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Comparative Study of Barriers to Physical Activity in Relation to Health and Wellness among Female Adolescents of Tier 1 & Tier 3 Cities

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ABSTRACT:

Background: Adolescence represents a pivotal phase for the formation of enduring physical activity routines; nevertheless, a significant number of adolescents globally, especially in India, do not achieve the suggested levels of physical engagement. Although obstacles to physical activity and their effects on adolescent health have been thoroughly examined, the majority of current studies have concentrated on gender differences or general urban-rural distinctions, resulting in a lack of insight into how these barriers and their association with health and wellness vary across specific city-tier classifications in India.

Objectives: The study sought to investigate the correlation between barriers to physical activity and health and wellness in Tier 1 adolescents, and explore the same correlation in Tier 3 adolescents, contrast the barriers to physical activity between Tier 1 and Tier 3 adolescents, and evaluate health and wellness differences between Tier 1 and Tier 3 adolescents.

Methods: A comparative cross-sectional approach was utilized involving 30 adolescents from each Tier 1 and Tier 3 cities (N = 60). Obstacles to physical activity were evaluated with the Barriers to Being Active Quiz (BBAQ-21; USDHHS, 1999), which encompasses seven kinds of barriers, whereas health and wellness was measured using the Health and Wellness Assessment (Edlin & Golonty, 2007), which includes six characteristics of wellness. Shapiro-Wilk tests revealed deviations from normality in multiple subscales; thus, Spearman's rank-order correlation was employed for Objectives 1 and 2, while Mann-Whitney U tests and one-way multivariate analysis of variance (MANOVA, Hotelling's T^2) was employed for Objectives 3 and 4, with parametric counterparts (Pearson's r, independent samples t-test) provided for comparison. Both instruments exhibited strong internal consistency (Cronbach's $\alpha = 0.885–0.895$) among the groups.

Findings: In Tier 1 adolescents, "Time Constraints" and "Peer Pressure" exhibited substantial negative correlations with many wellness aspects, with Peer Pressure impacting emotional well-being, physical fitness and body maintenance, environmental wellness, and stress levels (all $p < 0.05$). Among Tier 3 adolescents, none of the category of barriers showed a significant association with any aspect of wellbeing (all $p > 0.05$). The analysis of barriers among Tier 1 and Tier 3 adolescents indicated no significant differences, both

in individual categories and in the comprehensive multivariate barrier profile (MANOVA: $T^2 = 11.24$, $F(7, 52) = 1.44$, $p = 0.210$). In terms of health and wellness, no single category exhibited significant changes between the two groups; yet, the comprehensive multivariate wellness profile showed a significant difference (MANOVA: $T^2 = 15.64$, $F(6, 53) = 2.38$, $p = 0.041$), predominantly influenced by variations in Stress and Environmental Health.

Conclusion: Barriers to physical activity significantly forecast health and wellness results in Tier 1 adolescents, however this is not the case for Tier 3 adolescents, despite both demographics indicating similar levels of barriers overall. Simultaneously, adolescents in Tier 1 and Tier 3 show nuanced yet substantial variations in their overall wellbeing profile, a distinction not solely ascribed to constraints related to physical exercise. These results indicate that initiatives aimed at overcoming barriers to physical activity (especially time limitations and social pressures) could be more beneficial for enhancing wellness in Tier 1 settings, while Tier 3 initiatives might require a focus on wider environmental and lifestyle elements beyond just activity-related barriers.

INTRODUCTION

Adolescence is a pivotal developmental phase characterized by swift biological, psychological, and social changes. Cultivating health-enhancing habits at this juncture—particularly consistent physical activity (PA)—is crucial for ensuring enduring health and wellness results **(World Health Organization [WHO], 2020).** Consistent physical activity diminishes the first threats of non-communicable lifestyle ailments, improves cardiorespiratory health, and elevates mental well-being by alleviating anxiety and unhappiness with body image **(Biddle et al., 2014).** Nonetheless, worldwide public health patterns continually indicate a significant reduction in physical activity levels among adolescents, with female adolescents demonstrating considerably lower engagement rates than their male peers **(Guthold et al., 2020).**

Comprehending this gender-related inequality necessitates an analysis of the intricate array of individual, societal, cultural, and environmental barriers that impede women's participation in sports and physical activities **(Bauman et al., 2012).** Barriers to physical activity in adolescent females are multifaceted. At both the personal and social dimensions, elements such educational stress, time constraints, apprehension of injury, menstruation pain, body image issues, and entrenched gender stereotypes frequently inhibit active engagement **(Manic et al., 2021; Satija et al., 2018).** In addition to personal characteristics, structural and environmental conditions significantly influence adolescent's lifestyle behaviors **(Sallis et al., 2006**). In India, ecological conditions differ significantly throughout urban strata, especially between Tier 1 (major metropolitan areas) and Tier 3 (minor urban locales or semi-urban townships). urban areas: In Tier 1 Cities Young females frequently contend with intense academic rivalry, excessive screen time, congested metropolitan environments, protracted travel durations, and a scarcity of accessible, secure public parks. In contrast, they generally have superior access to exclusive exercise facilities, structured sports academies, and institutional athletic infrastructure. Whereas, in Tier 3 Cities, Young females often encounter constraining traditional socio-cultural standards, insufficient female-friendly or secure public areas, and a scarcity of athletic facilities. Nonetheless, they could gain from reduced urban congestion and more accessibility to open communal areas.

Assessing obstacles to physical activity without considering variations in urban tiers creates a significant void in health promotion initiatives. Recognizing these particular barriers is crucial for formulating targeted interventions that address urban inequities, enhance health literacy, and promote physical well-being among adolescent females in various environments.

