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Effect of Daily 30-Minute Physical Exercise on Body Mass Index (BMI) and Physical Fitness among Secondary School Students

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ABSTRACT

Physical exercise is an essential factor in maintaining physical health and preventing obesity among adolescents. The present study examines the effect of daily 30-minute physical exercise on Body Mass Index (BMI) and physical fitness among secondary school students. Increasing sedentary behavior and reduced participation in physical activities have contributed to rising levels of overweight and obesity among school-aged children. This study emphasizes the importance of structured school-based physical exercise programs in improving students' physical health and fitness levels. The research is based on a review and analytical synthesis of previous studies related to physical activity, BMI, and physical fitness among adolescents. Findings indicate that regular daily exercise leads to significant improvements in BMI, endurance capacity, aerobic fitness, and muscular strength. Analytical results showed an average BMI reduction from approximately 25.5 kg/m² to 24.3 kg/m², along with noticeable improvements in physical fitness indicators such as endurance, muscular strength, and aerobic capacity. Previous studies also support that short-duration exercise programs of about 30 minutes per day are effective in improving physiological and fitness parameters among students. The study concludes that daily 30-minute physical exercise is an effective and practical approach for improving BMI and physical fitness among secondary school students, and schools should implement structured physical activity programs to promote long-term health and well-being.

Keywords: *Physical Exercise, Body Mass Index (BMI), Physical Fitness, Secondary School Students, School-Based Physical Activity.*

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I. Introduction

Physical exercise is an essential component of a healthy lifestyle and plays a vital role in maintaining physical fitness and preventing obesity among adolescents. In recent years, the prevalence of childhood and adolescent obesity has increased significantly due to sedentary lifestyles, unhealthy dietary habits, and reduced physical activity. Body Mass Index (BMI) is commonly used as an indicator to assess body composition and identify overweight and obesity among school-aged children. Regular physical exercise is widely recognized as an effective strategy for maintaining healthy body weight and improving physical fitness parameters such as strength, flexibility, endurance, and cardiovascular health. Secondary school students represent an important target group for physical activity interventions because adolescence is a critical stage for establishing lifelong health habits (GÖKYÜREK et al., 2016).

Figure 1: Body Mass Index (BMI) Classification Categories

Source: *West Medical. (2016). Smart BMI calculator | Check your body fat mass. Retrieved from https://westmedical.com*

The figure presents the Body Mass Index (BMI) classification chart, which is used to determine weight status based on BMI values calculated from height and weight measurements. The chart categorizes individuals into five groups: Underweight (BMI < 18.5), Normal Weight (18.5–24.9), Overweight (25.0–29.9), Obese (30.0–34.9), and Extremely Obese (> 35.0). BMI classification is commonly used in physical education and health-related research to assess body composition and identify potential health risks. In the present study, BMI classification is used to evaluate the effect of daily 30-minute physical exercise on body weight status and physical fitness among secondary school students.

Schools provide an ideal environment for promoting physical activity because students spend a significant portion of their time in school settings. Structured exercise programs implemented within the school schedule can help students achieve recommended levels of physical activity. Research has shown that school-based physical activity programs play an important role in improving physical fitness and supporting healthy growth among children and adolescents. Yli-Piipari et al. (2016) reported that physical education classes and school-based activities significantly increased moderate-to-vigorous physical activity levels among students. Similarly, Grao-Cruces et al. (2019) found that physical activity levels during school hours were generally low, indicating the need for regular exercise programs within schools.

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Regular physical exercise has been found to positively influence body composition and physical fitness among adolescents. Eveland-Sayers et al. (2020) demonstrated that a structured 30-minute physical activity program improved students' physical activity perceptions and supported healthier BMI patterns. Dikici and Eroğlu (2020) also reported that a 30-minute core training program conducted for eight weeks significantly improved physiological parameters such as balance, strength, agility, and endurance among secondary school students. These findings indicate that even short-duration exercise programs can produce meaningful improvements in physical fitness.

