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An exploration of the psychometric properties of the SATAQ-4 among adolescent boys in Japan

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Abstract

Research among Western adult and adolescent males suggests that sociocultural influences are implicated in the drive for muscularity and weight-change behaviors. However, few studies have examined these relationships among adolescent boys from non-Western backgrounds. The current study sought to assess the psychometric properties of the Sociocultural Attitudes Towards Appearance Questionnaire-4 (SATAQ-4), a 22-item, 5-factor measure of sociocultural influence on appearance ideals, among Japanese ($n = 984$) adolescent boys. Relationships between appearance-related pressures, appearance ideal internalization, appearance-related teasing, drive for muscularity, and weight-change behaviors were also assessed. Exploratory and confirmatory factor analyses identified a four factor solution (Internalization: Thin/Low Body Fat, Internalization: Muscular/Athletic, Pressures: Media, and Pressures: Family/Peers) with 16 items in this sample. Correlational analyses supported the construct validity of the SATAQ-4. Thin internalization was associated with strategies to lose weight, while muscular internalization was associated with drive for muscularity and strategies to gain weight. Further, peer and parental appearance teasing was associated with perceived appearance pressures from family and peers, as well as weight change strategies. Overall, results suggested modification of the SATAQ-4 when used with Japanese samples, but supported its use to assess sociocultural influences. Additionally, the results highlight that sociocultural influences and muscularity concerns among Japanese adolescent boys are associated in similar ways with weight change strategies as has been established for adolescent males in Western countries.

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Conflict of interest
None.

1. Introduction

Appearance-related pressures and thin-ideal internalization are well-established risk factors for body dissatisfaction and disordered eating among young females (Cafri, Yamamiya, Brannick, & Thompson, 2005; Stice, 2002; Thompson & Stice, 2001). Given the increasing recognition of disordered eating among young males (Murray et al., 2017), clinicians and researchers have suggested that similar processes may impact body image and weight-related behaviors among males too. Existing evidence suggests that male appearance ideals generally emphasize heightened muscularity and a low percentage of body fat (Arbour & Martin, 2006; Tylka, 2011). Among Western men and boys, sociocultural pressures to achieve this ideal and internalization of the muscular ideal have been linked with drive for muscularity, body image disturbance, muscularity and weight dissatisfaction, disordered eating, low self-esteem, and risky body-change behaviors (e.g., steroid use, excessive exercise) (Bratland-Sanda & Sundgot-Borgen, 2012; McCabe & Ricciardelli, 2006; Schaefer et al., 2015; Thompson & Cafri, 2007; Tylka & Andorka, 2012).

However, there is a substantial gap in research on appearance-related pressures and their internalization in Asian males and the relationship between pressures, internalization and disordered eating behaviors. As a review of disordered eating in various Asian countries indicates, adolescents and young males from these countries experience non-neglectable levels of disordered eating and unhealthy weight-control behaviors that are associated with body dissatisfaction (Pike & Dunne, 2015). Thus, the investigation of correlates of disordered eating among Asian males is imperative for researchers and clinicians. Evidence indicates that, among Asian males, Japanese males may be at heightened risk for body dissatisfaction and engagement in potentially unhealthy weight-control behaviors. For example, in a comparison of adolescent males from several Asian countries (Japan, Malaysia, Fiji, and China), Japanese boys reported the highest levels of body dissatisfaction, even after controlling for differences in Body Mass Index (BMI) (Brockhoff et al., 2016). This, in spite of the fact that, the Japanese sample had a BMI that was in the normal range and was only slightly above the Chinese and Malaysian males who had the lowest BMI value across all the groups.

In Japan, the male ideal has traditionally focused on physical functionality and strength (Sugihara & Katsurada, 1999). Reflecting this cultural emphasis, the great majority (84%) of Japanese college males state that their ideal figure is muscular (Shito, Morita, Takeuchi, Sato, & Yamada, 2004). However, this preference for muscularity and athleticism may not be as pronounced among younger Japanese males. In a study examining appearance ideals among Japanese adolescent boys and girls, boys did not select more athletic body ideals than girls, suggesting that they too preferred a leaner, thinner appearance (Nielson, Reel, Galli, Crookston, & Miyairi, 2013). Consistent with this finding, it has been suggested that thinness is increasingly idealized among young Japanese males. Although the prevalence of underweight Japanese adolescent boys has almost doubled from 2003 to 2011 (Inokuchi, Matsuo, Takayama, & Hasegawa, 2014), the rates of dieting and weight loss attempts remain relatively high (Kusaka, 2008), suggesting the continued pursuit of thinness. In a study with high school boys, 9.2% of them admitted that they had tried weight-loss behaviors in the past, including unhealthy weight-loss behaviors such as fasting (Kusaka, 2008). This

increased emphasis on thinness among young males in Japan may be explained by a contemporary culture that glorifies a thin, and even feminine appearance among young men (Sato & Tsuchiya, 2010). Indeed, expectations that weight loss would increase one's physical attractiveness predicted weight-loss behaviors among high school boys in Japan (Kusaka, 2008). Thus, the male ideal is now polarized between the two extremes of thinness and muscularity among young males in Japan, so that there are some adolescents who idealize thinness and an androgynous appearance, while others idealize muscularity.

