weight adolescents who are also making weight loss efforts. For this reason, further research should be conducted in order to provide information about influential factors on sleeping, stress, depression, and the practice of sedentary behaviors. Therefore, this study aimed to analyze the body shape perception and health-related behavior of normal-weight Korean adolescents who account for more than 80% of all adolescents, and to verify the inadequate subjective body shape perception, weight control efforts, physical activity and mental health-related variables using the 10th KYRBWS data to provide information for the healthy and proper growth of adolescents.

MATERIALS AND METHODS

Subjects

Using KYRBWS data, this study analyzed middle school and high school students aged 13 to 18 via an anonymous self-administered online survey. KYRBWS has been administered by the Ministry of Education, the Ministry of Health and Welfare, and by the Korea Center for Disease Control and Prevention based on the National Health Promotion Act. Raw survey data was approved by the government (approval No. 117058), and the study proceeded after obtaining Research Ethics Review Approval of Sangji University Bioethics Review Board (1040782-180927-HR-15-34). A total of 64,991 students from 800 schools—400 middle schools and 400 high schools—were selected and 62,276 students of 799 schools participated, constituting a 95.8% participation rate. Among the subjects of KYRBWS, this study selected 48,274 normal-weight adolescents (23,084 males, 25,190 females). In this study, normal-weight adolescents are those in the 5th to 85th percentile on the Standard Growth Chart for Children and Adolescents (Korea Centers for Disease Control and Korean

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Table 1. General characteristics of subjects

Variable	Level	Boy	Girl	Total
Grade	Junior high	11,569 (50.1)	12,485 (49.6)	24,054 (49.8)
	Senior high	11,515 (49.9)	12,705 (50.4)	24,220 (50.2)
School work level	Excellent	3,773 (16.3)	2,927 (11.6)	6,700 (13.9)
	Above average	5,880 (25.5)	6,881 (27.3)	12,761 (26.4)
	Average	6,371 (27.6)	7,633 (30.3)	14,004 (29.0)
	Under average	4,818 (20.9)	5,637 (22.4)	10,455 (21.7)
	Poor	2,242 (9.7)	2,112 (8.4)	4,354 (9.0)
Economic status (SES): income	High	3,030 (13.1)	2,003 (8.0)	5,033 (10.4)
	Above average	6,941 (30.1)	7,262 (28.8)	14,203 (29.4)
	Average	10,124 (43.9)	12,434 (49.4)	22,558 (46.7)
	Under average	2,465 (10.7)	2,974 (11.8)	5,439 (11.3)
	Low	524 (2.3)	517 (2.1)	1,041 (2.2)
Residence state	Family	21,897 (94.9)	24,081 (95.6)	45,978 (95.2)
	Relative	197 (0.9)	130 (0.5)	327 (0.7)
	Boarding housing, home-staying, dormitory	895 (3.9)	904(3.6)	1,799 (3.7)
	Child care facilities	95 (0.4)	75 (0.3)	170 (0.4)
Father education background	Under junior high	373 (2.1)	431 (2.1)	804 (2.1)
	Under senior high	5,675 (31.4)	6,451 (32.1)	12,126 (31.8)
	Above college education	12,026 (66.5)	13,191 (65.7)	25,217 (66.1)
Mother education background	Under junior high	278 (1.5)	420 (2.0)	698 (1.8)
	Under senior high	6,625 (36.9)	8,388 (40.1)	15,013 (38.6)
	Above college education	11,070 (61.6)	12,084 (57.8)	23,154 (59.6)
Drinking experience	No	13,204 (57.2)	16,397 (65.1)	29,601 (61.3)
	Yes	9,880 (42.8)	8,793 (34.9)	18,673 (38.7)
Smoking experience	No	18,684 (80.9)	23,627 (93.8)	42,311 (87.6)
	Yes	4,400 (19.1)	1,563 (6.2)	5,963 (12.4)
Total		23,084 (100)	25,190 (100)	48,274 (100)

Values are presented as number (%).

Pediatric Society, 2007) based on their BMI (kg/m^2) (Table 1).

