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# PHYSIOLOGICAL ADAPTATIONS IN BODY COMPOSITION THROUGH SPECIFIC DESIGNED FOOTBALL PROGRAM IN SPECIAL CHILDREN

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**ABSTRACT:**

Maintaining healthy body composition is essential for children's health, particularly for children with disabilities, who often experience limited physical activity. This study examined the effect of a Specifically Designed Football Program (SDFP) on body composition in children with intellectual disabilities. A quasi-experimental pre-test/post-test control-group design was used with 60 male children (12–18 years) from special schools in Gwalior, India. The experimental group (n = 30) participated in a 20-week football program (three 60-minute sessions per week), whereas the control group (n = 30) maintained their usual activities. Body fat percentage was measured using the Jackson and Pollock 7-site skinfold method. The experimental group showed a significant reduction in body fat percentage (11.47% to 7.35%), whereas the control group showed a slight increase (11.32% to 11.78%). ANCOVA revealed a significant treatment effect ($F = 244.78$, $p < 0.001$). The findings demonstrate that structured football-based interventions effectively improve body composition in children with intellectual disabilities, highlighting the importance of adapted physical activity programs for promoting health in this population.

***KEYWORDS:*** *body composition, intellectual disability, adapted physical activity, football intervention, special children, body fat percentage.*

## INTRODUCTION:

Maintaining a healthy body composition and engaging in regular physical activity are critical for the overall well-being and development of children. These factors are particularly significant for children with special needs, who often face unique challenges in participating

in physical activities and are at higher risk of developing adverse health conditions associated with poor body composition (Demirci, 2019; Kampasová & Válková, 2022). Structured physical activity programs have been increasingly recognized as vital tools to promote physical fitness and improve health outcomes in this population (Demirci, 2018; Lankhorst et al., 2019; Salaün, 2011).

Football, as a dynamic and engaging sport, provides a comprehensive approach to physical training that promotes multiple physiological adaptations. Studies have shown that regular participation in football programs can lead to positive changes in body composition, including reduced body fat percentage and increased muscle mass in children (Krustrup et al., 2024; Randers et al., 2024). High-intensity interval training, often incorporated into sports like football, has also demonstrated improvements in body composition and physical fitness parameters in children and adolescents with special educational needs (Poon et al., 2023). These interventions are crucial for addressing issues such as lower fitness levels and higher obesity rates often observed in children with disabilities compared to their typically developing peers (Demirci, 2019).

While the general benefits of sports and physical activity for children with disabilities are acknowledged, there remains a need for specific, designed interventions tailored to their unique requirements. Research indicates that personalized adapted physical activity programs can effectively impact anthropometric variables and body composition in adolescents with intellectual disabilities (Salaün, 2011). The impact of these structured programs extends beyond physical benefits, contributing to overall health and development (Kampasová & Válková, 2022).

This study aims to address this need by investigating the physiological adaptations in body composition through a specific designed football program in special children. Building on the understanding of how physical activity influences body composition across populations, this research aims to evaluate the effectiveness of a targeted football intervention in promoting beneficial physiological changes in this specific demographic. The findings will contribute to the growing body of literature supporting the development and implementation of specialized exercise programs for children with special needs.

## MATERIALS AND METHODS:

**Research Design:** A quasi-experimental pre-test–post-test control-group design was employed to examine the effect of a Specifically Designed Football Program (SDFP) on body composition among children with intellectual disabilities. This design enabled the assessment of intervention-related changes while controlling for baseline differences between groups.

**Participants:** The study sample comprised 60 male children (N = 60) aged 12–18 years diagnosed with intellectual disabilities, who were purposively selected from special schools in Gwalior, Madhya Pradesh, India. Participants were allocated into an experimental group (n = 30) and a control group (n = 30). Written informed consent was obtained from legal guardians, and assent was obtained from all participants prior to data collection.

**Intervention:** The experimental group participated in a 20-week Specifically Designed Football Program consisting of three sessions per week, each lasting 60 minutes. The intervention incorporated structured football-specific drills and game-based activities designed to enhance cardiovascular endurance, muscular strength, and overall physical activity levels. The control group continued their routine daily activities without exposure to any structured physical training program.