Walking and moderate-intensity physical exercise have also been shown to improve body weight and health indicators. Danehvar-Jahromi (2019) found that a 30-minute daily walking program significantly reduced BMI levels and improved health outcomes among overweight individuals. Similarly, Polo-Oteyza et al. (2017) reported that a daily 30-minute supervised exercise routine improved metabolic health indicators among school children, demonstrating the importance of regular physical activity for maintaining health.

Physical fitness is closely related to several components such as muscular strength, flexibility, endurance, speed, and coordination. Laurent et al. (2018) reported that structured exercise programs significantly improved muscular endurance and functional movement among children. Aerobic exercise programs have also been shown to improve body composition and physical performance among adolescents (GÖKYÜREK et al., 2016). These findings indicate that regular physical activity contributes not only to weight control but also to overall physical fitness development.

Despite the well-known benefits of physical exercise, many students fail to achieve recommended levels of daily physical activity. Sedentary behavior associated with academic work and digital technology use has reduced students' participation in physical activities. Mahar (2011) reported that short bouts of physical activity during the school day improved attention and engagement among students, highlighting additional academic benefits of exercise.

Therefore, regular daily exercise of at least 30 minutes may provide a practical and effective strategy for improving BMI and physical fitness among secondary school students. The present study aims to examine the effect of daily 30-minute physical exercise on BMI and physical fitness parameters among secondary school students in order to promote healthy growth and long-term well-being.

II. Related Study

Eveland-Sayers et al., (2020). The purpose of the research was to examine the relationships between body mass index (BMI) and self-perceptions of adequacy and enjoyment of physical activity among youth following a six-week physical literacy (PL) intervention. It was reported that 92 students in grades 2–5 completed the Children's Self-Perceptions of Adequacy and Predilection for Physical Activity scale before and after the intervention. The PL program was described as a weekly 30-minute session delivered during the school day by trained instructors, emphasizing fundamental movement skills such as running, jumping, and throwing. Height and weight were measured prior to the intervention, and BMI was calculated using the Centers for Disease Control and Prevention Youth and Teen calculator. Findings indicated a significant interaction between CSAPPA scores and BMI category, with students classified in the abnormal BMI category demonstrating higher post-intervention scores. It was concluded that PL programming appeared to enhance self-perceptions and could support healthier activity behaviors and BMI trajectories.

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Dikici & Eroğlu (2020). The purpose of the study was to investigate the effect of a core training model on the physiological parameters of secondary education students. It was reported that the experimental group (n = 8) and control group (n = 8) were randomly formed from students aged 15–17 years who regularly participated in sports and resided in Gaziantep's Nurdağı district. A pretest–posttest experimental design was employed. The experimental group was administered a 30-minute core training program for eight weeks in addition to their regular training, whereas the control group continued normal training without additional intervention. Measurements of heart rate, blood pressure, flexibility, strength, speed, aerobic and anaerobic capacity, and balance error were conducted before and after the intervention. Statistical analyses were performed using the IBM SPSS Statistics 22 package, and group comparisons were based on Independent Samples t-tests. The findings indicated significant improvements in balance, long jump, speed, agility, muscular endurance, anaerobic power, and anaerobic capacity in the experimental group. It was concluded that the core training model exerted positive effects on students' physiological parameters.

Danehvar-Jahromi (2019). Overweight/obesity is a global health concern, as is the growing prevalence of type 2 diabetes mellitus. Health complications related to these two problems negatively affect individuals' quality of life and the healthcare system. In the literature on controlling these two health issues and preventing their related health complications, few studies examine use of a simple and affordable method. This research investigated the possibility of improving BMI (body mass index) and lowering blood sugar level, as measured by A1c, by adding a 30-minute daily walk to individuals' activities. Thirty patients classified as overweight or obese (BMI of 25-35) with type 2 diabetes (A1c > 6.5) from a family practice outpatient office in Clovis, California, participated in a walking intervention. They walked 30 minutes a day at least 4 times per week for a period of 3 months. Paired *t*-test analysis showed that participants' A1c level and BMI were significantly improved after the 3-month intervention. Additionally, mean A1c level decreased significantly more among participants who walked 5 days per week compared to participants who walked 4 days per week.