Multiple studies suggest the importance of Western ideals in shaping Japanese body ideals and body change behaviors. Brockhoff et al. (2012, 2016) assessed Japanese adolescents' identification with what they termed 'traditional' Japanese, 'modern' Japanese, and Western cultural values. The authors reported that unhealthy body change behaviors were related to the degree to which Japanese adolescents held pro-modern and/or pro-Western values. They interpreted this as evidence that Japanese adolescents are influenced by not only external (Western), but also internal cultural factors (change within Japan). As both Western and modern Japanese male appearance ideals emphasize the pursuit of low body fat and muscularity, further investigation of thinness and muscularity-oriented sociocultural influences (e.g., pressures, internalization) in this population represents an important area of inquiry.

One important aspect of replicating research with various samples is the ability to validate measures of appearance and eating-related constructs even across cultures. The Sociocultural Attitudes Towards Appearance Questionnaire (SATAQ) was originally developed in 1995 to assess cultural influences on appearance ideals (Heinberg, Thompson, & Stormer, 1995). Since that time, the measure has undergone several revisions in order to incorporate emerging aspects of sociocultural influence. The SATAQ-4 (Schaefer et al., 2015) is posited to contain five subscales assessing thin ideal internalization, muscular ideal internalization, peer appearance pressures, family appearance pressures, and media appearance pressures. Although the SATAQ has been used extensively in Western samples, less research has examined the psychometric properties of the scale in Asian samples. Earlier versions of the SATAQ have been used with Chinese male populations (Jackson & Chen, 2010; Lai et al., 2013) to assess societal and inter-personal aspects of appearance. In addition, the SATAQ-3 has been utilized among a small sample of Japanese males and females (Nielson et al., 2013), however, formal psychometric testing was not conducted to validate the measure in these samples. The SATAQ-4 has been validated with Japanese adolescent females, where the same factor structure was found as the original measure with only two cross-loading items (Yamamiya et al., 2016). The measure demonstrated adequate reliability and validity with the Japanese female adolescents. But it has not been examined among Japanese adolescent males. Therefore, the goals of the current study are to provide a preliminary examination of: (1) the psychometric properties of the SATAQ-4 among a group of adolescent boys from Japan; and (2) the relationships between appearance pressures, appearance-ideal internalization, appearance-related teasing, drive for muscularity, and weight-change behaviors within the sample.

2. Method

2.1. Participants

A total of 984 adolescent boys with a mean age of 16.29 years ($SD = 0.66$) and a mean BMI of 20.21 ($SD = 2.31$) participated in the study. Participants were students in grades 10 to 12 in public schools in Aichi prefecture, Japan. The overall sample was randomly split in half, utilizing one half for exploratory factor analysis (EFA; Sample 1 = 502) and the other half for confirmatory factor analysis (CFA; Sample 2 = 496). SPSS 22.0 (IBM, 2013) was used to conduct the EFA.

2.2. Measures

All scales were translated into Japanese by one of the authors (Y. Y.) whose native language is Japanese. These were then back-translated into English by individuals fluent in both English and Japanese. Several native English speakers compared the original items and back-translated items to confirm if they conveyed the same meaning, and in cases of a discrepancy, the procedure was repeated with different individuals until all the items on the English and the Japanese versions were judged to be semantically equivalent.

2.2.1. Demographic questionnaire—Participants reported their age, grade, height, and weight. Self-reported height and weight were used to calculate BMI.

2.2.2. Sociocultural Attitudes Towards Appearance Questionnaire-4 (SATAQ-4)—This 22-item scale includes five subscales – *Internalization: Thin/Low Body Fat* (5 items; e.g., “I want my body to look very thin”), *Internalization: Muscular/Athletic* (5 items; e.g., “It is important for me to look athletic”), *Pressures: Media* (4 items; e.g., “I feel pressure from the media to look in better shape”), *Pressures: Family* (4 items; e.g., “I feel pressure from family members to look thinner”), and *Pressures: Peers* (4 items; e.g., “I get pressure from my peers to decrease my level of body fat”) (Schaefer et al., 2015). Items are rated on a Likert scale ranging from “Definitely disagree” (1) to “Definitely agree” (5). The scale has demonstrated excellent reliability and construct validity with Western adult men and women samples (Schaefer et al., 2015). Moreover, it has been validated with Japanese adolescent females (Yamamiya et al., 2016).

