

Body Image, Body Satisfaction and Dieting Behavior in Japanese Preadolescents: The Toyama Birth Cohort Study

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Abstract

Objectives: To examine the relationships between body image, body satisfaction and dieting behavior in the context of pubertal changes in Japanese preadolescents.

Methods: A cross-sectional study of dieting behavior among 5,244 preadolescents (2,452 boys and 2,792 girls aged 12–13) born in Toyama prefecture.

Results: The percentages of those who perceived themselves fat, wanted to be thinner, and had tried dieting, which increased with body mass index (BMI), were significantly higher in girls than in boys (34.2% vs. 20.0%, 58.0% vs. 26.0%, and 17.3% vs. 5.7%, respectively). Independent of sex and BMI, those who wanted to be thinner and those who had tried dieting were more frequently observed in those who perceived themselves fat, and those who had tried dieting were more frequently observed in those who wanted to be thinner. Pubertal changes were significantly associated with dieting behavior, but their relationships to body image and body satisfaction differed between sexes; for boys, those who perceived themselves fat were more frequently observed in those without pubertal changes; whereas for girls, those who wanted to be thinner were more frequently observed in those with pubertal changes.

Conclusions: Dieting behavior of Japanese preadolescents was associated with whether they perceived themselves fat and wanted to be thinner, sometimes independent of whether they were actually overweight. Pubertal changes might induce a positive perspective of growing fat among boys and a desire to be thinner among girls, with the consequence that dieting behavior would be reinforced in those with pubertal changes.

Key words: preadolescents, body mass index, body image, body satisfaction, dieting behavior

Introduction

Recently in Japan, the prevalence of being overweight has increased among men and that of being underweight has increased among young women (1). Overweight is a major risk factor for chronic diseases (2), and underweight is associated with nutritional deficiency. Although the desire to be thinner and dieting behavior are widespread, weight control (weight loss in overweight persons and weight gain in underweight persons)

is a reasonable target for health promotion. Previous studies suggested the tracking of lifestyles, health conditions, and risk factors over the life span, particularly from childhood to adulthood (3–7). Both for children's and adults' health, it may be important to inculcate a sense of weight control from childhood.

Many investigators take interest in body image, body satisfaction, and dieting behavior in pre- and post-adolescents (8–22). Dramatic physical changes accompany puberty, and they may play a role in the establishment of body image (8, 9, 13). The gap between actual and ideal body images may potentially induce dieting behavior caused by body dissatisfaction (23). However, there have been few studies on the relationships between body image, body satisfaction, and dieting behavior in the context of pubertal changes. Moreover, it is uncertain whether the findings in western populations are applicable to Japanese population given the different backgrounds (e.g., ethnicity, culture, and lifestyles) (12). A better

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understanding of these relationships and the path to dieting behavior may help promote weight control. In this study, we aimed to examine the relationships between body image, body satisfaction, and dieting behavior in the context of pubertal changes in Japanese preadolescents.

Subjects and Methods

The Toyama Birth Cohort Study is an ongoing population-based birth cohort study, which consists of almost all children born from April 2, 1989 to April 1, 1990 in Toyama prefecture, Japan (24). The initial survey with a questionnaire and anthropometric measurement was conducted in 1992 (at ages 2–4). The follow-up surveys with a questionnaire were conducted in 1996 (at ages 6–7), 1999 (at ages 9–10, described below as age 9), and 2002 (at ages 12–13, described below as age 12). Information on family members, lifestyles, and physical status of children and their parents was collected at each survey. Informed consent was obtained from all parents of participants, and we paid special attention to the protection of the anonymity and confidentiality of the available information.

Study subjects were 5,244 eligible participants in the age 12 survey (2,492 boys and 2,752 girls), who had complete information on sex, height and weight at age 12, body image, body satisfaction, dieting behavior, pubertal changes, maternal height and weight (collected at the age 12 survey), and height and weight at age 9 (collected at the age 9 survey).

