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A Multivariate Study of Gender and Age Differences in Adolescent Quality of Life in Residential Schools

Jahangir Alom[1], Sima Khatun[2], Ashoke Mukherjee, PhD[3]*

[1]Research Scholar, Department of Physical Education and Sport Science, Visva-Bharati University, West Bengal, India
[2]Research Scholar, Department of Physical Education and Sport Science, Visva-Bharati University, West Bengal, India
[3]Assistant Professor, Department of Physical Education and Sport Science, Vinaya Bhavana, Visva-Bharati University, Santiniketan, West Bengal, India

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***Corresponding author:** Ashoke Mukherjee
Assistant Professor, Department of Physical Education and Sport Science, Vinaya Bhavana, Visva-Bharati University, Santiniketan, West Bengal, India

Abstract

This study investigated gender- and age-based differences in the quality of life (QoL) of residential school adolescents using the WHOQOL-BREF framework. A total of 216 students from residential schools in West Bengal, India, participated in the study (Male 14–15 years: n = 68; Male 16–17 years: n = 46; Female 14–15 years: n = 51; Female 16–17 years: n = 51). Participants were assessed across four Quality of Life (QoL) domains: physical health, psychological health, social health, and environment. A multivariate analysis of variance (MANOVA) was conducted to examine the combined effects of gender and age, followed by univariate analyses to identify domain-specific differences. The results revealed a significant gender difference only in the physical health domain, with males reporting higher physical health than females. No gender differences were found in psychological, social, or environmental domains. However, significant age differences emerged in these three domains, with younger adolescents reporting better overall QoL than older students. The findings highlight developmental and contextual influences on adolescents' lived experiences and underscore the need for residential schools to implement age-sensitive psychosocial support mechanisms to promote holistic well-being. These findings have implications for educational planning and student support systems in residential school settings.

Keywords: Adolescents; Age Differences; Gender Differences; Quality of Life; Residential Schools; WHOQOL-BREF.

INTRODUCTION

Quality of life (QoL) has become an essential construct in educational research, particularly in relation to the holistic development of children and adolescents (Lakić, 2012; Wallander & Koot, 2016). Beyond academic achievement, contemporary educational systems increasingly recognise the importance of physical, psychological, social, and environmental well-being in shaping students' overall functioning and long-term success (Norozi, 2023; Ly & Vella-Brodrick, 2024). Adolescence, as a transitional developmental period, is marked by rapid physical maturation, emotional reorientation, cognitive restructuring, and heightened social sensitivity (Mastorci *et al*., 2024). These changes can influence how young people perceive their health, relationships, and surroundings, making the assessment of QoL particularly relevant for this age group (Magiera & Pac, 2022; Gil-Lacruz *et al*., 2020). Within this context, residential schools present a unique environment where adolescents experience extended separation from family, structured routines, academic pressure, and communal living (George *et al*., 2024; Blau & Blau, 2019). These conditions may have both supportive and challenging effects on their well-being, underscoring the importance of systematically evaluating QoL among residential school learners (Lev-Wiesel *et al*., 2021; Zhong *et al*., 2024).

The WHOQOL-BREF framework is widely recognised as a robust tool for assessing QoL across diverse populations (Wong *et al*., 2018; Gil-Lacruz *et al*., 2022; Skevington *et al*., 2004). It encompasses four dimensions physical health, psychological well-being, social relationships, and environmental conditions which collectively offer a comprehensive understanding of individuals' perceived quality of life (Vahedi, 2010; Skevington *et al*., 2004). Studies using the WHOQOL-BREF have consistently demonstrated that adolescents'

QoL is influenced by numerous factors, including gender, age, socio-cultural contexts, lifestyle behaviours, and school environments (Kumari *et al*. 2024; Biswas *et al*., 2017; Chen *et al*., 2006). However, despite an expanding body of research on adolescent well-being, relatively few studies have explored QoL in residential school settings, particularly within the Indian context (Agnihotri *et al*., 2010; Biswas *et al*., 2017). India's residential schooling system, historically shaped by cultural, pedagogical, and socio-economic factors, is distinct from non-residential models (Gupta & Padel, 2018; Sharma *et al*., 2021). The structured environment, regulated schedules, limited family contact, peer dynamics, and institutional expectations can create a unique ecosystem that may affect students' perceptions of well-being across multiple domains (Martin *et al*., 2014; Li *et al*., 2023) .

