Research Article

Body Image Satisfaction and Body Composition Across Somatotype Categories Among School - Going Girls: A Cross - Sectional Study

Alphonsia N A[1*], Biju Kumar V L[2], Dr. Deena Joseph Arakkal[3], Archana Shaji[4], Sudheesh N S[5], Gopu M Vijayan[6]

[1*]Physical Education, Assistant Professor, Newman College Thodupuzha, Mahatma Gandhi University Kottayam, ORCID: 0009-0004-3083-2876, Email ID: alphonsiasony5@gmail.com
[2]Physical Education, Assistant Professor, Govt. Medical College Kottayam , Kerala university of Health Sciences, ORCID: 0009-0004-3083-2876, Email ID: bijukumarvl55@gmail.com
[3]Independent Researcher, Kerela, India, ORCID: 0009-0005-9487-7878, Email ID: deensedenhill@gmail.com
[4]Physical Education, Assistant professor, Mahatma Gandhi University, Kottayam, ORCID: 0009-0006-5942-1549, Email ID: achus5087@gmail.com
[5]Physical Education, HS PET, Kerala State Education Department, ORCID: 0009-0009-2776-3343, Email ID: dr.sudheeshsurendran@gmail.com
[6]Physical Education, HS PET, Kerala State Education department, ORCID: 0009-0004-1016-7047, Email ID: gopu056@gmail.com

Abstract

Background: Body image encompasses the intricate perception of an individual's own physical appearance, while somatotype provides a framework for describing body shape through anthropometric measurements. Assessing whether objectively measured body-composition traits correlate with body-image satisfaction is crucial for adolescent health and physical education.

Objective: This research explored body-image satisfaction and specific body-composition traits in school-going girls classified as endomorphic, mesomorphic, and ectomorphic. It further analyzed whether body-image satisfaction varied across these somatotype categories and its association with selected anthropometric variables.

Methods: Forty-five girls from three public schools in Thiruvananthapuram, Kerala were included in the final analysis, with 15 participants in each somatotype group. Somatotype classification was based on the Heath-Carter approach. Body weight, height, fat percentage, body mass index (BMI), lean body mass (LBM), body-fat weight (BFW), and height-weight ratio (HWR) were considered. Body-image satisfaction was assessed using the 19-item Body-Image Questionnaire. Descriptive statistics, an overall one-way ANOVA, pairwise independent-group t tests, effect sizes, and within-group Pearson correlations were considered.

Results: Mean body-satisfaction scores were 73.67 ± 13.08 for endomorphs, 80.67 ± 6.92 for mesomorphs, and 75.53 ± 9.80 for ectomorphs. The overall one-way ANOVA did not show a statistically significant difference among the three groups, $F(2,42) = 1.88$, $p = .166$, $\eta^2 = .082$. Pairwise differences were also non-significant: endomorphs versus mesomorphs, $t(28) = 1.832$, $p = .078$, $d = 0.67$; ectomorphs versus mesomorphs, $t(28) = 1.656$, $p = .109$, $d = 0.61$; and endomorphs versus ectomorphs, $t(28) = 0.442$, $p = .662$, $d = 0.16$. None of the reported within-group correlations exceeded the critical value of $r = .497$ at the .05 level.

Conclusion: Mesomorphs had the highest mean body satisfaction score and the group comparisons showed moderate standardized effects for the mesomorph - endomorph and mesomorph - ectomorph contrasts, but statistical significance was not demonstrated in this small sample. The findings suggest that somatotype related differences in objectively measured body characteristics should not automatically be interpreted as differences in body-image satisfaction.

Keywords: Body image, body satisfaction, somatotype, anthropometry, body composition, school-going girls, body mass index

1. Introduction

Body image is the perception, interpretation, and assessment individuals have of their own physical appearance, which may not align with actual body measurements or composition. This concept bridges the gap between physical traits and psychological interpretation. Adolescence is a time of rapid changes in body size and shape, coinciding with increased social comparison and concerns about appearance. Systematic reviews have shown that dissatisfaction with body weight is common among adolescents, particularly girls, although the prevalence varies depending on the population and measurement methods used (Bodega et al., 2024; Martini et al., 2023).

