

The Effects of Physical Activity on Physical Health, Behavior and Personality by Social Status of Urban and Rural Children: A Systematic Review

Efectos de la Actividad Física en la Salud Física, el Comportamiento y la Personalidad según el Estatus Social de Niños Urbanos y Rurales: Una revisión sistemática

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Abstract. This study investigates the impact of physical activity on children's physical health, behavior and personality by considering differences in social status in urban and rural environments. Using mixed methods, we combined surveys, observations and psychological measurements to gain in-depth insights. Involving children of different age groups (12-16 years old) from both neighborhoods (urban and rural), this study looked at the level, frequency, and type of physical activity they engaged in. In evaluating physical health, not only physical aspects such as fitness and body mass index were considered, but also factors such as sleep patterns and eating habits. In addition, the children's behavior and personality were also analyzed using tested measurement tools. This study aims to uncover significant differences and patterns that may emerge between urban and rural children in response to physical activity. The findings from this study are expected to provide an in-depth picture of the complex relationship between physical activity, social status and children's well-being. The practical implication of this study is to develop more focused interventions to promote physical activity in both settings, taking into account their social context. This study is a Systematic Literature Review (SLR) that has been published in the Web of Science, Transport Research International Documentation (TRID), Scopus, Medline, and Google Scholar. The data were analyzed using the process of selecting articles used utilizing the PRISMA. By presenting these findings comprehensively, this study contributes to a better understanding of child health efforts in different urban and rural environments. Physical activity interventions were effective in changing behavior and improving personality traits of children in both urban and rural areas. The importance of adaptation of intervention strategies depending on the environmental context recommends further research: Include more variables, consider psychological aspects in more depth, and explore the role of social factors in intervention success.

Keywords: Social, Health, Physical Activity, Urban and Rural

Resumen. Este estudio investiga el impacto de la actividad física en la salud física, el comportamiento y la personalidad de los niños teniendo en cuenta las diferencias de estatus social en entornos urbanos y rurales. Utilizando métodos mixtos, combinamos encuestas, observaciones y mediciones psicológicas para obtener información en profundidad. Con la participación de niños de diferentes grupos de edad (12-16 años) de ambos barrios (urbano y rural), este estudio analizó el nivel, la frecuencia y el tipo de actividad física que realizaban. Al evaluar la salud física, no sólo se tuvieron en cuenta aspectos físicos como la forma física y el índice de masa corporal, sino también factores como los patrones de sueño y los hábitos alimentarios. Además, también se analizaron el comportamiento y la personalidad de los niños mediante herramientas de medición probadas. Este estudio pretende descubrir las diferencias significativas y los patrones que pueden surgir entre los niños de zonas urbanas y rurales en respuesta a la actividad física. Se espera que los resultados de este estudio proporcionen una imagen en profundidad de la compleja relación entre la actividad física, el estatus social y el bienestar de los niños. La implicación práctica de este estudio es desarrollar intervenciones más centradas para promover la actividad física en ambos entornos, teniendo en cuenta su contexto social. Este estudio es una Revisión Sistemática de la Literatura (SLR) que se ha publicado en la Web of Science, Transport Research International Documentation (TRID), Scopus, Medline y Google Scholar. Los datos se analizaron mediante el proceso de selección de artículos utilizando el PRISMA. Al presentar estos hallazgos de forma exhaustiva, este estudio contribuye a una mejor comprensión de los esfuerzos en materia de salud infantil en diferentes entornos urbanos y rurales. Las intervenciones de actividad física fueron eficaces para cambiar el comportamiento y mejorar los rasgos de personalidad de los niños tanto en zonas urbanas como rurales. La importancia de adaptar las estrategias de intervención en función del contexto ambiental recomienda seguir investigando: Incluir más variables, considerar los aspectos psicológicos en mayor profundidad y explorar el papel de los factores sociales en el éxito de la intervención.

Palabras clave: Social, Salud, Actividad Física, Urbano y Rural

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Introduction

Physical Activity (PA) is still believed to provide benefits as one of the ways to overcome various problems in children's lives at all age levels. The benefits of being physically active are strongly supported by evidence from systematic reviews (Johnson et al., 2022; Álvarez et al., 2017; Schuch et al., 2018; Warburton et al., 2017). One of the most useful benefits for survival as a human being is beneficial for both body and mind. Almost all forms of physical activity

(PA) are beneficial, either as part of a regular exercise program or as a series of intermittent, incidental, purposeless, lifestyle-embedded activities (leading to non-exercise activity thermogenesis) (Marquez et al., 2020; Miller et al., 2016). This includes a reduced risk of weight gain and chronic diseases such as cardiovascular disease and type 2 diabetes (Lear et al., 2017). It all starts with the behaviors people engage in on a daily basis. Achieving and maintaining adequate PA and other healthy lifestyle behaviors during young adulthood is challenging due to the major transitions

associated with this life stage.

The worst behavior that children still engage in today around the world is sedentary behavior. Globally, self-report data from 1.9 million adults in 168 countries show that about one in four adults do minimal or no physical activity <150 minutes of moderate activity/week or equivalent (Guthold et al., 2018). Sedentary behavior if allowed in children will cause many problems both physically and psychologically. Children spend more time in sedentary activities which is associated with poorer sleep quality (Kakinami et al., 2017), risk of depression and its effects vary in different populations (Wang & Fan, 2019). Sedentary lifestyle increases all-cause mortality, doubles the risk of cardiovascular disease, diabetes, and obesity, and increases the risk of colon cancer, high blood pressure, osteoporosis, lipid disorders, depression, and anxiety. According to the World Health Organization (WHO), 60 to 85% of the world's people - from both developed and developing countries - have sedentary lifestyles, making it one of the most serious and under-treated public health problems today (WHO, 2020). It is estimated that nearly two-thirds of children are also sedentary, with serious implications for their future health.

