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The Relationship Between Gadget Use And Physical Fitness Among Primary School Children In Puducherry –A Cross Sectional Study

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Abstract

Introduction: *The increased use of digital gadgets among children has raised concerns regarding its potential impact on physical activity and fitness. While digital engagement can enhance cognitive and motor skills, it may also contribute to sedentary behaviour, potentially affecting health outcomes like obesity and reduced fitness levels. This study was conducted to evaluate the relationship between time spent on gadgets and physical fitness among primary school children in rural Puducherry.* ***Aim****: To determine the association between the duration of gadget use and physical fitness levels among primary school children aged 10–13 years.* ***Materials and Methods****: A cross-sectional study was conducted among 90 healthy primary school children (grades 6–8) using convenient sampling. Data were collected through a semi-structured questionnaire capturing gadget usage and physical activity hours. Physical fitness was assessed using three standardized test batteries: Sit and Reach Test (flexibility), Sit-ups (abdominal strength), and the 12-Minute Walk Test (VO_2 max). Statistical analysis included descriptive statistics and Pearson's correlation to explore associations between variables.* ***Results****: The mean age of participants was 12.04 ± 1.06 years; 62.2% were female. Most commonly used gadgets were television (80%) and mobile phones (51.1%). Children spent an average of 10.64 hours/week on gadgets and 9.21 hours/week on physical activity. No significant correlation was found between gadget use and physical performance. A significant positive correlation was noted between time spent on physical activity and abdominal strength ($r = 0.258$, $p = 0.023$).* ***Conclusion****: It was found that most children spent nearly equal time on gadgets and physical activity. No significant correlation was observed between gadget usage and physical fitness parameters. However, a positive association was found between physical activity duration and abdominal strength, as measured by sit-ups. The results suggest that moderate gadget use does not negatively impact physical fitness when balanced with regular physical activity.*

Keywords*: Primary school children, Physical fitness, Sit and reach test, Sit-ups, 12-minute walk test, VO_2 max, Cardio-respiratory endurance.*

INTRODUCTION

Physical fitness is a crucial indicator of a child's overall health and development. It is defined as the ability to perform daily tasks with vigour and without undue fatigue, and it encompasses various components such as cardiovascular endurance, muscular strength, flexibility, and body composition.[1] Regular physical activity in childhood has been linked to numerous physiological and psychological benefits including improved body weight regulation, enhanced self-esteem, better academic performance, and reduced risk of chronic diseases such as obesity, diabetes, and cardiovascular disorders. [2, 3]

However, with rapid technological advancements and increased access to digital devices, children's lifestyles have become increasingly sedentary. Devices such as televisions, smart phones, tablets, and computers now occupy a significant portion of children's daily time, often at the expense of physical activity. [4,5] Excessive screen time has been associated with negative health outcomes including obesity, musculoskeletal issues, and reduced aerobic fitness. [6] Moreover, the World Health Organization (WHO) has identified insufficient physical activity as a leading risk factor for global mortality and has reported that over 80% of adolescents worldwide do not meet the recommended levels of physical activity. [7]

Despite growing concerns, the evidence on the direct relationship between digital gadget usage and physical fitness levels in children remains inconclusive. Some studies suggest a strong association between

screen time and reduced physical activity, [8] while others report no significant correlation. [9] Furthermore, most of the existing research has been conducted in urban settings, leaving a gap in understanding the scenario among children in rural areas.

This study aims to bridge that gap by evaluating the relationship between the duration of gadget usage and physical fitness among primary school children in rural Puducherry. Understanding this association is vital for developing effective interventions to promote active and healthy lifestyles among children.

AIM

The aim of this study is to assess the relationship between the duration of digital gadget usage and physical fitness levels among primary school children aged 10 to 13 years in Puducherry.

Specifically, this study seeks to determine whether increased time spent on devices such as televisions, mobile phones, computers, and video games correlates with variations in physical fitness parameters, including flexibility, abdominal strength, and cardio-respiratory endurance.

OBJECTIVE:

To determine the average duration of digital gadget usage (e.g., television, mobile phones, computers, video games) among primary school children aged 10–13 years in Puducherry.