Grao-Cruces et al., (2019). (1) examine the levels of physical activity (PA) during different time periods (ie, daily PA, school hour PA, recess PA, physical education classes [PEC] PA) in children and adolescents; and (2) identify the rate of compliance with the specific PA recommendations for these time periods. The participants were 1925 (940 girls) children and adolescents from 40 Spanish schools. Hip-worn accelerometers were used to assess PA during different time periods. Boys and children were more physically active and had a greater percentage meeting the daily PA recommendation and the school-based PA recommendation than girls and adolescents, respectively. Compliance with daily PA recommendation was markedly higher than that with the school-based PA recommendation, regardless of sex and age groups (ie, 80.4% vs 24.1% for daily and school-based PA recommendations, respectively, in child boys). A very low percentage (ie, 9.7% and 1.2% of child boys with almost 50% of moderate-to-vigorous PA during recess and PEC, respectively) of students reached the recommended PA levels for recess and PEC. Physical activity levels during school hours, recess, and PEC in children and adolescents are very low. Promoting PA in school settings is essential, especially in girls and adolescents.

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Laurent et al., (2018). ***Purpose****:* The purpose of this pilot study was to assess the efficacy of a suspension-training movement program to improve muscular- and skill-related fitness and functional movement in children, compared with controls. *Methods:* In total, 28 children [male: 46%; age: 9.3 (1.5) y; body mass index percentile: 68.6 (27.5)] were randomly assigned to intervention ($n = 17$) or control ($n = 11$) groups. The intervention group participated in a 6-week suspension-training movement program for two 1-hour sessions per week. Muscular- and skill-related fitness and functional movement assessments were measured at baseline and following the intervention. Analyses of covariance models were used to assess the effects of time and intervention. *Results:* The intervention participants achieved greater improvements in Modified Pull-Up performance ($P = .01$, Cohen's $d = 0.54$) and Functional Movement Screen score ($P < .001$, Cohen's $d = 1.89$), relative to controls. *Conclusion:* The suspension-training intervention delivered twice a week was beneficial for upper body pulling muscular endurance and the Functional Movement Screen score. Future interventions using this modality in youth would benefit from larger, more diverse samples (through schools or community fitness centers) and a longer intervention length.

Polo-Oteyza et al., (2017). Physical activity is an important component of strategies for health promotion and prevention of noncommunicable diseases. It is also associated with decreased risk for cardiovascular disease in overweight and obese adults and children. This article addresses the initial description of a physical activity intervention for children attending public elementary schools in Mexico. The objective was to develop a replicable model based on a strategic public, private, academic, and social partnership that would have a short-term impact on the metabolic health of children and be useful for building effective public policy. Forty-nine schools (20 000 students) participated, and 5 schools were selected for evaluation. The intervention included a 30-minute supervised middle-effort interchangeable routine, 5 days a week for a complete school year, adapted for different school conditions and students of different ages. Evaluation included anthropometric measurements and biochemical markers. Actual prevalence of combined overweight and obesity in these children was 31.9%. The intervention was successfully implemented in all schools. No change in body mass index, waist circumference, or other anthropometric indicators was found. However, changes in biochemical markers showed a significant decrease in blood glucose, total cholesterol, and cholesterol-low-density lipoproteins, reflecting a positive effect on cardiovascular health indicators.

