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Review Article

Influence of Physical Exercise on Obesity Among Children: A Comprehensive Review

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A B S T R A C T

Over the past several years, the prevalence of paediatric overweight and obesity has increased substantially across different sociodemographic groups. Despite growing awareness and intervention efforts, the severity of obesity among children and adolescents continues to rise, making childhood obesity a major public health concern in the 21st century. Overweight and obesity have increasingly affected low- and middle-income countries, particularly in rapidly urbanizing communities. According to the World Health Organization (WHO), approximately 39 million children under five years of age were overweight or obese globally. Childhood overweight and obesity have become major contributors to adverse health outcomes and, in many settings, represent a greater long-term health burden than childhood undernutrition.

Early intervention is essential in addressing childhood obesity because excess weight during childhood and adolescence may persist into adulthood and increase the likelihood of developing chronic diseases and experiencing premature mortality. Current approaches to childhood obesity management emphasize maintaining a balanced and nutritious diet, reducing sedentary behaviours, and increasing regular physical activity. Physical exercise may influence several metabolic and physiological factors associated with obesity, including leptin and adiponectin concentrations, insulin sensitivity and resistance, and body-fat accumulation. Therefore, the type, intensity, frequency, and duration of exercise are important considerations when designing effective interventions for children and adolescents with obesity.

This review focuses particularly on the differential effects of aerobic exercise, resistance training, and combined exercise programmes on obesity-related cardiovascular risk factors in children and adolescents. Available evidence suggests that exercise interventions can serve as an effective therapeutic strategy for reducing cardiovascular risk and improving metabolic health among children with obesity. An appropriate exercise programme should ideally incorporate both aerobic and muscle-strengthening activities, with particular emphasis on reducing excess fat mass, improving overall physical fitness, and promoting long-term adherence. Such an integrated approach may contribute substantially to the prevention and management of paediatric obesity and its associated cardiometabolic complications.

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Introduction

Despite the fact that obesity has been identified as the health issue that affects people the most frequently in contemporary society, both industrialised and developing nations are now experiencing a progressive rise in the prevalence of this issue. Referring a report got published on World Obesity Federation on 2022 which mentioned that by 2030, child obesity estimated rate would be 10.81% among 5-9 years of age group of children in India. This report is alarming as it shows more than half of the children with obesity in the region, and 1 out of 10 of all obesed children across the globe, citing the report published by the Federation that works in alliance with the World Health Organization (WHO). These figures presented in report are disturbing and alarming for India as the country is not likely to meet World Health Organization's (WHO) commitment to have a check in the rise in childhood obesity by 2025. By going with the experts views which state that childhood obesity is largely an urban phenomenon. In the view of the paediatricians, when BMI of a child goes above 30, they are considered as obese. The primary factor contributing to the recent rapid rise in childhood obesity is complex. Physical activity decreased as a result of school closings during pandemic lock downs. The main factors reducing PA in young children are computer games and online media activity. These kids face a serious risk of acquiring heart conditions, paediatric diabetes, and other illnesses when they get older. As a result, it's crucial that parents take childhood obesity seriously in order to implement management and prevention measures. Parents and role models should motivate children to engage in daily physical activity and consume a nutritious diet rich in proteins and vitamins.[1]

Frequency of cases of Obesity in school going children in India

Kunwar et al. (2018) The prevalence of obesity was found to be lower in garrison schools due to the encouragement and priority placed on games and physical activity, according to research on cases of obesity in schoolchildren conducted in a military camp in North-Eastern India.

When Kaur et al. (2008) researched this issue, they discovered that children in high-income schools had three times as many overweight children (15.3%) and obese children (6.8%) as those in lower-income schools.

George A. Kelley et. al. (2015) To find out the impact of exercise on body mass index (BMI in kg m(-2)) in overweight and obese children and adolescents. And concluded that exercises have improved BMI in overweight and obese children and adolescents.

Kar SS(2015) Mentioned in his study that many factors contribute to childhood obesity such as excess of indoor activities/workouts/games and entertainment (e.g., watching TV, surfing internet, and playing computer games) alone or in combination with factors like unsafe neighbourhoods for walking and other outdoor activities, lack of open spaces and playgrounds in schools and communities along with increasing pressure on children to perform in academics and reduced emphasis on sports. Television watching habit is perhaps considered the best-established environmental influence on the initial development of childhood obesity**.** The researchers established the fact there is a less or poor linkage between media usage and obesity. An ideal combination of clinical assessment of baseline activities and environmental modification to promote physical activity should be part of any strategic preventive measure.

Follow Up with issues related to childhood obesity

For the better treatment, it's always advisable by the experts to analyse the major reasons of obesity, and further a good team work is essential. During the treatment of obese children, cooperation of paediatricians, psychiatrists (Child /Adolescent), dieticians, and sports physicians, if possible, will provide an increase in treatment fulfilment and positive results Epstein LH et al. (2008).[5] Along with team work, another way to enhance treatment compliance includes adjusting nutrition and providing psychological support alongwith physical activity (Table 1). Furthermore, cooperation with families, social circles, and teachers is also very significant in establishing permanent and positive behavioural changes in children.

Table 1.Instance of Treatment approach in long term follow up of child obesity

1	Extra calorie intake reduction
2	Increasing exercise
3	Motivation for behavioral modification
4	Drug therapy
5	Surgery

Importance of Physical activities to combat child obesity

Physical activity

It has been hypothesized that a relentless decrease in physical activities among all age children groups has been intensely contributed to rising rates of obesity and overweight all around the world. Lower support rates in

sports and PAs, especially among youthful young ladies, are moreover related with expanded obesity and overweight predominance Ahmad et. al.(2010).[1] In urban ranges guardians lean toward having their children observe tv at domestic instead of play exterior unattended, "watching tv and playing computer games are related with expanded predominance of obesity and overweight Styne DM(2005).[14]

According to the assessment by the United Kingdom Health Promotion Agency, as a result of analysing meta-analysis studies, body weight reducing studies applied to overweight/obese children are gathered under five main headings:-

- Family based physical activity and interventions for encouraging and promoting family health,
- Family based programs that consider parents and guardians the main element of change,
- Family based behavioral modification programs,
- Behavioral modification programs that do not include parents, and
- Exercise treatment programs alone [August GP et. al.(2008)].