To evaluate the physical fitness levels of the children using standardized tests: Sit and Reach Test (for flexibility), Sit-ups Test (for abdominal strength), 12-Minute Walk Test (for cardio-respiratory endurance).

To evaluate the correlation between the duration of gadget use and physical fitness among primary school children aged 10–13 years in Puducherry.

To assess the relationship between time spent in physical activity and physical fitness performance, particularly identifying which fitness components is most affected.

To compare gadget usage patterns and physical activity habits between boys and girls within the selected age group.

METHODOLOGY

A descriptive cross-sectional study was conducted between January and March 2025 to assess the relationship between gadget usage and physical fitness among primary school children in Puducherry. The study population included 90 healthy children aged 10 to 13 years, studying in 6th to 8th standard, selected through a convenient sampling method from various local schools in Puducherry. Ethical clearance was obtained from the Institutional Ethics Committee (IEC) (CTRI/2024/121/057241) prior to the commencement of the study. Written informed consent was obtained from school authorities and parents, and verbal assent was taken from the participating children.

Participants who fulfilled the inclusion criteria, i.e., children aged 10–13 years of both genders who were physically healthy and willing to participate were included in the study. Children with physical disabilities, recent musculoskeletal injuries, or known cardiovascular or respiratory conditions were excluded.

Data were collected using a semi-structured questionnaire to record demographic details, duration of gadget use (in hours per week), and time spent on physical activity. Physical fitness was assessed using standardized outcome measures:

- Sit and Reach Test (to assess flexibility),
- Sit-ups in 60 seconds (to measure abdominal strength),
- 12-Minute Walk/Run Test (to estimate VO_2 max and cardio respiratory endurance).

Each test was explained and demonstrated before administration. Children were given a trial run and then tested twice, with the average score recorded for analysis. Height, weight, and BMI were also measured using calibrated equipment. Data were analyzed using descriptive statistics and Pearson's correlation coefficient to explore associations between gadget use, physical activity, and fitness performance.

Selection criteria:

Inclusion Criteria

- Primary school children studying in 6th to 8th standard.
- Children aged between 10 and 13 years.
- Both male and female participants.
- Children who are physically healthy and willing to participate in the study.

Exclusion Criteria

- Physically challenged children.
- Children who are not willing to participate in the study.

- Children with a history of cardiovascular or respiratory problems.
- Children with a recent history of fractures, muscle strains, or sprains.

Fitness Assessment Protocols:

The study employed three standardized physical fitness assessment protocols to evaluate the functional capacity of primary school children. These tests focused on flexibility, abdominal muscular strength, and cardio-respiratory endurance. All assessments were conducted under the supervision of trained personnel, following a demonstration and one practice trial to ensure consistency.

1. Sit and Reach Test (Flexibility)

Objective:

To measure the flexibility of the lower back and hamstring muscles.

Equipment:

- Custom-constructed Sit and Reach Box (measuring scale starting at 23 cm aligned with foot level)
- Flat surface or mat
- Ruler or tape measure (if no measurement box is available)

Procedure:

- The child is asked to sit on the floor with both legs fully extended forward, feet placed flat against the box.
- Without bending the knees, the child places one hand over the other and reaches forward along the measuring surface as far as possible.
- The position is held for a minimum of 10 seconds to record maximum reach.
- Three trials are conducted, and the best distance reached (in cm) is recorded as the score.

Scoring:

Higher scores indicate better hamstring and lower back flexibility.

2. Sit-Ups Test (Abdominal Strength and Endurance)

Objective:

To assess the strength and endurance of abdominal muscles.

Equipment:

- Exercise mat
- Stopwatch
- Whistle
- Assistant to stabilize the participant's feet

Procedure:

- The child lies on their back with knees bent, feet flat on the floor, and fingers interlocked behind the neck.
- An assistant holds the ankles to maintain foot contact with the ground.
- On the whistle, the child begins performing sit-ups, attempting to touch their elbows to their knees.
- The child performs as many correct sit-ups as possible within 60 seconds.

Scoring:

- A sit-up is counted only if the elbows touch the knees while maintaining correct form.
- The total number of correct repetitions in 60 seconds is recorded.

3. 12-Minute Walk/Run Test (Cardio-Respiratory Endurance)

Objective:

To estimate the individual's aerobic fitness and VO_2 max capacity through sustained walking or running.

