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Investigating the Impact of Physical Exercise on dual benefit of Children's wellbeing during COVID -19: An Experimental Approach

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Abstract

Children primarily had to stay indoors during the Covid-19 pandemic because of lockdown regulations, which restricted their outdoor activities and made them fearful of catching the virus. The study aimed to assess the effect of physical exercise on the physical and mental wellbeing of children during Covid-19.

Materials and Methods: The pre-experimental, one group pretest–posttest research design was applied. Hundred children were included as study samples. A purposive sampling technique was applied.

Results: The average physical fitness score in pretest was 9.7 which increased to 11.48 and the mean posttest mental wellbeing score 31.75 was less than the mean pretest score 26.75. It is evident that the physical exercise was statistically significant [$P < 0.0001$] improved the physical and mental wellbeing of children.

Conclusion: The findings of the research study concluded that physical exercise is an effective intervention in improving children's physical and mental wellbeing

Keywords: Physical Exercise, Child Wellbeing, Covid-19

1. Introduction

Children's overall well-being is greatly enhanced by physical activity, which is essential for nurturing their mental and physical health. WHO defines physical activity as any bodily movement produced by skeletal muscles that require energy expenditure. It can take different forms such as walking, cycling, sports, active recreation, play, and household chores. Based on intensity, physical activity can be categorized into light, moderate and vigorous. Children and youth should spend a minimum of 60 min each day in moderate- to vigorous-intensity physical activity [MVPA].[1]

Physical activity [PA] is vital to the physical, psychological, social, and cognitive health of school-aged children and youth. [2,3]

Research suggests that regular exercise in childhood is associated with numerous health benefits, including improved cardiovascular fitness, enhanced muscular strength and endurance, and better weight management. [4,5] Moreover, engaging in physical activity from a young age has been linked to reduced risk factors for chronic diseases such as obesity, type 2 diabetes, and hypertension.[6,7]

Beyond its effects on physical health, there is growing recognition of the positive impact of exercise on mental wellbeing in children. Evidence indicates that physical activity is associated with reduced symptoms of anxiety and depression, enhanced mood regulation, and improved self-esteem and cognitive function. [8,9] These mental health benefits are particularly significant given the rising prevalence of mental health issues among children and adolescents in recent years.[10]

The COVID-19 outbreak had rapidly become a global health threat, and its impact was observed more on the children's health. As the schools closed during the outbreak, children were asked to stay home and required to report their daily health status. Stressful factors such as frustration and boredom, fear of infection, lack of face-to-face contact with classmates, family financial losses and lack of personal space at home could have a more problematic and lasting impact on children.[11] It was demonstrated that the COVID-19 pandemic could lead to an increase in mental health problems among children.[12] The study conducted by Zhou et al [13] wherein 8079 sample of Chinese middle and high school students were taken, the prevalence of depression symptoms, anxiety symptoms, and mixed symptoms of depression and anxiety was 43.7%, 37.4%, and 31.3%, respectively, during the COVID-19 outbreak.

In addition to mental health, the lifestyles of children changed dramatically during the COVID-19 outbreak. At home, physical activities for both parents and children might be reduced due to space constraints. Studies at home and abroad had confirmed that during the COVID-19 pandemic children's screen time increased and physical activity reduced, [14] which might negatively impact children's physical and mental health. [15] Physical inactivity is now identified as the fourth leading risk factor for global mortality. In 2018, the World Health Assembly agreed on a global target to reduce physical inactivity by 15% by 2030 and align with the Sustainable Development Goals. [16]

While the individual benefits of physical activity on a child's physical and mental health are well-documented, there is a need for further research to comprehensively understand the combined impact of exercise on these outcomes. Considering the imperative of adapting social isolation during the COVID-19 pandemic, the provision of virtual platforms for physical exercise assumes paramount importance in fostering the well-being of children. This study aims to address this gap by employing a pre-experimental, one-group pretest-posttest design to assess the effects of a structured physical exercise program on both physical and mental health parameters in children. By utilizing a rigorous methodology and evidence-based approach, this research seeks to provide valuable insights into the holistic benefits of physical activity for promoting child wellbeing.

1.1 Objective

1. To assess the physical and mental being of child.
2. To assess the effect of Physical Exercise on physical fitness and mental being of child.
3. To find an association of physical fitness and mental wellbeing with selected demographic variables of children.