Heights and weights at ages 9 and 12 were reported by children and parents. Heights were specified to the nearest 0.1 cm and weights were specified to the nearest 0.1 kg. Previous studies revealed that heights and weights reported by children and parents were close to those measured actually (25,

26). Body mass index (BMI; kg/m²) was used to assess obesity in children, because the International Obesity Task Force proved BMI to offer a reasonable measure of body fat in children (27). BMI in childhood changes substantially with age (28, 29), therefore, BMIs were classified as age- and sex-specific quartiles of the study subjects: ≤15.4, 15.5–16.7, 16.8–18.5, and 18.6≤ for boys at age 9; ≤15.2, 15.3–16.4, 16.5–18.0, and 18.1≤ for girls at age 9; ≤17.1, 17.2–18.4, 18.5–20.4, and 20.5≤ for boys at age 12; ≤17.0, 17.1–18.5, 18.6–20.5, and 20.6≤ for girls at age 12.

Body image, body satisfaction, and dieting behavior were assessed using the following questions, respectively: (1) Do you perceive yourself thin, average, or fat? (2) Do you want to be thinner or fatter, or are you satisfied as you are? (3) Have you tried dieting? Pubertal changes were defined by one or more affirmative answers to the following questions: (1) Has your axillary hair grown? (2) Has your pubic hair grown? (3) Has your voice changed? (for boys) (4) Have you experienced your first menstruation? (for girls).

Statistical analyses were performed with the Statistical Analysis Systems (SAS, version 8.2). The distributions of body image, body satisfaction, and dieting behavior were compared by chi-square test and Mantel-Haenszel test (for stratified data). The percentages of those who want to be thinner (prevalence of the body dissatisfaction (want to be thinner)), those who perceived themselves fat (prevalence of the body image of fat), and those who have tried dieting (prevalence of dieting behavior) were calculated by BMI quartile, and their trends were examined by the Cochran-Armitage test.

Results

Table 1 shows the distributions of body image, body

Table 1 Distributions of body image, body satisfaction, and dieting behavior

BMI quartiles	Body image			Body satisfaction			Dieting behavior	
	Thin	Average	Fat	Want to be thinner	Satisfied	Want to be fatter	-	+
Boy (n=2492)								
All	656 (26.3%)	1338 (53.7%)	498 (20.0%)	647 (26.0%)	1541 (61.8%)	304 (12.2%)	2351 (94.3%)	141 (5.7%)
1st	421 (66.0%)	212 (33.2%)	5 (0.8%)	21 (3.3%)	428 (67.1%)	189 (29.6%)	632 (99.1%)	6 (0.9%)
2nd	176 (29.2%)	405 (67.2%)	22 (3.6%)	75 (12.4%)	458 (76.0%)	70 (11.6%)	589 (97.7%)	14 (2.3%)
3rd	55 (8.8%)	502 (80.1%)	70 (11.2%)	157 (25.0%)	431 (68.7%)	39 (6.2%)	599 (95.5%)	28 (4.5%)
4th	4 (0.6%)	219 (35.1%)	401 (64.3%)	394 (63.1%)	224 (35.9%)	6 (1.0%)	531 (85.1%)	93 (14.9%)
Girl (n=2752)								
All	332 (12.1%)	1478 (53.7%)	942 (34.2%)	1595 (58.0%)	1085 (39.4%)	72 (2.6%)	2275 (82.7%)	477 (17.3%)
1st	266 (39.1%)	380 (55.8%)	35 (5.1%)	167 (24.5%)	447 (65.6%)	67 (9.8%)	630 (92.5%)	51 (7.5%)
2nd	59 (8.5%)	545 (78.4%)	91 (13.1%)	343 (49.4%)	347 (49.9%)	5 (0.7%)	602 (86.6%)	93 (13.4%)
3rd	7 (1.0%)	415 (60.8%)	261 (38.2%)	481 (70.4%)	202 (29.6%)	0 (0.0%)	538 (78.8%)	145 (21.2%)
4th	0 (0.0%)	138 (19.9%)	555 (80.1%)	604 (87.2%)	89 (12.8%)	0 (0.0%)	505 (72.9%)	188 (27.1%)

BMI: body mass index.

BMIs were classified as age- and sex-specific quartiles of the study subjects.