PROBLEM-STATEMENT

The Purpose of the present study was to Compare the barriers to Physical Activity in relation to Health and Wellness among female adolescents of Tier 1 & Tier 3 cities. The objectives formulated under the research are:
-To see the relation between barriers to being physically active and their relation with health and wellness in tier 1 adolescents.

-To see the relation between barriers to being physically active and their relation with health and wellness in tier 3 adolescents.

-To Compare the barriers to being physically active among tier 1 and tier 3 adolescents.

-To Compare the Health and wellness among tier 1 and tier 3 adolescents.

METHODOLOGY

Sample selection & and Sampling Technique: The sample selected was from metropolitan city namely Delhi and Remote Rural areas of Jhajjar District from Haryana. A total of Sixty (n = 60) subjects, Thirty Female (n=30) each from tier 1 and tier 3 city were selected. The adolescents selected were in their late adolescent stage. The sample was selected using randomized sampling technique.

Selection of Variables: The variable chosen to assess was Barriers to Being Active and Health & Wellness assessment as the broad variables under the study.

Tools and Techniques:

For the purpose of comparing The Barriers to Physical Activity "Barriers to Being Active Quiz (BBAQ-21)" constructed by United States Department of Health and

Human Service (USDHHS, 1999) was used. Health and Wellness was measured by using "Health and Wellness Assessment" developed by Gordan Edlin and Eric Golanty (2007).

Review Of related Literature

Inadequate physical activity (PA) levels are reported among Indian youth, with adolescents, particularly girls, having the lowest levels. We aimed to identify barriers to and enablers of PA among school children in New Delhi, examining potential differences by gender and school type (government vs. private). A total of 174 students (private school) participated in the study. students = 88There are 47% girls in government schools. students = 86A study involving 48% girls aged 12 to 16 from two Delhi schools conducted 16 focus group discussions (FGDs) with bilingual moderators. The FGDs were conducted separately for girls and boys, students in Grades VIII and IX, and private and government schools. Government school students in Hindi were interviewed, and their transcriptions were translated to English for analysis. The transcriptions were coded using a combination of inductive and deductive approaches, guided by the "youth physical activity promotion model. "The study identified various personal, social, and environmental barriers and enablers for physical activity (PA) among adolescents in India. Personal barriers included body image-related negative consequences of PA participation cited by private school girls. Social barriers included more social censure for participating in PA faced by girls from both schools. Environmental barriers included reduced opportunities for PA in schools, commonly reported across all participants. Personal enablers included perceived health benefits of PA reported by all participants. Social enablers included active parents and sports role models as motivators for increasing PA among several participants. Few environmental enablers were identified. This study underscores the need for further investment in physical activity within schools and for gender-sensitive policies to encourage PA participation among adolescents in India. **(Ambika Satija 1, 2018)**

This study aimed to understand the perceived benefits, facilitators, disadvantages, and barriers to physical activity among South Asian adolescents in India and Canada. Thirteen focus group discussions were conducted with South Asian adolescent boys and girls from different nutritional and socioeconomic backgrounds in rural and urban India and urban Canada. Across all groups, fitness and energy were perceived as major benefits of physical activity. In India, better academic performance was highlighted, while health benefits were well-detailed in Canadian groups. In all settings, friends, family, and teachers were perceived as both facilitators and barriers to physical activity. Lack of a safe space to play was a major concern for urban adolescents, while academic pressures and preference for other sedentary recreational activities were common barriers across all groups. Girls were less likely than boys to be interested in physical activity, and their participation in India was further limited by societal restrictions. The study suggests key areas for promoting physical activity among South Asian adolescents, including balancing academic pressure with opportunities for physical activity, especially in India; urban planning for a built environment conducive to physical activity; and gender-sensitive programming to promote girls' activity that also addresses culture-specific barriers. **(Divya Rajaraman 1, 2015)**

During adolescence, a critical phase in human life, the groundwork for a healthy future is established. However, physical inactivity poses a significant risk factor for non-communicable diseases (NCDs) and related mortality worldwide. To assess adolescents' behavioural intentions regarding regular physical activity, the Theory of Planned Behaviour (TPB) examines 'Attitude', 'Subjective norm', and 'Perceived behavioural control'. This study, conducted using the TPB, aims to evaluate the impact of a school-based health promotion intervention on behavioural intentions towards physical activity among urban

adolescents in West Bengal, India**.** A school-based non-randomised controlled interventional study with a parallel group design was conducted among adolescents aged between 12 and 16 years. Behavioural intentions towards performing regular physical activity were determined by measuring the constructs from the TPB. Cluster analysis was conducted using measurements from both the intervention and control groups. Participants with higher mean scores in the constructs were classified as intenders, while the rest were considered non-intenders.

The intervention's impact was evaluated by calculating the Relative Risk (RR) through a generalised linear model with robust standard error estimates. This allowed for the assessment of the probability of belonging to the higher intention cluster**.** Following the intervention, construct-wise scores improved significantly, particularly the perceived behavioural control mean score in the intervention group. The Relative Risk (RR) of becoming an intended for regular physical activity in the intervention group was 1.24 (95% CI: 1.04-1.48) when compared to the control group.**This finding suggests that health promoting schools can effectively reduce the emergence of significant NCD risk factors like physical inactivity.** Health promoting schools have been recognised as a strategic and cost-effective vehicle to promote positive development and healthy living. Schools must establish strong partnerships with diverse stakeholders to address barriers beyond their immediate environment and gain greater control over critical issues. (**Jha**, **2024**)

