

NARRATIVE LITERATURE:

ROLE OF PHYSIOTHERAPISTS IN SCHOOL HEALTH RESEARCH IN INDIA: A NARRATIVE SYNTHESIS OF LITERATURE

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ABSTRACT

Background: Several large-scale population studies have highlighted the decline in physical activity and fitness levels among Indian school children. There has been a determined effort at a National level to facilitate health and wellness among school children by mandating regular participation in physical activity and periodic assessments using standardized metrics. Though physiotherapy as a profession is well placed to support existing pathways towards promoting health and wellness in schools, it is not clear if physiotherapists are engaging in school health programs. This review therefore aimed to summarize studies conducted by Indian physiotherapists in school setting.

Methods: Using a narrative review approach, studies were retrieved using a two-step strategy: a. Literature Search in scientific database and repositories; b. Snowballing strategy. The search was executed in Medline through PubMed, ProQuest, Shodhganga, and Google Scholar. In addition, grey literature was retrieved using snowball sampling strategy to reach out to potential researchers.

Results: A total of 36 published and un-published studies were identified for this literature review. All but one was cross sectional studies and had sample size ranging from 25-2167 participants. Various components of physical fitness, physical activity levels and posture related ergonomics were the focus of studies. Population-based reference norms were also reported for grip strength and six-minute walk distance.

Conclusion: Indian Physiotherapist have consistently shown interest in school health programs. There is a need for concerted professional initiatives to bring together like-minded people and provide the necessary impetus to advocate the role of physiotherapists in school health programs.

Key Words: Grip Strength, Health Promotion, Physical Activity, Physical Fitness, Six-Minute Walk Distance

INTRODUCTION

Studies done in the past reveal that almost half of children and youth in India do not meet recommended guidelines for physical activity and sedentary behavior¹. The 2018 India Report Card on Physical activity for children and youth has reported that only about 25% of our children and youth accumulate ≥ 60 minutes of Moderate to Vigorous Physical Activity (MVPA) daily while only 15% meet recommended standards of Fitness². This report restates the need for renewed government strategies and investments to facilitate active living among children and youth.

In effect, the Central Board of Secondary Education introduced a well-designed program to mainstream health and physical education in schools for classes 9th and 10th from the academic year 2018-19³. This was extended to classes 1st to 8th from academic year 2019-20⁴. Similarly, in August 2019 a nation-wide Fit India Movement was launched by the Prime Minister to encourage people to remain healthy and fit by including physical activities and sports in their daily lives⁵. The Sports Authority of India developed the Khelo India Mobile Application to assess physical fitness of school going children across the country and also gave the Standard Operating Procedures for undertaking Khelo India Fitness

Assessment Training of Trainers Program⁶.

With the philosophy of encouraging physical activity towards healthy living aligning well with the scope of physiotherapy service provisions, there has been an increasing impetus for physiotherapists to be active promoters of physical activity and health promotion. In this context, the policy stimulus towards physical activity and health promotion in schools in the last couple of years augers well for physiotherapists to systematically contribute to school health program in our country. Anecdotal information suggests that many physiotherapy academic institutions and researchers are involved in school health programs. However, no studies have documented the role and contribution of physiotherapists in school health research in India. This literature review was therefore performed to identify and summarize research studies by physiotherapists with an emphasis on assessment and interventions to improve physical activity and fitness in school children.

Methodology:

To identify research studies on assessment and interventions to improve physical activity and fitness in school children by physiotherapists in India, a two-step strategy was adopted: a. Literature Search in scientific database and repositories; b.

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Snowballing strategy

For literature search in scientific database and repositories, a simple search strategy was constructed using word variations of physiotherapy, physical activity, fitness and its components and were combined using appropriate Boolean operators. The search was executed in Medline through PubMed, ProQuest and Shodhganga (National PhD Repository) and Google Scholar.

For snowballing strategy, a data template was created and circulated among the professional contacts of the authors requesting them to identify studies that they were part of OR aware of and fill-in the data templates based on their findings. If study details were not available in public domain, the authors were contacted and requested to provide information. This strategy was considered essential because it appeared that many studies on school health were conducted as part of postgraduate thesis or by faculty but were either not published or were not retrieved through scientific database and repositories.

The search was executed and results screened by authors AT and SKV and those found relevant to this review were included. The first author extracted and compiled the data. This literature review summarizes findings from both published and unpublished studies done in India by physiotherapist on school going children and adolescents. Only studies related to physical fitness parameters and posture were included in this review. Scientific papers related to studies in children with special needs were excluded in this review.