2.2.3. Perception Of Teasing Scale-Revised (POTS-R)—This 6-item scale assesses parental (3 items; e.g., “Your parents made comments or teased you about your appearance”) and peer (3 items; e.g., “Your friends and classmates made comments or teased you about being heavy”) teasing about weight and appearance (Shroff & Thompson, 2006). The authors reported acceptable psychometric properties. Items are rated on a Likert scale ranging from “Strongly disagree” (1) to “Strongly agree” (5). In the current study, the POTS-R demonstrated acceptable subscale reliability with Cronbach’s alpha ranging from 0.73 (*Parental Teasing*) to 0.74 (*Peer Teasing*).

2.2.4. Body Change Inventory (BCI)—This 12-item scale asks the respondents about body change strategies that they adopt in order to lose (6 items) or gain (6 items) weight (e.g., “How often do you eat less to lose weight?” and “How often do you think about eating

more to put on weight?” respectively) (Ricciardelli & McCabe, 2002). The items in this scale also included six items related to the use of food supplements to achieve the goal of losing or gaining weight. Items are rated on a Likert scale ranging from “Always” (1) to “Never” (6). This scale has demonstrated good reliability in prior work (Ricciardelli & McCabe, 2002). In a study with the original eight items, good reliability estimates were reported with a sample of Japanese high school students (Brockhoff et al., 2012). Moreover, this scale had high reliability and construct validity among Japanese adolescent females (Yamamiya et al., 2016). In the present study, the purpose was to obtain a broad understanding of strategies used by adolescents to lose or gain weight. Thus, a total of six items were utilized from the subscales examining the use of various strategies to lose weight (*Body Change Strategies to Decrease Weight*) and gain weight (*Body Change Strategies to Increase Weight*). Six items examining the use of food supplements to *gain* or *lose* weight were added, which expanded on the three items that examined use of food supplements to *lose* weight adopted from the original study by McCabe and Ricciardelli (2001). The items that assess levels of exercise were eliminated although they were used in the original study, because they assessed strategies to increase fitness rather than to change weight. In the current study, the BCI demonstrated excellent subscale reliability with a Cronbach’s alpha of 0.92 for both subscales (*Strategies to Lose Weight* and *Gain Weight*).

2.2.5. Drive for Muscularity Scale (DMS)—This 15-item scale examines participants’ desire for increased muscularity and engagement in behaviors intended to increase muscularity (e.g., “I wish I were more muscular”) (McCreary & Sasse, 2000). Items are rated on a Likert scale ranging from “Always” (1) to “Never” (6). The DMS has demonstrated good reliability among American adolescent boys (McCreary, 2007). This scale was validated with Japanese college students with minimal cultural adaptation and removal of five cross and low-loading items (Igarashi, Sugimoto, & Nishimura, 2011). The Cronbach’s alpha in the current sample was 0.86.

2.3. Procedure

Data for the adolescents was collected between December 2013 and January 2014 from three schools. Passive consent was obtained from principals and teachers who served as guardians. The self-administered questionnaire took approximately 30 minutes to complete. The study was approved by the Institutional Review Board of one of the authors’ institution (S.S.). These ethical procedures adhered to the requirements for conducting research in Japan.

2.4. Data analysis

Previous work has identified differences in the factor structure of the SATAQ-4 between males and females (Schaefer et al., 2015), as well as cross-cultural differences in the factor structure among adult males (Rodgers et al., 2016; Schaefer et al., 2015). However, no prior work has examined the SATAQ-4 among Japanese adolescent males. As Japanese boys might differ from US adults and Japanese females, EFA using principal axis factoring and promax oblique rotation was first conducted within Sample 1 to examine the factor structure of the SATAQ-4 and to identify items for deletion. Bartlett’s test of sphericity and the Kaiser-Meyer-Olkin measure of sampling adequacy were utilized to assess the factorability

of the SATAQ-4 items. Items are considered appropriate for factor analysis when Bartlett's test is statistically significant and the Kaiser-Meyer-Olkin value is 0.60 or higher (Tabachnick & Fidell, 2007). Decisions regarding the number of factors to retain were guided by an examination of the scree plot (Cattell, 1966; Floyd & Widaman, 1995), Kaiser-Guttman criterion, (Guttman, 1954; Kaiser, 1960), and the revised Velicer's minimum average partial (MAP) test (Velicer, Eaton, & Fava, 2000). Items with low primary factor loadings (< 0.40) and cross-loading items were deleted (Bosworth, Espelage, & Simon, 1999; Cicero, Kerns, & McCarthy, 2010; Floyd & Widaman, 1995; Ford, MacCallum, & Tait, 1986). Items that had a secondary loading of 0.30 or higher or items that had a gap of 0.20 or less between loadings were defined as cross-loading.