Equipment:

- 400-meter outdoor track
- Stopwatch
- Whistle
- Measuring tape or distance markers
- Assistants to count laps

Procedure:

- Participants are instructed to run or walk around the track at their own pace for 12 minutes.

- They are permitted to rest or slow down if tired, but encouraged to resume as soon as possible.
- Each participant is assigned with a person to monitor laps and ensure accurate measurement.
- At the 12-minute mark, a whistle is blown and the child stops in place.
- The distance between the last completed lap and stopping point is measured and added to the total.

Scoring:

- The total distance covered (in meters) is recorded.
- Higher values reflect better cardiovascular endurance.

These assessments were selected based on their simplicity, reliability, and appropriateness for school-aged children. The test batteries align with previously validated protocols such as those used by Suleiman et al. [1] and Sinmundsson et al. [2], enabling consistent evaluation of physical fitness components in field settings.

STATSITICAL ANALYSIS

Data were analyzed using descriptive and inferential statistical methods. The statistical tools employed in this study included:

Analysis Type	Purpose	Statistical Tool Used
Descriptive Statistics	To describe basic characteristics of the sample	Mean, Standard Deviation, Frequency
Correlation Analysis	To determine associations between variables	Pearson's Correlation Coefficient (r)

All statistical analyses were performed using appropriate software. A p-value of < 0.05 was considered statistically significant.

Descriptive Statistics Summary:

Table 1: Distribution of age, gender and BMI in primary school children

Basic characteristics (N=90)		Mean	Standard Deviation
Age (years)		12.04	± 1.06
BMI		18.63	± 3.31
Gender	Male	34	37.8
	Female	56	62.2

Table 1 described the basic characteristics of the study population. it was observed that the mean age of the study population was 12.04 ± 1.06 years and the majority of the study sample was females about 62.2% and males were observed about 37.8 %. It was also observed that the body mass index (BMI) of the study population was 18.63 ± 3.31. The result infers that this study population consists of more female children and most of the children found in normal weight.

Table 2: Distribution of children using gadgets

Gadgets	Number	Percentage
Television	72	80
Video game	18	20
Mobile	46	51.1
Computer /Laptop	8	8.9

Table 2 describes the distribution of gadgets usage in the study population. It was noticed that 80 % of the children were watching TV regularly and 51.1 % of the children using mobile phones 20 % of the children are using videogames and 8.9 % computer and laptop. The result infers that most of the children watching television, and the least number of children using computers and laptops

Table 3: Mean and standard deviation of the time duration of gadgets usage and time spent on physical activities

Total Duration (Hours /week)	N	Mean	Standard deviation

Hours/week spent on gadgets	90	10.64	± 7.25
Hours/week spent on physical activity	90	9.21	± 4.40

From table 3 it was observed that the average duration of gadgets usage was 10.64 hours per week whereas, the amount of time spent in physical activity was 9.21 ± 4.40 hours per week. This result infers that the children spent more or less equal time on gadgets and physical activities.

Table 4: Mean and standard deviation of physical performance

Test	N	Mean	Standard deviation
Sit and Reach (cm)	90	20.62	± 5.26
Sit-ups (reps in 60 seconds)	90	15.04	± 6.78
12-Minute Walk Test (meters)	90	1111.67	± 257.91

Table -4 displayed the physical performance of the study population in which the average mean value of sit and reach distance was 20.62 ± 5.26 cm and average repetitions of sit up was 15.04 ± 6.78 in the 60 seconds and the average distances covered in 12 minutes walking test was 1111.67 ± 257.91 meters

Correlation Statistics Summary:

Table 5: Correlation between times spent on gadgets and physical performance

Fitness Test	r value	p value	Significance
Sit and Reach (Flexibility)	0.040	0.730	Not Significant
Sit-ups (Strength)	0.222	0.050	Not Significant (Borderline)
12-Minute Walk Test	0.038	0.741	Not Significant

Table 5 denotes that there was no significant correlation between the duration of time spent on gadgets and physical performance which shows the insignificant p-value ($p \geq 0.05$). The observed 'r' value for sit and reach test was 0.040 with an insignificant p-value (0.730). The observed 'r' value for 12-minute walking tests 0.038 which is insignificant with the p-value (0.741).