Body composition offers a more comprehensive understanding of physical build than body weight alone. Although BMI is a common metric linking body mass with height, it does not distinguish fat mass from fat-free mass. Percentage body fat, lean body mass, and body-fat weight can therefore provide complementary information.

Somatotyping is an organized method of anthropometry that classifies body types into three categories: endomorphy, mesomorphy, and ectomorphy. In the Heath-Carter framework, endomorphy is associated with relative fatness, mesomorphy with relative development of muscles and bones, and ectomorphy with relative slenderness (Carter, 2002). The connection between body composition and body image does not always follow a straightforward pattern. An individual's perception of their appearance might not align with their measured BMI or body fat percentage. Earlier studies have shown links between dissatisfaction with one's body and body weight or

BMI among adolescents, while also highlighting differences across various samples and measurement methods (Martini et al., 2023; Leppik et al., 2008).

The Body-Image Questionnaire (BIQ), associated with Bruchon-Schweitzer and colleagues, includes 19 items and has been described as yielding a general Body Satisfaction dimension. Koleck et al. (2002) examined this dimension in a large French sample. Combining a standardized body-satisfaction measure with anthropometric classification provides an opportunity to examine whether objectively defined physique profiles correspond to subjective body satisfaction.

The present study therefore focused on girls categorized into endomorphic, mesomorphic, and ectomorphic groups and examined differences in body-image satisfaction as well as associations with selected body-composition variables.

2.Objectives

(a)To describe body-image satisfaction and selected body-composition characteristics among girls classified as endomorphic, mesomorphic, and ectomorphic.

(b)To compare body-image satisfaction among the three somatotype groups.

(c)To examine the relationship between body-image satisfaction and BMI, lean body mass, body-fat weight, and height-weight ratio within each somatotype group.

3.Hypothesis

The study proposed that body-image satisfaction would differ among endomorphic, mesomorphic, and ectomorphic groups and that body-image satisfaction would be significantly related to selected body-composition variables.

4.Methods

4.1Research design

The study used a cross-sectional, comparative and correlational design. Somatotype was treated as the grouping variable and body-image satisfaction as the principal psychological outcome. Selected anthropometric and body-composition measures were considered explanatory variables.

4.2Participants and sampling

The final analytical sample consisted of 45 female students drawn from three public schools in Thiruvananthapuram, Kerala. There were 15 participants in each category: endomorphs (n = 15), mesomorphs (n = 15), and ectomorphs (n = 15). The present manuscript reports the final tested sample because participant-level screening records were not available for reanalysis.

4.3Somatotype assessment

Somatotype was determined using the Heath-Carter anthropometric method. The method expresses physique through endomorphy, mesomorphy, and ectomorphy (Carter, 2002). The source study reports the use of ISAK-related software for deriving somatotype and selected anthropometric variables.

4.4Body-composition variables

The variables reported were body weight, height, percentage body fat, BMI, lean body mass, body-fat weight, and height-weight ratio.

4.5Body-image assessment

Body-image satisfaction was assessed using the 19-item Body-Image Questionnaire associated with Marilou Bruchon-Schweitzer. The resulting body-satisfaction score was used as the principal psychological outcome.

4.6Statistical analysis

Means and standard deviations were used to describe the groups. Based on the reported group means, standard deviations, and equal sample sizes, an overall one-way ANOVA was used to assess the three-group difference in body satisfaction. Pairwise independent-group t-test results reported in the source analysis were retained. Cohen's d and η^2 were used as effect-size indicators. Pearson correlations reported separately within each somatotype group were also retained. Because participant-level raw data were unavailable, the present statistical revision is limited to analyses supportable from the reported summary statistics and does not reconstruct individual observations.