Gender differences in adolescent QoL remain a widely discussed topic in global research. Several studies have reported that boys often exhibit better physical health indicators, largely due to higher engagement in physical activities, fewer body-image concerns, and lower rates of internalising symptoms (Bisegger *et al*., 2005; Parveen & Javed, 2015). Conversely, girls frequently report lower physical and psychological well-being, influenced by hormonal changes, social pressures, and differences in coping styles (Rajachar & Gupta, 2017; Bisegger *et al*., 2005). However, findings across studies remain inconsistent and context-dependent (Wang *et al*., 2022; Meade & Dowswell, 2016; X. Chen *et al*., 2020). Some research suggests negligible gender differences in psychosocial domains, indicating that environmental and institutional factors may moderate traditional gender patterns (Zaborskis & Grincaite, 2018; Mikkelsen *et al*., 2022). In residential schools, where students share similar routines, resources, and opportunities, gender-based disparities might be less prominent in psychological, social, or environmental domains, warranting further investigation (Hasanah *et al*., 2022; Hasan *et al*., 2017; Lev-Wiesel *et al*., 2021).

Age-related differences in adolescent QoL have also been documented. Younger adolescents (13–15 years) often report higher levels of well-being, possibly due to lower academic pressure, fewer social responsibilities, and a more optimistic developmental outlook (Cilar Budler & Stiglic, 2023; Ratra & Singh, 2022). In contrast, older adolescents (16–17 years) may experience increased academic stress, career-related anxieties, peer comparison, and evolving identity concerns, resulting in lower scores in psychological, social, and environmental domains. Residential school demands such as senior students' greater workload, leadership expectations, and reduced leisure time may intensify these developmental challenges (Mikkelsen *et al*., 2022; Lu *et al*., 2024). Nevertheless, empirical evidence specific to age-based QoL differences in residential school settings remains limited in the Indian educational landscape (Ram *et al*., 2021; Srivastava & Singh, 2016).

Despite the growing interest in adolescent well-being, there is a notable lack of multivariate studies examining the interplay between gender and age within residential schools (Singh & Junnarkar, 2014; Kumari *et al*., 2024). Much of the existing research relies on univariate or descriptive approaches, which fail to capture the combined influence of multiple demographic variables on different QoL domains (Singh & Junnarkar, 2014; Winn *et al*., 2025). A multivariate analysis of variance (MANOVA) is particularly suited to this area of inquiry, as it enables the simultaneous examination of multiple dependent variables, providing deeper insight into patterns that might not be evident through isolated analyses (Warne, 2014; Landler *et al*., 2022). The scarcity of MANOVA-based studies addressing QoL in Indian residential schools signals a clear methodological and conceptual gap.

Moreover, most Indian studies on adolescent QoL focus on urban, non-residential, or school-going populations at large, with limited attention to residential schools, which play a crucial role in the educational landscape of many regions, including West Bengal (Biswas *et al*., 2017; Ramadass *et al*., 2017; Raj *et al*., 2025). Residential schools cater to diverse groups of students, including those from rural, socio-economically disadvantaged, or geographically remote backgrounds (Rajendra & Sarin, 2021; Finnan, 2020). Understanding how gender and age shape their QoL can offer critical insights for educational policymakers, school administrators, counsellors, and curriculum designers, helping to develop targeted interventions that promote holistic well-being.