It has been found that physical activity has a significant positive predictive effect on the development of personality traits such as neuroticism, conscientiousness and sociability (Liao et al., 2022). Physical activity can influence children and adolescents' neuroticism, conscientiousness and agreeableness through peer relationships (Asquith et al., 2022). A benefit that parents perceive as having a significant positive impact on their child's PA within the family is their child joining a sports club (Cai et al., 2022; Chaeroni et al. 2021). The efficacy of physical activity interventions may depend on personality traits (Stieger et al., 2020). Intervention outcomes may be improved if personality is taken into account when designing programs.

The benefits of PA should be available to people living in urban and rural areas. Living in rural areas allows adolescents to maintain a more active lifestyle with more physical activity and less sitting time (Wattelez et al., 2021). The results also suggest that safety is an important driver for engagement in PA. Children and adolescents from rural environments show better results in cardiorespiratory fitness (Chaeroni et al., 2022), upper and lower extremity muscle fitness, and have better coordination, speed and agility compared to their urban counterparts (Sylejmani et al., 2019). Place of residence, apart from other environmental factors, should be taken into account when building country strategies and interventions that will promote physical activity and health. Physical exercise has a significant positive impact on the development of personality traits such as neuroticism, conscientiousness, and agreeableness (Liao et al., 2022). Peer relationships provide a mediating effect between physical exercise and adolescent personality traits. This review evaluates the effectiveness of interventions aimed at increasing PA among adolescent children.

Systematic reviews are research methods that compile

and comprehensively analyze previous research results on a particular topic. If there is a systematic study conducted on physical activity interventions and child development in various geographical settings, then the results can provide deep insights.

Materials and Methods

Inclusion criteria were studies that included children (aged between 9-14 years) from different social statuses (urban and rural); studies that investigated the relationship between physical activity and children's physical health, behavior, and personality; studies that used a research design that allowed causal inference or had adequate control of confounding variables; studies published in English between 2017 and 2024; studies available in accredited scientific journals and were peer-reviewed.

Exclusion criteria were studies that included populations other than children (aged beyond 6-12 years); Studies that did not include associations between physical activity and children's physical health, behavior, or personality; Studies with research designs that did not allow inference of causality or had significant methodological flaws; Studies that were not available in English or not published in an accredited scientific journal; Studies that were not relevant to the purpose of this systematic review.

By applying these inclusion and exclusion criteria, it is hoped that this systematic article can produce relevant, credible, and reliable results regarding the effect of physical activity on the physical health, behavior, and personality of children from various social backgrounds.

Initial Search

Author: (no author restrictions). Title: "Effects of Physical Activity on Physical Health, Behavior, and Personality". Keywords: "physical activity", "physical health", "behavior", "personality", "children", "urban", "rural", "social status". Publication Date: 2017 - 2024. Language: English. Source: Accredited Scientific Journal. Main Objective: The main objective of this article is to conduct a systematic review of the existing literature to investigate the relationship between physical activity and children's physical health, behavior, and personality, taking into account differences in social status among children living in urban and rural areas. This article aims to collect, evaluate and synthesize the available scientific evidence to explore the impact of physical activity on various aspects of health and development of children from different social backgrounds. As such, this article is expected to provide deeper insights into how social factors such as economic status and living environment influence the relationship between physical activity and children's well-being.

Trial design

Only randomized controlled trials (RCTs) were included, including feasibility trials and trials, which were published in English from a variety of important sources.

Methods followed PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines (Aromataris & Munn, 2020), and this protocol was listed. Results relating to daily behavior (Ashton, Lee & de Vries, 2014), personality (Ashton, Kennedy & Radford, 2020), and comparing the effectiveness of targeted interventions by place of residence (Urban and rural) have been published (Sharkey et al., 2020). This paper critiques and synthesizes the results of interventions that report PA outcomes.

Participant Eligibility Criteria

Healthy children with parental consent were involved in this activity, aged 9-14 years. This age range was chosen because it is broad and therefore can include more studies. The aim of this review was to provide recommendations for the healthy child population, therefore healthy children were included. Studies with participants from special populations (e.g., diagnosed chronic conditions, severe mental illness, eating disorders, elite athletes, and children with special needs) were excluded.

Intervention

Behavioral interventions that focus on daily habits, PA, and preventive living habits are also included. PA changes are rarely considered in isolation, therefore interventions to improve diet and habits are also considered. The focus was on behavior change interventions, defined as a coordinated set of activities designed to change a specific pattern of behavior (Michie, van Stralen & West, 2011). Studies that did not meet this definition were excluded e.g., supervised and controlled exercise programs examining the impact of exercise on clinical biomarkers and fitness.