Measurement tools and variables

The 13th KYRBWS (2017) consists of 123 questions that address 15 factors such as drinking, smoking, subjective status, physical activity, dietary life, obesity and weight control, and mental health. The survey questions and factors were developed by the Physical Activity, Obesity, and Weight Control Advisory Committee and Mental Health Advisory Committee supported by Korea National Health and Nutrition Examination Survey, Youth Risk Behavior Survey of the United States, and Health Behavior in School-aged Children Study of Europe (Korean Ministry of Education, 2008, 2014; Ministry of Health and Welfare, 2014; Science and Technology, 2008; Welfare and Family Affairs, 2017).

Subjective body shape perception

We tested subjective body shape perception by asking, "How do you perceive your body shape?" Subjects who responded, 'very thin' or 'somewhat thin' were classified as perceiving themselves as thin, those who responded 'average' were classified as perceiving themselves as normal, and those who responded 'somewhat fat' or 'very fat' were classified as perceiving themselves as obese.

Efforts for weight control

We tested efforts for weight control by asking, "In the past 30 days, have you made efforts to control your weight?" The responses were categorized into: 'no weight control,' 'weight loss effort,' 'weight gain effort,' and 'effort to preserve weight.'

Physical activity

We evaluated participants' physical activity by assessing the rate of their participation in high-intensity physical activity, the rate of their participation in muscle strengthening exercise, and their practice of sedentary behavior. We asked them the following ques-

tions: "Of the past 7 days, how many days did you exercise in such a way that made your heart beat faster than usual or got you out of breath for more than 60 minutes?", "Of the past 7 days, how many days did you participate in exercise that got you out of breath or sweating for more than 20 minutes?", and "Of the past 7 days, how many days did you do exercises such as push-ups, sit-ups, weight-lifts, dumbbell exercises or chin-ups?"

Based on the 2017 KYRBWS, each response was recategorized as a 'no' or 'yes' according to whether subjects practiced 60-plus minutes of physical activity for more 5 days and whether they participated in in high-intensity physical activity or muscular strength exercises for more than 3 days. Also, satisfied cutoff level one or more than three aforementioned kinds of physical activity were defined with regular physical activity and recategorized into two levels. We asked participants, "In the past 7 days, how many hours a day did you spend sitting on average?" Of the sedentary behavior duration for a week was calculated with weighted as below, and it was set on the fraction of group which spent average sitting less than 2 hr a day for non-academic purposes such as watching TV, playing games, surfing the Internet, and chatting in the past 7 days. Sedentary behavior duration for a week was calculated with weighted.

Mental health

With regards to mental health and stress perception, participants were asked, "How much stress do you usually feel?" Those who responded 'very much' or 'much' were recategorized as 'perceive stress', and those who responded 'a little' or 'not at all' were recategorized as 'do not perceive stress.' We evaluated depression experience by asking, "In the past 12 months, have you felt sadness or despair to the point that your everyday life was stopped for 2 whole weeks?" Those who responded were categorized into 'yes' and 'no' categories. We evaluated subjective sleeping fulfillment by asking participants, "Do you feel that your nightly sleeping duration over the past 7 days was generally sufficient for relieving fatigue?" Subjects who responded 'more than enough' or 'enough' were recategorized as 'enough', and those who responded 'not enough' or 'not at all' were recategorized as 'not enough.'

Data processing

The 13th KYRBWS (2017) was sampled by clustering and weighting subjects' feedback. For data analysis, IBM SPSS Statistics ver. 23.0 (IBM Co., Armonk, NY, USA) was used. General characters were analyzed by descriptive statistics. To analyze health behaviors in accordance with subjective body shape perception, Pearson chi-square test was implemented. The correlation between subjective body shape perception and health behavior was analyzed by logistic regression analysis to calculate the odds ratio (OR) and 95% confidence interval (CI). The statistical power of the significance level α was set at <0.05.

RESULTS

Differences in subjective body shape perception and health-related behavior

Our analysis of the relationship between weight control effort and subjective body shape perception went as follows: Of male and female adolescent respondents, those who responded, "I make efforts to gain weight," were most likely to perceive themselves as thin. Those who responded, "I make efforts to maintain my weight," were most likely to perceive themselves as normal, and those who responded, "I make efforts to lose weight," were most likely to perceive themselves as obese ($P<0.001$).