Given these gaps, the present study aims to examine the multivariate effects of gender and age on the QoL of adolescents studying in residential schools in West Bengal, using the WHOQOL-BREF as the evaluative framework. By applying MANOVA, the study provides a rigorous analysis of how these demographic factors jointly and individually influence physical health, psychological health, social health, and environmental perceptions. The findings are expected to contribute to the scholarly understanding of adolescent well-being in residential school contexts and inform practical strategies to enhance student life and learning environments. Understanding these demographic differences can help educators and school administrators design age- and gender-responsive educational and support programs.

METHODOLOGY

Research Design

The study employed a cross-sectional, quantitative research design to examine the influence of gender and age on multiple dimensions of quality of life among residential school adolescents using the

WHOQOL-BREF framework (Setia, 2016; Wong *et al*., 2018)

Participants and Sampling

A total of 216 adolescents (The final sample included 114 males and 102 females) from residential schools in West Bengal, India, participated in the study. The sample comprised four demographic subgroups: males aged 14–15 years (n = 68), males aged 16–17 years (n = 46), Females Aged 14–15 years (n = 51), and females aged 16–17 years (n = 51). A purposive sampling technique was used to recruit students who met the inclusion criteria, which included: (a) full-time residential school enrolment, (b) age between 14–17 years, and (c) willingness to participate voluntarily (Etikan *et al*., 2015). The detailed demographic and anthropometric characteristics are presented in Table 1.

Table 1: Demographic and anthropometric characteristics of the participants

Group	Male (Mean ± SD)		Female (Mean ± SD)		Total	
	14-15 (N-68)	16-17 (N-46)	14-15 (N-51)	16-17 (N-51)	Male (N-114)	Female (N-102)
Age	14.43 ± 0.50	16.49 ± 0.51	14.22 ± 0.42	16.39 ± 0.49	15.25 ± 1.13	15.30 ± 1.18
Height (mt.)	1.57 ± 0.06	1.65 ± 0.05	1.54 ± 0.05	1.56 ± 0.05	1.60 ± 0.07	1.60 ± 0.07
Weight (kg.)	45.54 ± 6.65	52.00 ± 5.53	43.37 ± 4.35	48.00 ± 5.27	48.15 ± 6.96	45.69 ± 5.34
BMI (Kg. / mt.^{2})	18.33 ± 1.83	19.13 ± 1.75	18.42 ± 1.75	19.65 ± 1.96	18.65 ± 1.13	19.03 ± 1.95

Note: SD = Standard Deviation; mt. = Meter; Kg. = Kilogram; N = Number of participants

Instrumentation

The WHOQOL-BREF questionnaire, developed by the World Health Organisation, was used to assess participants' perceived quality of life across four domains: physical health, psychological well-being, social relationships, and environmental conditions (Skevington *et al*., 2004)

The instrument has demonstrated acceptable reliability and validity across different populations and has been used in previous adolescent research (Skevington *et al*., 2004). In the present study, the WHOQOL-BREF demonstrated acceptable internal consistency across domains, consistent with prior adolescent research.

Procedure

Permission to conduct the study was obtained from institutional authorities before data collection. The purpose of the study was explained to students, and informed consent was obtained from participants and their guardians. The questionnaire was administered in a classroom setting under supervision to ensure clarity, confidentiality, and independent responses. No identifying personal information was collected.

Ethical Considerations

The study adhered to the standard ethical principles for educational research involving human participants. Approval was obtained from the Departmental Research Committee of the authors' institution before data collection. Participation was voluntary, informed consent was obtained from parents/guardians, and assent was obtained from the adolescents. Anonymity and confidentiality of responses were ensured, and no identifying information was collected.