Next, confirmatory factor analysis in Sample 2 was used to verify the structure of the SATAQ-4 observed in Sample 1. For the CFA, the comparative fit index (CFI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR) were used to assess overall model fit. CFI values of 0.90 or higher indicate good model fit (Bentler, 1990); CFI values of 0.95 or higher indicate excellent model fit (Hu & Bentler, 1999). RMSEA values of 0.08 or less (Browne & Cudeck, 1993) and SRMR values of 0.05 or less (Byrne, 1998) indicate good model fit. Mplus 6.12 was used to conduct the CFA (Muthén & Muthén, 2010). For missing data, full information maximum likelihood (FIML) was used.

Cronbach's alphas were used as indicators of internal consistency for the SATAQ-4 subscales. An alpha value of 0.70 or higher indicates adequate internal consistency (George & Mallery, 2003). Subscale means were also calculated and intercorrelations between the subscales were computed. Lastly, construct validity was assessed via Pearson correlations computed between the subscales of the SATAQ-4 and measures of peer teasing, parent teasing, engagement in strategies to lose weight and gain weight, and drive for muscularity. Correlations of 0.1 are considered small, 0.3 are medium, and 0.5 are large (Cohen, 1988). Based on previous research, we anticipated moderate positive correlations between SATAQ-4 subscales assessing internalization of thinness/low body fat and engagement in strategies to lose weight. We further anticipated moderate positive correlations between SATAQ-4 subscales assessing internalization of athleticism/muscularity and the DMS. Finally, we anticipated moderate positive correlations between SATAQ-4 subscales assessing family pressures with the POTS parental teasing items, as well as between SATAQ-4 subscales assessing peer pressures and the POTS peer teasing items.

3. Results

3.1. Exploratory factor analysis

Based on Bartlett's test of sphericity ($\chi^2 = 8422.59$, $df=231$, $p < .001$) and the Kaiser-Meyer-Olkin value (0.90), the SATAQ-4 items were deemed appropriate for factor analysis. Although the SATAQ-4 exhibited a five-factor structure in college and community women and men from Western countries, the eigenvalues, scree plot, and Velicer's revised MAP test suggested a four-factor solution in Japanese adolescent boys, with *Pressures: Peers* and *Pressures: Family* items loading onto a single factor. The pattern matrix indicated five cross-loading items: "It is important for me to look athletic," "I want my body to look very lean,"

“I think a lot about having very little body fat,” “I get pressure from peers to decrease my level of body fat,” and “I get pressure from my peers to look in better shape.” These items were deleted and the remaining items were submitted for a second EFA. This analysis revealed an additional cross-loading item (“I feel pressure from my peers to improve my appearance”), which was subsequently deleted before submitting the remaining 16 items to EFA. The third EFA resulted in all the items loading strongly onto their primary factor. No additional cross-loading items were observed. The final scale contained four subscales: *Internalization: Thin/Low Body Fat* (3 items), *Internalization: Muscular/Athletic* (4 items), *Pressures: Media* (4 items), and *Pressures: Family/Peers* (5 items). See Table 1.

3.2. Confirmatory factor analysis

The CFA indicated that the 16-item four-factor solution provided a good fit to the data (CFI = 0.95, RMSEA = 0.07, SRMR = 0.05).

3.3. Internal consistency, subscale means, and intercorrelations between subscales

The SATAQ-4 subscales demonstrated good internal consistency (Table 2). Subscale means indicated that respondents, on average, reported low to moderate levels of appearance ideal internalization and sociocultural pressures. Correlations between the SATAQ-4 subscales were generally small to medium in size.

3.4. Construct validity

The correlations between the SATAQ-4 subscales and teasing, drive for muscularity, and body change strategies were generally medium in strength (Table 2). Peer and parental teasing measures were most strongly correlated with the *Pressures: Family/Peer* subscale of the SATAQ-4, suggesting strong construct validity. The *Internalization: Thin/Low Body Fat* subscale exhibited a medium correlation with use of strategies to lose weight, while the *Internalization: Muscular/Athletic* subscale exhibited medium to strong correlations with use of strategies to gain weight and drive for muscularity, supporting the construct validity of those subscales.

4. Discussion

Body image concerns among non-Western male samples have received considerably little attention, suggesting a need for further work in this area. To this end, it is important to identify if measures validated with Western samples are applicable in other cultures, and if relationships with sociocultural influences are relevant within different cultures. Japan presents a unique setting for body image research as some work indicates higher levels of body dissatisfaction among Japanese adolescents (Brockhoff et al., 2012), which is assumed to be related to cultural influences. In addition, there appears to be a dichotomy of appearance ideals with some young men valuing muscularity while simultaneously, others value a slim, androgynous appearance. Few, if any studies, have validated or examined sociocultural influences and their relationship with various body image influences. Therefore, in this study, a sociocultural influence measure named the Sociocultural Attitudes Towards Appearance Questionnaire-4 (SATAQ-4) was validated with Japanese adolescent

boys and relationships between appearance pressures, internalization, teasing, drive for muscularity, and disordered eating behaviors were examined.

