Physical Activity in Children
Original Article
ISSN: 2783-5391

Effects of an Intervention based on Social Support on Sedentary Behavior and Moderate-to-Vigorous Physical Activity of Children

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Received: 22 October, 2024; **Revised:** 5 December, 2024; **Accepted:** 6 December, 2024; **Published**: 22 December, 2024.

Abstract

Introduction: Advancement and encouragement of physical activity (PA) should be facilitated through the support of family and friends.
Objective: This research was undertaken to investigate the effects of an intervention centered on social support on children's participation in PA.
Methods: This study utilizes a semi-experimental design. The sample consisted of 42 male children, who were randomly assigned to either the intervention or control groups. The measurement of social support was conducted using the family scale social support questionnaire, while PA patterns were assessed with a contemporary accelerometer (ActiGraph wGT3X-BT). The intervention was implemented weekly over a period of eight weeks, with each session lasting 60 minutes. Data analysis was performed using ANOVA and the Pearson correlation test.
Results: Baseline data indicated that participants in both groups exhibited nearly identical BMI values, with no statistically significant differences observed ($P>0.05$). The findings revealed that the intervention group had a mean daily moderate to vigorous PA (MVPA) of 26.74 ± 8.56 minutes, compared to the control group's mean of 25.14 ± 12.67 minutes. The intervention resulted in a notable improvement in perceived social support and levels of MVPA ($P<0.05$). Additionally, there was a significant reduction in sedentary time ($P<0.05$). Furthermore, a direct and significant correlation was found between social support and MVPA ($P<0.001$).
Conclusion: Interventions based on parental social support, which often provides limited encouragement for children's engagement in PA, are effective. Therefore, the research recommends that parents enhance their support for their children's participation in such activities.

Keywords: Social Support, Child, Intervention, Exercise, Parents

How to Cite: Atubi OF, Effects of an Intervention based on Social Support on Sedentary Behavior and Moderate-to-Vigorous Physical Activity of Children. Phys. Act. Child. 2024;1(2):49-54. doi: 10.61186/PACH.2024.484890.1035

1. Introduction

Leisure time encompasses the hours or moments during which individuals engage in activities such as play and recreation, free from obligations related to work and daily life necessities. Physical activity (PA) and sports serve as a versatile and impactful means of enjoying healthy and fulfilling leisure time (1). Their influence extends to various sectors, including the economy, public health, education, and social interactions, while also playing a crucial role in mitigating numerous social issues and moral challenges prevalent in society (2,3). Engaging in health-promoting behaviors, particularly regular PA, is vital for future health outcomes. However, participation in PA has declined for several reasons, including advancements in technology, shifts in lifestyle, and a growing preference for mental pursuits (4). This decline is most pronounced during the transition from childhood to adolescence, particularly among girls (5). The reduction in PA levels within the community results in significant health and treatment costs for both individuals and governments (6).

In the realm of sports, individuals encounter various motivators for achievement, such as overcoming challenges, competing (which serves as a benchmark for personal skill assessment), managing time constraints, pushing personal limits, and enhancing skills over time, including communication and socialization abilities (7,8). Social motivators may include the expectations and rewards from peers, recognition from teammates, elevated social status, or financial incentives (9).

Engaging in PA has historically been essential for individuals and families of all ages and cultures. It has notably strengthened family connections and fostered a variety of social interactions (10). PA, facilitated by recreational and diverse ceremonial events, cultivates happiness within family units. Additionally, it plays a significant role in creating a sense of safety and enhancing both psychological and social well-being for individuals and communities alike, thereby encouraging health and a balanced lifestyle. A considerable segment of society views sports as a worthwhile and advantageous pursuit. As a result, it is expected that community members will not only support the concept of sports but also participate actively in PA, thus closing the divide between theoretical understanding and practical application (11,12).