With regards to physical activity, those who practiced 60-plus minutes of physical activity 7 times per week appeared higher in males who perceived themselves as normal ($P<0.001$). In females, this tendency appeared more frequently in those who perceived themselves as normal and less frequently in those who perceived themselves as thin, but the difference was not significant ($P>0.05$). Males and females who perceived themselves as normal-weight were more likely to practice high-intensity physical activity more than 3 times per week, do muscular strength practicing activity more than 3 times per week, do regular physical activity, and display standard sedentary behavior ($P<0.001$), as opposed to those who perceived themselves as thin, who were less likely ($P<0.001$).

Stress perception was relatively higher in males and females who perceived themselves as obese ($P<0.001$). Males who perceived themselves as thin were more likely to report experiences of depression. In females, the experience of depression was more common in those who perceived themselves as obese ($P<0.001$). With regards to sleep fulfillment, males who perceived themselves as thin were relatively more likely to report insufficient sleep ($P<0.01$) as were females who perceived themselves as obese ($P<0.001$).

Males who perceived themselves as normal reported higher levels of happiness and those who perceived themselves obese tended to have lower levels of happiness ($P<0.001$). Females who perceived themselves as normal or thin reported higher levels of happiness, compared to the lower levels of happiness reported by those who perceived themselves as obese ($P<0.001$).

With regards to subjective health perception, the perception of

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Table 2. Difference of subjective body shape perception and health-related behavior

Variable	Level	Boy				Girl			
		Thin	Normal	Obese	χ^2 (*P*)	Thin	Normal	Obese	χ^2 (*P*)
Efforts weight control	Nothing weight control	5,046 (61.3)	5,882 (59.5)	2,120 (42.7)	5,294.65 (0.001)	2,767 (61.6)	4,890 (43.4)	3,075 (32.6)	2,534.26 (0.001)
	Loss weight effort	320 (3.9)	1,795 (18.1)	2,072 (41.8)		846 (18.8)	4,587 (40.7)	5,300 (56.2)	
	Gain weight effort	2,370 (28.8)	680 (6.9)	78 (1.6)		266 (5.9)	50 (0.4)	25 (0.3)	
	Preserve weight control	495 (6.0)	1,535 (15.5)	691 (13.9)		613 (13.6)	1,733 (15.4)	1,038 (11.0)	
7(5) Days per 1 week 60 min physical activity practicing rate	No	2,228 (56.4)	2,594 (51.9)	1,447 (63.7)	88.319 (0.001)	2,122 (85.6)	5,040 (84.3)	4,141 (85.5)	3.983 (0.136)
	Yes	1,723 (43.6)	2404 (48.1)	826 (36.3)		356 (14.4)	938 (15.7)	702 (14.5)	
Over 3 days per 1 week vigorous-intensity physical activity practicing rate	No	2,228 (56.4)	2,594 (51.9)	1,447 (63.7)	37.617 (0.001)	1,658 (36.9)	3,729 (33.1)	3,175 (33.6)	21.40 (0.001)
	Yes	1,723 (43.6)	2,404 (48.1)	826 (36.3)		2,834 (63.1)	7,531 (66.9)	6,263 (66.4)	
Over 3 days per 1-week muscular strength exercise practicing rate	No	2,544 (30.9)	2,815 (28.5)	1,789 (36.1)	89.386 (0.001)	2,972 (66.2)	6,910 (61.4)	6,043 (64.0)	35.98 (0.001)
	Yes	5,687 (69.1)	7,077 (71.5)	3,172 (63.9)		1,520 (33.8)	4,350 (38.6)	3,395 (36.0)	
Regular physical activity rate	No	761 (9.2)	731 (7.4)	469 (9.5)	27.374 (0.001)	1,423 (31.7)	3,133 (27.8)	2,694 (28.5)	23.26 (0.001)
	Yes	7,470 (90.8)	9,161 (92.6)	4,492 (90.5)		3,069 (68.3)	8,127 (72.2)	6,744 (71.5)	
Sedentary behavior guideline practicing rate	No	6,723 (83.6)	7,851 (81.4)	4,068 (83.5)	18.915 (0.001)	4,095 (92.4)	10,072 (90.6)	8,583 (92.3)	23.269 (0.001)
	Yes	1,315 (16.4)	1,798 (18.6)	805 (16.5)		336 (7.6)	1,043 (9.4)	718 (7.7)	
Perceived stress	High	5651 (68.7)	7358 (74.4)	3,364 (67.8)	101.30 (0.001)	2,554 (56.9)	6,814 (60.5)	47,72 (50.6)	207.74 (0.001)
	Low	2580 (31.3)	2534 (25.6)	1597 (32.2)		1,938 (43.1)	4,446 (39.5)	4,666 (49.4)	
Depress experience	No	6,482 (78.8)	8,077 (81.7)	3,926 (79.1)	27.195 (0.001)	3,186 (70.9)	8,144 (72.3)	6,282 (66.6)	83.81 (0.001)
	Yes	1,749 (21.2)	1,815 (18.3)	1,035 (20.9)		1,306 (29.1)	3,116 (27.7)	3,156 (33.4)	
Subjective sleeping fulfillment	Not enough	5,743 (69.8)	6,680 (67.5)	3,358 (67.7)	11.788 (0.003)	3,620 (80.6)	8,980 (79.8)	7,819 (82.8)	32.82 (0.001)
	Enough	2,488 (30.2)	3,212 (32.5)	1,603 (32.3)		872 (19.4)	2,280 (20.2)	1,619 (17.2)	
Perceived subjective happiness	High	5,843 (71.0)	7,273 (73.5)	3,442 (69.4)	31.434 (0.001)	3,022 (67.3)	7,586 (67.4)	5,568 (59.0)	179.01 (0.001)
	Low	2,388 (29.0)	2,619 (26.5)	1,519 (30.6)		1,470 (32.7)	3,674 (32.6)	3,870 (41.0)	
Perceived subjective health	High	5,863 (71.2)	6,522 (65.9)	2,702 (54.5)	386.816 (0.001)	3,426 (76.3)	6,890 (61.2)	5,073 (53.8)	649.32 (0.001)
	Low	2,368 (28.8)	3,370 (34.1)	2,259 (45.5)		1,066 (23.7)	4,370 (38.8)	4,365 (46.2)	