Results:

The database search and snowballing strategy retrieved 36 publications. The review revealed that the most common domains of studies by Physiotherapists in school children in the Indian scenario covered measures of physical activity, functional capacity, components of physical fitness such as aerobic capacity, strength, flexibility and on ergonomic and posture related outcomes. The following section summarizes studies retrieved through our literature search and would provide a basis of understanding the status of studies conducted by Indian Physiotherapists among school children. The descriptions are categorized based on the outcomes and covers all types of study design. In addition, details of Sample size, Population, Outcome measures and Setting in which the study were conducted are summarized in Table 1.

A. Multi-Component Physical Fitness as Outcomes:

Physical fitness is defined as a set of attributes that people have or achieve that relates to the ability to perform physical activity. The health-related physical fitness components are body composition, cardiorespiratory endurance and musculoskeletal fitness⁷. Many studies have been done by Physiotherapists in Indian children to assess the different components of physical fitness using a variety of valid tests. Saxena Metal⁸ studied fitness parameters like anthropometry, cardiopulmonary and muscular endurance, strength, speed, power, agility etc. in almost 1400 school children in Vadodara between the ages of 10 to 14 years between 2006 and 2015. Similarly, Raja et al⁹ studied fitness components like

endurance, flexibility, strength and power in 1049 school children in Karnataka between the ages of 8 to 14 years while Thakur et al¹⁰ assessed fitness parameters using the FITNESSGRAM test battery in 625 children in the age of 12 to 15 years in Maharashtra. All these studies had a general common conclusion that boys performed better in most fitness parameters than girls in all age groups (except till 12 years) and the performance increased steadily with age in boys. These studies also inferred that fitness performance was influenced by age, BMI, socio economic status and regular physical activity^{8,9,10,11}. Sharma¹² studied the effect of obesity on self-esteem, academic and physical performance in around 1069 school children between the ages of 9 to 16 years. The study concluded that there was a negative correlation between BMI and physical fitness performance and positive correlation between academic performance and the aerobic capacity and self-esteem

Karkera et al¹³ compared the physical fitness and activity levels between 650 urban and rural children in the ages of 9 to 13 years and concluded that rural children performed better in flexibility and cardio vascular endurance tests when compared to their urban counterparts. Likewise, Veluswamy et al¹⁴ compared the cardiorespiratory endurance of 272 children and youth between the ages of 12 to 15 years with recently published reference norms for the Eurofit tests and concluded that most participants were below 40th percentile of Eurofit norms indicating either poor fitness levels or having different norms.

Almost all these studies recommend a need for increasing awareness of fitness (especially health related fitness) among school teachers, children and parents and also suggest regular/annual assessments for the fitness parameters in schools.

B. Physical Activity as Outcome.

Physical activity is defined as any body movement produced by muscle action that substantially increases energy expenditure¹⁵. Accelerometry is the tool of choice to objectively measure physical activity, but is not feasible and affordable in all studies¹⁶. Thus, most studies use variety of questionnaires to assess level of physical activity. The few studies done by Physiotherapists in Indian children too have used questionnaires to assess physical activity. Thakur et al¹⁷ studied the levels of physical activity in 358 children aged 10 to 15 years using the Physical Activity Questionnaire (PAQ-A) and reported moderate levels in boys and low levels of physical activity in girls. A comparison of physical activity between rural and urban children was done using Self-Administered Physical Activity Checklist¹³. This study concluded that the physical activity was more in rural children as compared to urban children. There are a few studies that have evaluated correlation of physical activity with parameters such as physical activity self-efficacy¹⁸ and anthropometric parameters¹⁹. These studies have a general conclusion that the physical activity levels in Indian children and youth is less than what is prescribed^{13,17,20}.

C. Six-Minute Walk Distance as Outcome

Six-minute walk test is a simple practical test of functional

capacity and is considered easy to administer, well tolerated and reflective of activities of daily living²¹. As a result, many studies have used six-minute walk distance as outcome measures. Researchers have developed normative values and predictive equations for six-minute walk distance in various countries and different populations. In India too, normative values and equation has been developed for adults as well as children. D'Silva et al²² established normal reference standards for six-minute walk distance of children aged between 7-12 years while Chitroda et al²³ and Vardhan²⁴ studied the six-minute walk distance covered by children in the age groups of 6 to 11 years and 7 to 16 years respectively. The distance recorded was found to correspond with the respective age groups in all the above studies. Gender and age affected the distance covered, with boys covering more distance than girls in all age groups and the distance increasing with an increase in age. A study by Desai et al²⁵ also demonstrated that socioeconomic status and physical activity had an impact on the six-minute walk distance in children.