In the contemporary age, PA and sports serve as a multifaceted instrument with extensive implications, establishing their significance in promoting healthy and enjoyable leisure pursuits (13). The impact of these activities on multiple sectors, such as the economy, public health, education, and social relationships, is clear, as is their contribution to addressing various social challenges and the moral deterioration observed in contemporary society (14,15). A wealth of research has substantiated the

advantages of engaging in PA for both physical and mental well-being, as well as their effectiveness in preventing chronic diseases associated with sedentary lifestyles. Environmental factors significantly influence health-related behaviors, as demonstrated by social-ecological models. These frameworks suggest that health behaviors and PA emerge from the complex interplay between individuals and their environments. As a result, the environment can either promote or obstruct an active lifestyle (16,17). However, research, both historical and experimental, indicates that variations in participation levels in PA cannot be attributed solely to environmental influences. Instead, social, cultural, individual, and psychological factors are interconnected with environmental elements and may even take precedence. Among these, social support is a significant factor to consider (18,19).

Social factors play a crucial role in influencing students' engagement in PA (20,21). These factors are shaped by the degree of encouragement provided by parents, peers, educators, and family members. This influence can manifest directly through social support or indirectly through the modeling of behaviors (22,23). Researchers have characterized social support as the extent of affection, companionship, care, respect, attention, and assistance that an individual receives from others, including family members, friends, and various social groups (21,24,25). In children, the influence of PA and the encouragement from parents and peers are frequently examined as significant social factors. The modeling of human behavior serves as a theoretical framework within social learning, positing that human behavior is acquired and modified through interactions and learning experiences with influential social figures (26)

PA and sports play a crucial role in socialization, and it can be asserted that the encouragement and involvement of family and friends, referred to as social support, significantly influence individuals' engagement in PA (21,24). Their presence in these activities allows individuals to learn essential socialization principles and develop relationships, including working towards a common objective, respecting the rights and regulations governing others, and embracing responsibility. The concept of social support from parents or friends encompasses any actions that motivate, facilitate, and sustain an individual's participation in PA (21,24,25). The influence of family, parents, and friends is particularly noteworthy, as children often view their parents and peers as role models and sources of support. Social support can enhance behavior through both direct and indirect means. Direct social support involves engaging in PA together or undertaking household responsibilities that create opportunities for PA engagement, such as caring for family members and managing household tasks to enable others to participate in sports. Indirect support includes actions like encouraging or persuading a family member or friend to initiate an exercise regimen. Studies indicate that parental social support and the environment of schools positively influence students' enjoyment of PA (27). Furthermore, there exists a significant and positive correlation between the perceived environment, social support, and self-efficacy in relation to participation in PA (21,24,26,28). This suggests that parental support in PA serves as a role model for children and adolescents, positively impacting various behaviors, including their enjoyment of such activities. In addition, research has indicated an indirect correlation between social support and engagement in PA. Additionally, studies have highlighted the role of familial and peer support as a significant mediating factor in the connection between perceived environment, self-efficacy, and PA within educational settings (22-24,27). It has been suggested that the advancement and encouragement of PA should be facilitated through the support of family and friends. However, it remains uncertain whether educational methods and interventions that leverage social support can effectively encourage children's engagement in PA, particularly when parents offer minimal support. Consequently, this study was conducted to examine the impact of a social support-based intervention on children's involvement in PA.

2. Methods

This research employs a semi-experimental design featuring a pre-test-post-test framework alongside a control group.

2.1. Participants

The target demographic includes children aged 9 to 12 years. A total of 42 male children were selected for the sample. Participants were identified through a combination of available and targeted sampling methods. Selection criteria were based on the results from the parental social support questionnaire, with 42 children chosen who scored below a predetermined threshold in their responses to form the statistical sample. Initially, a list was created of children and their parents who met the established criteria. Following this, an introductory interview was held with each parent to outline the research objectives. Those who agreed to participate voluntarily were included in the study. The sample size was determined in accordance with the experimental nature of the research, which generally necessitates a minimum of 15 participants. To address potential participant attrition, which could compromise the internal validity of the study, a final sample size of 42 was established, subsequently divided randomly into two groups of 21: one intervention group and one control group. Inclusion criteria included: 1) being male children who, based on their scores in the social support questionnaire, had a score below a predetermined threshold; 2) not having any significant physical or mental health issues that required treatment; and 3) obtaining consent from both the children and their parents. Exclusion criteria comprised: 1) missing more than two sessions during the intervention period; 2) failing to complete PA protocol; and 3) a lack of willingness to continue participation in the research.