Values are presented as number (%).
**P*<0.05. ***P*<0.01. ****P*<0.001.

being healthy was more common in males who perceived themselves as obese, and relatively less common in those who perceived themselves as thin ($P < 0.001$). In females, the perception of being healthy was more common in those who perceived themselves as obese and relatively uncommon among those who perceived themselves as thin ($P < 0.001$) (Table 2).

Relation subjective body shape perception and health-related behaviors

Males who perceived themselves as normal made 0.71 times the effort to control their weight compared to men who perceived themselves as thin ($P < 0.001$). Those who perceived themselves as obese made 1.91 times the effort ($P < 0.001$). Among females, those who perceived themselves as normal made 1.42 times the effort to control their weight. Females who perceived themselves as obese made 2.01 times the effort and the OR was higher ($P < 0.001$).

Regarding physical activity, males who perceived themselves as normal were 0.99 times less likely to practice 60-plus minutes of physical activity per a day than those who perceived themselves as thin ($P < 0.05$), and those who perceived themselves as obese were 0.80 times less likely to engage in such physical activity ($P < 0.001$). In females, it was 1.1 times more likely that they would participate in 60-plus minutes of physical activity per day for those who perceived themselves as normal, and 1.01 times more likely for those who perceived themselves as obese ($P < 0.05$).

Males who perceived themselves as normal were 1.27 times more likely to carry out high-intensity physical activity more than 3 times per week than those who perceived themselves as thin ($P < 0.001$),

and they were 0.98 times less likely to do so if they perceived themselves as obese ($P < 0.05$). Females who perceived themselves as normal were 1.18 times more likely to do high-intensity physical activity more than 3 times per week and they were 1.16 times more likely to do so if they perceived themselves as obese ($P < 0.05$).