Search Strategy

Search strategies were developed by the author team in consultation with librarians who specialize in systematic reviews. Two search strategies were developed: one for academic literature and one for expert literature. Academic literature plays an important role, namely: Defining the Scope: Defines the research topic and identifies gaps in knowledge; Guides Research Methods: Helps in the selection of appropriate research methods; Provides Theoretical Basis: Provides a conceptual framework for the research; Identifies Variables: Identifies relevant research variables and constructs; Presents Previous Findings: Presents an overview of previous findings in the field being studied; Directs Interpretation of Results: Assists in interpreting the research results by comparing them with previous findings; Identifying Knowledge Gaps: Identifies knowledge gaps to formulate recommendations for further research. Meanwhile, expert literature has the following important roles: Directing Topic Selection: Provides an in-depth understanding of the research topic; Identifies Key Sources: Provides key sources for in-depth analysis; Aids Interpretation of Results: Guides interpretation of findings with in-depth context; Highlights Knowledge Gaps: Identifies gaps in the literature that encourage further research. The searches

were conducted in September 2023. The academic literature search covered five electronic bibliographic databases: Web of Science, Transport Research International Documentation (TRID), Scopus, Medline, and Google Scholar. A pilot search was run and expanded to ensure that the previously identified key papers were included in the search strategy. Titles, abstracts, and keywords (where possible, TRID only allowed title searches) were searched for physical activity.

Data extraction

The standardized data was filled out independently by two reviewers using google forms. The Google form was developed with detailed instructions for extracting information from respondents to minimize potential bias in extraction between reviewers. Data extracted included: author, title, year of publication, study setting (country and city), study context, season of data collection, study design, population description, research questions, LRT exposure measures, how exposure was defined, physical activity outcome measures, whether physical activity measures were self-reported or measured by a tool, confounding factors measured, theoretical framework, statistical methods used, results, whether the study considered equity in any way (e.g., indicators of gender, income, place of residence (urban and rural or differences in physical activity), future research recommendations, and policy recommendations. Once both reviewers had completed the data extraction, the extractors met to review and validate the data. Any disagreements that arose were resolved through discussion.

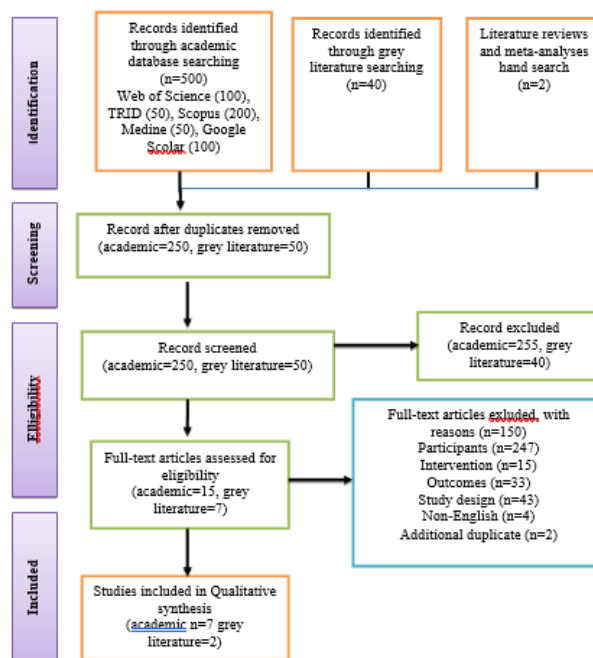


Figure 1. The process of selecting articles used utilizing the PRISMA guideline

Evaluate the certainty of evidence

Certainty of evidence was assessed using a modified GRADE (Grading of Recommendations Assessment, Development, and Evaluation) approach (<https://gdt>).

grade.pro.org/app/handbook/handbook.html). Certainty of evidence was rated as high, medium, low, or very low for each outcome (e.g., walking behaviors at home, to and from school, cycling behaviors, MVPA). Each outcome was assigned an initial certainty of evidence based on the study design. If the design was a randomized controlled trial of either a natural experiment or a quasi-experiment.

Findings

The database search identified a total of 500 articles, 300 of which were duplicates. Title and abstract screening yielded 15 potential articles whose full text was screened by both reviewers for inclusion. Many articles were removed due to lack of focus on LRT, combined focus on LRT with other forms of public transportation, lack of focus on measurable physical activity, or geographic focus. After full-text screening, 7 papers were included in this review.