Table 6: Correlation between times spent on physical activity and physical performance

Fitness Test	r value	p value	Significance
Sit and Reach (Flexibility)	-0.006	0.961	Not Significant
Sit-ups (Strength)	0.258	0.023	Significant
12-Minute Walk Test	-0.102	0.376	Not Significant

Table 6 shows that there was significant positive correlation between amount of time spent in physical activity with the number of repetitions in sit-ups, $r = 0.258$, $p = 0.023 < 0.05$.The observed 'r' value for sit and reach test was -0.006 with the insignificant p-value 0.09. The observed 'r' value for the 12-minute walk test was -0.0102 which is also insignificant with the p-value (0.376). These results infer that the above mentioned physical parameters show a negative correlation with the duration of time. Therefore, when the time spent on physical activity was more, the corresponding number of repetition in sit-ups was more and vice versa. The correlation of other physical performance tests with the duration of time spent on physical activity was insignificant.

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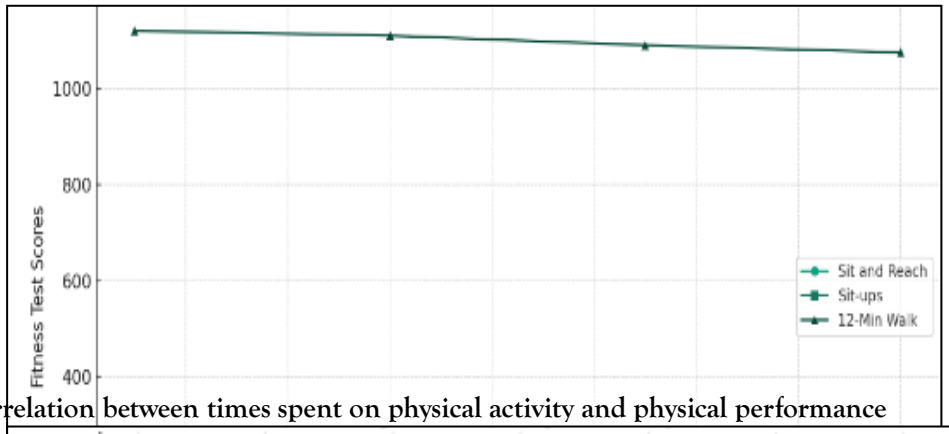
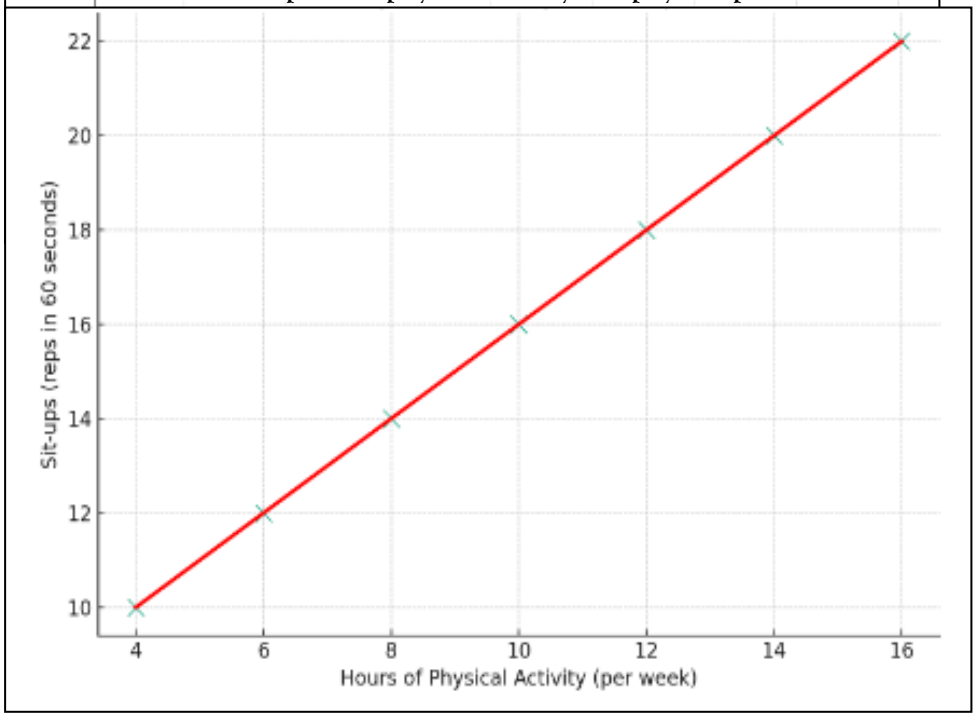
Graph 1: Correlation between times spent on gadgets and physical performance