(1st ≤17.1, 2nd 17.2–18.4, 3rd 18.5–20.4, 4th 20.5≤ for boys at age 12; 1st ≤17.0, 2nd 17.1–18.5, 3rd 18.6–20.5, 4th 20.6≤ for girls at age 12)

Table 2 Prevalence of body image of fat according to BMIs at ages 9 and 12

BMI quartiles at age 12	BMI quartiles at age 9		
	1st	2nd, 3rd	4th
Boy (n=2492)			
All	14/606 (2.3%)	119/1266 (9.4%)	365/620 (58.9%)
1st	1/400 (0.3%)	4/234 (1.7%)	0/4 (0.0%)
2nd	4/134 (3.0%)	13/448 (2.9%)	5/21 (23.8%)
3rd	4/61 (6.6%)	42/445 (9.4%)	24/121 (19.8%)
4th	5/11 (45.5%)	60/139 (43.2%)	336/474 (70.9%)
Girl (n=2752)			
All	52/739 (7.0%)	407/1351 (30.1%)	483/662 (73.0%)
1st	10/462 (2.2%)	25/215 (11.6%)	0/4 (0.0%)
2nd	20/202 (9.9%)	64/452 (14.2%)	7/41 (17.1%)
3rd	13/59 (22.0%)	182/488 (37.3%)	66/136 (48.5%)
4th	9/16 (56.3%)	136/196 (69.4%)	410/481 (85.2%)

BMI: body mass index.

BMIs were classified as age- and sex-specific quartiles of the study subjects.

(1st ≤15.4, 2nd 15.5–16.7, 3rd 16.8–18.5, 4th 18.6≤ for boys at age 9; 1st ≤15.2, 2nd 15.3–16.4, 3rd 16.5–18.0, 4th 18.1≤ for girls at age 9; 1st ≤17.1, 2nd 17.2–18.4, 3rd 18.5–20.4, 4th 20.5≤ for boys at age 12; 1st ≤17.0, 2nd 17.1–18.5, 3rd 18.6–20.5, 4th 20.6≤ for girls at age 12)

satisfaction, and dieting behavior. The prevalence of the body image of fat, the body dissatisfaction (want to be thinner), and dieting behavior were higher in those who had a higher quartile of BMI at age 12 (Cochran-Armitage test for trend $p < 0.001$). The distributions of body image, body satisfaction, and dieting behavior were significantly different between sexes. Girls showed a higher prevalence of the body image of fat than boys (34.2% vs. 20.0%). In the first quartile group for BMI, those who perceived themselves thin were more frequently observed than those who perceived themselves average among boys but not among girls. Girls showed a higher prevalence of the body dissatisfaction (want to be thinner) than boys (58.0% vs. 26.0%). Even in the first quartile group for BMI, the percentage in girls was 24.5% compared with 3.3% in boys. Girls showed a higher prevalence of dieting behavior than boys (17.3% vs. 5.7%). Even in the first quartile group for BMI, the percentage in girls was 7.5% compared with 0.9% in boys.

Table 2 shows the prevalence of the body image of fat according to BMIs at ages 9 and 12. In every quartile group for BMI at age 12, those who perceived themselves fat were more frequently observed in those who had a higher quartile of BMI at age 9. This result indicates that body image may be built on both past and present BMIs.

Table 3 shows the prevalence of the body dissatisfaction (want to be thinner) and dieting behavior according to BMI and

Table 3 Prevalence of body dissatisfaction (want to be thinner) and dieting behavior according to BMI and body image

BMI quartiles		Body image		
		Thin	Average	Fat
Boy (n=2492)				
All	Want to be thinner	11/656 (1.7%)	249/1338 (18.6%)	387/498 (77.7%)
	Dieting behavior	8/656 (1.2%)	58/1338 (4.3%)	75/498 (15.1%)
1st	Want to be thinner	3/421 (0.7%)	14/212 (6.6%)	4/5 (80.0%)
	Dieting behavior	4/421 (1.0%)	2/212 (0.9%)	0/5 (0.0%)
2nd	Want to be thinner	6/176 (3.4%)	53/405 (13.1%)	16/22 (72.7%)
	Dieting behavior	3/176 (1.7%)	9/405 (2.2%)	2/22 (9.1%)
3rd	Want to be thinner	2/55 (3.6%)	105/502 (20.9%)	50/70 (71.4%)
	Dieting behavior	1/55 (1.8%)	20/502 (4.0%)	7/70 (10.0%)
4th	Want to be thinner	0/4 (0.0%)	77/219 (35.2%)	317/401 (79.1%)
	Dieting behavior	0/4 (0.0%)	27/219 (12.3%)	66/401 (16.5%)
Girl (n=2752)				
All	Want to be thinner	18/332 (5.4%)	707/1478 (47.8%)	870/942 (92.4%)
	Dieting behavior	9/332 (2.7%)	180/1478 (12.2%)	288/942 (30.6%)
1st	Want to be thinner	10/266 (3.8%)	124/380 (32.6%)	33/35 (94.3%)
	Dieting behavior	5/266 (1.9%)	37/380 (9.7%)	9/35 (25.7%)
2nd	Want to be thinner	6/59 (10.2%)	249/545 (45.7%)	88/91 (96.7%)
	Dieting behavior	3/59 (5.1%)	63/545 (11.6%)	27/91 (29.7%)
3rd	Want to be thinner	2/7 (28.6%)	241/415 (58.1%)	238/261 (91.2%)
	Dieting behavior	1/7 (14.3%)	55/415 (13.3%)	89/261 (34.1%)
4th	Want to be thinner	0/0 (–)	93/138 (67.4%)	511/555 (92.1%)
	Dieting behavior	0/0 (–)	25/138 (18.1%)	163/555 (29.4%)