Table 1.
Main characteristics of the included studies

Paper	place of research	Sample size analyse	Comparative group	Measurement tools/self-reported or measured	LRT exposure measure	Physical activity measure
Antonio, A. B., Mercedes, V. S. (2023)	España	The sample size in the study consisted of 307 adolescents aged between 12 and 18 years, with 55.7% being male (n=171) and 44.3% female (n=136). The participants were selected through intentional non-probabilistic sampling from public centers, clubs, associations, and companies in Maracena, Granada. The sample size of 307 adolescents is considered adequate for a descriptive cross-sectional study like this, as it allows for a diverse representation of the target population and provides a sufficient amount of data to draw meaningful conclusions regarding the enjoyment, motivation, and satisfaction with extracurricular sports activities among adolescents.	In the study on enjoyment, motivation, and satisfaction with extracurricular sports activities among adolescents, the comparative group was composed of adolescents aged between 12 and 18 years who were not participating in extracurricular physical activities. The study focused on adolescents engaged in extracurricular physical activity to assess their levels of enjoyment, motivation, satisfaction, perceived quality, and overall assessment of sports services. By comparing these adolescents with a group not engaged in extracurricular physical activities, researchers could analyze the differences in enjoyment, motivation, and satisfaction levels between the two groups. This comparison helps in understanding the impact of extracurricular sports activities on adolescents' experiences and perceptions related to physical activity.	In the study on enjoyment, motivation, and satisfaction with extracurricular sports activities among adolescents, several measurement tools were used to assess different variables. These tools included self-reported questionnaires administered to the participants. Here are the main measurement tools used in the study: Scale of Measurement of Enjoyment in Physical Activity (PACES): This scale was used to measure the enjoyment experienced by adolescents in physical activity. Scale of Measurement of Motives for Physical Activity-Revised (MAPM-R): This scale was utilized to assess the motives driving adolescents to engage in physical activity. Sports Services Assessment Questionnaire (EPOD2): This questionnaire was employed to evaluate the perceived quality, satisfaction, and value of sports services among the adolescents participating in extracurricular activities.	The study on enjoyment, motivation, and satisfaction with extracurricular sports activities among adolescents did not specifically mention the use of a Likert scale or Likert-type response format as an exposure measure. However, Likert scales are commonly used in research to assess attitudes, perceptions, and opinions by asking participants to rate their agreement or disagreement with a series of statements on a scale. In the context of the study, Likert scales could have been used within the measurement tools such as the Scale of Measurement of Enjoyment in Physical Activity (PACES), the Scale of Measurement of Motives for Physical Activity-Revised (MAPM-R), and the Sports Services Assessment Questionnaire (EPOD2) to capture the adolescents' responses regarding their enjoyment, motivation, satisfaction, and perceived quality of sports services. Likert scales typically consist of a series of statements or items with response options ranging from "strongly disagree" to "strongly agree" or from "not at all enjoyable" to "extremely enjoyable." Participants select the response that best reflects their feelings or opinions on each item.	In the study on enjoyment, motivation, and satisfaction with extracurricular sports activities among adolescents, physical activity was measured using self-reported questionnaires and scales. The Scale of Measurement of Enjoyment in Physical Activity (PACES) and the Scale of Measurement of Motives for Physical Activity-Revised (MAPM-R) were utilized to assess different aspects of physical activity among the adolescent participants. Scale of Measurement of Enjoyment in Physical Activity (PACES): This scale was used to measure the enjoyment experienced by adolescents in physical activity. It likely included items related to how much enjoyment participants derived from engaging in physical activities. Scale of Measurement of Motives for Physical Activity-Revised (MAPM-R): This scale was employed to assess the motives driving adolescents to engage in physical activity. It likely included items related to the reasons why participants chose to participate in physical activities.
Izawa, K. P., Kasahara, Y., Watanabe, S., Oka, K., Brubaker, P. H., Kida, K., & Akashi, Y. J. (2021)	Japan, Marianna University School of Medicine Hospital	The study initially included 356 potential subjects, of which 258 met the inclusion criteria. However, 32 additional patients were excluded due to incomplete or missing data, resulting in a final	The comparative groups in the study were chronic heart failure (CHF) patients classified into three groups based on New York Heart Association (NYHA) class: class I, class II, and class III. These groups were used to assess the impact of disease	The study used objective measures to assess physical activity and health utility in chronic heart failure patients. Physical activity was measured using a Kenz Lifecorder EX 1-axial accelerometer, which was worn by the patients at waist level for 9 days. The accelerometer computed daily energy expenditure on physical	This study aimed to evaluate the relationship between physical activity and health utility, and the effects of disease severity on physical activity and health utility in patients with chronic heart failure (CHF). Physical activity	The study utilized objective measures to assess physical activity in chronic heart failure (CHF) patients. Specifically, the physical activity was measured using a Kenz Lifecorder EX 1-axial accelerometer, which was worn by the patients at waist

Summary of results

A summary of the main characteristics of the papers, dissertations and reports included in this review can be seen in Table 1 (n= 9). Most studies (n=8), including all 7 academic articles. The most frequently used research location was in China (n=2).

Primary objective: Physical Health Improvement

Regular physical activity can improve children's physical health, including cardiorespiratory fitness, muscle strength, behavior, mental and weight control.