Graph 2: Correlation between times spent on physical activity and physical performance



RESULTS:

The study included 90 primary school children aged 10 to 13 years, with a majority being female (62.2%). The average age was 12.04 ± 1.06 years, and the mean BMI was 18.63 ± 3.31, indicating that most participants had normal body weight. Gadget usage analysis revealed that television was the most commonly used device (80%), followed by mobile phones (51.1%), while laptops and computers were used least (8.9%). Children spent an average of 10.64 ± 7.25 hours per week on gadgets and 9.21 ± 4.40 hours per week on physical activity. Physical fitness was assessed using sit and reach (mean = 20.62 ± 5.26 cm), sit-ups (mean = 15.04 ± 6.78 reps), and the 12-minute walk test (mean = 1111.67 ± 257.91 meters). Pearson correlation analysis revealed no statistically significant association between gadget usage and any of the fitness parameters ($p > 0.05$). However, a significant positive correlation was observed between time spent on physical activity and sit-up performance ($r = 0.258$, $p = 0.023$), indicating that higher physical activity levels are associated with better abdominal strength. Other fitness parameters showed no significant correlation with physical activity duration. These findings suggest a balanced lifestyle among rural children, with equal engagement in physical activity and digital device usage.

DISCUSSION:

This study aimed to examine the relationship between time spent on digital gadgets and physical fitness levels among primary school children aged 10 to 13 years in rural Puducherry. The results revealed that most children spend a nearly equal amount of time on digital devices and physical activity, with no significant correlation between gadget usage and key physical fitness components, except for a statistically significant association between time spent on physical activity and abdominal strength, as assessed by the sit-up test.

The findings provide valuable insights into the lifestyle balance between screen-based behaviours and physical activity in rural children. The observation that children spent an average of 10.64 hours per week on gadgets and 9.21 hours on physical activity suggests that this population is engaging in a relatively balanced pattern of behaviour. This stands in contrast to global trends where children are increasingly shifting toward sedentary digital media consumption, often exceeding recommended screen time limits and contributing to decreased physical activity levels. [1]

Previous studies have expressed concern about the negative health implications of increased screen time, including childhood obesity, impaired vision, musculoskeletal disorders, and behavioural problems. [2–4] Kautiainen et al. found a significant association between prolonged television viewing, computer use, and increased prevalence of overweight and obesity, especially among girls. [5] However, in the present study, no such direct relationship between gadget usage and physical fitness parameters such as flexibility, endurance, or VO_2 max was found. This aligns with findings from Robinson et al., who also reported a weak or null relationship between screen time and physical activity levels among children and adolescents [6].

It is possible that the lack of association in our study reflects a compensatory behaviour among rural children, who might be managing screen use and physical activity more evenly than their urban counterparts. In addition, the rural setting may provide more opportunities for unstructured play and mobility, potentially buffering the negative impacts of screen time observed in more urbanized, sedentary settings. [7]

The only significant correlation in the study was between time spent on physical activity and performance in the sit-up test ($r = 0.258$, $p = 0.023$), indicating that children who engaged in more physical activity demonstrated better abdominal strength. This finding is consistent with the physiological principle that muscular strength improves with increased frequency and duration of exercise, particularly exercises involving repetitive core activation. [8] Sit-ups are widely accepted as a reliable field test for evaluating abdominal muscle endurance and strength in children and adolescents. [9]

However, no significant correlation was observed between physical activity and other fitness components such as flexibility (sit and reach) and cardiorespiratory endurance (12-minute walk test). This could be due to multiple factors, including the variability in the type and intensity of physical activity the children were engaged in. Flexibility, for instance, is often influenced by specific types of activity such as stretching or yoga, which may not be part of a child's daily routine unless explicitly practiced. [10] Similarly, endurance training requires sustained aerobic activity, which might not be achieved during casual or intermittent play.

