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Original Research Article

Assessment of physical literacy amongst school going children aged 10-17 years: a survey study

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ABSTRACT

Background: Physical literacy term outlines, the physical competence, confidence, knowledge, motivation and understanding that an individual developed intending to keep physical activity at an appreciable level all throughout their life. The. need of the study is to find out the prevalence of physical literacy in children and do they inculcate it into their lives.
Methods: The study was conducted on students aged 10-17 years from schools in and around Pune using the Canadian assessment of physical literacy-2 scale.
Results: It was found that prevalence of physical literacy for boys was 72.61% for girls' prevalence of physical literacy was 64.02% with knowledge domain being most affected in both.
Conclusions: It was being concluded that physical literacy was more affected in females influencing factors being social, environmental and biological. Knowledge and understanding domain were affected the most.

Keywords: Physical literacy, Daily behaviour, Physical competence, Knowledge, Understanding, Motivation, confidence

INTRODUCTION

Physical literacy

The term outlines, the physical competence, confidence, knowledge, motivation and understanding that an individual developed intending to keep physical activity at an appreciable level all throughout their life.[1,2]

Physical fitness

A group of attributes or elements, individuals have/attain that refers to their capability to perform physical activity.

Physical activity

It is described as any leading movement that is produced by skeletal muscle contraction which causes increase in caloric requirement over resting energy expenditure. Exercise is a kind of physical activity composed of planned, structured and repetitive bodily movement performed to improve or carry on one or more components of physical fitness.

Benefits of physical literacy for children

Decreased risk of obesity

Majority of children leave primary school obese; their prevalence is 1 in 4, but children who are active since young age have remarkably low risk of evolving weight problems. Childhood obesity could be prevented if kids engage in 30 min of vigorous physical activity every day. Healthy habits and making exercise fun and satisfying part of life should be goal.[3]

Spatial awareness

Superior spatial awareness is observed in children who are physically literate. This permits them to move through environment with confidence. At an early age, balance, coordination and agility are developed posture, functionality and energy levels continue to enhance into adolescence.[3]

Academic attainment

Physical activity has a positive effect on academic acquisition. Based on U. S. study,14.8% of students showed improved focus following physical activity, and about 17% reports showed children felt more alert and ready to learn. Many studies come up with strong evidence to support the link between physical activity and behaviour in school.[3]

Improved confidence

Due to physical literacy, children have the confidence to explore new challenges and activities. This boldness influences other areas of life including making friends, attaining, academically and making decisions for the future.[3]

Increased interest in sports

Participation in sports has declined over last decade. Children aren't developing fundamental movements skills necessary to excel at these activities.[3]

The youngsters are unlikely to develop interest in taking part as they don't feel comfortable playing sports. Helping children to become physically literate at young age can motivate a new generation of kids to develop interest in sports that will positively affect their lives.

Motivation and cognitive function

Cognitive health has a direct impact due to physical activity and it can even improve memory recollection. Based on many studies, exercise excites certain chemicals in brain which affect the function of neurons and grey matter and also build-up of blood vessels. People that exercise daily have more density of neurons and grey matter in certain parts of brain regulating critical thinking.

Benefits of physical activity

Prevention of chronic disease, decreased mental stress and depression, increased bone viscidity, increased blood flow and glucose delivery, prevention of obesity reduced risk of overuse injury, improved energy level and concentration, enhanced performance in work, recreational activity and sports activity.[4]

Objectives

Objectives of the study were to assess the four domains of physical literacy namely: daily behaviour, physical competence, knowledge and understanding and motivation and confidence for girls and boys of age 10-17 and calculate the result on independent basis.

Ethical clearance

The project was started with the presentation of synopsis and ethical clearance from the ethical committee of PES modern college of physiotherapy.

METHODS

Study design

This was a single time survey study.

Sample size

The 150 school students of which 75 were males and 75 were females from schools in and around Pune. calculation: confidence level: 95%, error: 5%, population proportion 89%.[5-7]

Students were randomly selected from Rakshak Nagar gold society and Modern high school, Shivajinagar, Nirmala convent school: Kharadi, Prodigy Public School: Wagholi, Lexicon international school: Wagholi and Sanskriti school: Wagholi. Further pre assessment evaluation was done acc.to inclusion exclusion criteria and fundamental musculoskeletal and endurance assessment.

Outcome measure

The CAPL-2 scale was used as the outcome measure.