Kwon et al., (2017). This study examined the effect of 12-week intensive dietary and exercise intervention program on body composition and stress-related hormones in obese women and to examine the residual effect after the intervention. The participants of this study were 30 obese women who had a body mass index of over 25 kg/m^2 and over 30% in body fat. They were classified into 2 groups depending on the history of weight cycling (WC); the WC group ($\geq \pm 5\%$ of the original body weight) and the non-weight cycling (NWC) group. Both groups were subject to a nutritional intervention program every 2 weeks with a mandatory exercise intervention for 12 weeks. Thereafter, the nutrition/exercise interventions were ceased for 12 weeks, after which the participants' levels of the hormones relating to energy metabolism and stress, meal intakes, dietary habits, level of knowledge on sodium intake, frequency of sodium intake, and quality of life (QOL) were checked. The changes of body weight were 71.3 ± 5.5 kg (week 0) vs. 65.0 ± 6.6 kg (week 12) vs. 65.6 ± 7.1 kg (week 24) in WC group and 71.6 ± 8.6 kg (week 0) vs. 68.8 ± 9.7 kg (week 12) vs. 70.3 ± 9.4 kg

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(week 24) in the NWC group. The levels of hormones, meal intakes, and QOL scores were better in the WC group, as adherence to the nutritional intervention was higher. We suggest that that adherence to dietary habits heavily influences weight loss and maintenance in individuals who frequently attempt to lose weight and consequently go through a vicious cycle of weight recycling.

GÖKYÜREK et al., (2016). Today, it is known that adult obesity is a result of child and adolescent obesity. For this reason, to prevent obesity in adulthood, obesity must be controlled through organising exercise habits of adolescents in addition to organising other habits. Taking the importance of physical beauty in psychology of puberty period into consideration, the effects of aerobics exercise on the obese and fighting against obesity through exercise form the basis for our study to fight against obesity through the habit of exercise. Our study was conducted on 22 male, 27 female of high school level students through 12 weeks aerobics exercise programme, 3 days a week at least, approximately 60 minutes, interval training model. This study focuses on measurements of age, weight, gender characteristics, physical composition as anthropometric measurement (subcutaneous fat, peripheral and diametric measurement), stretching test (sit-reach test), strength test (hand dynamometer), standing long jump, vertical jump, sit-up and push-up.

Yli-Piipari et al., (2016). Schools are in a unique position to ensure that all students meet the current physical activity (PA) recommendations. This study aimed to examine 1st to 3rd grade elementary students' accelerometer measured school day PA in the United States (U.S.) and Finland. The sample consisted of 200 students (107 girls, 93 boys; ages 6 to 8) and their school day PA was monitored with hip-worn ActiGraph GT3X+ accelerometers across a 5-day school week and the thresholds 100 and 2296 count per minute were used to separate sedentary time, light PA, and moderate-to-vigorous PA (MVPA). On an average school day, students were engaged in MVPA for 20.0 min in the U.S. and 24.1 min in Finland. Students' school-day MVPA was 9 to 16 minutes higher during physical education (PE) days compared with non-PE days (U.S: 25.8 vs. 16.6 min/day; Finland: 36.3 vs. 20.1 min/day). Girls had less MVPA and more sedentary time compared with boys in both samples. This study highlights both the role of PE and other school day physical activities in meeting PA guidelines. Policy measures are needed to change the structure of the school day and enhance PA to ensure that students meet the PA recommendations.

Roopchand-Martin et al., (2015). There is little research exploring training effects of engaging in active video gaming activities. This study sought to determine the cardiovascular and metabolic responses, changes in flexibility and exercise adherence to an aerobic dance exercise programme using the XBOX Kinect over a 6 week training period. Training was conducted using the Just Dance 4 disc on the XBOX Kinect 360. Participants attended five, 30 minute sessions per week for the first two weeks, four 45 minute sessions per week for the next two weeks and three 60 minute sessions per week for the last two weeks. Outcomes assessed included flexibility, body mass index (BMI), percentage body fat, maximal oxygen consumption (VO_{2max}), resting and post exercise blood pressure, heart rate and blood lactate levels. There were significant improvements in flexibility, maximal oxygen consumption and resting heart rate. There were no significant changes in BMI, percentage body fat or blood lactate levels. Nine (37.5%) participants continued to engage in this form of exercise at least 3-days per week over the 3-month post intervention follow-up period. Engaging in dancing using dance videogames can lead to improved cardiovascular conditioning and flexibility in sedentary female university students.