Physical inactivity is a major global health concern, accounting for one in every ten deaths. Adolescents, comprising 18% of the world's population, are particularly vulnerable to becoming physically inactive in the future. This study aims to assess the level of physical activity (PA) among late adolescents and identify the factors that motivate and prevent them from being active. A sample of 450 adolescents aged 18-19 years was included in the study. Standardised self-administered questionnaires, including the Global Physical Activity Questionnaire and the Behavioural Regulation in Exercise Questionnaire, were used to measure PA levels and motivation, respectively. Additionally, barriers to participating in PA were explored. The study revealed that approximately one-third of the participants (32.4%) were physically inactive. Motivation levels were predominantly driven by self-determined motives, and girls were more motivated to engage in PA than boys. However, PA levels among males were significantly higher than those among females. Interestingly, healthy family practices were found to be associated with increased PA levels. The primary barriers identified were excessive electronic gadget use and lethargy. This study highlights the concerning prevalence of physical inactivity among late adolescents and the significant barriers that prevent them from being active. To address this issue, efforts should be made at various levels, including institutional and community levels, to emphasise the importance of physical activity among individuals, family members, and peers. By doing so, we can lay the foundations for healthy lifestyles in the future and prevent the emergence of risk factors for non-communicable diseases (NCDs) such as physical inactivity. (**Divyasree**, **2018**)

Physical activity (PA) offers numerous mental and physical health benefits. However, young people and children often engage in low levels of PA, particularly as they progress from primary to secondary school. To improve physical health among school-going children, different schools should implement school-based PA intervention programs. Researchers designing PA intervention protocols for school children face various challenges during implementation. This narrative review aims to identify these challenges and barriers encountered during data collection on PA among school-going adolescent children. The review highlights the key issues related to the implementation of school-based PA and fitness programs for school children. These include problems with communication with schools, recruitment of participants and obtaining informed consent, implementation and data collection, the school environment, and barriers to PA in schools. Documenting these difficulties can enhance the knowledge and efficacy of researchers, leading to stronger relationships with school-based educational institutions. This collaboration can ultimately result in the implementation of intervention protocols and improved physical fitness among schoolchildren. (**Nagrale**, **2024**)

Adolescence is a time of rapid physical, psychological, and social changes. Recent studies show that during this stage, adolescents experience a decrease in physical activity (PA) levels, along with high rates of overweight and obesity. This study aimed to assess PA levels and physical condition (PC) related to perceived barriers (PB) and limiting factors for PA practice in a randomised sample of adolescents in Barcelona, Spain. The study considered overweight status and gender. A cross-sectional study was conducted with 143 adolescents (53.8% boys, median age of 15 years) from Secondary Education in public schools located in a randomly selected district (Sants – Montjuïc) in Barcelona. The variables assessed included PC (ALPHA-Fitness), PA levels (Physical Activity Questionnaire PAQ-A), and perceived barriers (Self-Reported Barriers to Participation in Physical Activity questionnaire). The different variables were tested by calculating means and standard deviations, considering the

presence/absence of overweight and the adolescents' gender. Means between groups were compared using Student's t test. The results showed significant differences in most variables, suggesting a correlation between being overweight or obese and having a worse PC. Additionally, gender (being a girl) and body mass index (overweight or obese) showed a direct correlation to perceiving significantly greater barriers to PA practice. (**Fernández**, **2017**)

Great attention is now being paid to effective policies and programmes to promote physical activity among adolescents. Girls consistently found to be less active than boys. This study aimed to assess gender differences in perceived barriers to physical activity practice and their relationship with physical activity levels and physical condition among adolescents. Methods and results: A cross-sectional study was conducted in February–April 2017 among students. (n =In the final year of two state high schools in Florence, Italy, 368 participants underwent anthropometric measurements (height, weight, waist, and hip circumferences), blood pressure, and the administration of three standardised questionnaires: the International Physical Activity Questionnaire, the Mediterranean Diet Score Quiz, and the Barriers to Being Active Quiz. Gender differences were assessed using a multivariate logistic regression model, adjusted for age and body mass index. The results showed that the prevalence of participants who reached recommended levels of physical activity was lower among girls compared to boys (OR 0.27; 95% CI 0.17–0.43). Additionally, girls reported a higher number of perceived barriers to physical activity (OR 1.52; 95% CI 1.29–1.79). Lack of energy for exercise and lack of willpower were the two barriers most frequently reported by girls. Multivariable adjusted logistic regression analysis revealed that gender (female) and positivity of at least one perceived barrier (score ≥ 5) were independently selected as the main determinants of non-compliance with WHO criteria for physical activity. Exercise professionals should be aware of the barriers that young girls may face during exercise prescription and be able to provide them with useful individual strategies to overcome these challenges. (**Martina Rosselli**, **2020**)

The aim of this research was to identify the most common barriers to physical activity in adolescents, based on a systematic review of published studies. The research included original scientific studies that analysed barriers to physical activity in adolescents, using questionnaires to assess the barriers. The studies were conducted from January 1, 2003, to July 2020. The final analysis, based on the set criteria, included 11 studies that were processed and presented. The results showed that more internal barriers than external ones occur in girls compared to boys. External barriers, such as lack of time and school obligations, are more common causes of not engaging in physical activity in boys. Among girls, the most commonly reported barriers were "I'd rather do some other activities" and a lack of time. This research provides valuable information on the reasons why adolescents reduce or stop engaging in physical activity. It helps identify the barriers that need to be addressed to promote physical activity among this age group. (**Božić**, **2021**)