Study duration

This study was a one time survey study carried out within 6months from October 2022 to April 2023. Method of sampling was convenient sampling.

Inclusion criteria

School going children of age 10 to 17, students who were able to independently read and write were included.

Exclusion criteria

Child with any disability, child with any congenital disease, child having mental retardation and child with any cardiovascular or bronchial disease were excluded.

Procedure

Participants were selected according to inclusion and exclusion criteria. Consent form and ascent form were taken from the participants. Prior musculoskeletal, strength, endurance and flexibility assessment were done.

Physical literacy assessment was taken by CAPL-2 scale, four domains were assessed according to their protocol and results were calculated on independent basis.

Calculating daily behaviour domain score

Pedometer steps component score: Range:0-25. Weekly time spent in moderate to vigorous physical activity (MVPA) component score: Range:0-5.

Grades

Beginning: You are beginning your journey towards acquiring the daily behaviour needed for a physically active lifestyle. Have more fun and be healthier by trying to increase the physical activity you do each day and by decreasing your screen time and the time you are sitting still.

Progressing: You are progressing towards the guidelines for daily behaviour. Your daily behaviour score is similar to other children your age. Have more fun and be healthier by trying to increase the physical activity you do each day and by limiting your screen time and the time you are sitting still.

Achieving: You are achieving the recommended levels for daily behaviour. That means you are gaining health benefits from your physically active lifestyle. Keep up the great work by trying to be even more physically active and spending less time sitting still or watching screens.

Excelling: Congratulations, you are doing a great job at being active every day. That means you are getting a lot of health benefits from your physically active lifestyle.

Calculating pedometer counts

Each child wearing the pedometer was instructed to wear the pedometer for 7 full days in a row, counting instead. After you receive the pedometer as day 1. At the end of each day when you go to bed write down how many steps you took. Take the pedometer off when you get into bed at night and place it on your bedside table, put it back on as soon as you get out of bed in the morning. Reset the pedometer to 0 every morning when you wake up and do not push the reset button any other time. Never wear the pedometer in water. You can wear the pedometer during sports team practices or games if your coach says it is ok for you to do so if you have to wear tight fitting clothes, like gymnastics, Leotard, then you can put on a pair of shorts over the top, or wear a belt and attach the pedometer to that instead. If you take the pedometer off for any reason, record the length of time that you were not wearing the pedometer on your log sheet, alongside the reason why you took it off.

Calculating self-perceived MVPA score

It is calculated as follows, for no. of days the child reports at least 60 mins of physical activity: for 0 or 1 day, component score=0, for 2 days=1, for 3 days=2, 4 days=3, 5 days=4 and for 6 or 7 days=5.[3]

Calculating physical competence domain score (30)

The scores for individual components are as follows: plank score=10 points, PACER score=10 points and CAMSA score=10 pts.

Grades

Beginning: You are beginning on the journey of the physical competence needed to for a physically active lifestyle. Have more fun and be healthier by practicing the skills involved in the physical tests like: running, jumping, catching, throwing, pushing up, and holding the plank.

Progressing: You are progressing on the journey of having the physical competence that is related to health benefits. Your physical competence scores are similar to other children your age. Have more fun and be healthier by practicing the skills by running while jumping, catching, throwing and kicking and also try running for longer periods of time, and holding the plank a little longer

Achieving: You are achieving the recommended levels of physical competence. That means your scores are related to health benefits. Keep up the great work by improving the areas that you find more challenging. If it's the plank, follow the steps to improve your plank score.

Excelling: Congratulations, you are doing a great job of being physically competent. That means your score is related to a lot of health benefits. Keep up the great work!

CAMSA (Canadian agility and movement skill assessment) score: 10 points

Each skill performed during the CAMSA is evaluated using 1 or more criteria. Each skill criteria are scored as: either performed (1 point), or not correctly performed (0 Points). No partial points are provided.

CAMSA skill score

The point distribution between skills performed is as follows: for 1.2-foot jump (range 0 to 2), sliding=(range 0 to 3), catching=(range 0 to 1), throwing=(range 0 to 2), skipping=(range 0 to 2),1-foot hop=(range 0 to 2) and kicking=(range 0 to 2).

The skill score is simply the total number of skills that were correctly performed, so the skill score will range from 0-14.