BMI: body mass index.

BMIs were classified as age- and sex-specific quartiles of the study subjects.

(1st ≤17.1, 2nd 17.2–18.4, 3rd 18.5–20.4, 4th 20.5≤ for boys at age 12; 1st ≤17.0, 2nd 17.1–18.5, 3rd 18.6–20.5, 4th 20.6≤ for girls at age 12)

Prevalence of body dissatisfaction (want to be thinner): $p < 0.001$ in boys, $p < 0.001$ in girls (Mantel-Haenszel test).

Prevalence of dieting behavior: $p < 0.001$ in boys, $p < 0.001$ in girls (Mantel-Haenszel test).

body image. In every quartile group for BMI at age 12, those who wanted to be thinner and those who had tried dieting were more frequently observed in those who perceived themselves fat. Table 4 shows the prevalence of dieting behavior according to body image and body satisfaction. In every group of body

Table 4 Prevalence of dieting behavior according to body image and body satisfaction

Body image	Body satisfaction		
	Want to be thinner	Satisfied	Want to be fatter
Boy (n=2492)			
All	104/647 (16.1%)	29/1541 (1.9%)	8/304 (2.6%)
Thin	3/11 (27.3%)	2/395 (0.5%)	3/250 (1.2%)
Average	35/249 (14.1%)	21/1039 (2.0%)	2/50 (4.0%)
Fat	66/387 (17.1%)	6/107 (5.6%)	3/4 (75.0%)
Girl (n=2752)			
All	427/1595 (26.8%)	50/1085 (4.6%)	0/72 (0.0%)
Thin	5/18 (27.8%)	4/249 (1.6%)	0/65 (0.0%)
Average	137/707 (19.4%)	43/764 (5.6%)	0/7 (0.0%)
Fat	285/870 (32.8%)	3/72 (4.2%)	0/0 (-)

p<0.001 in boys, p<0.001 in girls (Mantel-Haenszel test).

Table 5 Prevalence of body image of fat according to BMI and pubertal changes

BMI quartiles	Pubertal changes	
	-	+
Boy (n=2492)		
All	198/966 (20.5%)	300/1526 (19.7%)
1st	2/353 (0.6%)	3/285 (1.1%)
2nd	13/258 (5.0%)	9/345 (2.6%)
3rd	31/162 (19.1%)	39/465 (8.4%)
4th	152/193 (78.8%)	249/431 (57.8%)
Girl (n=2752)		
All	147/819 (17.9%)	795/1933 (41.1%)
1st	24/419 (5.7%)	11/262 (4.2%)
2nd	34/231 (14.7%)	57/464 (12.3%)
3rd	35/103 (34.0%)	226/580 (39.0%)
4th	54/66 (81.8%)	501/627 (79.9%)

BMI: body mass index.

BMI's were classified as age- and sex-specific quartiles of the study subjects.

(1st ≤17.1, 2nd 17.2–18.4, 3rd 18.5–20.4, 4th 20.5≤ for boys at age 12; 1st ≤17.0, 2nd 17.1–18.5, 3rd 18.6–20.5, 4th 20.6≤ for girls at age 12)

p<0.001 in boys, p≤0.7 in girls (Mantel-Haenszel test).