To identify barriers to physical activity (PA) for adolescents, considering gender and age, and examine the association between these barriers and their physical activity levels. A cross-sectional, nationally representative study involving 3,346 students aged 10 to 16 years (1,759 girls) was conducted. The dataset used in this paper was derived from adolescents who reported perceived barriers to PA. N=2300A study of 1,259 girls aged 13-16 years examined barriers and physical activity (MVPA) among them. Barriers were analysed for all participants and separately for boys and girls, as well as by age group and place of residence. Multiple regression analysis was used to examine the relationships between perceived barriers and physical inactivity for all participants, and then separately for boys and girls. Results showed that lack of energy, lack of time, and lack of support were three of the five barriers reported by more than 40% of adolescents. Girls were statistically more likely than boys to report these barriers, and older youth were more likely than younger youth to report them. For boys, lack of time was the most common barrier. (OR=2.56; CI=1.66-3.96)Lack of skills (OR=2.35; CI=1.94-3.95)Lack of willpower (OR=1.71,CI=1.05-2.80)The lack of support is a significant issue. (OR=1.64, CI= 1.11-2.41)Were the predictors contributing to the low level of physical activity? Girls lack the skills. (OR=3.16, CI=1.62-6.18)Lack of energy (OR=1.84, CI=1.14-2.96)Lack of support (OR=1.64, CI=1.07-2.54)Lack of time (OR=1.61,CI=1.00-2.60) Perceived barriers to physical activity among adolescents have a strong negative impact on the recommended level of physical activity. Girls are most affected by a lack of skills, while boys are most affected by a lack of time. Identifying more precisely the barriers to physical activity among adolescents will enable the development of more effective interventions in high-risk populations.. (**Maria Jodkowska**, **2015**)

Adolescence is a critical period of development when personal lifestyle choices and behaviour patterns are established, including the choice to be physically active. However, physical inactivity, sedentary behaviour, and low cardiorespiratory fitness are strong risk factors for the development of chronic diseases, leading to morbidity and mortality, as well as economic burden through health and social care provision and reduced occupational productivity. Worryingly, there are concerning trends in adverse

physical activity behaviours, necessitating urgent and concerted action. Healthcare professionals caring for adolescents and young adults are ideally placed and suited to deliver powerful messages promoting physical activity and behaviour change. Every encounter presents an opportunity to ask about physical activity, provide advice, or signpost to appropriate pathways or opportunities. Key initial targets include reducing sedentary behaviour and increasing activity levels, even small amounts being more beneficial than none at all. (**Bhavesh Kumar** (**consultant physician in sport and exercise medicine**) A, **2015**)

This study aimed to explore the associations between physical activity intensity and well-being (positive and negative affect) in adolescents. A secondary aim was to determine if these associations were moderated by sex. Grade 8 students from 14 government-funded secondary schools in low socio-economic areas of Western Sydney (Australia) were assessed. Data from three timepoints (baseline, 7–8 months, and 14–15 months) were combined to increase the sample size. Physical activity was objectively assessed for one week at each timepoint using Actigraph accelerometers, and the time spent in light, moderate, and vigorous physical activity was estimated. The short form Positive and Negative Affect Scale for Children was used to measure well-being. Quantile regression was used to analyse the data. A total of 3140 observations were collected from 1223 students (mean age at baseline: 12.9 (0.54); 55.1% male). Surprisingly, light and moderate physical activity was not associated with well-being. However, higher levels of vigorous physical activity were associated with more positive affect [β(SE) = 0.307 (0.06), $p < 0.001$]. This association suggests that there may be a turning point in the impact of vigorous physical activity on well-being, with an estimated vigorous physical activity turning point of 36.48 minutes per day (31.39–41.59 minutes). Similarly, higher levels of vigorous physical activity were associated with less negative affect.β(SE) =Adolescents who engaged in vigorous physical activity experienced a significant reduction in negative affect, with a negative association that was more pronounced in females than males. This reduction in negative affect was observed up to the estimated vigorous physical activity turning point, which was 37.35 minutes of vigorous physical activity per day (31.27 to 43.44 minutes). Our findings emphasise the importance of adolescents engaging in vigorous physical activity to improve their positive affect and reduce negative affect. (**Sarah** A. **Costigan** a b, **2019**)

Physical activity during adolescence may contribute to the development of healthy adult lifestyles, helping to reduce the incidence of chronic diseases. However, defining the optimal amount of physical activity in adolescence presents several scientific challenges. This article reviews the evidence on the short- and long-term health effects of adolescent physical activity. Systematic reviews were conducted using a reference period between 2000 and 2004, primarily based on the MEDLINE/PubMed database. Relevant studies were identified by examining titles, abstracts, and full papers, adhering to a priori inclusion criteria. A conceptual framework is proposed to outline how adolescent physical activity may contribute to adult health. This framework includes four pathways: Pathway A: Tracking physical activity from adolescence to adulthood. Pathway B: Direct influence of adolescent physical activity on adult morbidity. Pathway C: Role of physical activity in treating adolescent morbidity. Pathway D: Short-term benefits of physical activity in adolescence on health. The literature reviews supported pathway 'A', although the magnitude of the association appears to be moderate. This suggests an indirect effect on all health benefits resulting from adult physical activity. Drawing recommendations, it's important to note that while studies on physical fitness are relevant for understanding the relationships between fitness and health, guidelines should focus on physical activity rather than fitness. Defining adolescent physical activity guidelines is beyond the scope of this article, but our conceptual framework and the recognition that domains of physical activity differ from those of adults may be helpful for governmental and non-governmental agencies involved in creating these guidelines. **(Hallal, 2012)**

RESULTS & STATISTICAL TECHNIQUES USED

Table 1: Reliability of Questionnaires using Cronbach's Alpha

Instrument	Group	Cronbach's α	No. of Items
BBAQ-21 (Barriers)	Tier 1	0.888	7
BBAQ-21 (Barriers)	Tier 3	0.885	7
Health & Wellness Assessment	Tier 1	0.895	6
Health & Wellness Assessment	Tier 3	0.885	6

All four Groups showed good internal consistency ($\alpha > 0.80$), confirming the reliability of both Questionnaires for the present Study.