Factor analyses resulted in differences in the factor structure for the sample from what was previously found with Western male samples and Japanese female samples. For this sample, there were four factors (family/peer pressures, media pressures, thin/low body fat internalization, and athletic/muscular internalization). This result may reflect the polarization of ideal body internalization among young males in Japan. Although the majority of young males strive for a body with adequate muscle mass (i.e., not too much, not too little), a substantial proportion of young males pursue a thin and feminine body. This is supported by results of previous research where adolescent boys have been found to select body ideals that are slim and androgynous looking (Nielson et al., 2013). Brockhoff et al. (2016) connect body dissatisfaction among Japanese adolescent boys with acculturation and it is possible that depending on which culture adolescents identify with, they would have internalized a different ideal. This needs to be investigated in future research. Given that the factor structure of the SATAQ-4 did not match the original five-factor structure, it is possible that cultural differences operate in the experience of appearance pressures and appearance-ideal internalization.

The internal consistency values of the SATAQ-4 subscales were good, supporting the reliability of subscale scores in this sample. In addition, the correlations between the SATAQ-4 and measures of appearance-related teasing, drive for muscularity, and strategies to gain and lose weight suggest good construct validity for the measure. Similar to Lawler and Nixon's (2011) report of a positive relation between media influence and drive for muscularity among Irish adolescents, data from this sample of Japanese males suggests that adolescent boys who have internalized messages from the media about appearance are likely to have a higher drive for muscularity. Moreover, there were moderate relations between thin-ideal internalization and strategies to lose weight. Lastly, the moderate relations between the parent and peer teasing variables and scores on the SATAQ-4 align with previous research (done with the SATAQ-3) using Western female and male samples (Cafri et al., 2005; Jackson & Chen, 2010; Smolak, Levine, & Thompson, 2001). The findings on the connection between teasing and muscularity concerns are valuable, as they highlight the importance of modifying interventions for males with muscularity dissatisfaction to include a component regarding negative appearance feedback from others.

A strong positive correlation was found between strategies to gain weight and drive for muscularity. Thus, Japanese adolescent boys with a strong drive for muscularity are more likely to engage in strategies to gain weight. This is an important consideration as adolescent boys have been found to engage in unhealthy strategies to gain weight including reduction of carbohydrates in their diets, overconsumption of protein, and the use of steroids and muscle-enhancing products (Thompson & Cafri, 2007).

While the current study is useful in establishing the psychometric properties of the SATAQ-4 and in providing support for sociocultural factors affecting appearance concerns, as well as strategies to lose and gain weight, the study has certain limitations. As the data was collected in an urban area of Japan, and as a result of the sampling method, the results may not be

generalizable to adolescent populations in other regions of Japan. In addition, no direct questions were asked about the extent of media exposure, limiting conclusions regarding the construct validity of the *Pressures: Media* subscale. The data was collected almost five years ago, which is an additional limitation. Lastly, this was a cross-sectional study, which limits the ability to make causal inferences about the relationships between sociocultural factors, drive for muscularity, and strategies to change weight.

The findings of the present study have implications for assessment and treatment of body image issues and related mental illnesses in Japan. It is important to obtain a nuanced understanding of cultural factors that impact body image and how these relationships vary across countries, as this helps in the development of specific interventions that cater to the requirements of individuals from that culture. These may increase the efficacy and effectiveness of these interventions. The relationships between parental and peer teasing, pressure from media, peers, and family, and engaging in strategies to lose or gain weight need to be highlighted for clinicians who may see boys or men with subsyndromal body image and eating concerns.