The agency reported that community education hardly ever influenced behavioral changes, the most effective way to provide positive outcomes in treatment included considering the child an individual, making the child to have information and think about this issue and subsequently, choosing effective treatment methods suitable for the child's and family's daily life dynamics [August GP et. al.(2008)].

Katherine González Ruiz et. al. (2017) concluded that physical exercise, mainly aerobic, as an effective intrusion for non-alcoholic fatty liver disease progression by targeting hepatic lipid composition, visceral and subcutaneous adipose tissue. Systematic review registration, Intensive exercise favors a negative energy balance by dually affecting energy expenditure and energy intake without changes in appetite sensations, suggesting that adolescents are not at risk of food frustration.[6]

Martínez Torres et. al.(2017)Their study findings have clinical and public health implications, as the university population has been reported to be a stage of life where some behavioral and metabolic changes occur. These changes, combined with the adoption of Western lifestyles and diets, have led to an increase in the proportion of overweight and obese Colombians, especially among university students.[11]

In cases of very high intensity exercise at the start of treatment children may cause injuries. Therefore, one should start with low intensity exercise and the intensity should be increased gradually. The children and adult treatment programs are not different. Experts need to prepare more entertaining short programs for children because they may easily become bored and discontinue the program. Normally all exercise programs should consist of a dynamic warm up period of 10–15 minutes, an educational exercise period of 20 to 60 minutes, and a cooling period that includes low intensity movements [Whitlock E et. al.(2008)]

In exercise recommendations for children, exercise programs corresponding to the English acronym FITT (Frequency, Intensity, Time, and Type), which means having a high level of conditioning, are recommended (figure 1) [Taşkın G et al.(2018)]

Exercise Types and examples for Children [Takken T et. al.(2012)]:-

- **Aerobic exercises**: These work the big muscles of the body and boost respiratory power while also raising heart rate.Examples include skate-boarding, kayaking, dancing, basket-ball, swimming, gymnastics, volleyball, tennis, rope jumping, house cleaning, running, and cycling.
- Building muscles through exercises like pushups, weight-lifting, and rope climb a rope, tree, or rock.
- **Bone strengthening**: Exercises such as running, climbing mountains, walking, playing basketball and volley ball, and jumping rope should be done at least three times per week.
- **Extension 'Strain'**: Increases muscle elasticity and lowers the risk of injury, as shown in gymnastics, yoga, and dancing.

Figure 1.Physical workout programs can be suggested in children and teenagers by using FITT principles [Taşkın G et. Al(2018)]

FITT	Cardiovascular (aerobic) program	Interval program	Muscle resistance program
Frequency	≥3/week	≥3/week	≥3/week
Intensity	Moderate to intense exercises	3–5 minutes Mild-moderate Interrupting for	High (50–70% MVC)
Time	20–60 minutes	Total 20–60 minutes	2–3 minutes per muscle group (8–20 repetitions) Total ≥30
Type of work outs	Running, jumping, biking Swimming, soccer	Running, jumping swimming, biking	push-ups, climbing paddle
Program duration	8–12 weeks	6–12 weeks	6–12 weeks

Abbreviation's

- **FITT**: Frequency, Intensity, Time, & Type;
- **MVC**: Maximum Voluntary Contraction.

In technologically advanced society, it is quite challenging to help children establish a way of life that combines nutrition therapy with a behavioural approach that encourages physical exercise.the contemporary. The findings of the study conducted on south asian children below 5 years by Jay Shah et al(2022) also pointed a high prevalence of overweight

among young children, with a significant difference between dietary diversity scores and scheduled Tribal families in India. On the other hand, Muslim families appear to be a protective factor against childhood overweight/obesity. Regarding prevention strategies, parents should focus on propaganda campaigns to reduce overweight and obesity and strengthen preventive measures.

The current consensus is that BMI is a valid and feasible indirect measure of body fatness, useful in clinical and epidemiologic studies, but it suffers from a number of limitations. Health professionals should be aware and consider these limitations. More efforts are needed to develop other valid and feasible measures of body composition. Further research on the applications of waist circumference, bio-impedance, or other forms of weight-for-height index remains valuable. It has been argued that population-specific standards should be used due to biological differences between populations. To assist international comparisons, in epidemiologic studies, the IOTF reference is superior. The most significant finding of this review of the literature on paediatric obesity is that there is a lack of evidence-based research on effective interventions. The existing research has found that most methods of weight loss are unsuccessful over time. Prevention is clearly the best way to deal with paediatric obesity.

Conclusion

- Obesity and overweight in children raises the chance of developing various physical and mental illnesses. The final remarks will include a few recommendations for parents and mentors, such as encouraging overweight kids to increase high energy activity, reduce low energy activity (viewing TV, computers, or mobile screens), and establish healthy eating habits. As an author, I would recommend the following environments to help children who are overweight lower their weight:
- Creating more supportive circumstances for physical exercise and a healthy diet in the social and physical settings where children live, learn, and play;
- Recognising and addressing the early warning signs of childhood obesity and overweight, and
- Investigating strategies to make it easier for kids to access and obtain nutrient-dense foods while making it harder for them to access and obtain meals and beverages that are rich in fat, sugar, or sodium.

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