		sample size of 226 patients for analysis. The patients were then divided into three groups based on New York Heart Association (NYHA) class: class I (n = 92), class II (n = 97), and class III (n = 37)	severity on physical activity and health utility in CHF patients	activity (PAEE) every 4 seconds using body weight and a proprietary manufacturer's factor Ka (exercise index), which is dependent on exercise intensity level. The daily number of steps taken and daily PAEE were respectively calculated as the total step count and kcal expended over 7 days divided by 7	was measured objectively using the Kenz Lifecorder EX 1-axial accelerometer, while health utility was assessed using the Short Form-6D (SF-6D). This study did not investigate specific exposure to a substance or environmental factor	level for 9 days. The accelerometer computed daily energy expenditure on physical activity (PAEE) every 4 seconds using body weight and a proprietary manufacturer's factor Ka (exercise index), which is dependent on exercise intensity level. The daily number of steps taken and daily PAEE were respectively calculated as the total step count and kcal expended over 7 days divided by 7
Reyes-Sánchez F, Basto-Abreu A, Torres-Álvarez R, Carnalla-Cortés M, Reyes-García A, Swinburn B, et al. (2023)	Mexico	The study utilized anthropometric and sociodemographic information from the Mexican Health and Nutrition Surveys (ENSANUT) conducted in 2000, 2006, 2012, 2016, and 2018, with a total sample size of 137,907 adults aged 20 years and older. This large sample size allowed for robust projections of obesity prevalence and estimation of the required caloric reductions to achieve the specified obesity goals for 2030 and 2040	the research focused on estimating the caloric reductions needed to achieve obesity goals in Mexico for 2030 and 2040 by projecting obesity prevalence and estimating the required caloric reductions based on different obesity goal scenarios. The comparative aspect of the study lies in comparing the projected obesity prevalence rates and the necessary caloric reductions across different scenarios and socioeconomic status (SES) groups	The study utilized measured anthropometric data to calculate body mass index (BMI) and categorize individuals as normal, overweight, or obese based on the World Health Organization (WHO) classification. The anthropometric data, including body weight and height, were measured following standardized procedures across survey waves. The study also used a standardized definition of socioeconomic status (SES) constructed using a principal components analysis (PCA) with polychoric correlation matrix based on household characteristics such as number of rooms, amenities, construction materials, and appliances.	The exposure measure in the study was the projected increase in average energy intake needed to maintain a higher body weight compared with an initial time, known as the maintenance energy gaps (MEGs). These MEGs were estimated by socioeconomic status (SES) using previous ENSANUT waves, then projected to 2030 and 2040, and used as inputs in the microsimulation model to simulate body weight over time. The study focused on how these projected MEGs would impact body weight and obesity prevalence, particularly in the context of different obesity goal scenarios and SES groups.	The study assumed a sedentary level of physical activity, which was kept constant over time in the microsimulation model. The physical activity level (PAL) was assumed to be 1.5, which is the value for a sedentary lifestyle. The model estimated changes in body weight triggered by the projected maintenance energy gaps (MEGs) under the assumption of a sedentary lifestyle. However, the study did not collect or report any direct measures of physical activity.
Wan Y., Zhao Y & Song, H. (2021)	Beijing, China	The study involved 366 children, with 191 children at the age of 5 and 174 children at the age of 6. This sample size is considered quite substantial for a study of this nature and is likely to provide statistically significant results.	The study used a pre-test and post-test design to compare the results of the same group of children before and after the intervention of increased physical activity	The study utilized the Ages and Stages Questionnaires: Social-Emotional (ASQ:SE) to measure the social-emotional development of the children. The ASQ:SE is a standardized tool that assesses various aspects of a child's behavior, including self-regulation, compliance, communication, adaptive behaviors, autonomy, affect, and interaction with people. The ASQ:SE provides a structured assessment of social-emotional development and is completed by caregivers or teachers who observe the child's behavior	The study focused on the short-term effects of increased physical activity on the social-emotional behavior of children in public kindergartens in Beijing, China	The study did not explicitly mention the specific method used to measure physical activity. However, given the focus on the impact of physical education and fitness classes on the social-emotional behavior and critical thinking of preschool children, it can be inferred that the physical activity measure may have involved structured physical education sessions and fitness classes provided to the children over a period of three months
Greeven, S. J., Medellin AM., Watkins, J. M., Coble C. J., Brunner J. E., Fernández Solá P. A., Dutta S, Hobson JM, Evanovich JM, Martínez Kercher VM and Kercher KA. (2023).	rural community in Indiana, USA	A total of 102 respondents completed the survey, including 39 children and 63 adults, out of a total of 150 students at the middle school. The response rate was 26%. Listwise deletion was used for handling missing data, and any incomplete observations were dropped from analysis, which reduced the total sample size to n = 39 children and n = 63 adults. A sensitivity analysis was conducted by running the analyses on the raw and final samples, and the results were highly similar.	The comparative group in this study consists of both children and adults from a rural middle school community in Indiana, USA. The child sample primarily comprised 6th and 7th grade students, while the adult sample primarily included parents, adult family members, adult caregivers of children enrolled at the middle school, and teachers/administrators at the middle school. The study aimed to gain a multi-level perspective from the target community, and there were no specific exclusion criteria for participation in the study	The study utilized a combination of self-reported and measured tools to assess physical activity, sport participation, and psychological needs. For children, the Physical Activity Questionnaire for Children (PAQ-C) was used to assess physical activity during various times of the day and week. This questionnaire is a self-reported measure of physical activity. Additionally, select items from the Expanded Food and Nutrition Education Program (EFNEP) Food and Physical Activity Behaviors Questionnaire were included in the child and adult surveys. These items are also self-reported measures. It's important to note that the study did not explicitly mention the use of directly measured physical activity data, such as accelerometry or pedometers. Therefore, the primary assessment of physical activity and sport participation was based on self-reported measures.	The study utilized the Physical Activity Questionnaire for Children (PAQ-C) to assess physical activity and sport participation among the children in the sample. The PAQ-C is a self-reported measure that assesses physical activity during various times of the day and week, including physical education class, recess, lunch, after school, evenings, weekends, and spare time. It consists of ten items scored on a 5-point scale, with higher scores indicating higher levels of physical activity. It's important to note that the study primarily relied on self-reported measures to assess physical activity and sport participation among the children in the sample.	
Cousson-Gélie, F., Carayol, M., Fregeac, B. et al. (2019)	The research was conducted by a team	The sample size analysis for the study indicates that a total of 4000 subjects are required, with approximately 2000	The study involves a two-armed prospective cluster-randomized controlled intervention trial. Communities of communes	The GLMC study incorporates both objective and self-reported evaluations of physical activity (PA). The objective method of measuring the impact of the intervention on PA	The exposure measure in the GLMC study is the multilevel extended Theory of Planned Behavior (TPB)-based	The GLMC study utilizes both self-reported and objectively measured methods to assess physical activity (PA) in children. Self-reported PA