Table 6 Prevalence of body dissatisfaction (want to be thinner) according to body image and pubertal changes

Body image	Pubertal changes	
	-	+
Boy (n=2492)		
All	244/966 (25.3%)	403/1526 (26.4%)
Thin	3/308 (1.0%)	8/348 (2.3%)
Average	85/460 (18.5%)	164/878 (18.7%)
Fat	156/198 (78.8%)	231/300 (77.0%)
Girl (n=2752)		
All	322/819 (39.3%)	1273/1933 (65.9%)
Thin	5/191 (2.6%)	13/141 (9.2%)
Average	180/481 (37.4%)	527/997 (52.9%)
Fat	137/147 (93.2%)	733/795 (92.2%)

p=0.9 in boys, p<0.001 in girls (Mantel-Haenszel test).

Table 7 Prevalence of dieting behavior according to body satisfaction and pubertal changes

Body satisfaction	Pubertal changes	
	-	+
Boy (n=2492)		
All	33/966 (3.4%)	108/1526 (7.1%)
Want to be thinner	22/244 (9.0%)	82/403 (20.3%)
Satisfied	9/569 (1.6%)	20/972 (2.1%)
Want to be fatter	2/153 (1.3%)	6/151 (4.0%)
Girl (n=2752)		
All	90/819 (11.0%)	387/1933 (20.0%)
Want to be thinner	70/322 (21.7%)	357/1273 (28.0%)
Satisfied	20/449 (4.5%)	30/636 (4.7%)
Want to be fatter	0/48 (0.0%)	0/24 (0.0%)

p<0.001 in boys, p<0.05 in girls (Mantel-Haenszel test).

image, those who had tried dieting were more frequently observed in those who wanted to be thinner. These results indicate that the body image of fat is associated with the body dissatisfaction (want to be thinner), and body dissatisfaction is associated with dieting behavior.

The relationships of pubertal changes to body image, body satisfaction, and dieting behavior, were examined. Table 5 shows the prevalence of the body image of fat according to BMI and pubertal changes. Pubertal changes were significantly associated with the body image of fat among boys but not among girls. Particularly in boys who had a higher quartile of

BMI at age 12, those who perceived themselves fat were more frequently observed in those without pubertal changes. Table 6 shows the prevalence of the body dissatisfaction (want to be thinner) according to body image and pubertal changes. In contrast to body image, pubertal changes were significantly associated with the body dissatisfaction (want to be thinner) among girls but not among boys. Particularly in girls who perceived themselves thin or average, those who wanted to be thinner were more frequently observed in those with pubertal changes. Table 7 shows the prevalence of dieting behavior according to body satisfaction and pubertal changes. Those who had tried dieting were more frequently observed in those with pubertal changes in both sexes. These results indicate that the relationships of pubertal changes differ between sexes; for boys, pubertal changes are associated with the body image of fat but not with the body dissatisfaction (want to be thinner). Pubertal changes may induce a positive perspective of growing fat, but on the other hand they may promote dieting behavior in those who want to be thinner; for girls, pubertal changes are associated with the body dissatisfaction (want to be thinner) but not with the body image of fat. Pubertal changes may induce a desire to be thinner and promote dieting behavior in those who want to be thinner.

Discussions

Based on the Toyama Birth Cohort Study, we examined the relationships between body image, body satisfaction, and dieting behavior in the context of pubertal changes. To our knowledge, this is the first study that demonstrated these relationships and the path to dieting behavior and confirmed the effects of pubertal changes on body image, body satisfaction, and dieting behavior in Japanese preadolescents.

We confirmed that the body image of fat is associated with the body dissatisfaction (want to be thinner), and body dissatisfaction is associated with dieting behavior. As mentioned in a review of literature on body image (23), body image may play a key role in the establishment of behavior patterns, and the gap between actual and ideal body images may potentially induce dieting behavior caused by body dissatisfaction.