Table 2: Test of Normality using Shapiro-Wilk

Group	Variable	W	p	Distribution
Tier 1 Barriers	Lack of Time	0.925	0.036	Non-normal
Tier 1 Barriers	Social Influence	0.916	0.021	Non-normal
Tier 1 Barriers	Lack of Energy	0.947	0.143	Normal
Tier 1 Barriers	Lack of Will Power	0.965	0.414	Normal
Tier 1 Barriers	Lack of Injury	0.952	0.188	Normal
Tier 1 Barriers	Lack of Skill	0.956	0.238	Normal
Tier 1 Barriers	Lack of Resources	0.887	0.004	Non-normal
Tier 3 Barriers	Lack of Time	0.899	0.008	Non-normal
Tier 3 Barriers	Social Influence	0.930	0.051	Normal
Tier 3 Barriers	Lack of Energy	0.953	0.208	Normal
Tier 3 Barriers	Lack of Will Power	0.916	0.021	Non-normal
Tier 3 Barriers	Lack of Injury	0.935	0.065	Normal
Tier 3 Barriers	Lack of Skill	0.938	0.081	Normal
Tier 3 Barriers	Lack of Resources	0.924	0.034	Non-normal
Tier 1 Wellness	All 6 categories	—	> 0.05	Normal (all)
Tier 3 Wellness	Stress	0.923	0.033	Non-normal
Tier 3 Wellness	Other 5 categories	—	> 0.05	Normal

To choose between parametric and non-parametric statistical methods, Shapiro-Wilk tests were performed on each barrier and wellness category, independently for Tier 1 and Tier 3 groups.

Table Interpretation: There are deviations from normalcy in a number of barrier subscales and one wellness subscale. Non-parametric tests (Spearman's rho for correlation; Mann-Whitney U for group comparison) were used as the main statistical method for consistency and robustness because not all variables in both groups met the normality assumption. Parametric equivalents (Pearson r, independent t-test) were reported alongside for reference.

Objective 1: Relationship between Barriers to Physical Activity and Health & Wellness among Tier 1 Adolescents. Tested using **Spearman's rank-order correlation (7 barrier categories × 6 wellness categories)**

Table 3a: Spearman Correlation Matrix — Tier 1 (r-values)

Barrier Category	Emotional Health	Fitness & Body Care	Environmental Health	Stress	Nutrition	Medical Self-Resp.
Lack of Time	-0.418*	-0.253	-0.321	-0.268	-0.043	-0.446*
Social Influence	-0.459*	-0.469*	-0.419*	-0.368*	-0.215	-0.355
Lack of Energy	-0.149	-0.207	-0.219	-0.253	-0.044	-0.133
Lack of Will Power	-0.221	-0.091	-0.100	-0.012	0.111	-0.036
Lack of Injury	-0.096	-0.104	-0.046	-0.207	0.094	-0.149
Lack of Skill	0.013	-0.023	-0.139	-0.127	0.078	0.024
Lack of Resources	-0.100	-0.129	-0.099	-0.034	0.140	-0.144

** $p < 0.05$ (statistically significant)*

Overall Barriers Total × Wellness Total: r = -0.226, p = 0.231 (not significant)

Table 3b: Significant Correlations — Tier 1

Barrier	Wellness Dimension	r	p	Strength & Direction
Lack of Time	Emotional Health	-0.418	0.021	Moderate negative
Lack of Time	Medical Self-Responsibility	-0.446	0.013	Moderate negative
Social Influence	Emotional Health	-0.459	0.011	Moderate negative
Social Influence	Fitness & Body Care	-0.469	0.009	Moderate negative
Social Influence	Environmental Health	-0.419	0.021	Moderate negative
Social Influence	Stress	-0.368	0.045	Weak-moderate negative

Interpretation: The barrier categories most strongly (and adversely) linked to health and wellness among Tier 1 adolescents were "Lack of Time" and "Social Influence." Reduced medical self-responsibility and worse mental health were substantially correlated with higher perceived time constraints. Four of the six wellness characteristics (emotional health, fitness and body care, environmental health, and stress management) were significantly and adversely correlated with social influence as a barrier, which demonstrated the greatest impact. Lack of energy, willpower, injury, skill, and resources were the other barrier categories that did not exhibit statistically significant correlations with wellness aspects in this sample. There was no significant correlation between the overall barriers total and wellness total scores (r = -0.226, p = 0.231), indicating that the link is restricted to some barrier types rather than a general one.

Objective 2: Relationship between Barriers to Physical Activity and Health & Wellness among Tier 3 Adolescents. Tested using **Spearman's rank-order correlation (7 barrier categories × 6 wellness categories)**

Table 4: Spearman Correlation Matrix — Tier 3 (r-values)

Barrier Category	Emotional Health	Fitness & Body Care	Environmental Health	Stress	Nutrition	Medical Self-Resp.
Lack of Time	0.073	0.072	0.005	0.223	0.135	0.070
Social Influence	0.107	0.157	0.311	-0.015	0.054	0.186
Lack of Energy	-0.138	-0.171	-0.054	-0.028	-0.034	0.023
Lack of Will Power	0.108	0.051	0.192	0.106	-0.029	0.143
Lack of Injury	-0.030	0.031	0.018	0.197	0.032	0.142
Lack of Skill	-0.089	0.022	0.146	0.152	-0.073	0.020
Lack of Resources	0.022	0.048	0.083	0.345	-0.007	0.231

Statistical significance (all p > 0.05).