Practicing muscular strength activity more than 3 times per week was 1.26 times more common in males who perceived themselves as normal than in males who perceived themselves as thin, and it was 1.42 times more common in males who perceived themselves as obese ($P < 0.001$). In females, it was 0.91 times less common in those who perceived themselves as normal ($P < 0.05$) and 1.12 times more common in those who perceived themselves as obese ($P < 0.001$). The rate of regular physical activity was 1.63 times higher for males who perceived themselves as normal than it was for males who perceived themselves as thin ($P < 0.001$), and 1.09 times higher in those who perceived themselves as obese ($P < 0.05$). In females, the rate of regular physical activity was 1.27 times higher for those who perceived themselves as normal and 1.31 times higher for those who perceived themselves as obese ($P < 0.01$). The rate of sedentary behavior in males who perceived themselves as normal was 1.22 times higher in than it was in those who perceived themselves as thin ($P < 0.001$) and 1.07 times higher than in those who perceived themselves as obese ($P < 0.05$). In females, it was 1.15 times higher among those who perceived themselves as normal and 0.95 times lower in those who perceived themselves as obese ($P < 0.05$).

Males were 0.72 times less likely to perceive their mental health as normal if they perceived themselves as thin ($P < 0.001$) and 1.0 times more likely to perceive their mental health as normal if they perceived themselves as obese ($P < 0.05$). Females were 0.86 times less likely to perceive their mental health as normal if they perceived themselves as normal-weight and 1.29 times more likely if they perceived themselves as obese ($P < 0.001$). When reporting on their experience of depression, males who perceived themselves as normal reported depression at a rate 0.78 times lower than those who perceived themselves as thin ($P < 0.001$) and this rate was 0.93 times lower in those who perceived themselves as obese ($P < 0.05$). Females who perceived themselves as normal reported depression at a rate 0.88 times lower ($P < 0.05$) and those who perceived themselves as obese reported depression at a rate 1.19 times higher ($P < 0.01$). The rate of reported sleep fulfillment in males was 1.24 times higher among those who perceived themselves as thin, and 1.39 times higher in those who perceived themselves as obese ($P < 0.01$). In females, it was 1.14 times higher among those who perceived themselves as normal ($P < 0.05$), and 0.95 times lower among those who perceived themselves as obese ($P < 0.05$).

Subjective happiness perception in males was perceived normal was 1.14 times higher in perceived than thin ($P < 0.05$), and it was 0.93 times lower in perceived obese ($P < 0.05$). In females, it was 1.00 times higher among those who perceived themselves as normal ($P < 0.05$) and 0.70 times lower in those who perceived themselves as obese ($P < 0.05$). Subjective health perception in males who perceived themselves as normal was 1.21 times higher

Table 3. Correlation of subjective body shape perception and health-related behavior

Variable	Level	Boy	Girl
Efforts weight control	Thin	reference	reference
	Normal	0.714 (0.621–0.822)***	1.423 (1.216–1.665)***
	Obese	1.906 (1.615–2.249)***	2.005 (1.706–2.355)***
7(5) Days per a week 60 min physical activity practicing rate	Thin	reference	reference
	Normal	0.994 (0.913–1.081)	1.109 (0.972–1.266)
	Obese	0.797 (0.713–0.889)***	1.010 (0.880–1.160)
Over 3 days per a week vigorous-intensity physical activity practicing rate	Thin	reference	reference
	Normal	1.267 (1.162–1.382)***	1.182 (1.099–1.270)
	Obese	0.981 (0.888–1.084)	1.154 (1.072–1.243)
Over 3 days per a week muscular strength exercise practicing rate	Thin	reference	reference
	Normal	1.261 (1.170–1.358)***	0.910 (0.845–.981)*
	Obese	1.418 (1.319–1.525)***	1.121 (1.059–1.186)***
Regular physical activity practicing rate	Thin	reference	reference
	Normal	1.630 (1.405–1.891)***	1.273 (1.073–1.511)**
	Obese	1.093 (0.921–1.296)	1.309 (1.101–1.556)**
Sedentary behavior guideline practicing rate	Thin	reference	reference
	Normal	1.221 (1.104–1.351)***	1.150 (0.932–1.418)
	Obese	1.069 (0.932–1.225)	0.950 (0.765–1.181)
Perceived stress	Thin	reference	reference
	Normal	0.715 (0.657–0.779)***	0.860 (0.802–0.922)***
	Obese	0.996 (0.886–1.121)	1.289 (1.200–1.384)***
Depress experience	Thin	reference	reference
	Normal	0.781 (0.713–0.855)***	0.878 (0.776–0.993)*
	Obese	0.929 (0.824–1.048)	1.191 (1.051–1.350)**
Subjective sleep fulfillment	Thin	reference	reference
	Normal	1.244 (1.146–1.351)***	1.137 (0.980–1.318)
	Obese	1.393 (1.250–1.552)***	0.948 (0.813–1.105)
Perceived subjective happiness	Thin	reference	reference
	Normal	1.135 (1.063–1.212)	1.004 (0.933–1.081)
	Obese	0.926 (0.858–1.000)	0.700 (0.650–0.754)
Perceived subjective health	Thin	reference	reference
	Normal	1.208 (1.115–1.310)***	1.646 (1.455–1.862)***
	Obese	1.867 (1.683–2.071)***	2.117 (1.867–2.401)***