5.Results

5.1Descriptive profile

Variable	Endomorphs (n=15)	Mesomorphs (n=15)	Ectomorphs (n=15)
Body weight, mean ± SD	67.33 ± 8.29	50.07 ± 5.26	42.27 ± 6.12
Height, mean ± SD (cm)	160.20 ± 6.70	162.07 ± 6.84	159.93 ± 5.22
Fat percentage, mean ± SD	25.72 ± 1.62	17.13 ± 1.16	13.35 ± 0.94
BMI, mean ± SD	26.65 ± 2.99	18.95 ± 1.63	16.39 ± 1.63
Lean body mass, mean ± SD	50.30 ± 5.61	41.00 ± 4.84	36.59 ± 5.01
Body-fat weight, mean ± SD	17.29 ± 2.83	8.60 ± 1.20	5.68 ± 1.14
Height-weight ratio, mean ± SD	39.49 ± 1.82	44.04 ± 1.53	46.06 ± 1.31
Body satisfaction, mean ± SD	73.67 ± 13.08	80.67 ± 6.92	75.53 ± 9.80

The descriptive results demonstrate marked differences in anthropometric characteristics across the somatotype groups. Endomorphs recorded the highest mean body weight, fat percentage, BMI, lean body mass, and body-fat weight, whereas ectomorphs recorded the lowest values for these measures. Mesomorphs had the highest mean body-satisfaction score.

5.2Overall comparison of body satisfaction

The overall one-way ANOVA based on the reported group summary statistics yielded $F(2,42) = 1.88$, $p = .166$, with $\eta^2 = .082$. Thus, the observed variation in body satisfaction across somatotype groups did not reach the conventional .05 significance level. The η^2 value indicates that approximately 8.2% of the variance in the reported body-satisfaction scores was associated with somatotype grouping in this summary-level analysis.

Comparison	Mean difference	t	p	Cohen's d	Interpretation
Endomorph vs Mesomorph	-7.00	1.832	.078	0.67	Moderate effect; NS
Ectomorph vs Mesomorph	-5.14	1.656	.109	0.61	Moderate effect; NS

Endomorph vs Ectomorph	-1.86	0.442	.662	0.16	Small effect; NS

Mesomorphs had a higher mean body-satisfaction score than endomorphs and ectomorphs. The standardized differences were moderate for both comparisons (d = 0.67 and d = 0.61, respectively), although neither reached statistical significance. The endomorph–ectomorph comparison showed a small standardized difference (d = 0.16).

5.3Correlations between body satisfaction and body-composition variables

Somatotype	BMI	LBM	BFW	HWR
Endomorphs	.064	.315	.401	.035
Mesomorphs	.344	.106	.299	.417
Ectomorphs	.062	.100	.027	.016

None of the reported correlations exceeded the critical value of r = .497 at the .05 level with 14 degrees of freedom. The largest observed association was between height-weight ratio and body satisfaction among mesomorphs (r = .417), followed by body-fat weight and body satisfaction among endomorphs (r = .401).

6.Discussion

The present analysis indicates that mesomorphs had the highest mean body-satisfaction score, followed by ectomorphs and endomorphs. Nevertheless, the overall ANOVA did not demonstrate a statistically significant difference among the three somatotype categories. The pairwise tests similarly did not cross the conventional $p < .05$ threshold.

An essential aspect of the findings is that a lack of statistical significance does not necessarily mean the observed differences between groups were insignificant. Comparisons between endomorph–mesomorph and ectomorph–mesomorph groups showed moderate standardized effects, with values of d = 0.67 and d = 0.61, respectively. The relatively small sample size in each group might have restricted the statistical detection of these moderate effects. Therefore, it is important to consider both significance testing and effect-size information when interpreting the results.

The anthropometric findings indicate that somatotype classification was linked to notable differences in body composition characteristics. Endomorphs exhibited significantly higher average body weight, body-fat percentage, BMI, lean body mass, and body-fat weight, whereas ectomorphs had the lowest measurements. Despite these clear physical differences, there were no statistically significant variations in body satisfaction.

The within-group correlation findings also suggest that body satisfaction was not strongly associated with BMI, lean body mass, body-fat weight, or height-weight ratio within any of the three groups. This supports the view that body-image satisfaction is a multidimensional psychological construct and cannot necessarily be explained by anthropometric measurements alone.