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References

- Arbour KP, & Martin A. (2006). Effects of exposure to muscular and hypermuscular media images on young men's muscularity dissatisfaction and body dissatisfaction. *Body Image*, 3(2), 153–161. <https://doi.org/10.1016/j.bodyim.2006.03.004>. [PubMed: 18089218]
- Bentler PM (1990). Comparative fit indexes in structural models. *Psychological Bulletin*, 107(2), 238–246. 10.1037/0033-2909.107.2.238. [PubMed: 2320703]
- Bosworth K, Espelage DL, & Simon TR (1999). Factors associated with bullying behavior in middle school students. *Journal of Early Adolescence*, 19(3), 341–362. 10.1177/0272431699019003003.
- Bratland-Sanda S, & Sundgot-Borgen J. (2012). Symptoms of eating disorders, drive for muscularity and physical activity among Norwegian adolescents. *European Eating Disorders Review*, 20(4), 287–293. 10.1002/erv.1156. [PubMed: 21898700]
- Brockhoff M, Mussap AJ, Fuller-Tyszkiewicz M, Mellor D, Skouteris H, McCabe MP, & Ricciardelli LA (2016). Cultural differences in body dissatisfaction: Japanese adolescents compared with adolescents from China, Malaysia, Australia, Tonga, and Fiji. *Asian Journal of Social Psychology*, 19, 385–394. 10.1111/ajsp.12150.
- Brockhoff M, Mussap AJ, Mellor D, Skouteris H, Ricciardelli LA, McCabe MP, & Fuller-Tyszkiewicz M. (2012). Cultural influences on body dissatisfaction, body change behaviours, and disordered eating of Japanese adolescents. *Asian Journal of Social Psychology*, 15, 238–248. 10.1111/j.1467-839X.2012.01379.x.
- Browne MW, & Cudeck R. (1993). Alternative ways of assessing model fit In Bollen KA, & Long JS (Eds.). *Testing structural equation models* (pp. 136–162). Newbury Park, CA: Sage.
- Byrne BM (1998). *Structural equation modeling with LISREL, PRELIS, and SIMPLIS: Basic concepts, applications and programming*. Mahwah, NJ: Lawrence Erlbaum.
- Cafri G, Yamamiya Y, Brannick M, & Thompson JK (2005). The influence of sociocultural factors on body image: A meta-analysis. *Clinical Psychology: Science and Practice*, 12, 421–433. 10.1093/clipsy/bpl053.

- Cattell RB (1966). The scree test for the number of factors. *Multivariate Behavioral Research*, 1, 245–276. 10.1207/s15327906mbr0102_10. [PubMed: 26828106]
- Cicero DC, Kerns JG, & McCarthy DM (2010). The Aberrant Salience Inventory: A new measure of psychosis proneness. *Psychological Assessment*, 22(3), 688–701. 10.1037/a0019913. [PubMed: 20822281]
- Cohen J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed). Hillsdale, NJ: Erlbaum.
- Floyd FJ, & Widaman KF (1995). Factor analysis in the development and refinement of clinical assessment instruments. *Psychological Assessment*, 7, 286–299. 10.1007/s10862-006-9035-8.
- Ford JK, MacCallum RC, & Tait M. (1986). The application of exploratory factor analysis in applied psychology: A critical review and analysis. *Personnel Psychology*, 39(2), 291–314. 10.1111/j.1744-6570.1986.tb00583.x.
- George D, & Mallery P. (2003). *SPSS for Windows step by step: A simple guide and reference* 11.0 update (4th ed). Boston: Allyn & Bacon.
- Guttman L. (1954). Some necessary conditions for common-factor analysis. *Psychometrika*, 19(2), 149–161. 10.1007/BF02289162.
- Heinberg LJ, Thompson JK, & Stormer S. (1995). Development and validation of the Sociocultural Attitudes Towards Appearance Questionnaire. *International Journal of Eating Disorders*, 17, 81–89. [PubMed: 7894457]
- Hu LT, & Bentler P. (1999). Cutoff criteria for fit indices in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, 6, 1–55. 10.1080/10705519909540118.
- IBM Corp (2013). *IBM SPSS statistics for Windows*, Version 22.0. Armonk, NY: IBM Corp (Released).
- Igarashi T, Sugimoto K, & Nishimura H. (2011). “Takumashisa kikyū” shakudo no sakusei to shinrai-sei/datou-sei no kento [Reliability and validity of the Japanese version of the Drive for Muscularity scale]. *The Japanese Journal of Counseling Science*, 44, 158–166. 10.11544/cou.44.2_158.
- Inokuchi M, Matsuo N, Takayama JI, & Hasegawa T. (2014). Trends in thin body stature among Japanese male adolescents, 2003–2012. *Annals of Human Biology*, 41, 277–281. 10.3109/03014460.2013.856938. [PubMed: 24274656]
- Jackson T, & Chen H. (2010). Factor structure of the Sociocultural Attitudes Towards Appearance Questionnaire-3 (SATAQ-3) among adolescent boys in China. *Body Image*, 7(4), 349–355. <https://doi.org/10.1016/j.bodyim.2010.07.003>. [PubMed: 20800561]
- Kaiser HF (1960). The application of electronic computers to factor analysis. *Educational and Psychological Measurement*, 20, 141–151. 10.1177/001316446002000116.
- Kusaka T. (2008). Shishunki-danshi no genryokodo no jittai-chosa [A study about the weight loss action of adolescent boys]. *Bulletin of Kawasaki College of Allied Health Professions*, 28, 33–37.
- Lai CM, Mak KK, Pang JS, Fong SSM, Ho RCM, & Guldán GS (2013). The associations of sociocultural attitudes towards appearance with body dissatisfaction and eating behaviors in Hong Kong adolescents. *Eating Behaviours*, 14, 320–324. <https://doi.org/10.1016/j.eatbeh.2013.05.004>.
- Lawler M, & Nixon E. (2011). Body dissatisfaction among adolescent boys and girls: The effects of body mass, peer appearance culture and internalization of appearance ideals. *Journal of Youth and Adolescence*, 40(1), 59–71. 10.1007/s10964-009-9500-2. [PubMed: 20058058]
- McCabe MP, & Ricciardelli LA (2001). Body image and body change techniques among young adolescent boys. *European Eating Disorders Review*, 9, 335–347. 10.1002/erv.389.
- McCabe MP, & Ricciardelli LA (2006). A prospective study of extreme weight change behaviors among adolescent boys and girls. *Journal of Youth and Adolescence*, 35, 402. 10.1007/s10964-006-9062-5.
- McCreary DR (2007). The Drive for Muscularity Scale: Description, psychometrics, and research findings In Thompson JK, & Cafri G. (Eds.). *The muscular ideal: Psychological, social and medical perspectives* (pp. 87–106). Washington, DC: American Psychological Association.
- McCreary DR, & Sasse DK (2000). An exploration of the drive for muscularity in adolescent boys and girls. *Journal of American College Health*, 48(6), 297–304. 10.1080/07448480009596271. [PubMed: 10863873]