2.2. Measurements

2.2.1. Demographic Information

The demographic data for children included age, height, weight, and body mass index (BMI). For parents, the assessment encompassed age, socioeconomic status (rated from 1 [very low] to 5 [very high]), and education level (ranging from 1 [below diploma] to 5 [doctorate]).

2.2.2. Social Support

The family scale social support questionnaire (29) is a 21-question questionnaire that is used to measure human satisfaction with family support. This questionnaire contains questions about the experiences, perceptions and feelings that most people have from time to time in relation to their family. For each statement there can be three answers yes, no and I don't know. I don't know the answer, zero score, no answer in questions 1, 4, 11, 16 and 21 is considered 1 score and yes, zero score, and in other questions, no answer, zero score and yes score is considered 1. The range of the total score of the questions is between 0 and 21, and a high score means more social support. In this study, the validity of this instrument has been confirmed by nine experts, yielding a Content Validity Index (CVI) of 0.92 and a Content Validity

Ratio (CVR) of 0.94. The Cronbach's alpha coefficient for the survey was found to be 0.93.

2.2.3. Physical Activity and Sedentary Behavior

PA and sedentary behavior were assessed utilizing an ActiGraph wGT3X-BT accelerometer (ActiGraph LLC, Pensacola, FL, USA) operating at a frequency of 80 Hz. This three-dimensional accelerometer captures the activity data of participants with a high degree of precision. Subsequently, the collected data is transmitted to a computer system via Bluetooth and analyzed using the Acti-Life software, which is specifically designed for accelerometer data. The use of this device is a non-invasive approach, allowing participants to wear it continuously for 24 hours a day over the course of one week. The accelerometer is capable of determining the intensity levels of PA (categorized as light, moderate, and vigorous), the duration of sedentary behavior, and the total energy expenditure associated with PA.

2.3. Procedure

The study participants were randomly allocated to either an intervention group or a control group. To maintain ethical integrity, the research goals were explicitly conveyed to all participants, who were made aware of their right to withdraw from the study at any time. Following this, a consent form detailing the terms of participation was provided, and each participant received a copy to sign upon their agreement. In collaboration with the parents, the children were instructed to collect the accelerometer from the tester one week prior to the implementation of the protocol. They were also required to wear the device on their feet for one week after the initial training session. The accelerometer gathered data related to the child's PA and sedentary behavior. Afterward, the intervention group engaged in a social support intervention for eight weeks, while the control group did not receive any specific training during this period. At the conclusion of the intervention, all participants participated in a post-test, which was conducted under the same conditions as the pre-test. Social support intervention sessions for parents were conducted in a group setting. These sessions occurred weekly over an eight-week duration, with each session lasting 60 minutes. The protocol for the social support approach was meticulously crafted to identify, challenge, and alter the negative thought patterns of injured athletes (Table 1).

Table 1. The Content of Intervention.

Session	Content
Session 1	Introduction and trust-building, emphasizing that social support is a vital resource for enhancing mental and physical well-being, along with an exploration of various types of social support and their impacts on daily life
Session 2	Identification and creation of a social support network chart, along with an assessment of its advantages and disadvantages
Session 3	Development of a personal social support network chart, evaluating its strengths and weaknesses
Session 4	Enhancement and, if necessary, modification of the informational support network, including performance evaluation in reinforcing the equipment support network
Session 5	Strengthening and, if needed, restructuring the emotional support network, with a performance assessment of the informational support network
Session 6	Exploration of methods for establishing social support networks among children's friends, identifying the types of support they provide, and evaluating the effectiveness of the emotional support network
Session 7	Identification of virtual education groups aimed at improving social support for children, assessing the effectiveness of these groups, and exploring potential membership in these pre-identified virtual networks
Session 8	A summary discussion to conclude on the most effective utilization of various forms of social support, along with an introduction to the training received regarding the parent-child relationship