Values are presented as odds ratio (95% confidence interval).
*P<0.05. **P<0.01. ***P<0.001.

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than it was among those who perceived themselves as thin, and it was 1.87 times higher among those who perceived themselves as obese ($P < 0.01$). Among females, it was 1.65 times higher in those who perceived themselves as normal and 2.12 times higher in those who perceived themselves as obese ($P < 0.01$) (Table 3).

DISCUSSION

Adolescence is a developmental period in which physical and mental growth occurs rapidly. Therefore, social, environmental, educational, and systematic health care is necessary for the healthy growth of adolescents (Bundy et al., 2018). In an ideal environment, adolescents who are underweight should be able to gain weight by taking in enough nutrition, adolescents of a normal weight should be able to maintain their healthy weight, and overweight or obese adolescents should be able to reach a normal weight. We have seen increasing trends in obesity, but in a 2015 US National Survey, a cohort study conducted on 12,275 Chinese American children and adolescents reported that the overall outbreak rate of overweight and obese adolescents had decreased from 24% in 2004 to 21% (Lau et al., 2019). Today, obesity rates are consistently controlled and mediated for adolescents around the world and in many ways, we have seen decreasing trends. It is a fact that more than 70% of adolescents are of normal weight. Thus, more studies should focus on the inappropriate weight control behavior of normal-weight adolescents. Generally, weight control can result in inappropriate efforts and results due to subjective perception of weight rather than objective, and so a health education and general environment should be provided to facilitate proper weight perception and judgment among adolescents. In 2013, Korean 4.4% middle and 7.1% high school obese students distortedly perceived overweight or obese themselves 59% middle and 71% high school students (Korean Ministry of Education, 2014). However, adolescents' actual weight and their subjective body shape perception were shown to be different, thus providing evidence that normal-weight adolescents perceive themselves improperly and make unnecessary efforts to lose weight (Gaylis et al., 2019).

According to the subjective weight perception of normal adolescents perceived having obese and generally having weight control efforts, and perceived obese to control their weight. But in the previous study (World Health Organization, 2004), conformity between weight perception the same body image was very low in BMI normal group, which is different from the results of the present study.

Sixty min of physical activity per 1 day, 7 (5) days per 1 week, males and females perceived normal were practicing properly, and perceived in thin females were relatively less. Vigorous-intensity physical activity more than 3 times per 1 week, muscular strength exercise rate for more than 3 times per 1 week, regular physical activity rate, and sedentary behavior guidelines rate, were appeared only perceived normal males and female and perceived thin females practiced relatively less. The study shows that adolescents who perceived themselves normally were practicing physical activity properly and adolescents who perceived themselves as thin were not aware of the importance of physical activity for improving strength and body composition, confirming the need for the implementation of physical education (Song et al., 2019).