- Murray SB, Nagata JM, Griffiths S, Calzo JP, Brown TA, Mitchison D, ... Mond JM (2017). The enigma of male eating disorders: A critical review and synthesis. *Clinical Psychology Review*, 57, 1–11. 10.1016/j.cpr.2017.08.001. [PubMed: 28800416]
- Muthén LK, & Muthén BO (2010). *Mplususer's guide* (6th ed). Los Angeles, CA: Muthén & Muthén.
- Nielson HE, Reel JJ, Galli NA, Crookston BT, & Miyairi M. (2013). Body image and Westernization trends among Japanese adolescents. *The Health Educator*, 45, 4–11.
- Pike KM, & Dunne PE (2015). The rise of eating disorders in Asia: A review. *Journal of Eating Disorders*, 3, 33. 10.1186/s40337-015-0070-2. [PubMed: 26388993]
- Ricciardelli LA, & McCabe MP (2002). Psychometric evaluation of the Body Change Inventory: An assessment of an instrument for adolescent boys and girls. *Eating Behaviors*, 2, 1–15. 10.1016/S1471-0153(01)00044-7.
- Rodgers RF, Schaefer LM, Thompson JK, Girard M, Bertrand M, & Chabrol H. (2016). Psychometric properties of the Sociocultural Attitudes Towards Appearance Questionnaire-4 (SATAQ-4) in French women and men. *Body Image*, 17, 143–151. 10.1016/j.bodyim.2016.03.002. [PubMed: 27081747]
- Sato Y, & Tsuchiya S. (2010). Kokosei no sesshoku-shogaikeiko: Sono seisa ni tsuite [Tendency of eating disorders in high-school: For gender difference]. *Japanese Journal of Psychosomatic Medicine*, 50, 321–326.
- Schaefer LM, Burke NL, Thompson JK, Heinberg LJ, Calogero RM, Bardone-Cone AM, ... Swami V. (2015). Development and validation of the Sociocultural Attitudes Towards Appearance Questionnaire-4 (SATAQ-4). *Psychological Assessment*, 27(1), 54–67. 10.1037/a0037917. [PubMed: 25285718]
- Shito K, Morita I, Takeuchi Y, Sato H, & Yamada K. (2004). Hongaku gakusei ni okeru taikei-ishiki no seisa ni kansuru kenkyu [Investigating gender differences of body-shape concerns among the students of our university]. *Journal of Nursing and Social Services (Health Sciences University of Hokkaido)*, 11, 79–85.
- Shroff H, & Thompson JK (2006). The tripartite influence model of body image and eating disturbance: A replication with adolescent girls. *Body Image*, 3(1), 17–23. 10.1016/j.bodyim.2005.10.004. [PubMed: 18089205]
- Smolak L, Levine MP, & Thompson JK (2001). The use of the sociocultural attitudes towards appearance questionnaire with middle school boys and girls. *International Journal of Eating Disorders*, 29(2), 216–223. [PubMed: 11429984]
- Stice E. (2002). Risk and maintenance factors for eating pathology: A meta-analytic review. *Psychological Bulletin*, 128(5), 825–848. 10.1037/0033-2909.128.5.825. [PubMed: 12206196]
- Sugihara Y, & Katsurada E. (1999). Masculinity and femininity in Japanese culture: A pilot study. *Sex Roles*, 40, 635–646. 10.1023/A:1018896215625.
- Tabachnick BG, & Fidell LS (2007). *Using multivariate statistics* (5th ed). Boston, MA: Pearson Education, Inc.
- Thompson JK, & Cafri G. (2007). An introduction In Thompson JK, & Cafri G. (Eds.). *The muscular ideal: Psychological, social, and medical perspectives*. Washington, DC: APA Books.
- Thompson JK, & Stice E. (2001). Thin-ideal internalization: Mounting evidence for a new risk factor for body-image disturbance and eating pathology. *Current Directions in Psychological Science*, 10(5), 181–183. 10.1111/1467-8721.00144.
- Tylka TL (2011). Refinement of the tripartite influence model for men: Dual body image pathways to body change behaviors. *Body Image*, 8(3), 199–207. 10.1016/j.bodyim.2011.04.008. [PubMed: 21664886]
- Tylka TL, & Andorka MJ (2012). Support for an expanded tripartite influence model with gay men. 9, 57–67. Retrieved from http://u.osu.edu/tracytylka/files/2015/02/Tylka_Andorka-1klxhcf.pdf.
- Velicer WF, Eaton CA, & Fava JL (2000). Construct explication through factor or component analysis: A review and evaluation of alternative procedures for determining the number of factors or components In Goffin RD, & Helmes E. (Eds.). *Problems and solutions in human assessment* (pp. 41–71). Boston, MA: Spring.
- Yamamiya Y, Shimai S, Schaefer LM, Thompson JK, Shroff H, Sharma R, & Ordaz DL (2016). Psychometric properties and validation of the Sociocultural Attitudes Towards Appearance