Statistical Analysis

Data screening and analysis were performed using the jamovi software (The jamovi project, 2025). Descriptive statistics were calculated for all four QoL domains. A multivariate analysis of variance (MANOVA) was conducted to test the combined effects of gender and age, followed by univariate ANOVAs for domain-specific comparisons (Frost, 2017; Çakir & Kalkavan, 2020). Effect sizes were calculated using Cohen's d, with d = 0.2 indicating small, 0.5 medium, and ≥ 0.8 large effects (Sullivan & Feinn, 2012). Statistical significance was set at $p < .05$.

RESULTS

The purpose of this study was to examine the influence of gender and age on four domains of quality of life (QoL) among residential school adolescents. Descriptive statistics (see Table 2) indicated that male students reported higher physical health scores across both age groups, whereas younger adolescents (14–15 years) consistently showed better psychological, social, and environmental well-being compared to older adolescents (16–17 years), irrespective of gender. Overall, the data demonstrated acceptable distributional properties with normality assumptions being satisfied, allowing for further inferential analysis.

Table 2: Descriptive Statistics for WHOQOL-BREF Domains (N = 216)

Domain	Gender	Age Group	Mean (SD)	Skewness	Kurtosis
Physical Health	Male	14–15	51.37 (10.67)	–0.56	–0.30
	Male	16–17	47.52 (11.76)	0.06	–0.01
	Female	14–15	42.93 (9.57)	–0.56	1.43
	Female	16–17	43.77 (10.54)	0.19	–0.81
Psychological Health	Male	14–15	65.99 (13.07)	–0.37	–0.26
	Male	16–17	54.26 (13.96)	–0.10	–0.71
	Female	14–15	65.36 (14.45)	–0.86	1.07
	Female	16–17	56.21 (13.11)	–0.07	–0.18
Social Health	Male	14–15	62.38 (18.35)	–0.58	–0.07
	Male	16–17	53.80 (18.06)	–0.05	0.01
	Female	14–15	58.49 (17.91)	–1.02	1.8
	Female	16–17	53.41 (18.59)	–0.74	0.27
Environment	Male	14–15	59.01 (13.49)	–0.10	–0.61
	Male	16–17	50.00 (13.79)	–0.22	0.24
	Female	14–15	56.80 (13.25)	–0.58	1.02
	Female	16–17	49.15 (13.29)	0.56	–0.74

To assess the relationships among the dependent variables, Pearson correlation coefficients were computed (see Table 3). All four QoL domains demonstrated significant positive correlations at the 0.01 level, indicating meaningful interdependency across the physical, psychological, social, and environmental dimensions. These results confirmed the suitability of a multivariate approach and supported the decision to conduct a MANOVA.

Table 3: Correlation Matrix Among WHOQOL-BREF Domains (df = 214)

Domain	Physical Health	Psychological Health	Social Health	Environment
Physical Health		.434**	.334**	.426**
Psychological Health			.432**	.532**
Social Health				.426**
Environment				

Note. p < .01.

A two-way multivariate analysis of variance (MANOVA) was carried out to determine the combined effects of gender and age on QoL domains (see Table 4). The results revealed a statistically significant multivariate main effect of gender (Pillai's Trace = 0.101, F (4, 209) = 5.90, p < .01) and age (Pillai's Trace = 0.162, F (4, 209) = 10.10, p < .01), indicating that both factors independently contributed to differences in overall QoL among participants. However, the interaction between gender and age was not significant (Pillai's Trace = 0.013, F (4, 209) = 0.69, p > .05), suggesting that the influence of gender was consistent across age groups and vice versa.

Table 4: Two-way Multivariate Analysis (MANOVA)

Effect	Pillai's Trace	F (4,209)	Sig.
Gender	0.101	5.90**	p < .01
Age	0.162	10.10**	p < .01
Gender × Age	0.013	0.69	p > .05

Follow-up univariate ANOVAs were performed to identify the specific domains contributing to these multivariate effects (see Table 5). A significant gender difference was found only in the physical health domain (F (1, 212) = 17.35, p < .01, η^2p = .076), with males reporting better physical functioning and perceived health status than females. No significant gender differences were observed in psychological health (p > .05), social relationships (p > .05), or environmental conditions (p > .05), suggesting that males and females experienced comparable well-being in these three areas of their residential school environment.