Stress perception was higher in males and females who perceived themselves as obese or thin. Compared to previous studies, adolescents stress was becoming obese (Chiang et al., 2019) and increasing the actual obesity is high (Hanlon et al., 2019) normal-weight perception, overweight perception, and underweight perception adolescents varied (Buscemi et al., 2018) and showed similar or different results from the reported as unrelated to personal BMI (Yayan and Çelebioğlu, 2018). Experiences of depression were more common in males who perceived themselves as thin and in females who perceived themselves as obese. We can deduct from this that males feel more depressed by a small body shape, and that females' have a sensitive response to an increased body shape. Females experienced more stress and depression (Steadman et al., 2018) when they reported perceiving themselves as obese. Males, too, felt more depressed in instances where they perceived themselves as overweight or obese, and females felt less depressed in instances where they perceived themselves as underweight. This result matched or differed from the present study. With regards to subjective sleep fulfillment, males who perceived themselves as thin and females who perceived themselves as obese responded that they were not getting enough sleep. Most of the adolescents in this study did not experience enough sleep both subjectively and objectively (Heath et al., 2018). In South Korea, the United States, Japan, and China, a significant insufficiency in subjective sleep fulfillment was reported in Korean adolescents (National Youth Policy Institute, 2010). With regards to issues of mental health and weight due to insufficient sleep (Hayes et al., 2018). These results indicated that proper sleep management is needed since insufficient sleep gives rise to adolescent obesity. Subjective happiness perception was low in males and females who perceived themselves as obese. A study describes subjective health perception was high among males who perceived themselves as obese and relatively low among females who perceived themselves as thin,

owing to the tendency to perceive obesity as being healthy and thin as being unhealthy. Females showed similar trends across those with both normal and abnormal perceptions of themselves (Choi and Kim, 2017) and subjective health perception was shown to affect the obesity level (Rey et al., 2017). Subjective weight perception and health behaviors in perceived thin, overweight perceiving changes in most countries (Choi and Kim, 2017) commonly 15-year-old adolescents of 33 European and North American countries from 2002 to 2014, but big changes and psychological dissatisfaction appeared in female adolescents of Scotland and Norway (Whitehead et al., 2018). In efforts control weight, the males who perceived themselves as normal showed fewer efforts. Perceived male in obese and female normal and obese showed more efforts for weight control, that they perceived the dangerous influence of obesity. The proportion of the normal-weight adolescents who perceived themselves as thin was high in males and the proportion who perceived themselves as fat was high in females (Choi and Kim, 2017). In efforts for weight control, the proportion of efforts to lose weight was higher in females than males, and the proportion of efforts to maintain weight in the normal-weight group was lower than in the overweight and obese groups (Buscemi et al., 2018). But the efforts for the weight that it was higher in abnormal perception group (Hawkins et al., 2018). In this study, the result partially matches with male and female adolescents, excluding obesity perception adolescents in males, are making a lot of efforts for weight control.

Through this study we analyzed the correlation between each variable concerning normal-weight perception and obesity perception based on the perceived thin, as a result, efforts for weight control were 0.7 times less in normal perceived males compared to males who perceived thin. Male obesity perceived and female normal and obesity perceived adolescents were trying to effort for weight control. Overall, this can be interpreted as demonstrative of the fact that the efforts for weight control were being made in the normal range.

Sixty minutes of physical activity 1 day, 7 (5) days per 1 week, in males, normal and obesity perceived adolescents practicing 0.8 times less physical activity. In perceived thin males and obese perceived females and normal adolescents practiced 1.0 times more physical activity. In vigorous intense physical activity for more than 3 times per 1 week, in perceived normal males and females and perceived obese females practiced normally, but in perceived obese males were practicing less. In other words, males who perceived themselves as obese were reluctant to engage in intense exercise for more than 3, 5, or 7 days per week, which further highlights the necessity for some kind of support or mediation in encouraging adolescents to participate in high-intensity physical activity efficiently. Males who perceived themselves as normal, and males and females who perceived themselves as obese were seen to practice muscular strengthening activities more than 3 times per week, but females who perceived themselves as normal practiced less. It can be deduced from this that females who perceive themselves to be of normal weight are reluctant to do exercises like strength training as such exercises are assumed to increase muscle volume and change the outward body shape. Both males and females who perceived themselves as normal or obese practiced more regular physical activity, understanding the importance of physical activity for health. Adolescents' stress and depression both decreased when they received more physical education, but in the case of female adolescents, physical activity in physical education was practiced everyday life also had a negative impact (Daly-Smith et al., 2018). Regular physical activity has a positive impact on adolescent health, but female adolescents are reluctant to do intense physical activity or muscle strengthening exercises, and so ways to encourage their voluntary participation should be investigated. In terms of sedentary behavior, males and females who perceived themselves as normal and males who perceived themselves as obese exhibited more, but females who perceived themselves as obese exhibited less. Since adolescents in upper grades between 12 and 15 year-older who endure increasing class hours, sedentary time such as during school, after school, and at weekends (Harding et al., 2015) the practice of physical activity and the reduction of sedentary behavior are both known to positively impact the physical and mental health status of overweight and obese male adolescents (Bray et al., 2018). Ways of increasing activity and reducing sedentary behavior should therefore be discussed for adolescents.