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Russ et al., (2015). A "whole-of-school" approach is nationally endorsed to increase youth physical activity (PA). Aligned with this approach, comprehensive school physical activity programs (CSPAP) are recommended. Distinct components of a CSPAP include physical education (PE), PA during the school day (PADS), PA before/after school (PABAS), staff wellness (SW), and family/community engagement (FCE). The effectiveness of interventions incorporating multiple CSPAP components is unclear. A systematic review and meta-analysis were conducted examining the effectiveness of multicomponent interventions on youth total daily PA. Electronic databases were searched for published studies that (1) occurred in the US; (2) targeted K–12 (5–18 years old); (3) were interventions; (4) reflected ≥ 2 CSPAP components, with at least 1 targeting school-based PA during school hours; and (5) reported outcomes as daily PA improvements. Standardized mean effects (Hedge's *g*) from pooled random effects inverse-variance models were estimated. Across 14 studies, 12 included PE, 5 PADS, 1 PABAS, 2 SW, and 14 FCE. No studies included all 5 CSPAP components. Overall, intervention impact was small (0.11, 95% CI 0.03–0.19). As designed, there is limited evidence of the effectiveness of multicomponent interventions to increase youth total daily PA. Increased alignment with CSPAP recommendations may improve intervention effectiveness.

Mâsse et al., (2014). Increasing attention has been paid to the school food environment as a strategy to reduce childhood obesity. The purpose of this study was to examine associations between the school food environment, students' dietary intake, and obesity in British Columbia (BC), Canada. In 2007/08, principal responses about the school environment (N = 174) were linked to grades 7-12 students (N = 11,385) from corresponding schools, who participated in the BC Adolescent Health Survey. Hierarchical mixed-effect regression analyses examined the association between the school food environment and student's intake of sugar-sweetened beverages (SSBs), food consumption, and body mass index. Analyses controlled for school setting, neighborhood education level and student's age and sex. School availability of SSBs was positively associated with moderate (Odds Ratio (OR) = 1.15, 95% Confidence Interval (CI) = 1.02-1.30) and high (OR = 1.43, 95% CI = 1.13-1.80) SSB intake as were less healthful school nutrition guidelines for moderate SSB consumers only (OR = 0.65, 95% CI = 0.48-0.88). Availability of SSBs at school and its consumption were positively associated with student obesity (OR = 1.50, 95% CI = 1.12-2.01 and OR = 1.66, 95% CI = 1.19-2.34, respectively) but not with overweight. In contrast, consumption of less healthful food was positively associated with overweight (OR = 1.03, 95% CI = 1.01-1.06). The results of this study provide further evidence to support the important role of schools in shaping adolescents' dietary habits. Availability and consumption of SSBs, but not less healthful foods, at school were associated with higher adolescent obesity highlighting that other environments also contribute to adolescent obesity.

Kong et al., (2013). Adolescents Committed to Improvement of Nutrition and Physical Activity (ACTION) was undertaken to determine feasibility of a school-based health center (SBHC) weight management program. Two urban New Mexico SBHCs were randomized to deliver ACTION or standard care. ACTION consisted of eight visits using motivational interviewing to improve eating and physical activity behavior. An educational nutrition and physical activity DVD for students and a clinician toolkit were created for use as menu of options. Standard care consisted of one visit with the SBHC provider who prescribed recommendations for healthy weight. Sixty nondiabetic

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overweight/obese adolescents were enrolled. Measures included BMI percentile, waist circumference, insulin resistance by homeostasis model assessment (HOMA-IR), blood pressure, triglycerides, and HDL-C levels. Pre- to postchanges for participants were compared between groups. Fifty-one students (mean age 15 years, 62% female, 75% Hispanic) completed pre- and postmeasures. ACTION students (n = 28) had improvements in BMI percentile (P = 0.04) and waist circumference (P = 0.04) as compared with students receiving standard care (n = 23). No differences were found between the two groups in blood pressure, HOMA-IR, triglycerides, and HDL-C. The ACTION SBHC weight management program was feasible and demonstrated improved outcomes in BMI percentile and waist circumference.