CAMSA time score

For time in secs: if 14<15 sec, score=13, 15<16 secs=12, 16<17 sec=11, 17<18 sec=10, 18<19 sec=9, 19<20 sec=8, 20<21 sec=7, 21<22 sec=6, 22<23 sec=5, 23<24 sec=4, 24<25 sec=3, 25<26 sec=2 and for 26<27 sec=1.[4]

For the total CAMSA score, time score=:0-14, Skill score=0-14 so total score=0-28.

The best score from 3 trials is taken.

Calculating PACER score

Following are the instructions to the participants: Participant should stand in a running position and make sure that they are behind the start line. At the sound of the first beep, you should take off as soon as possible to ensure that you cross over the line at the other side. Once you get there, turn around and wait for the next beep. As soon as you hear the next beep start running again to get back to the other side. Each minute the beeps will get faster and faster. Reach to the other side before the sound of the next beep. When you hear a triple beep, this tells you that you have completed a level and the beeps are about to get a bit faster. Continue to run back and forth until you're not able to make it over the line before the next beep.

The scores for 20 m PACER laps were as follows: for laps <5, score=0,5-9 laps, score=1, 10-14 laps, score=2, 15-19 laps, score=3, 20-24 laps, score=4, 25-29 laps, score=5, 30-34 laps, score=6, 35-39 laps, score=7, 40-44 laps, score=8, 45-49 laps, score=9, >49 laps, score=10.[4]

Plank assessment

Instructions for the participants were as follows: Participant should start on your hands and knees, lean on your elbows and fold your arms so that your fingertips touch your elbows. When correct elbow spacing is achieved, shoulders should be directly above the elbows. Now fold your hands together against the floor and move your toes back so that you can straighten. Look at your hands and make a perfectly straight line from your head, through your shoulders and hips to your ankles. Correct body position as required for your legs. I am going to time how long you can keep your body perfectly straight. Lean on your elbows and fold your arms so that your fingertips touch your elbows.

Interpretation

For plank time (sec)<20, score=0, 20-29 sec, score=1, 30-39 sec, score=2, 40-49 sec, score=3, 50-59 sec, score=4, 60-69 sec, score=5, 70-79 sec, score=6, 80-89 sec, score=7, 90-99 sec, score=8, 100-110 sec, score=9 and for >110 sec, score=10.[4]

Knowledge and understanding domain

Assess the child's physical literacy knowledge by 5 questions with specific scoring criteria. The CAPL-2 questionnaire was used.

Motivation and confidence domain

This domain was assessed with the help of CAPL-2 questionnaire which assigned 7.5 pts to each 3 item component of assessment. The maximum possible score was 30 pts.

Statistical analysis

For this model having for factors the chi square statistics was 23 with the degrees of freedom=28.87. The alpha was taken to ne 0.05 for n=150.The value of X^2/df was 0.8. The total CAPL score were X^2=14.5 for boys and 8for girls. For the physical competence domain boys (0.5) achieved more better scores than the girls (0.4) and daily behaviour [boys (0.5), girls (0.4)]. There was a significant difference seen for the knowledge and understanding domains for both boys and girls (0.2). The scores for physical competence showed an increase from the age 10 (0.2) to age 17 (0.4) for females and age 10 (0.4) to age 17 (0.8) for males.

The mean for daily behaviour seemed to gradually decrease for both girls 25 at the age 10 to 20 at the age 17 and boys 26 at the age 10 to 17 at the age 17. The scores were maintained for the ages 10-14 when started to decline at the age 15-17.

RESULTS

This study was done on 150 school going students in Pune out of which 75 were males and 75 were females. It was found that prevalence of physical literacy for boys was 72.61% with knowledge and understanding domain being most affected (60.12%) followed by daily behaviour, (72.43%) motivation and confidence (73.16%) and physical competence (76.22%).

For girls' prevalence of physical literacy was 64.02% with knowledge being most affected (56.57%) followed by motivation and confidence (63.43%) daily behaviour (64.71%) physical competence (69.02%).