Concerning reported perceptions of stress and experiences of depression, stress was high in female adolescents who had normal weight but perceived themselves as obese. A study which emphasized the importance of mental health surveyed, using psychosocial approaches, overweight and obese children and adolescents over a 2-year period and presented evidence to demonstrate that the likelihood of becoming overweight or obese in adulthood was increased (Quek et al., 2017). Overall, this study compared to adolescents who perceive themselves as thin, adolescents who see themselves as fat experience a lower quality of mental health (Whitehead et al., 2018). A study related to subjective body shape perception (Choi and Choi, 2016) showed that a group with mental health issues made more efforts to lose weight (Chu et al.,

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2019) as well. In other words, the degree to which inappropriate body perception is increasing stress perception and experience of depression (Neumark-Sztainer et al., 2000) stands to support the importance of mental health promotion. With regards to subjective sleep fulfillment, females who perceived themselves as obese did not report satisfactory amounts of sleep. Continually insufficient sleep among adolescents can lead to harmful behavior for inappropriate health promotion (Bansil et al., 2011). In the United States, research showed the impact of abnormal sleep patterns on the mental health of 13- to 18-year-old adolescents (Zhang et al., 2017). This evidence supports the result of this study that deciphered a relation between perceptions of abnormal weight and mental health. The National Youth Policy Institute (2010) reported physical activity participation as being associated with subjective sleep satisfaction (Lang et al., 2019). Thus, appropriate methods should be suggested to improve the Korean adolescent lifestyle, which is limited in the education environment, in order to improve their sleeping patterns.

In subjective happiness perception, males and females who perceived themselves as normal felt happier and males and females who perceived themselves as obese males and females felt less happy. In Scotland from 1990 to 2014, the subjective weight perception of 12- to 14-year-old male and female adolescents was almost negligible. But to compare adolescents perceived weight normally, confidence and happiness decreased in perceived overweight adolescents (Whitehead et al., 2018). In Korea, compared to adolescents perceived weight normally, happiness was lower in perceived overweight (OR, 0.889) and usual stress was 1.0 times higher (Kim et al., 2018). This result reaffirmed that obesity misperception harms adolescent happiness and that normal and proper weight and body shape perception is important. Subjective health perception in males was 1.2 times higher in perceived normal and 1.9 times higher in perceived obese. In females, it was 1.6 times higher in perceived normal and 2.1 times higher in perceived obese. This result explains that male and female normal perceived obesity appeared positively higher, which is similar to a research that adolescents' BMI and body weight perception associated negative with body weight perception (Heshmat et al., 2015).

In conclusion, to analyze adolescent health behavior that perceived normal weight is very important social-scientific approach to healthy growth. In other words, abnormally perceiving weight and body shape behavior harms adolescent physical and mental health, implying a need for health education and mediation. Thus, further studies should proceed to focus on appropriate efforts for weight control related to adolescent mental health promotion, the effects of reduction in depression and stress perception through physical activity (Witherspoon et al., 2013), and effective ways to improve sleep satisfaction, subjective health perception, and happiness. In this respect, the results of this research verified the evidence related to the health behavior of Korean normal-weight adolescents as it was analyzed in KYRBWS, which is a resource that can represent the characteristics of Korean adolescents, and thus can be used as informative data for adolescent appropriate behavior for the health promotion.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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