	from various institutions in France	in the intervention group and 2000 in the control group, corresponding to around 160 classes. This calculation takes into account the clustering effect of the randomization and assumes a loss-to-follow-up rate of 15%	are randomized in equal proportions to one of the two study arms: the GLMC experimental arm, which receives the multi-level, extended TPB-based program intended to promote physical activity, and the control arm, which does not receive any intervention	involves the use of accelerometers, which is a rare approach in studies of children. Additionally, the study includes self-reported measures of psychosocial variables such as attitudes, subjective norms, perceived behavioral control, intentions, planning, and perception of activity opportunities, which are assessed using a questionnaire with a four-point scale	intervention designed to promote physical activity in children. This intervention is delivered over a 3.5-month period annually for two years and targets schools, families, and communities simultaneously. The primary hypothesis is that this intervention will increase the proportion of children achieving the World Health Organization's recommended 60 minutes of moderate to vigorous physical activity per day by 15%	is measured using an adapted version of the Physical Activity Questionnaire for Children (PAQ-C), which covers various domains of PA undertaken by children. Additionally, a subsample of 400 children will wear accelerometers (Actigraph GT3X+) to objectively measure PA. The accelerometers capture movement data in three orthogonal directions and are worn around the waist for at least four consecutive days to estimate PA levels
Liu G, Li W & Li X, (2023)	Beijing, China	The sample size for the research was 18,009 valid samples after excluding samples with missing values. This large sample size provides a robust basis for the statistical analyses and generalizability of the findings	These samples were drawn from 438 classes in 112 schools located in 28 county-level units across China, ensuring good national representativeness	The provided document does not explicitly mention whether the measurements were self-reported or directly measured. However, it does state that the CEPS dataset collected basic information such as students' height, weight, cognitive ability, and academic achievement, indicating that at least some measurements were likely directly measured rather than self-reported	The study investigated the relationship between weekend physical activity duration and academic achievement among adolescents. Therefore, the exposure measure in this study is the weekend physical activity duration, which was self-reported by the students and recorded as 0 if there was no physical activity on weekends, 1 if they exercised for one hour, 2 if they exercised for two hours, and 3 if they exercised for three or more hours	The physical activity measure in the study was the duration of physical activity on weekends, as reported by the students. It was categorized based on the time spent on physical activity, with options including no physical activity, one hour of physical activity, two hours of physical activity, and three or more hours of physical activity. This measure was used to assess the impact of different durations of physical activity on academic achievement among adolescents
Josephine, N., Booth., Andy, R. Ness, Carol, J., Phillip, D., Tomporowski, James M.E., Boyle, Sam D., Leary., John J., Reilly. (2023).	South west, England	The sample size of the study was 4755 participants (2128 males and 2627 females) who attended the 11-year clinic and provided valid accelerometer data. The study utilized a large sample size, which is a strength of the research, as it increases the statistical power and generalizability of the findings. Additionally, the ALSPAC cohort is broadly socio-economically representative, which further enhances the generalizability of the study's findings	It examined the associations between physical activity levels and mental health outcomes in a population-based sample of children and adolescents from the ALSPAC cohort. The study utilized a longitudinal design, which allowed for the examination of changes in physical activity levels and mental health outcomes over time within the same individuals. The study also utilized multiple measures from a range of informants (young people, parents, and teachers) to assess mental health outcomes, which adds to the strength of the study's findings	The study utilized objective measures of physical activity, specifically accelerometry, to assess physical activity levels in participants. The accelerometers were worn for at least three days, including at least one weekend day, and data were processed using a validated algorithm to determine the amount of moderate-to-vigorous physical activity (MVPA). For mental health outcomes, the study utilized two measures: the Short Moods and Feelings Questionnaire (SMFQ) and the Strengths and Difficulties Questionnaire (SDQ). The SMFQ was completed by both parents and participants themselves at age 11 and by participants themselves at age 13 to assess depressive symptoms. The SDQ was completed by parents and teachers at age 11 and by participants themselves at age 13 to assess emotional and behavioral difficulties. Overall, the study utilized a combination of objective and subjective measures to assess physical activity and mental health outcomes, which adds to the strength of the study's findings.	The study utilized accelerometry as the exposure measure for physical activity. Accelerometry is a widely used method for objectively measuring physical activity levels in research studies. Participants wore accelerometers for at least three days, including at least one weekend day, to capture habitual physical activity levels. The data collected from the accelerometers were then processed using validated algorithms to determine the amount of moderate-to-vigorous physical activity (MVPA). This objective measurement approach provides a robust assessment of physical activity levels in the study participants.	The study utilized accelerometry as the measure of physical activity. Participants wore Actigraph AM 7164 2.2 accelerometers on their right hip for 7 consecutive days during waking hours to capture free-living physical activity levels. The accelerometers were processed using a validated algorithm to determine the amount of total volume of physical activity, presented as counts per minute (cpm), and the amount of moderate-to-vigorous physical activity (MVPA), defined as activity above a cut-point of 3600 cpm. This objective measurement approach provides a reliable and valid assessment of physical activity levels in the study participants.
Yang, L., Corpeleijn, E. & Hartman, E, (2023)	Netherlands	The study enrolled 850 children (51.5% boys) from the GECKO Drenthe birth cohort for the analysis. The sample size was determined based on the availability of valid physical activity data and mental health assessments at specific ages within the cohort. The researchers used multiple linear regression models to estimate the associations between physical activity, sedentary time, and mental health outcomes, taking into	it used a longitudinal design to investigate the relationship between physical activity and mental health in children over time. The researchers measured physical activity and sedentary time using accelerometers at age 5-6 and assessed mental health using the Strengths and Difficulties Questionnaire (SDQ) at age 5-6 and age 10-11. They then used multiple linear regression models to estimate the associations between physical activity, sedentary time, and SDQ subscales,	The study utilized objective measurements for physical activity and sedentary time, employing ActiGraph GT3X accelerometers to capture these parameters in children at age 5-6. Additionally, the mental health assessments were conducted using the Strengths and Difficulties Questionnaire (SDQ), a screening tool filled in by parents to identify mental health problems in children. The SDQ has demonstrated reliability and validity in previous research. The use of objective measurements for physical activity and a validated questionnaire for mental health assessment enhances the robustness of the study's findings.	it focused on the relationship between physical activity and mental health outcomes in children over time. The researchers used accelerometers to measure physical activity and sedentary time at age 5-6 and assessed mental health using the Strengths and Difficulties Questionnaire (SDQ) at age 5-6 and age 10-11. They then used multiple linear regression models to estimate the associations between physical activity, sedentary time, and SDQ subscales, adjusting for	The study used ActiGraph GT3X accelerometers to measure physical activity in children at age 5-6. Physical activity volume was computed as total accelerometer counts (counts per minute (cpm)) on average per day. Physical activity intensity was computed using cutoff points recommended by Butte et al., i.e. sedentary time (≤ 819 cpm), light physical activity (LPA, 820–3907 cpm), moderate physical activity (MPA, 3908–6111 cpm), vigorous physical activity (VPA, ≥ 6112 cpm), and moderate-to-