2. Materials and Methods

Pre-experimental, one-group pretest-posttest research design was utilized to assess the impact of physical exercise on a child's physical and mental health. The study was conducted at two Schools after obtaining permission from concerned authorities. Samples were recruited through WhatsApp groups created with the help of schoolteacher. A Google form was created and sent to participants interested in participating in the study to assess their eligibility.

The samples were school children from 12 to 14 yrs. of age and were willing to participate in this research. Children who had physical disability or mental health problems, and difficulty in language comprehension were excluded. Content validity was done with the help of subject experts. Reliability of the tool was carried out among 10 children by inter-rator method [calculated value 09]. Pilot study was done on 10 samples with the same setting. Purposive sampling technique was used to select samples. for the main study. In addition, 15 children dropped out during the intervention period due to sickness, cancellation of participation. Finally, 100 study samples were included for the main study. The data collected from December 2021 to September 2022.

Samples continued physical exercise for one month [21 days] for 5 days a week under the supervision of an investigator. All the samples attended a virtual meeting via Zoom. At this meeting, the researchers explained and demonstrated physical exercise and took re-demonstration. The post test was conducted on the 6th day, 12th day, 18th day and 24th day.

The pretest was given using an observational checklist to assess physical fitness and modified the KIDSCREEN test for mental wellbeing. The intervention was Physical exercises which included were Mat exercises, Jumping Jack exercises, Push-ups, Mini-squats, abdominal crunches, Planks and bridging exercises, Biceps, and triceps crunches. The session began with 10 min warm-ups followed by 30 min physical exercises. The session ended with 5min shavasana to cool down.

3. Ethical approval

The research was carried out in conformity with the ethical standards set forth in the Helsinki Declaration. Participants gave assent and their parents gave informed consent before administration of pretest. According to document number DYPV/EC/586/2020 Dated 4thSeptember 2020, the Ethics committee evaluated and approved the study protocol, subject assent, and parents' consent form.

4. Statistical analysis

The SPSS 21 version was used to examine the participant data. The significance of the difference between the pretest and posttest stress scores was determined using the paired t-test, and the relationship between physical fitness, mental wellbeing and selected demographic characteristics was determined using the Fisher's exact test. The level of significance was<0.05.

5. Results

The demographic characteristics of the sample reveal that among the 100 children, a significant majority, comprising 66%, fell within the age range of 12 to 13 years. Furthermore, within this cohort, 53% were identified as female. In terms of parental education, a substantial portion of mothers and fathers, constituting 73% and 70% respectively, possessed a graduation degree. Moreover, a notable proportion of fathers [59%] and mothers [42%] were engaged in remote work arrangements from home.

Sleep patterns among the children indicated that the majority, accounting for 41%, slept for less than six hours, while a mere 5% reported sleeping for more than eight hours. In terms of body weight, 64% of the surveyed children were classified as having a normal weight, while 36% were identified as overweight.
To investigate the first objective of the study, the results of all samples were combined before and after physical exercise which are depicted in table 1. Researcher applied paired t-test, so average physical fitness score in pretest was 9.7 which increased to 9.92, 10.15, 10.56 and 11.48 on day 6, day12, day18 and day 24. T-values for this test were 5.28, 7.6, 10.37 and 18.97 on day 6, day12, day18 and day 24 with 99 degrees of freedom. Corresponding p-values were small [less than 0.05] for day 6, day12, day18 and day 24. It is evident that physical exercise significantly improved the physical fitness of children.

Table 1: Effect of Physical Exercise on child's physical fitness

N=100

Time point	Mean	SD	T	df	p-value
Pretest	9.70	2.55			
Day6	9.92	2.51	5.28	99	0.000
Day12	10.15	2.53	7.60	99	0.000
Day18	10.56	2.58	10.37	99	0.000
Day24	11.48	2.63	18.97	99	0.000

Similarly, paired t-test applied to answer the second objective of the study. The average mental wellbeing score as shown in fig no.1, pretest was 26.75 which increased to 28.48, 29.21, 29.53 and 31.75 on day6, day 12, day 18 and day 24. T-values for this test were 19.28, 18.84, 18.86 and 20.62 on day6th, day12th, day 18th and day 24th with 99 degrees of freedom. Corresponding p-values were small [less than 0.05] for days 6, 12, 18 and 24. Mental wellbeing scores increased significantly after physical exercise over time. It is evident that physical exercise significantly improved the mental wellbeing of children.