Overall Barriers Total × Wellness Total: r = 0.148, p = 0.437 (not significant)

Interpretation: None of the seven barrier categories were statistically significantly associated with any of the six health and wellness dimensions among Tier 3 adolescents (all p > 0.05). It implies that the barriers to physical activity indicated by Tier 3 adolescents are not linearly related to their health and wellness scores in this sample, as they were for Tier 1 adolescents. This is an important point of difference - it suggests that the barrier–wellness link may be tempered by contextual/environmental characteristics that vary between tier categories (e.g., lifestyle habits, access to facilities, level of urbanization).

Objective 3: Comparison of Barriers to Physical Activity between Tier 1 and Tier 3 city Adolescents. Tested using **Mann-Whitney U (primary, non-parametric), Independent samples t-test (Welch), and one-way MANOVA (Hotelling's T^2) for the overall multivariate comparison across all 7 categories.**

Table 5: Descriptive Statistics and Group Comparison — Barriers

Barrier Category	Tier 1 Mean (SD)	Tier 3 Mean (SD)	Mann-Whitney U	p (MWU)	t	p (t-test)	Cohen's d
Lack of Time	4.67 (1.73)	4.63 (1.52)	449.0	0.994	0.079	0.937	0.020
Social Influence	4.93 (1.53)	4.60 (1.48)	513.5	0.341	0.859	0.394	0.222
Lack of Energy	4.57 (1.65)	4.73 (1.39)	418.5	0.639	-0.423	0.674	-0.109
Lack of Will Power	4.53 (1.74)	4.93 (1.41)	382.5	0.313	-0.979	0.332	-0.253
Lack of Injury	4.20 (1.88)	4.93 (1.68)	333.0	0.080	-1.592	0.117	-0.411
Lack of Skill	4.80 (1.86)	4.50 (1.48)	501.0	0.447	0.690	0.493	0.178

Barrier Category	Tier 1 Mean (SD)	Tier 3 Mean (SD)	Mann-Whitney U	p (MWU)	t	p (t-test)	Cohen's d
Lack of Resources	4.37 (1.71)	4.57 (1.72)	415.5	0.606	-0.452	0.653	-0.117
Total Barriers Score	32.07 (9.38)	32.90 (8.24)	404.0	0.501	-0.366	0.716	-0.094

Overall multivariate test (one-way MANOVA / Hotelling's T^2): $T^2 = 11.24$, $F(7, 52) = 1.44$, $p = 0.210$ — not significant.

Analysis: There were no significant differences among the seven distinct barrier categories between Tier 1 and Tier 3 teenagers (all $p > 0.05$), nor was there a significant difference in the aggregate total barriers score ($p = 0.716$). The multivariate MANOVA assessing the overall barrier profile between the two groups revealed no significant difference ($p = 0.210$). Effect sizes were minimal across all classifications (Cohen's d between 0.02 and 0.41), with "Lack of Injury" exhibiting the most substantial (but still non-significant, small-to-medium) difference, while Tier 3 adolescenst indicated slightly greater injury-related barriers. In this group, adolescents from Tier 1 and Tier 3 exhibited statistically similar levels of barriers to physical activity.

Objective 4: Comparison of Health and Wellness between Tier 1 and Tier 3 city Adolescents. Tested using **Mann-Whitney U (primary), Independent samples t-test (reference), and one-way MANOVA (Hotelling's T^2) for the overall multivariate comparison across all 6 categories.**

Table 6: Descriptive Statistics and Group Comparison — Health & Wellness

Wellness Dimension	Tier 1 Mean (SD)	Tier 3 Mean (SD)	Mann-Whitney U	p (MWU)	t	p (t-test)	Cohen's d
Emotional Health	36.87 (7.34)	37.37 (5.82)	428.0	0.750	-0.292	0.771	-0.075
Fitness and Body Care	35.03 (6.52)	36.87 (6.87)	387.5	0.359	-1.061	0.293	-0.274
Environmental Health	37.50 (6.30)	35.57 (5.53)	539.0	0.190	1.263	0.212	0.326
Stress	34.77 (6.20)	37.13 (6.03)	325.0	0.065	-1.500	0.139	-0.387
Nutrition	35.23 (6.57)	36.87 (5.97)	390.5	0.382	-1.008	0.318	-0.260
Medical Self-Responsibility	36.47 (5.57)	36.10 (5.92)	456.0	0.935	0.247	0.806	0.064
Total Wellness Score	215.87 (31.26)	219.90 (28.88)	418.0	0.641	-0.519	0.606	-0.134

Overall multivariate test (one-way MANOVA / Hotelling's T^2): $T^2 = 15.64$, $F(6, 53) = 2.38$, $p = 0.041$ — significant.

Interpretation: There were no significant differences in any of the six wellbeing dimensions between Tier 1 and Tier 3 cities adolescents (all univariate $p > 0.05$), and the overall total wellness score similarly showed no significant variation ($p = 0.606$). Nevertheless, the multivariate MANOVA analysis — which evaluates all six wellbeing dimensions simultaneously instead of individually — attained statistical significance ($p = 0.041$). This indicates that although no individual wellness characteristic

exhibits a significant difference independently, the aggregate pattern of scores across all six aspects collectively distinguishes Tier 1 from Tier 3 adolescents. This scenario illustrates a multivariate test identifying a combined effect that univariate tests, when considered separately, lack the capacity to reveal. Stress" ($p = 0.065$, $d = -0.39$) and "Environmental Health" ($p = 0.190$, $d = 0.33$) were the primary factors influencing this overall difference, as Tier 3 adolescents had notably elevated stress-related wellness scores, whereas Tier 1 adolescents demonstrated significantly higher environmental health scores.