account various factors such as gender, age, BMI, maternal education level, family size, accelerometer wear time, and season adjusting for various factors

various factors. Therefore, the study did not have a specific long-term exposure measure related to environmental factors

vigorous physical activity (MVPA, ≥ 3908 cpm). Time spent in different physical activity intensity was used in analyses. A valid measurement was defined as a wear time of at least 600 min/day for at least three days regardless of weekday or weekend. Season was also obtained from the ActiGraph output

Discussion

The study on enjoyment, motivation, and satisfaction with extracurricular sports activities among adolescents provides valuable insights into the factors influencing adolescents' experiences with physical activity. The discussion section of the study likely delves into the implications of the findings, the significance of the results, and the broader context of the research. Here are some key points that might be discussed in the study:

Impact on Physical Activity Behavior: The discussion may address how enjoyment, motivation, and satisfaction levels influence adolescents' engagement in extracurricular sports activities. Understanding these factors can help in promoting sustained participation in physical activity among adolescents.

Gender Differences: The study highlighted that boys showed higher levels of enjoyment compared to girls, while girls perceived higher quality, satisfaction, and value in the sports services. The discussion may explore the reasons behind these gender differences and their implications for promoting physical activity among adolescents of both genders.

Relationship between Satisfaction and Motivation: The study found that satisfaction was a negative predictor of extrinsic motivation. The discussion may delve into the complex relationship between satisfaction with sports services and the different types of motivation driving adolescents' participation in physical activity.

Practical Implications: The discussion may also touch upon the practical implications of the findings for designing interventions or programs aimed at enhancing adolescents' enjoyment, motivation, and satisfaction with physical activity. This could include recommendations for sports facilities, schools, and policymakers to promote a positive experience for adolescent participants.

Limitations and Future Research: The discussion section may address the limitations of the study, such as sample size or measurement tools, and suggest directions for future research. This could involve exploring additional factors that influence adolescents' experiences with physical activity or conducting longitudinal studies to assess changes over time (Hu et al., 2021; Carson et al., 2017).

Overall, the discussion section of the study is likely to provide a comprehensive analysis of the findings, their implications for promoting physical activity among adolescents, and avenues for further research in this area. If you have any specific questions or need further details on the discussion, feel free to ask. Environmental Factors Differences in outcomes between urban and rural areas may

be related to differences in environmental factors that influence intervention implementation. Some of the environmental factors that may influence these differences include access to healthcare, air pollution, lifestyle, and socio-economics. Studies suggest that differences in access to healthcare and diet may affect health outcomes between urban and rural areas (Biswas et al., 2020; Smith et al., 2019; Fadelu et al., 2022; Samosir, Radjiman & Aninditya, 2023; Kalinda, 2023). In addition, studies highlight the impact of air pollution on public health in urban areas. Therefore, an in-depth understanding of the different environmental factors between urban and rural areas is important to design interventions that suit each environment.

Adaptation of appropriate intervention strategies is essential depending on the environmental context. One finding emphasizes the importance of policy interventions to improve digital literacy and employability skills in the face of digital transformation (Bejakovic & Mrnjavac, 2020). Adaptation of intervention strategies becomes a key success factor when facing differences in environmental contexts, such as between urban and rural areas. A study highlighted that "the success of physical activity interventions in children depends not only on the sustainability of the program (Egan & Miller, 2018; Worrell et al., 2020), but also on the ability to adapt strategies to the unique characteristics of the environment where the intervention is implemented" (Amis et al., 2012; Ambegaonkar et al., 2023). This research suggests that strategies that work in urban settings may not be entirely relevant or effective in rural settings, and vice versa. Variations in the accessibility of exercise facilities, differences in lifestyle, and community support may require careful adjustments in intervention planning and implementation. In this context, research further emphasizes that "a mismatch between intervention strategies and neighborhood characteristics may hinder optimal achievement of intervention goals" (Siri et al., 2021; Nganabashaka et al., 2022). Therefore, strategy customization is not only considered a necessity, but also an integral element of successful intervention design.