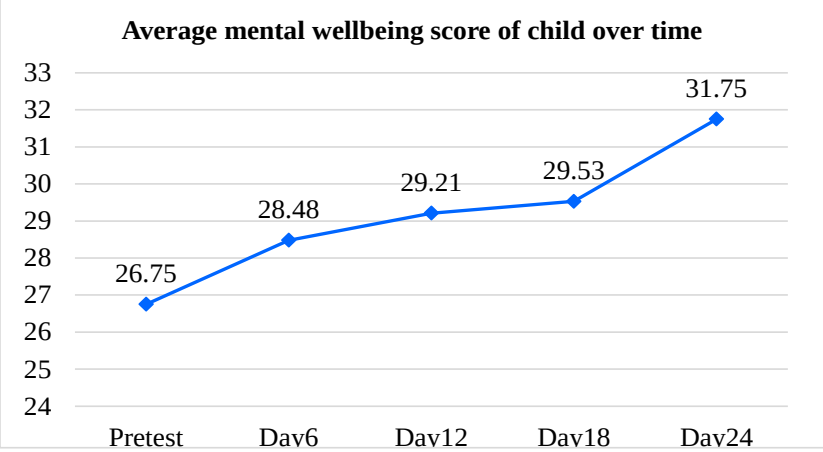

Fig no.1 Mental Wellbeing Score of children

Fisher's exact test was applied to find the association of physical fitness and mental wellbeing with selected demographic variables of children. The details are shown in table no.2 and table no.3.

Table 2: Association of physical fitness with selected demographic variables of children (N=100)

Demographic variable		Physical fitness			p-value
		Average	Good	Poor	
Age	12-13 years	29	17	20	0.001
	13-14 years	20	0	14	
Gender of child	Male	24	3	20	0.018
	Female	25	14	14	
	Work from home	25	6	11	
BMI Category	Underweight	42	16	5	0.000
	Normal	7	0	29	
	Overweight	0	1	0	
	Veg and non-vegetarian	14	0	25	
Sleeping hours	Less than 6 hours	15	0	26	0.000
	6 - 7 hours	25	4	7	
	7- 8 hours	8	10	0	
	> 8 hours	1	3	1	
Indoor Activity	Less than 1 hours	19	2	26	0.000
	1-2 hours	26	9	8	
	3-4 hours	4	3	0	
	4-5 hours	0	3	0	

The table no.2 shows that the p-values corresponding to demographic variables age, gender of child, BMI category, Dietary Pattern, sleeping hours and Indoor Activity were small [less than 0.05], the demographic variables age, gender of child, BMI category, sleeping hours and Indoor Activity were found to have significant association with the physical fitness of children.

Table 3: Association of mental wellbeing with selected demographic variables of children (N=100)

Demographic variable		Mental wellbeing			p-value
		Average	Good	Poor	
Age	12-13 years	52	11	3	0.005
	13-14 years	34	0	0	
BMI Category	Underweight	53	10	0	0.000
	Normal	33	0	3	
	Overweight	0	1	0	
Dietary Pattern	Vegetarian	49	11	1	0.004
	Veg and non-vegetarian	37	0	2	
Sleeping hours	Less than 6 hours	40	0	1	0.000

	6 - 7 hours	32	3	1	
	7- 8 hours	12	6	0	
	> 8 hours	2	2	1	
Indoor Activity	Less than 1 hours	45	1	1	0.003
	1-2 hours	36	5	2	
	3-4 hours	4	3	0	
	4-5 hours	1	2	0	

The table no.3 shows that the p-values corresponding to age, BMI Category, Dietary Pattern, sleeping hours and Indoor Activity were small [less than 0.05], the demographic variables age, BMI Category, Dietary Pattern, Sleeping hours and Indoor Activity were found to have significant association with mental wellbeing of children.