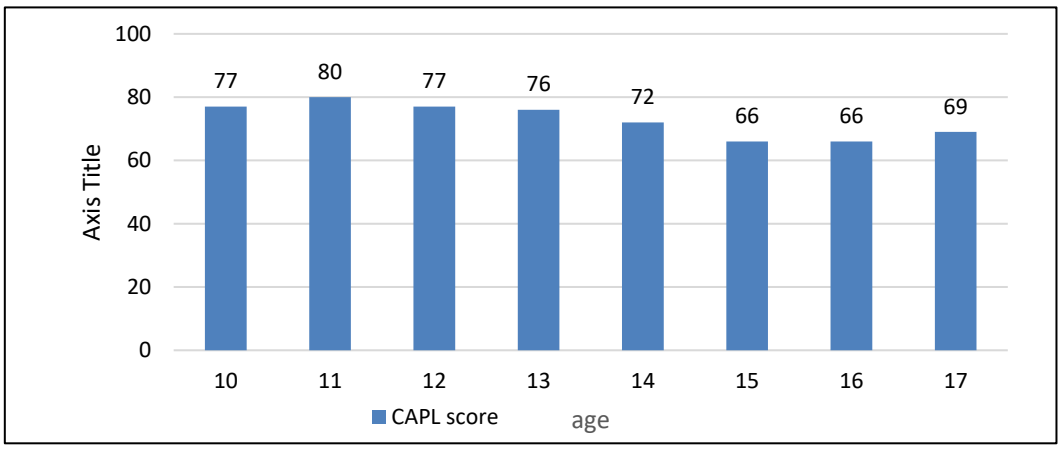

Figure 1: Total CAPL scores for the ages 10-17 for boys.

Table 1: Scores for 4 domains of physical literacy for ages 10-17 for boys.

Age (in years)	Daily behaviour	Physical competence	Knowledge and understanding	Motivation and confidence	Total CAPL
10	26	22	4	24	77
11	27	27	4	23	80
12	25	23	5	24	77
13	24	23	6	23	76
14	21	23	6	22	72
15	18	23	7	28	66
16	17	22	7	19	66
17	17	22	8	22	69

Table 2: Scores for 4 domains of physical literacy for ages 10-17 for girls.

Age (in years)	Daily behaviour	Physical competence	Knowledge and understanding	Motivation and confidence	Total CAPL
10	25	24	7	24	80
11	23	24		23	75
12	21	23	5	22	72
13	22	24	6	22	75
14	24	23	7	19	73
15	19	22	7	18	66
16	17	22	7	17	63
17	20	23	7	16	66

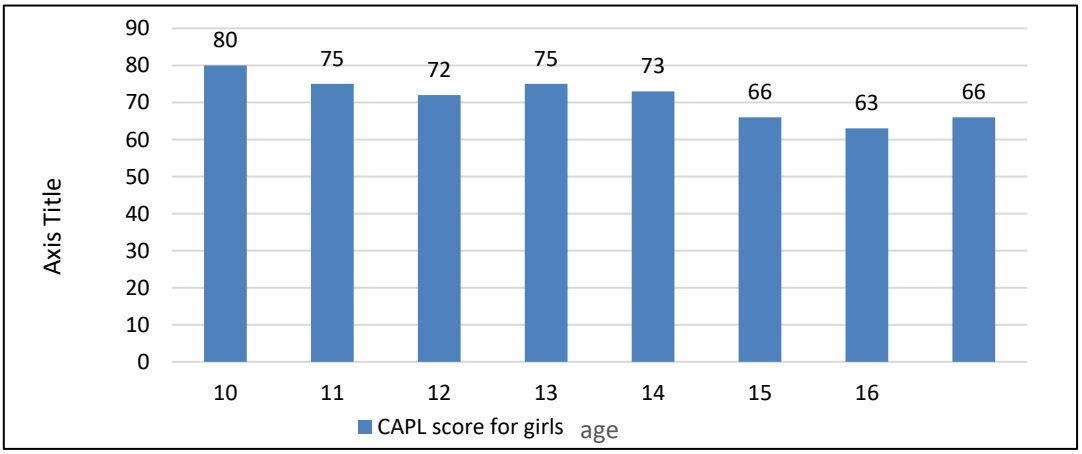

Figure 2: Total CAPL scores for the ages 10-17.

DISCUSSION

The aim of the study was to assess and find the prevalence of physical literacy amongst school going children aged 10-17 years old with the use of CAPL. The 75 males and 75 females were chosen according to inclusion and exclusion criteria. Pre assessment included demographic data, BMI, musculoskeletal assessment, muscular endurance, cardiovascular endurance and flexibility tests. All the 4 domains of physical literacy were assessed namely knowledge and understanding, physical competence, and motivation and confidence and daily behaviour. The study showed a prevalence of 72.6% in males and 64.02% in females with knowledge and understanding domain being most affected in both.

Physical literacy

The term outlines the physical competence, confidence, knowledge, motivation and understanding that an individual developed intending to keep physical activity at an appreciable level all throughout their life. It is an overreaching concept that embraces principles which can guide physical education.