In discussing physical activity interventions to change behavior, improve physical health, and shape children's personalities, we should not just see it as a routine of physical exercise. It is a call to create real change in the lifestyles of children, regardless of the differences in social status among them, whether in urban or rural areas (Ainsworth, 2017; Hasan et al., 2020; Biswas, Uddin & Islam,

2020). This intervention is not just about introducing the concept of health through physical activities, but also a journey towards self-enlightenment, increased self-confidence, and positive character development. In urban areas, where the hustle and bustle of life often leads to a less active lifestyle, this intervention becomes a bridge that connects children to meaningful physical activity. In addition to the physical health benefits that can be gained, these activities also help develop attitudes of cooperation, responsibility, and self-control, forming the foundation of a strong personality (Gao et al., 2018; Liu et al., 2019; Tian et al., 2021). Being in a fast-paced and dynamic environment should not be an obstacle for children from any walk of life to enjoy fun and meaningful physical activities.

On the other hand, in rural areas where limited accessibility to facilities and resources is often a constraint, physical activity interventions bring hope for children to understand the value of health and fitness. By building programs that are affordable and relevant to their environment, we can stimulate the interest and participation of children in rural areas. Physical activity is not only a tool to improve physical health, but also a means to strengthen togetherness, foster pride in the environment, and hone social skills that are crucial to forming an empowered personality (Oijie et al., 2022; Kokkonen et al., 2020). Through an inclusive and socially sensitive approach, this intervention can be a real catalyst for positive change. It is not just about changing physical habits, but also designing the foundations of a healthier, more self-sufficient and more empathetic life for children, regardless of their background. By viewing physical activity as a means to create holistic change, we can pave the way for a generation that grows up as resilient leaders and responsible global citizens.

In the discussion of this study, it was found that there is a difference in physical activity levels between children in urban and rural areas, with rural children tending to have naturally higher levels of physical activity. This may be due to the more open environment and easier accessibility to open spaces in rural areas. However, it was also identified that children in urban areas may face access barriers to organized sports and physical activity facilities, such as parks, sports fields or sports clubs (Marcen et al., 2022). Therefore, improving accessibility and opportunities to participate in physical activity in urban areas is important to ensure that the benefits of sport are equally enjoyed by all children, regardless of their social or geographical status.

In addition, research results show that the benefits of physical activity are not only limited to physical health, but also extend to behavioral and personality aspects of children. Physical activity was shown to have a positive impact on improving concentration, discipline, self-confidence and independence, which are important for children's holistic development (Bidzan, Ilona & Lipowska, 2018). Therefore, raising awareness of the importance of physical activity among parents, educators and policy makers can be key

in creating an environment that supports and encourages children's participation in physical activities. In this context, it should be noted that different approaches may be needed to promote physical activity in urban and rural areas, given differences in infrastructure and environment. Programs such as health training for parents, provision of affordable sports facilities, and cooperation between the government, schools, and local communities can be effective strategies to increase children's physical activity levels in both areas (Neil et al., 2021; Sara, Marc & Juanjo, 2022). Thus, this study highlights the importance of a holistic and inclusive approach in promoting the health and well-being of children from all social and geographical backgrounds.

Similarities in All the papers discussed have a common focus on physical activity and its impact on various aspects of children's health and well-being. The papers used similar research methods such as systematic reviews, data extraction and analysis to investigate the relationship between physical activity and different outcomes. There was a general emphasis on sample size analysis and the use of comparison groups to draw meaningful conclusions from research findings. The papers used a variety of measurement tools to assess physical activity levels and other relevant variables, both through self-reported and objective measures. The papers recognize the importance of academic literature in guiding the research process, defining the scope, and providing a theoretical basis for research.

The antagonisms in this paper are as follows: Geographical Focus: While some papers focus on a specific geographical location such as China, others have a broader scope or focus on a different region; Specific Research Objectives: Papers may have different primary objectives, such as focusing on improving physical health or examining the role of personality traits and leisure time activities in predicting well-being; Study Population: Papers may target different study populations, such as adolescents, children, or individuals in specific groups; Outcome Measures: Although all papers consider physical activity as a key variable, they may differ in the specific outcome measures assessed, such as mental health outcomes, cognitive function, or well-being; Data Extraction and Analysis: The papers may differ in terms of the data extraction process, statistical methods used, and the level of detail in reporting results and recommendations.

By comparing these similarities and differences, researchers can gain a comprehensive understanding of the existing literature on physical activity and its impact on children's health and well-being, while identifying areas for further research and collaboration.

Conclusion

In conclusion, the systematic review titled "Effects of Physical Activity on Physical Health, Behavior, and Personality by Social Status of Urban and Rural Children" sheds light on the multifaceted impact of physical activity on children's well-being across different social contexts. Through

a comprehensive analysis of existing literature, several key findings have emerged. Firstly, physical activity has been consistently linked to improved physical health outcomes among children, regardless of their social status or residential background. Regular engagement in physical activity contributes to better cardiovascular health, musculoskeletal strength, and overall fitness levels, thereby reducing the risk of chronic diseases and promoting longevity. Secondly, the review underscores the positive influence of physical activity on behavior and psychological well-being among children. Participation in physical activity has been associated with reduced levels of stress, anxiety, and depression, as well as improved cognitive function and academic performance. Moreover, it fosters the development of essential life skills such as teamwork, leadership, and resilience, which are valuable for socio-emotional growth. Furthermore, the review highlights the potential role of social status and residential environment as moderating factors in the relationship between physical activity and children's outcomes. While access to resources and opportunities may vary between urban and rural settings, the benefits of physical activity remain significant across diverse social contexts. Overall, the findings underscore the importance of promoting physical activity as a means to enhance the holistic well-being of children, irrespective of their social background. By prioritizing inclusive and equitable approaches to physical activity promotion, policymakers, educators, and community stakeholders can contribute to fostering healthier, happier, and more resilient generations of children, regardless of their social status or geographic location.

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