Regarding age, statistically significant differences emerged in three domains: psychological health (F (1, 212) = 31.15, p < .01, η^2p = .128), social health (F (1, 212) = 7.41, p < .05, η^2p = .034), and environmental health (F(1, 212) = 20.28, p < .01, η^2p = .087). In each case, the younger adolescents (14–15 years) scored significantly higher than older adolescents (16–17 years), indicating better emotional functioning, stronger peer relationships, and more positive perceptions of their living and learning environment. No significant age-related difference was found in physical

health ($p > .05$), suggesting that bodily well-being remained stable across mid-adolescent years.

Table 5: Univariate ANOVA Summary for QoL Domains

Source	Physical Health (η^2_p)	Psychological Health (η^2_p)	Social Health (η^2_p)	Environment (η^2_p)
Gender	17.35** (.076)	0.124 (.001)	0.727 (.003)	0.684 (.003)
Age	1.058 (.005)	31.15** (.128)	7.41* (.034)	20.28** (.087)
Gender × Age	2.57 (.012)	0.477 (.002)	0.481 (.002)	0.133 (.001)

Note: ** = $p < 0.01$, * = $p < 0.05$, η^2p = partial eta squared

To further clarify these differences, Bonferroni-adjusted post hoc tests were conducted (see Table 6). The results confirmed that the observed main effect of gender on physical health favoured male students with a moderate effect size. Additionally, the significant differences between age groups in the psychological, social, and environmental domains consistently favoured younger students, with effect sizes ranging from small to large.

Table 6: Bonferroni Post-Hoc Comparisons

Domain	Comparison	MD	t	p	Cohen's d
Physical Health	Male > Female	6.09	4.17	< .001**	0.573
Psychological Health	14–15 > 16–17	10.44	5.58	< .001**	0.768
Social Health	14–15 > 16–17	7.12	2.86	.005**	0.391
Environment	14–15 > 16–17	8.51	4.64	< .001**	0.634

In summary, the results of the study demonstrated that gender specifically influences the physical health aspect of QoL among residential school adolescents, while age plays a more prominent role in shaping their psychological well-being, social connectedness, and satisfaction with the school environment. The absence of significant interaction effects indicates that these influences are independent and not contingent upon each other. These findings collectively highlight distinct developmental and gender-based variations in the perceived quality of life in residential school settings.

DISCUSSION

This study examined gender- and age-related differences in the quality of life of residential school adolescents using the WHOQOL-BREF framework. The results provided clear evidence that both demographic factors contribute uniquely to adolescents' perceived well-being within structured school environments.

A significant gender difference was observed in the physical health domain, with males reporting better perceived physical functioning than females. These findings are consistent with prior research indicating that male adolescents typically engage in higher levels of physical activity, demonstrate greater muscle strength, and perceive themselves as more physically capable than their female peers (Hermassi *et al*., 2023; Chen *et al*., 2006). Social expectations and body-image concerns may contribute to girls having a comparatively lower perception of physical fitness and overall physical well-being (Baceviciene *et al*., 2019). In the highly structured residential school environment, where physical training is regular and uniform, boys may adapt more favourably to the physical challenges of the institutional routine, resulting in higher physical health scores (Greier *et al*., 2019; Da'i *et al*., 2023; Brazo-Sayavera *et al*., 2021).

In contrast, psychological health, social relationships, and environmental well-being did not differ significantly between males and females. This outcome suggests that both genders have relatively similar emotional functioning, peer interactions, and perceptions of support and safety in residential schools (Gil-Lacruz *et al*., 2020; Wong *et al*., 2018). Shared living arrangements, equal access to academic and recreational resources, and comparable exposure to institutional routines may minimise the gender-based inequalities often seen in non-residential settings (Syed, 2017; Cherewick *et al*., 2021). The absence of gender disparities in these domains highlights the potential equalising impact of residential schooling on psychological and social experiences (Gil-Lacruz *et al*., 2022; Rigby, 2012).