Effects on cognition and memory

Due to physical activity blood flow to the brain increases which stimulates neurons and leads to cell growth specifically in hippocampus. The number of brain neurotransmitters (dopamine) increases which assists our ability to focus, concentrate, learn and remember. It also affects the accumulation of grey matter.[8]

Spatial awareness

Superior spatial awareness is observed in children who are physically literate. This permits them to move through environment with confidence. At an early age, balance, coordination and agility are developed posture, functionality and energy levels continue to enhance into adolescence.

Prevention of illness

Daily physical activity is found to have decreased mental stress and depression, improve endocrine function and increase bone density, increased blood flow and glucose delivery and reduced risk of obesity.

Effect on immune system

Physical activity has a beneficial effect on interleukin and natural killer cells. Interleukin stimulates the growth of immune cells and works simultaneously with natural killer cells to damage tumour cells and remove the injured tissues and viral infected cells.

The study showed a prevalence of 72.6% in males and 64.02% in females with knowledge and understanding domain being most affected in both.

The factors leading to less prevalence in females include: Weaker influence at school and family levels, lower participation in extracurricular sports, less favourable individual attribute to physical activity, biological pubertal changes like increase in body fat, decrease cardiac endurance and lower perceived competence in physical education. These factors are modifiable which suggests the gap between females and males can be reduced.[1] A decline in physical activity with increasing age has been observed the rates for which differ in males and females. Increase in age is associated with increased academic pressure which gradually leads to decrease in hours spent on moderate to vigorous physical activity eventually reducing the motivation/interest. Other factors include family and peer support, self-efficacy, sport participation and access to community PE resources and smart phone addiction leading to sedentary lifestyle.[7]

Knowledge and understanding domain

This domain can positively influence the other three interconnected domains, namely daily behaviour, physical competence and motivation and confidence. Awareness and valuing on developing physical competence is supported which can increase motivation and confidence for participation in physical activity. Knowledge includes what is physical activity, strength, endurance, how does it differ in muscular and cardiovascular system, what can be done to develop and improve these, the health benefits associated with it and their positive impact on future.

Mechanism

The basal ganglia are responsible for mediatorship between multiple actions under consideration in the cortex, by facilitating most important action while subduing other competing actions. Basal ganglia comprise of indirect, hyper direct and direct pathways to output structures from cortex. Direct pathways give focused facilitation of needed action for current situation, indirect pathways sub-dues actions that are not appropriate.[8]

Positive and negative enforcement

Positive reinforcement: can be described as any required stimulus added to gain a desired behaviour.

Negative reinforcement: can be described as any unrequired stimulus that is removed to gain a desired behaviour.

Motivation

By obtaining new knowledge by increasing the exposure, motivation towards something novel can be increased. Gaining knowledge helps children recognise the voids in their understanding which may drive feeling of interest. This process makes a positive feedback cycle that increases motivation to continue learning when someone

is inherently motivated to act for challenges that arise, the activities provide satisfaction.

Competence

The goal of learning process is attaining competence. It can be described as integrated blend of the components of knowledge, attitudes, skills and behaviour required for successful task or activity performance. These skills comprise of problem solving, communication in educational and vocational fields, logical reasoning and critical evaluation moving between certain domains. The motivation for achievement will be supporting a person's level of competence. According to recent studies the course of physical education should necessitate physical literacy concept with the basic movement skills. Physical literacy should be an important goal for physical education.

The plan aiming an increment in physical activity should consider the pathways that are likely to vary for males and females and should be multifactorial. Gaining an understanding for physical literacy should illuminate on the special nature of physical education, which is neither only about teaching children to play sports nor about teaching those with high competence to become trained athletes. Physical education is about supporting every young child, person, student to become a longtime member in physical activity.[9,10]

Limitations

There were some limitations and difficulties faced while carrying out the study.

The population was limited to Pune. It was difficult to carry out the tests for physical competence namely the PACER run test and the CAMSA test due to unavailability of gyms, the tests were modified according to the place/ground available, there may be an error in calculating the pedometer counts. Lastly the age distribution was unequal.

CONCLUSION

Physical literacy was found to be more affected in females' factors being social, physical and environmental. The knowledge and understanding domain were most affected, which if worked on can help increase the physical literacy ratio as all the four domains are interconnected. The study draws attention towards the need to find ways and encourage studies to improve this domain and create awareness regarding the concept.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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