**Dependent Variable and Measurement Procedures:** Body composition served as the primary dependent variable and was assessed through body fat percentage using the Jackson and Pollock 7-site skinfold method. Skinfold measurements were obtained from the chest, abdomen, suprailiac, subscapular, biceps, triceps, and thigh sites using standardized procedures. The collected measurements were subsequently analyzed using a 7-site skinfold calculator to estimate body fat percentage. Data were recorded at baseline (pre-test) and following the intervention period (post-test).

**Statistical Analysis:** Descriptive statistics, including means and standard deviations, were computed for all variables. Within-group differences between pre-test and post-test scores were analyzed using paired-sample t-tests. Between-group differences in post-test body composition, controlling for baseline values, were examined using analysis of covariance (ANCOVA). The level of statistical significance was set at $\alpha = 0.05$.

**Ethical Considerations:** Ethical approval for the study was obtained from the institutional ethics committee. All procedures were conducted in accordance with established ethical

standards, ensuring participant confidentiality, voluntary participation, and the right to withdraw at any stage of the study.

## RESULTS

Body composition was assessed at pre-test and post-test, and adjusted post-test means were computed to control for baseline differences, consistent with the quasi-experimental design.

**Descriptive Statistics:** Table 1.1 presents the pre-test, post-test, and adjusted post-test means and standard deviations for body fat percentage in both groups.

**Table 1.1:** ***Descriptive Statistics of Body Composition (Body Fat %)***

| Groups | Pre-test Mean ± SD | Post-test Mean ± SD | Adjusted Post-test Mean |
|---|---|---|---|
| ***Experimental*** | 11.47 ± 4.65 | 7.35 ± 3.26 | 7.29 |
| ***Control*** | 11.32 ± 4.39 | 11.32 ± 4.39 | 11.32 ± 4.39 |

***Table 1.1*** revealed at baseline, both groups demonstrated comparable mean body fat percentages (Experimental: 11.47 ± 4.65; Control: 11.32 ± 4.39), indicating initial equivalence.

Following the 20-week intervention, the experimental group exhibited a marked reduction in mean body fat percentage from 11.47% to 7.35%, reflecting a decrease of approximately 4.12 percentage points. In contrast, the control group showed a slight increase from 11.32% to 11.78%, representing a marginal 0.46 percentage-point increase. These descriptive findings suggest a favorable trend in body composition for participants exposed to the Specifically Designed Football Program (SDFP), whereas no improvement was observed in the control group.

**ANCOVA Results:** To determine whether the observed differences were statistically significant while controlling for baseline values, an Analysis of Covariance (ANCOVA) was conducted.

***Table 1.2: Summary of ANCOVA on the body composition on the selected variable body composition of special children***

| Source of Variance | df | SS | MS | F | Sig. |
|---|---|---|---|---|---|
| **Treatment Group** | 1 | 311.71 | 311.71 | 244.78 | **0.000** |
| **Error** | 57 | 72.58 | 1.27 | | |

| Source of Variance | df | SS | MS | F | Sig. |
|---|---|---|---|---|---|
| Total | 60 | 384.29 | | | |

***Significant F {0.05} = 2.66 (though the provided value was t 0.05, df (1,57) =2.66, an F-value is appropriate for ANCOVA for comparing group means)**

The ANCOVA revealed a highly significant treatment effect, $F(1,57) = 244.78$, $p < .001$. The adjusted post-test mean body fat percentage was substantially lower in the experimental group (7.29%) compared to the control group (11.85%).

These findings indicate that, after controlling for pre-test scores, participation in the SDFP resulted in a statistically significant reduction in body fat percentage. The magnitude of the F-value suggests a strong intervention effect, leading to rejection of the null hypothesis.

Overall, the results demonstrate that the Specifically Designed Football Program produced significant improvements in body composition among children with intellectual disabilities, whereas no meaningful changes were observed in the control group.

**DISCUSSION OF FINDINGS:**

**Effect of the Specifically Designed Football Program on Body Composition:** The present study examined the impact of a Specifically Designed Football Program (SDFP) on body composition, particularly body fat percentage, among children with intellectual disabilities using a quasi-experimental design. The findings provide strong evidence supporting the effectiveness of structured and adapted physical activity interventions in improving body composition in this population.