Questionnaire-4 (SATAQ-4) with a sample of Japanese adolescent girls. *Body Image*, 19, 89–97.
10.1016/j.bodyim.2016.08.006. [PubMed: 27636160]

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Table 1

Pattern coefficients, eigenvalues, and percent variance for the SATAQ-4 in Japanese boys.

Items	Internalization			Pressures	
	Thin/Low	Body Fat	Muscular/Athletic	Family/Peers	Media
2. I think a lot about looking muscular.	0.149		0.556	-0.154	0.038
3. I want my body to look very thin.	0.729		-0.068	0.092	-0.006
4. I want my body to look like it has little fat.	0.671		0.094	-0.021	-0.026
5. I think a lot about looking thin.	0.618		0.033	-0.019	0.033
6. I spend a lot of time doing things to look more athletic.	-0.056		0.855	0.079	-0.040
7. I think a lot about looking athletic.	0.035		0.803	0.027	0.009
10. I spend a lot of time doing things to look more muscular.	-0.050		0.870	0.012	0.019
11. I feel pressure from family members to look thinner.	0.006		0.043	0.834	0.006
12. I feel pressure from family members to improve my appearance.	0.043		0.009	0.503	0.102
13. Family members encourage me to decrease my level of body fat.	0.008		-0.036	0.981	-0.098
14. Family members encourage me to get in better shape.	-0.040		0.040	0.860	0.039
15. My peers encourage me to get thinner.	0.050		-0.084	0.608	0.240
19. I feel pressure from the media to look in better shape.	-0.076		0.000	0.045	0.921
20. I feel pressure from the media to look thinner.	0.027		-0.021	0.021	0.934
21. I feel pressure from the media to improve my appearance.	0.068		0.014	-0.013	0.690
22. I feel pressure from the media to decrease my level of body fat.	-0.022		0.034	0.065	0.866
Eigenvalues	1.11		1.42	6.36	2.84
Percent variance	6.93		8.85	39.73	17.77

Note. Factor loadings and eigenvalues obtained using principal axis factoring with promax oblique rotation. Factor loadings 0.40 in boldface.

Table 2

Cronbach's alpha, means, and construct validity for SATAQ-4 subscales in Japanese boys.

Statistic	Internalization		Pressures	
	Thin/Low Body Fat	Muscular/Athletic	Family/Peer	Media
Cronbach's alpha	0.70	0.86	0.89	0.93
Mean (SD)	2.53 (0.88)	2.41 (0.95)	1.44 (0.71)	1.41 (0.70)
Correlations				
SATAQ-4 Internalization: Thin/Low Body Fat	–	–	–	–
SATAQ-4 Internalization: Muscular/Athletic	0.39***	–	–	–
SATAQ-4 Pressures: Family/Peer	0.30***	0.08	–	–
SATAQ-4 Pressures: Media	0.34***	0.18***	0.57***	–
Peer Teasing	0.30***	0.13	0.52***	0.42***
Parental Teasing	0.31***	0.05**	0.61***	0.43***
Lose Weight Strategies	0.35***	0.13**	0.41***	0.53***
Gain Weight Strategies	0.00	0.42***	–0.08	–0.01
Drive for Muscularity	0.23***	0.61***	0.03	0.17***

Note, Peer Teasing = Perception of Teasing Scale-Revised Peers; Parental Teasing = Perception of Teasing Scale-Revised Parents; Lose Weight Strategies = Body Change Inventory; Strategies to Decrease Weight; Gain Weight Strategies = Body Change Inventory; Strategies to Increase Weight; Drive for Muscularity = Drive for Muscularity Scale.

**
 $p < .01$.

 $p < .001$.