DISCUSSION OF THE FINDINGS

The current research investigated barriers to physical exercise and its correlation with health and wellness in adolescents from Tier 1 and Tier 3 areas. The results are examined below about the Objectives, utilizing analogous evidence from the current literature on barriers to adolescent physical activity and health results.

Objective 1: Barriers to Physical Activity and their relation to Health and Wellness in Tier 1 Adolescents. The current results demonstrate that within Tier 1 adolescents, "Lack of Time" and "Social Influence" exhibited a significant negative correlation with various aspects of health and wellness, particularly emotional health, medical self-responsibility, fitness and body care, environmental health, and stress. This finding aligns with other prior research performed in urban Indian and global adolescents demographics. **Jodkowska (2015)** also indicated that insufficient time was a significant predictor of physical inactivity in adolescents, especially among males (OR = 2.56, 95% CI = 1.66–3.96), corroborating the current observation that time-related limitations persist as a major urban barrrier. In a systematic analysis of adolescent barriers, **Bozic (2021)** similarly recognized "lack of time" as one of the three most commonly cited barriers for both genders, hence reinforcing its significance in the Tier 1 sample of this study.

The significant adverse correlation identified between "Social Influence" and many wellness aspects (emotional health, physical fitness and body care, environmental wellness, and stress) among Tier 1 adolescents is also consistent with existing literature. **Rajaraman (2015),** in a qualitative investigation of South Asian youth in India and Canada, discovered that peers, relatives, and educators served as both enablers and barriers to physical activity in all research contexts, highlighting the significant and contradictory influence of the social milieu. Similarly, **Satija (2018)** found in focus group discussions with adolescents in Delhi that social disapproval, especially toward girls, was frequently mentioned as an barrier to engaging in physical activity, reinforcing the significance of the social-influence pathway highlighted in the Tier 1 findings of this study. Considering that Tier 1 cities embody greater urbanization, social density, and academic competitiveness, it is reasonable to assert that peer comparison, parental aspirations, and social scheduling conflicts have a more significant impact on both engagement in activities and psychosocial well-being outcomes like emotional health and stress management.
The insignificant correlations identified with energy deficiency, willpower, injuries, skill, and resources among Tier 1 adolescents necessitate consideration. This discerning pattern of importance indicates that not all barriers uniformly result in diminished well-being; instead, barriers that are socially and temporally embedded seem to exert the most significant psychosocial impact in an urban Tier 1 environment, aligning with **Rosselli (2020),** who discovered that psychosocial and motivational barriers (such as lack of energy and willpower) were particularly pronounced among girls, suggesting that the relationship between barriers and wellness in urban contexts may be further influenced by gender — a factor deserving of investigation in forthcoming Tier 1 research.

Objective 2: Obstacles to Physical Activity and its Connection to Health and Wellness in Tier 3 Adolescents. among stark opposition to the Tier 1 results, none of the seven barrier categories exhibited a statistically significant relationship with any of the six health and wellness aspects among Tier 3 adolescents. The lack of a quantifiable correlation is a significant and noteworthy discovery rather than a negligible outcome to be disregarded, aligning with documented insights in the literature concerning the contextual particularity of obstacles to physical exercise. **Rajaraman (2015**) clearly differentiated obstacles in rural and urban South Asian contexts, revealing that issues such the "absence of a secure area for recreation" were primarily an urban issue, whereas adolescents in rural and smaller-town areas had a distinct, less defined set of hurdles. This suggests that the barrier categories identified by the BBAQ-21 — a tool initially created and validated in a Western urban setting (USDHHS, 1999) — may not align seamlessly with the actual experiences and environmental contexts of Tier 3 adolescents, whose physical activity habits might be influenced by informal play opportunities, rural or small-town living patterns, and more flexible social arrangements compared to their Tier 1 adolescents.

This conclusion is additionally corroborated by **Nagrale (2024),** who emphasized that researchers encounter significant barriers in harmonizing physical activity data collection across diverse school and community contexts, pointing out that environmental and contextual variables frequently hinder the understanding of barrier-outcome associations beyond urban locales. In Tier 3 cities, it is conceivable that health and wellness are more significantly affected by elements beyond the BBAQ-21 barrier framework — including dietary habits, familial health practices, or overarching socioeconomic factors — rather than by the particular activity-related obstacles evaluated in this research. **Divyasree (2018)** similarly observed that familial health behaviors were significantly linked to the physical activity levels of adolescents, indicating that household and community influences, rather than personal perceived barriers, might be more pertinent determinants of well-being in less urbanized demographics. **Objective 3:** Analysing the barriers to Physical Activity among Tier 1 and Tier 3 Adolescents. The analysis of barrier scores indicated no statistically significant differences between Tier 1 and Tier 3 adolescents, both in specific barrier categories and in the comprehensive multivariate barrier profile (MANOVA, $p = 0.210$). This discovery indicates that adolescents in various urban classifications recognize comparable barriers to physical exercise, regardless of variations in their urban infrastructure, population density, and availability of organized sports facilities. This discovery is significant when considered in relation to the broader literature, which has predominantly highlighted gender as the chief factor influencing barrier perception, rather than city tier or urbanity. **Bozic (2021) and Rosselli (2020)** both indicated that gender, rather than geography, was the primary factor influencing the divergence of barrier profiles, with females consistently identifying more internal, psychosocial barriers (such as lack of energy and willpower) while males reported more external, logistical challenges (including lack of companionship, time constraints, and school responsibilities). The analogous barrier levels identified between Tier 1 and Tier 3 adolescents in this study provide indirect evidence that specific adolescent impediments to physical activity — especially time limitations and motivational influences — may be largely consistent across various urbanization settings in India, rather than being unique to each tier.