From a physical-education perspective, the findings suggest that school programmes should avoid treating anthropometric status as a direct indicator of psychological body satisfaction. Health-oriented physical activity, functional fitness, balanced nutrition, body appreciation, and supportive psychosocial environments may be more appropriate components of school-based body-image education.

The interpretation of the statistical findings is limited by the absence of participant-level raw data. The present reanalysis therefore uses the reported summary statistics and does not claim analyses that require the original observations. In addition, the small sample, cross-sectional design, and single geographical area restrict

generalizability.

7.Limitations

•The final sample was small, with only 15 participants in each somatotype group.
•The participants were drawn from three public schools in a single geographical area, limiting generalizability.
•The cross-sectional design does not permit causal interpretation.
•Participant age, pubertal status, socioeconomic characteristics, physical-activity level, nutritional behavior, and appearance-related social-media exposure were not available in the source material.
•Participant-level raw data were unavailable; therefore, the revised statistical analysis was restricted to the reported summary statistics.
•The source material does not document ethical approval, informed consent/assent procedures, or instrument-language adaptation details. These should be added if they were obtained in the original investigation.

8.Conclusion

Among the 45 school-going girls included in the analysis, mesomorphs showed the highest mean body-satisfaction score. However, the overall difference among endomorphic, mesomorphic, and ectomorphic groups was not statistically significant, $F(2,42) = 1.88$, $p = .166$. Pairwise comparisons were likewise non-significant, although the mesomorph–endomorph and mesomorph–ectomorph contrasts showed moderate standardized effects. None of the examined body-composition variables demonstrated a statistically significant within-group correlation with body satisfaction. These findings indicate that measurable differences in physique and body composition do not necessarily translate into statistically demonstrable differences in perceived body satisfaction in this small sample.

9.Implications

•School physical-education programmes should address body image alongside physical fitness and anthropometric assessment.
•Anthropometric indicators should not be treated as direct substitutes for psychological assessment of body satisfaction.
•Future studies should recruit larger and more diverse samples to improve statistical power.
•Future research should include age, maturation status, physical activity, dietary behavior, social-media exposure, and psychosocial variables.
•Longitudinal studies could determine whether changes in body composition and somatotype are accompanied by changes in body-image satisfaction.

REFERENCES:

1. Bodega, P., de Cos-Gandoy, A., Fernández-Alvira, J. M., et al. (2024). Body image and dietary habits in adolescents: A systematic review. Nutrition Reviews, 82(1), 104–127. https://doi.org/10.1093/nutrit/nuad044.
2. Martini, M. C. S., Assumpção, D., Barros Filho, A. A., Mattei, J., & Barros, M. B. A. (2023). Prevalence of body weight dissatisfaction among adolescents: A systematic review. Revista Paulista de Pediatria, 41, e2021057.
3. Carter, J. E. L. (2002). The Heath-Carter Anthropometric Somatotype: Instruction Manual. San Diego, CA: San Diego State University.
4. Leppik, A., Rima, E., & Jürimä, J. (2008). Relationship between body image and body mass index in college men. Bibliographic details should be verified before submission.
5. Koleck, M., Bruchon-Schweitzer, M., Cousson-Gélie, F., Gilliard, J., & Quintard, B. (2002). The Body-Image Questionnaire: An extension. Perceptual and Motor Skills, 94(1), 189–196.

https://doi.org/10.2466/pms.2002.94.1.189.
6. Bowers, R. W., & Fox, E. L. (1979). Sports Physiology. Boston, MA: W.M.C. Brown.
7. Grundy, S. M., Blackburn, G., Higgins, M., Lauer, R., Perri, M. G., & Ryan, D. (1999). Physical activity in the prevention and treatment of obesity and its comorbidities. Medicine & Science in Sports & Exercise, 31(11 Suppl), S502–S508.
8. Schilder, P. (1950). The Image and Appearance of the Human Body: Studies in the Constructive Energies of the Psyche. New York: International Universities Press.
9. Mayors, C. R. (1974). Measurement in Physical Education. New York: The Ronald Press Company. Zeigler, E. F. (1982). Physical Education and Sport: An Introduction. Philadelphia, PA: Lea & Febiger.