D. Grip Strength as Outcome

A strong correlation between grip strength and total muscle strength has been observed in children and adolescents²⁶. As a result, handgrip strength is considered to be an indicator of overall strength and general health²⁷. Koley et al²⁸ reported normative values for handgrip strength in almost 2167 Indian subjects between 6 to 25 years. They stated that the increase in grip strength with age was approximately parallel for male and female students until 13 years of age, after which male students were significantly stronger than female students. Another study by Shetty M et al²⁹ provided reference values for grip strength, tip to tip, key and tripod pinch for ages 5-18 years of age. This study was done in about 900 children and adolescents. Studies have also reported positive correlation between handgrip strength and anthropometric measurements (like total extremity length, upper arm circumference, etc) in children^{29,30}.

E. Ergonomic and Posture-related Outcomes

Posture is defined as 'a position or attitude of the body; the relative arrangement of body parts for a specific activity; or a characteristic manner of bearing one's body'³¹. Correct posture minimizes the strain on the human body by maintaining balance of the muscles and skeleton³². In the current scenario in India, the children are expected to carry heavy backpacks to school which are known to alter the posture. Several studies done by Physiotherapists in school children attempt to assess the effect of carrying school bags or backpacks on shoulder and cervical posture. Ramprasad et al³³ studied the changes in various postural angles (cranio-vertebral [CV], head on neck [HON], head and neck on trunk [HNOT], trunk and lower limb angle) with different backpack weights in 200 preadolescent children in the ages of 12 to 13 years. They reported a significant increase in CV angle after 15% of bodyweight as backpack load, change in HON and HNOT after 10% of bodyweight as backpack load and also change in trunk and lower limb angle after 5% of bodyweight as backpack load. The authors concluded that carrying a backpack of 15% body weight altered all the postural angles in pre-adolescent children. A similar study done by Shivananda et al³⁴ in school children between the ages of 13 to 16 years used cranio-

horizontal angle, cranio-vertebral angle and sagittal shoulder posture to assess postural changes with use of backpack. They too concluded that the incidence of forward head posture increased while carrying backpack of about 15% the body weight. Similar studies were done by Vaghela et al³⁵ and Mandrekar et al³⁶ who studied effects of different weight backpacks (18% and 13.5% of the body weight respectively) on posture and also reached the similar conclusion. Koley et al³⁷ too reported positive correlations between backpack weight and height with ranges of lumbar flexion and extension in school going boys and girls. Verma et al³⁸ reported prevalence of forward head posture to be 63% among the school children in their study. They reasoned this to incorrect use of heavy backpacks, lack of ergonomic school furniture, extended hours in incorrect postures in varied environments such as in schools during classes and at homes while using electronic devices. Dharmayat et al³⁹ did a cross-sectional study in 500 school going girls aged 10-14 years to assess posture and musculoskeletal pain using New York Posture Rating Scale (NYPR) and Visual Analogue Scale (VAS) respectively. They concluded that the most common site of pain related to carrying the backpack was shoulder and also that forward head posture was the most frequent postural abnormality. Tomar et al⁴⁰ also reported neck and back pain in school going children related to weight of back-pack. Some studies have researched the effect of backpack loading on other body functions like six-minute walk test⁴¹, respiratory capacities⁴², Physiological Cost Index⁴³, balance⁴⁴ and ergonomic behavior⁴⁵ and reported a negative impact on all these functions. Awareness regarding correct posture and correction strategies to improve posture in school children has also been attempted by some Physiotherapists. Bhadsorawala et al⁴⁶ studied the awareness of correct sitting posture in 400 school children in the age group 14 to 17 years. They reported that though 75% of the students were aware of the correct sitting posture, only a few actually maintained it while watching TV, playing video, eating meals etc. Reduction in neck pain and neck disability was observed by Perooru et al⁴⁷ after posture modification and home care exercises (isometric neck exercises and free exercises) were done regularly for 3 weeks by children in the age groups of 10 to 14 years.