6. Discussion

The findings of the study provide convincing evidence regarding the significant positive impact of physical exercise on both the physical fitness and mental health of children. These results align with previous research indicating the multifaceted benefits of regular physical activity in promoting overall health and wellness among children. It has been documented that the level of physical activity among adolescents worldwide does not meet minimum requirements.[17] A previous study conducted by Al-Sobayeletal.,[18] showed that adolescents spend approximately 24 min per day engaging in leisure and non-leisure activities, which is below the recommended daily activities, for this age group. Physical activity is important for maintaining and improving mental and physical health. It is of concern that 50% of adolescents do not meet the minimum physical-activity recommendations for the achievement of health benefits. [19]

The healthcare professional is ideally placed to engage children in healthy lifestyle choices involving optimal physical exercise to improve health and wellbeing. Healthcare professionals can also actively engage families, schools, and local authorities to support young people in an active environment. [20]

Regarding physical fitness, the study observed a consistent improvement in physical fitness scores among children following the structured exercise program. The present study showed the average physical fitness score in pretest was 9.7 which increased to 11.48 on day 24. Physical fitness score increased significantly after physical exercise over time.

Similarly, Gmmash A. et al. [21] showed that showed a significant improvement in perceived physical activity levels following the virtual educational program compared with the baseline level. The eight-week protocol enhanced participants' physical activity level, self-determination index.

The significant increase in physical fitness scores over time suggests that regular engagement in physical activity can lead to tangible enhancements in key fitness components such as cardiovascular endurance, muscular strength, and flexibility. This finding is consistent with previous studies that have demonstrated the efficacy of exercise interventions in improving physical fitness parameters in children.[4,5]

Mental health is often defined as a state of well-being which can help an individual cope with their feelings and daily stressors. Pretest findings of the study suggest that 3% of the children had poor mental wellbeing, 86% of them had average mental wellbeing and only 11% of them had good mental

wellbeing. In the same way, the study documented a notable improvement in mental wellbeing scores among participants following the exercise intervention. The observed increase in mental wellbeing scores indicates that physical activity not only contributes to physical health but also exerts a positive influence on psychological outcomes such as mood regulation, self-esteem, and cognitive function. This finding is supported by a growing body of literature highlighting the beneficial effects of exercise on mental health outcomes in children and adolescents. [8,9]

An online survey conducted by Liu et al. [22] after lockdown in Chinese children and adolescents showed that 12.33% and 6.26% of participants reported depression and anxiety, separately, which was similar to our results.

A meta-analysis Solmi M. et al. [23] showed that the peak and median age at onset for any mental disorder were 14.5 years, supporting the idea that adolescence might be a key period of vulnerability to psychological impacts. It also highlights an increased need to prevent mental ill-health in children as impact of COVID-19.

Several research reports on the effect of exercise in improving mental well-being, and specific positive effects of exercise on factors such as mood and anxiety have been identified. [24,25]

These findings support those of a systematic review and meta-analysis conducted by Rodriguez-Ayllon et al.[26] and suggest that regular physical activity can support children's mental health. In the present study, findings are evident that physical exercise significantly improved the mental wellbeing of children.

The study conducted by Agarwal and Juneja[27] suggests that the mental issues that are gathering up in Indian population, and these results are expected to aid in future research on coping mechanisms for similar stressful situations and predict potential therapies for lowering COVID-19 apprehensions.

Since p-values corresponding to demographic variables age, gender of child, BMI category, sleeping hours and indoor activity were small [less than 0.05] they were found to have significant association with the physical fitness of children. Likewise, the study findings of Gavin Breslin[28] shows that 24% of children achieved the recommended level of 60 minutes of moderate-to-vigorous physical activity [MVPA] per day, with more boys than girls achieving this level. Most of the studies reported an increase in sleep problems during the pandemic than before the pandemic. [29]

Considering the numerous advantages of physical activity, it is preferable to engage in it for the betterment of a child's wellbeing. There are few limitations that may have affected external validity of study results, such as the data entered may have been less reliable since the participants were minors. This research's findings can be applied to future research, which can aim to further evaluate the impact on children physical and mental health by utilizing a bigger sample size, long-term intervention via randomized controlled trial.

7. Conclusion

In conclusion, this study reveals the positive impact of regular physical activity on both the physical and mental health of children. Significant improvements in physical fitness and mental well-being were observed over a 24-day period. Demographic variables such as age, gender, indoor activity, sleep duration, and BMI category were found to correlate strongly with these health outcomes. These findings emphasize the necessity of promoting physical exercise among children to enhance their overall health and quality of life. Further research is warranted to delve into the underlying mechanisms and explore additional factors influencing children's well-being.

8. Conflict of Interest

No existing or potential conflict of interest relevant to this article was reported.

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