The results demonstrated notable age-based differences across psychological, social, and environmental domains, with younger adolescents (14–15 years) scoring significantly higher than older adolescents (16–17 years). These patterns align with developmental research indicating that as adolescents progress toward senior grades, they experience increasing academic pressure, social expectations, and responsibility (Magiera & Pac, 2022; Mikkelsen *et al*., 2022). Older adolescents often face important career-related decisions and competitive examinations, leading to heightened stress and reduced well-being (Nagabharana *et al*., 2021; Kamath & Baruah, 2023). Additionally, their growing sensitivity toward peer evaluation and social acceptance may negatively

influence their perceived social support and satisfaction (Petersen *et al*., 2023; Shah *et al*., 2024).

Age differences in environmental well-being also highlighted that older adolescents tend to perceive their surroundings less positively than younger students (Wang *et al*., 2022; Aymerich *et al*., 2021). Over time, adolescents may become more aware of institutional rules, discipline, physical infrastructure limitations, and restricted autonomy inherent in residential schooling (Aulianissa Manindjo *et al*., 2023). As expectations rise with age, the school environment may be perceived as more demanding and less accommodating, contributing to lower environmental scores in senior groups (Wu & Becker, 2023).

Interestingly, no significant age difference was found in physical health, indicating that bodily functioning and perceived physical status remain relatively stable across mid-adolescent years in this sample (Wu & Becker, 2023; Rajmil *et al*., 2009). The standardised physical activity routines in residential schools may contribute to maintaining similar levels of physical capability across age groups (Khodnapur *et al*., 2012; Widianto *et al*., 2019).

The lack of a significant interaction between gender and age shows that their effects on QoL act independently (Warne, 2014). In other words, gender differences in physical health remain consistent across age groups, and age differences in psychological, social, and environmental well-being persist regardless of gender.

Collectively, these findings highlight two key implications. First, gender-responsive strategies may be necessary to enhance the physical well-being of female students in residential schools, potentially through improved sports participation, physical literacy programs, and supportive health counselling. Second, age-appropriate psychosocial support systems are essential, particularly for older adolescents who face added pressures and transitional challenges. Strengthening mental health services, peer-support initiatives, and opportunities for autonomy and leadership may improve their well-being.

This study contributes valuable insights to adolescent well-being research, particularly within the relatively understudied context of Indian residential schools. However, some limitations must be acknowledged. The study relied on self-reported data, which may be influenced by subjective bias. Additionally, the cross-sectional design does not capture developmental changes over time. Future studies may benefit from longitudinal analysis, inclusion of qualitative perspectives, and comparisons with non-residential adolescents to gain a deeper understanding of contextual influences on quality of life.

CONCLUSION

In conclusion, gender influences the physical dimension of well-being, while age significantly affects psychological, social, and environmental domains of quality of life among residential school adolescents. The findings underscore the need for targeted interventions that address gender-specific and developmental challenges to promote holistic well-being in residential school settings.

RECOMMENDATIONS

Based on the findings of the present study, it is recommended that residential schools implement gender-sensitive physical health programs with particular emphasis on improving physical activity participation and health awareness among female students. Age-specific psychological support services, including regular counselling and stress-management programs, should be strengthened, especially for older adolescents who exhibited lower psychological well-being. Efforts should also be made to enhance social support systems through structured peer interaction, mentorship, and increased teacher–student engagement. In addition, continuous improvement of the residential and learning environment related to safety, sanitation, recreation, and infrastructure is essential. Regular monitoring of adolescents' quality of life using standardised tools such as the WHOQOL-BREF is further recommended, along with policy-level initiatives that integrate quality-of-life indicators into the evaluation framework of residential schools to promote holistic adolescent development.

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