F. Flexibility as Outcomes

Flexibility is the ability of a specific muscle or muscle group to move a joint or series of joints smoothly and easily through a full range of motion⁴⁸. Enhanced musculoskeletal fitness in children, adolescents and adults is associated with an improvement in overall health status and a reduction of risk for chronic disease and disability⁴⁹. Studies done by Physiotherapists in children in the Indian scenario commonly involve assessment of hamstring flexibility. Sit and reach test and its various modifications like the back-saver sit and reach test, modified back saver sit and reach test have been tested to assess the best method to study hamstring flexibility^{50,51}. Flexibility was found to be have a weak correlation with BMI⁵² but was found to be better in girls as compared to boys in almost all age groups in children and adolescents^{8,10}

Discussion:

School-based health promotion is being increasingly seen as a long-term public health solution to the rising burden of chronic

non-communicable diseases. The recent policy level interventions both at the education board and government level highlight the importance of encouraging children to remain active as a strategic plan towards the goal of making India a health Nation. In the last decade, multiple global alliances are calling for increasing participation of physiotherapist in physical activity and health promotion initiatives.⁵³ School setting provides excellent opportunities for physiotherapist to engage with teachers and parents and in turn encourage large population towards active and healthy living. However, in the current school health framework, physiotherapists have not been considered as important stake holders. This could be due to varied perception regarding physiotherapists role in health promotion and limited advocacy regarding the potential role of physiotherapist in promoting health among children within a school setting. There also seems to be limited resources in the form of guidelines or recommendations from professional organizations that advocate the role of physiotherapist in school health. This review was an attempt to document the role physiotherapist have played in school health research. It was anticipated that the review would provide an insight into where does the profession stand and this may help shape future directions.

The review has highlighted many important characteristics regarding school health research by Indian Physiotherapists. All studies (barring one) were cross-sectional in nature and had sample sizes ranging from 25 – 2167. The mean sample size was 431 children. Studies have been conducted across urban, semi-urban and rural settings and seem to represent diverse regions of the country. A reasonable number of studies have attempted to provide population-based reference norms for outcomes such as six-minute walk distance and grip strength. From the publications screened in this review, it appears that physiotherapist have consistently been engaging with school health related research and there seems to be some common areas of focus between studies.

If a concerted effort is made by the professions' stakeholders, it appears feasible to improve participation of physiotherapist in school health programs. Participation of physiotherapists in school health program would augur well for the National mission of nurturing a health Nation. Several avenues exist for physiotherapist to engage with schools in supporting their effort towards improving health and fitness among school children. In this regard, Society of Indian Physiotherapist has approved the formation of a school health task force. The task force would aim to

- ▶ Develop strategies for capacity building of Indian PTs towards promotion of health and wellness in schools
- ▶ Create awareness among schools about the role of PTs in school health programs and train physical education teachers in fitness assessment
- ▶ Develop strategies for support schools in implementing school health assessment & programs in different regions of the country.

It is hoped that efforts like these will bring together like-minded people from across the country and have a strategic plan at both National and regional levels to improve the participation of physiotherapists in School health initiatives. These efforts would augment and support the important role physical education teachers are playing in shaping the health and wellness of future generations of the country.

Limitations:

There are several limitations to the review. At first, this review should not be considered comprehensive. Though an attempt was made to retrieve study findings from both grey literature and through unpublished data, it is highly likely that many studies were not picked up by our search strategy. In addition, it is also likely that many studies were published in journals that are not indexed in Medline or were not picked up during search in Google Scholar. Though an attempt was made to devise a search strategy, it was not feasible to use the same set of key words in all database and repositories and this would limit the potential for reproducing the findings. As the aim of the review was to provide a bibliographic estimate of publications by Indian physiotherapists, quality rating of published research was not undertaken and hence no recommendations are being made regarding the validity of the findings. This review only focused on research initiatives. It is possible that physiotherapists are participating in school health program as part of their clinical and community services.

Conclusion:

Indian Physiotherapist have consistently shown interest in school health programs. It is highly likely that many programs exists but they are not easily available in the public domain. There is a need for a concerted professional initiative for bringing together like-minded people and provide the necessary impetus to facilitate and advocate the role of physiotherapists in school health programs.

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Table 1: Descriptive Summary of Included studies