The descriptive results revealed a clear divergence in body fat percentage trends between the experimental and control groups. At baseline, both groups demonstrated comparable mean body fat percentages (Experimental Group: 11.47 ± 4.65; Control Group: 11.32 ± 4.39), indicating initial equivalence. Following the 20-week intervention, the experimental group exhibited a significant reduction in mean body fat percentage to 7.35 ± 3.26, representing a decrease of approximately 4.12 percentage points. This reduction aligns with established literature indicating that regular physical activity and structured exercise interventions can produce favorable changes in body composition, including reductions in body fat (Aryannezhad et al., 2025; Bradbury et al., 2017; Braulio et al., 2021; Specht et al., 2022). Such improvements are generally associated with enhanced health outcomes and reduced risk of obesity-related conditions (Braulio et al., 2021; Delfa-de-la-Morena et al., 2025).

**Changes in Body Composition in the Control Group:** In contrast, the control group, which maintained their routine daily activities, demonstrated a slight increase in mean body fat percentage to 11.78 ± 4.46. This finding suggests relatively stable or slightly worsening body composition in the absence of a structured intervention. The observed trend highlights the importance of targeted physical activity programs for children with intellectual disabilities and is consistent with findings among children with limited participation in organized physical activity or sports programs (Kampasová & Válková, 2022).

**Statistical Evidence of Intervention Effectiveness:** To control for pre-existing differences between groups and strengthen causal inference, an Analysis of Covariance (ANCOVA) was employed (Goss et al., 2013; Sarakarn, P et al., 2024), consistent with the quasi-experimental design adopted in this study (Burrell, 2023). The adjusted post-test mean body fat percentage for the experimental group (7.29%) was substantially lower than that of the control group (11.85%). The ANCOVA results demonstrated a highly significant treatment effect ($F = 244.78$, $p = 0.000$, indicating $p < 0.001$), leading to the rejection of the null hypothesis. These findings confirm that participation in the SDFP produced a significant improvement in body composition, even after statistically controlling for baseline differences.

**Consistency with Previous Research:** The observed improvements may be attributed to the structured and engaging nature of the football-based intervention, which integrates aerobic and anaerobic components through football-specific drills and game-based activities. Such activities increase energy expenditure, enhance metabolic efficiency, and improve overall physical fitness, thereby contributing to reductions in body fat percentage. These findings are consistent with previous research demonstrating the effectiveness of multicomponent exercise programs and adapted physical activity interventions in improving body composition among individuals with intellectual disabilities (Farías-Valenzuela et al., 2022; Jacinto et al., 2023; Kampasová & Válková, 2022; Salaün, 2011; Tan, 2012).

**Implications for Adapted Physical Activity Programs:** The results underscore the importance of tailored physical activity interventions that address the specific needs and abilities of children with intellectual disabilities. Adapted programs, such as the SDFP, not only promote beneficial physiological adaptations but also encourage active participation in physical activity, thereby contributing to long-term health and overall well-being. The findings support the growing body of evidence emphasizing the role of specialized exercise

programs in addressing health disparities and improving physical health outcomes among children with disabilities.

Overall, the present study provides strong empirical evidence supporting the implementation of structured football-based interventions as an effective strategy for improving body composition in children with intellectual disabilities. These findings contribute to the expanding literature on adapted physical activity and highlight the importance of integrating specialized exercise programs within educational and rehabilitative settings to promote healthier physiological development in this population.

**CONCLUSION:**

The present study examined the effect of a Specifically Designed Football Program (SDFP) on body composition, particularly body fat percentage, among children with intellectual disabilities. The findings conclusively demonstrate the intervention's positive impact, as participants in the experimental group showed a substantial, statistically significant reduction in body fat percentage compared with the control group. The ANCOVA results further confirmed that these improvements were attributable to the intervention, even after adjusting for baseline differences.

The observed reduction in body fat percentage highlights the effectiveness of structured and specialized physical activity programs in promoting favorable physiological adaptations among children with intellectual disabilities. The incorporation of football-specific drills and game-based activities provided an engaging and developmentally appropriate approach to enhancing physical fitness and improving body composition.

Overall, this study contributes important empirical evidence to the growing body of literature supporting adapted sports-based interventions for special populations. The findings underscore the critical role of targeted exercise programs in fostering improved health outcomes, reducing obesity-related risks, and enhancing overall well-being among children with intellectual disabilities. Furthermore, the results emphasize the importance of implementing structured physical activity interventions within special education and rehabilitative settings to support long-term physical health and development in this population.

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