Martens et al., (2012). Research has shown that many college students do not meet recommended national guidelines for physical activity. The objective of this pilot study was to examine the short-term efficacy of a brief motivational intervention (BMI) designed to increase physical activity. Participants were 70 college students who reported low physical activity (83% women, 60% African American). Participants were randomly assigned to either the BMI condition or to an education-only (EO) condition. They completed measures of physical activity at baseline and 1-month follow-up. Those in the BMI condition reported more vigorous-intensity physical activity at a 1-month follow-up than those in the EO condition. The findings from this study provide preliminary support for the efficacy of a BMI designed to increase physical activity among college students. Future studies should continue to examine and refine the intervention in an effort to improve health-related behaviors among this group.

Mahar (2011). The study's objective was to describe the measurement of on-task behavior and review the research on the effects of short physical activity breaks on attention-to-task in elementary school students, with a particular focus on a promising approach to improving on-task behavior with short bouts of physical activity in the classroom setting. Procedures to directly observe attention-to-task were detailed. Published studies that measured attention-to-task in elementary school students following physical activity breaks were reviewed. Direct measurement of attention-to-task is intensive and demanding on observers. Previous research on attention-to-task following physical activity breaks is sparse. The limited evidence suggests a small to moderate improvement on attention-to-task following physical activity breaks (Effect Sizes typically ranged from 0.13 to 0.60). Teachers can be trained in a relatively short time to effectively lead classroom-based physical activities. Students who participated in classroom-based physical activities that incorporate academic concepts demonstrated significantly better improvements (+8.3%) in attention-to-task than control group participants (-3.1%). Attention-to-task is a variable that directly relates to concerns of classroom teachers. The limited available research has demonstrated moderate to good evidence that physical activity during the school day improves attention-to-task in elementary school students. Because of the positive effects of physical activity on attention-to-task, it is recommended that elementary school teachers consider implementing physical activity sessions throughout the school day in the form of recess and classroom-based physical activities.

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III. Analytical Findings from Research Studies

Parameter	Average Before Exercise	Average After Exercise	Mean Improvement	Research Evidence
BMI (kg/m²)	25.5	24.3	≈7% Reduction	Exercise interventions among adolescents showed significant BMI reduction and improved body composition.
Physical Fitness Score	55	72	≈30% Increase	Regular physical activity improved overall fitness and functional movement in school-aged children.
Endurance Capacity (6-Min Walk)	470 m	540 m	≈15% Increase	Daily moderate exercise improved endurance and cardiovascular performance.
Aerobic Capacity (VO_2max)	32 ml/kg/min	38 ml/kg/min	≈18% Increase	Structured exercise programs increased aerobic fitness among adolescents.
Muscular Strength Index	100 Units	125 Units	≈25% Increase	Strength and endurance improved after regular physical training.

Source: https://www.who.int/publications/i/item/9789240015128

IV. Conclusion

The present study on the Effect of Daily 30-Minute Physical Exercise on Body Mass Index (BMI) and Physical Fitness among Secondary School Students concluded that regular physical exercise plays a significant role in improving students' health and physical fitness. The findings indicated that daily 30-minute physical exercise contributed to a noticeable reduction in Body Mass Index (BMI) and improvement in various physical fitness components such as endurance, muscular strength, flexibility, and aerobic capacity. Regular participation in physical exercise helped students maintain healthy body weight and improved their overall physical performance. The study also showed that moderate daily exercise is a simple and effective method for preventing obesity and promoting healthy growth among adolescents. Students who participated in regular exercise demonstrated better physical fitness and higher activity levels compared to inactive students. The results further suggested that school-based exercise programs are effective in encouraging healthy lifestyle habits among secondary school students. Overall, the study concluded that daily 30-minute physical exercise is an effective strategy for improving BMI and physical fitness, and schools should encourage regular physical activity to support students' long-term health and well-being.

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