A. Studies Reporting Multi-Component Physical Fitness as Outcomes				
Author	Sample size	Age and Gender	Outcomes	Setting
Saxena et al ^{8*}	1395	10 to 14 years, Both genders	Anthropometry, Cardiopulmonary and muscular endurance, flexibility, Speed, Power Agility	Semi urban
Raja et al ⁹	1049	8 to 14 years, Both genders	Presidential Fitness challenge	Semi urban
Thakur et al ^{10*}	625	12 to 15 years, Both genders	FITNESSGRAM	Urban
Thakur et al ¹¹	522	12 to 15 years, Both genders	SES, Anthropometry	Urban
Sharma ^{12*}	1069	9 to 16 years Both genders	Anthropometry, Cardiopulmonary and muscular endurance, flexibility, Coopersmith Self-esteem Inventory Questionnaire	Urban
Karkera et al ¹³	650	9 to 13 years, Both genders	Self-Administered Physical Activity Checklist, Euro fit physical fitness test	Urban and rural
Veluswamy et al ¹⁴	272	12 to 15 years, Both genders	Cardiopulmonary endurance	Urban
B. Studies Reporting Physical Activity as Outcome.				
Thakur et al ¹⁷	358	10 to 15 years, Both genders	PAQ-A	Urban
Alva et al ¹⁸	272	12 to 15 years, Both genders	SEPA, PAQ-A, ASAQ	Urban
Sarungbam et al ^{19*}	76	11 to 14 years, Both genders	PAQ-C	Urban
Sankar et al ^{20*}	Not Available		Questionnaire, FITNESSGRAM	Urban
C. Studies Reporting Six-Minute Walk Distance as Outcome				
D'Silva et al ²²	400	7 to 12 years, both genders	6MWT	Semi urban
Chitroda et al ²³	300	6 to 11 years	6MWT	Urban
Vardhan et al ²⁴	460	7 to 16 years, both genders	6MWT	Urban
Desai et al ²⁵	300	6 to 11 years	6MWT, SES	Urban and rural
D. Studies Reporting Grip Strength as Outcome				
Koley et al ²⁸	2167	6 to 25 years, Both genders	Handgrip strength	Semi urban
Shetty et al ²⁹	900	5 to 18 years, Both genders	Handgrip strength	Urban
Koley et al ³⁰	454	12 to 18 years, Both genders	Handgrip strength	Urban and rural

E. Studies Reporting Ergonomic and Posture-related Outcomes

Author	Sample size	Age and Gender	Outcomes	Setting
Ramprasad et al ³³	200	12 to 13 years, Both genders	CVA, HON, HNOT, trunk and lower limb angle	Semi urban
Shivananda et al ³⁴	200	13 to 16 years, Both genders	CHA, CVA, SSP	Urban
Vaghela et al ³⁴	160	10 to 15 years, Both genders	CHA, CVA, SSP	Semi urban
Mandrekar et al ³⁶	70	10 to 15 years	CHA, CVA, SSP	Urban
Koley et al ³⁷	300	6 to 15 years, Both genders	Lumbar flexion, extension	Urban
Verma et al ³⁸	300	12 to 16 years	CVA	Semi urban
Dharmayat et al ³⁹	500	10 to 14 years	NYPR scale, VAS	Semi urban
Tomar et al ⁴⁰	195	14 to 15 years, Both genders	Questionnaire	Semi urban
Shah et al ⁴¹	60	07-13 Years	6MWT	Urban
Kulkarni et al ^{42*}	30	12 to 14 years, Both genders	PFT	Urban
Soman et al ^{43*}	70	8 to 10 years, Both genders	PCI	Urban
Tendulakar et al ^{44*}	150	10 to 14 years, Both genders	SEBT	Urban
Rajan et al ⁴⁵	65	Mean age 13 years, Both genders	Questionnaire	Urban
Bhadsorwala et al ⁴⁶	400	14 to 17 years	Questionnaire	Urban
Perooru et al ⁴⁷	25	10 to 14 years	NDI, VAS	Semi urban
Gadhiya et al ⁵⁰	141	5 to 12 years, Both genders	BSSRT, MBSSRT	Semi urban
Jaspreet et al ⁵¹	140	5 to 12 years, Both genders	Sit and reach test, Hip joint angle	Semi urban
Arora et al ⁵²	300	10 to 19 years, Both genders	Sit and reach test, BMI	Urban

*Not published in peer-reviewed journals, identified through grey literature and personal communication

SES – Socioeconomic status, SEPA- Self-Efficacy for Daily Physical Activity Questionnaire , PAQ-A- Physical Activity Questionnaire-Adolescents, PAQ-C- Physical Activity Questionnaire-Children, ASAQ - Adolescent Sedentary Activity Questionnaire, 6MWT – 6 Minute Walk Test, CVA-cranio-vertebral angle, CHA- cranio-horizontal angle, SSP-shoulder sagittal posture, HON - head on neck, HNOT - head and neck on trunk, PFT – Pulmonary function test, PCI – Physiological Cost Index, SEBT – Star Excursion Balance Test, NDI- Neck Disability Index, VAS- Visual Analog Scale, NYPR- New York Posture Rating, BSSRT – Back saver sit and reach test, MBSSRT – Modified Back saver sit and reach test, BMI – Body Mass Index

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