The study's findings also reveal important gender and lifestyle-related trends. While 62.2% of the participants were female, no major differences were noted in gadget usage across genders. Television was the most commonly used device, consistent with other research conducted in rural populations, where access to mobile data or computing devices may be limited. [11] Mobile phone usage was the second most common, aligning with the global penetration of smart phones even in lower socioeconomic areas. [12]

Interestingly, while children reported similar durations for gadget usage and physical activity, only the latter showed a meaningful correlation with fitness levels. This suggests that the quality and context of time use may be more influential than quantity alone. Passive consumption of content (e.g., watching TV) may not inherently displace physical activity unless it becomes prolonged or habitual. Conversely, even modest but consistent physical activity can lead to measurable health benefits, particularly in muscular strength and endurance. [13]

Our findings reinforce the observations made by Melkevik et al., who reported that screen-based sedentary behaviour is not consistently associated with lower levels of physical activity across genders and geographical regions. [14] This suggests that digital engagement and physical inactivity are not mutually exclusive behaviours but rather parallel lifestyle patterns that may or may not overlap based on individual and environmental contexts.

From a public health perspective, these results carry both encouraging and cautionary implications. On one hand, the rural children in this study appear to be maintaining a reasonable balance between digital engagement and physical movement. On the other, the increasing accessibility of smart phones and gaming platforms even in remote areas may tip this balance in the future. Continuous monitoring and early educational interventions are essential to ensure that digital consumption does not gradually displace physical activity, particularly as children enter adolescence when academic pressures and screen exposure typically increase. [15]

The strength of this study lies in its use of standardized and validated physical fitness assessment tools, such as the sit and reach test, sit-ups, and 12-minute walk/run test, which are widely accepted in paediatric physical fitness evaluation. [16, 17] The study also focused on a rural population, which is often underrepresented in screen time and physical fitness research, thereby filling a significant gap in the literature.

However, several limitations must be acknowledged. First, the sample size was relatively small (n=90) and drawn using a convenience sampling method, which limits the generalizability of findings. Second, there was an unequal gender distribution, with more female participants, potentially introducing bias. Third, the study relied on self-reported data for gadget usage and physical activity, which may be subject to recall bias or underreporting. Fourth, psychological and behavioural variables, such as screen content, sleep patterns, dietary habits, and parental influence, were not assessed but could be important mediators of the relationship between screen time and physical fitness. [18,19]

Future studies should consider larger, more diverse samples from both rural and urban settings, as well as longitudinal designs to assess changes over time. The integration of objective tracking tools (e.g., pedometers, accelerometers, screen-time tracking apps) would enhance accuracy. Additionally, the inclusion of qualitative components such as focus groups or interviews could provide deeper insights into children's motivations and experiences related to both digital and physical activities.

This study contributes to the growing body of literature examining the effects of digital technology on child health. While no direct negative impact of gadget use on physical fitness was observed, the positive association between physical activity and abdominal strength emphasizes the value of maintaining regular movement during childhood. Education and awareness initiatives that promote active lifestyles without necessarily demonizing screen time may be more effective in rural settings where children appear to strike a relatively healthy balance. Nonetheless, with increasing technological accessibility, proactive strategies must be implemented to preserve this balance and support holistic child development

CONCLUSION:

This study assessed the relationship between gadget usage and physical fitness among primary school children in rural Puducherry. Using standardized tests, it was found that most children spent nearly equal time on gadgets and physical activity. No significant correlation was observed between gadget usage and physical fitness parameters. However, a positive association was found between physical activity duration and abdominal strength, as measured by sit-ups.

The results suggest that moderate gadget use does not negatively impact physical fitness when balanced with regular physical activity. These findings highlight the importance of promoting consistent exercise routines among children rather than focusing solely on limiting screen time. As digital technology continues to permeate daily life, especially among younger populations, a balanced approach is key. Further studies involving larger, more diverse populations are recommended to explore these relationships in varied socio-geographic contexts.

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