Body image was significantly associated with BMIs at ages 9 and 12. On the other hand, even in the first quartile group for BMI, there were quite a few girls who perceived themselves average or fat (60.9%), wanted to be thinner (24.5%), and had tried dieting (7.5%). These percentages, which were equal to those shown in other Japanese populations (11, 14), indicate that the desire to be thinner and dieting behavior has permeated even preadolescent girls. Indeed, body image may be built on both past and present BMIs, but those who perceive themselves fat are not always consistent with those who are actually overweight, particularly among girls. The distributions of body image, body satisfaction, and dieting behavior were significantly different between sexes. Girls showed higher prevalences of the body image of fat, the body dissatisfaction (want to be thinner), and dieting behavior than boys. Previous studies suggested similar sex-specific differences; girls showed a greater gap between actual and ideal body images (12, 14, 19, 23), more critical assessment of their physical attractiveness

(8), more strong dissatisfaction with their body (10, 17, 23), more frequent weight concerns, and a higher prevalence of dieting behavior (11, 12, 14–16, 18, 23, 30) than boys. Dieting behavior can be associated with poor diet quality (20), and frequent dieters can be at a high risk of growth failure, puberty delay, and developing eating disorders (31, 32). To prevent harmful dieting behavior of preadolescent girls, it is important to help them understand their healthy weight and establish their correct body image (both actual and ideal body images).

Pubertal changes were significantly associated with dieting behavior, but their relationships to body image and body satisfaction differed between sexes; for boys, those who perceived themselves fat were more frequently observed in those without pubertal changes; whereas for girls, those who wanted to be thinner were more frequently observed in those with pubertal changes. The roles of pubertal changes in the path to dieting behavior may differ between sexes. Boys with pubertal changes may have a positive perspective of growing fat, but on the other hand they may pursue dieting if they want to be thinner. Previous studies revealed that boys showed an increased body satisfaction with age (8, 10, 17) and adopted strategies to increase muscle tone (16, 18). Boys seem to positively accept pubertal changes, particularly physiological changes leading to a muscular body. Meanwhile, girls with pubertal changes may have a stronger desire to be thinner, consequently leading to dieting behavior. Previous studies revealed that girls showed an increased body dissatisfaction with age (8, 10, 11), and body dissatisfaction was significantly stronger in postadolescents than in preadolescents (9). Girls seem to negatively accept pubertal changes, particularly a physiological increase in body fat. There is no doubt that increasing emphasis on thinness by the mass media has a profound effect on the desire to be thinner, particularly among female (15, 16, 18–22, 33). Alarmingly, such current trends may affect even preadolescents.

This study had the following potential limitations. First, the Toyama Birth Cohort Study relied on a relatively simple self-report of body image, body satisfaction, and dieting behavior. There are several figure rating scales for assessing actual and ideal body images; the gap between actual and ideal body images indicates a degree of body satisfaction (23, 34). However, such scales are not easy to use in a large population. Moreover, a review of literature on body image measures suggested that verbal measures might be more successful than visual measures (23). Second, Toyama prefecture is located in the middle of Japan, with both rural and urban areas. Environmental factors, particularly sociocultural factors, are somewhat different from prefecture to prefecture. However, because of advance in information technology and the mass media, people can obtain the same information at the same time. It is unlikely that the results of this study are quite different from what actually happens in Japan. Third, the cross-sectional design makes it difficult to determine causal relationships. There may be a feedback loop among BMI, body image, body dissatisfaction, and dieting behavior; BMI might contribute to the establishment of body image, and body image might contribute to the promotion of dieting behavior caused by body dissatisfaction, with the consequence that BMI would change (23).

However, the prevalence of the body image of fat was higher in those who had a higher BMI, the prevalence of the body dissatisfaction (want to be thinner) was higher in those who perceived themselves fat, and the prevalence of dieting behavior was higher in those who wanted to be thinner. It is unlikely that the results of this study are affected by the feedback loop. The relationships and the path to dieting behavior shown in this study should be confirmed in other populations and in a follow-up design.

In conclusion, dieting behavior of Japanese preadolescents was associated with whether they perceived themselves fat and wanted to be thinner, sometimes independent of whether they were actually overweight. Pubertal changes might induce a positive perspective of growing fat among boys and a desire to be thinner among girls, with the consequence that dieting

behavior would be reinforced in those with pubertal changes. Previous studies revealed that environmental factors such as parents, peers, friends, the mass media, and other sociocultural factors might influence body image, body satisfaction, and dieting behavior (15, 16, 18, 20, 22). Further studies may be required to examine the effects of these environmental factors on Japanese preadolescents.

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