Consequently, the current findings ought to be analysed in conjunction with Rajaraman (2015), who identified certain context-dependent variations (e.g., worries around safe spaces being predominantly urban, whereas academic pressure was prevalent among both rural and urban Indian youth). Consequently, it is plausible that although the general scale of barriers is similar across levels, as demonstrated in this study, the nature or experiential significance of particular barriers (for instance, "lack of resources" signifying insufficient sports infrastructure in Tier 1 compared to actual absence of facilities in Tier 3) may still vary qualitatively despite converging quantitative assessments — a subtlety that the quantitative BBAQ-21 scoring alone fails to encompass, and which future mixed-methods investigations could beneficially examine. **Objective 4:** Analysis of Health and Wellness differences between Tier 1 and Tier 3 Adolescents. Although there were no significant differences in individual wellness dimensions between Tier 1 and Tier 3 adolescents, the multivariate MANOVAA comparison of the entire six-dimensional wellness profile achieved statistical significance (Hotelling's $T^2 = 15.64$, $F(6,53) = 2.38$, $p = 0.041$), with "Stress" and "Environmental Health" being the primary contributors to this overall difference. This discovery — a significant multivariate distinction despite inconsequential univariate analyzes — aligns with the extensive literature acknowledging that adolescent health and wellness is a complex construct best comprehended as an integrated profile rather than through individual metrics. **Hallal (2012),** in an extensive examination of adolescent physical activity and its implications for long-term health, highlighted that the health ramifications of adolescent activity patterns function through various interrelated pathways (behavioural continuity into adulthood, direct morbidity impacts, and immediate wellness advantages), thereby endorsing the view of wellness as a cohesive profile rather than a collection of isolated outcomes, as demonstrated in the current multivariate results.

The particular role of "Stress" in the differences between Tier 1 and Tier 3 (where Tier 3 adolescents exhibit superior stress-related wellness scores) is significant, especially considering Costigan (2019), who discovered that increased vigorous physical activity correlates with enhanced positive affect and diminished negative affect in adolescents, with this beneficial relationship being more evident in girls. If Tier 1 adolescents encounter heightened academic and social pressures — as indicated by the substantial correlations between Social Influence and wellness identified in Objective 1 of this study, and in alignment with the academic-pressure obstacles noted by Rajaraman (2015) among urban Indian adolescents — this may reasonably result in relatively inferior stress-related wellness outcomes compared to Tier 3 adolescents, whose lifestyle and academic competitiveness may vary. In contrast, the slightly superior "Environmental Health" ratings observed among Tier 1 adolescents might indicate enhanced access to civic infrastructure, healthcare services, and sanitation commonly linked to larger urban centers, despite this not resulting in improved activity-barrier profiles (Objective 3) or overall wellness scores.

Objectives 3 and 4 collectively offer a significant insight: while Tier 1 and Tier 3 adolescents encounter similar barriers to physical activity, their overall health and wellness profiles exhibit statistically significant, if minor, differences. This implies that elements outside the physical activity-related barriers assessed by the BBAQ-21 — including environmental infrastructure, academic and social pressures, and lifestyle tempo — are probably influencing tiered wellbeing disparities. This analysis is widely endorsed by **Jha (2024),** who discovered that health promotion initiatives in schools aimed at enhancing perceived behavioral control (instead of solely addressing physical obstacles) yielded significant advancements in adolescents' intentions regarding physical activity, indicating that psychosocial and environmental factors, rather than mere perceptions of barriers, may serve as more effective means for enhancing adolescent well-being across various urban levels.

Summary of Findings as per above Discussions:

Barriers and Health in Tier 1 adolescents.,

Tier 1 adolescents had significant negative connections between two barriers — "Lack of Time" and "Social Influence" — and many wellness dimensions (emotional health, medical self-responsibility, exercise and body care, environmental health, and stress). Social Influence exerted the most extensive effect, influencing four out of six wellbeing variables. This trend corresponds with earlier studies indicating that time constraints and the influence of peers, family, and teachers are significant barriers for urban adolescents **(Jodkowska, 2015; Rajaraman, 2015; Satija, 2018**), implying that in densely populated and academically competitive urban environments, social and temporal impediments bear excessive psychosocial significance. Barriers and Health in Tier 3 Adolescents

No barrier category shown a notable correlation with any aspect of wellbeing among Tier 3 adolescents. Instead of being a negligible result to disregard, this indicates a significant contextual variation: the BBAQ-21's barrier framework — conceived in a Western, urban environment — might not accurately reflect the determinants of wellness in smaller-town locales, where elements such as familial health behaviors or lifestyle patterns **(Divyasree, 2018; Rajaraman, 2015**) could be more influential than the particular activity barriers assessed.

Analyzing barriers Between Tier 1 and Tier 3

No significant distinction was observed between the two groups, both in individual categories and in the comprehensive multivariate barrier profile (MANOVA $p = 0.210$). This implies that barrier levels are often similar throughout urban tiers — aligning with research that indicates gender, rather than location, is usually the more significant factor in barrier perception **(Bozic, 2021; Rosselli, 2020).** Nonetheless, the barriers may have varying interpretations even when scores align (e.g., "lack of resources" suggesting distinct circumstances in each context).

Analyzing Wellness differences Between Tier 1 and Tier 3

Although no individual wellness dimension exhibited significant differences among the groups, the aggregate six-dimension wellness profile showed a notable difference (MANOVA $p = 0.041$), mostly influenced by Stress and Environmental Health. This suggests that adolescents in Tier 1 and Tier 3 exhibit nuanced variations in overall wellbeing, likely associated with distinct scholastic and social pressures (Tier 1) compared to varying access to civic and natural resources, despite their activity barriers appearing same.

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