2.4. Data Analysis

In the present study, descriptive statistics, including means and standard deviations, were employed to characterize the research variables. An independent t-test was conducted to assess the differences in means between the groups during the pretest phase. To evaluate the scores from the pretest and posttest, a 2 (GROUP: comprising intervention and control) × 2 (TIME: encompassing pretest and posttest) ANOVA was utilized. Pearson correlation test was used for calculating associations between social support and PA pattern. The threshold for statistical significance was established at $P < 0.05$.

3. Results

3.1. Demographic Data

Table 2 presents the mean and standard deviation of the demographic characteristics of both children and their parents. The study included 42 children, aged between 9 and 12 years (mean age = 10.56 ± 0.48 years), who were selected from primary schools and randomly allocated to either the intervention or control groups, with each group comprising 21 children. The average ages of participants in the intervention and control groups were 10.52 ± 0.41 years and 10.58 ± 0.59 years, respectively, with no statistically significant differences observed (P>0.05). Baseline measurements indicated that the body mass index (BMI) of participants in both groups was comparable, again showing no significant differences (P>0.05). In terms of parental demographics, the analysis revealed no significant age differences between parents in the intervention and control groups (P>0.05). Furthermore, the socioeconomic status of parents in both groups did not differ significantly (P>0.05).

Table 2. Demographic Characteristics of the Children and Parents.

	Variable	Intervention	Control	Comparison
Children	Age (years)	10.52 ± 0.41	10.58 ± 0.59	P=0.857
	Height (m)	1.38 ± 0.08	1.36 ± 0.06	P=0.635
	Weight (kg)	32.33 ± 1.86	31.96 ± 1.58	P=0.589
	BMI	17.11 ± 1.94	17.16 ± 1.17	P=0.824
Parent	Age (years)	42.96 ± 3.54	41.76 ± 3.77	P=0.679
	Socioeconomic status	2.48 ± 0.33	2.63 ± 0.45	P=0.129
	Education	2.21 ± 0.58	2.41 ± 0.50	P=0.352

3.2. Baseline Data

Table 3 presents descriptive statistics concerning social support and patterns of PA, detailing the proportions of sedentary behavior, light PA, moderate-to-vigorous PA (MVPA), and daily MVPA among various groups. The findings reveal that the average daily MVPA for the intervention group was 26.74 ± 8.56 minutes, in contrast to the control group's average of 25.14 ± 12.67 minutes. However, no statistically significant difference was found between the two groups (P=0.824). These findings imply that the children involved in this study did not meet the

recommended guideline of 60 minutes of MVPA each day. Additionally, there were no significant differences observed in the percentages of sedentary behavior, light PA%, MVPA%, and social support among the groups (P>0.05).

Table 3. Baseline Data for Social Support and Physical activity across Groups.

	Intervention	Control	Comparison
Social Support	7.63 ± 1.24	7.58 ± 1.20	P=0.679
Physical Activity			
% Sedentary Time	62.25 ± 5.15	63.93 ± 6.87	P=0.754
% Light Physical Activity	25.12 ± 3.85	24.96 ± 2.84	P=0.853
% MVPA	12.63 ± 1.29	11.11 ± 1.29	P=0.108
Daily MVPA (Minutes)	26.74 ± 8.56	25.14 ± 12.67	P=0.824

3.3. Pre-test vs. Post-test

3.3.1. Social Support

The results indicated that individuals in the intervention group experienced a heightened sense of social support from their parents during the post-test assessment, with a mean difference of 5.26. Furthermore, the ANOVA analysis revealed significant main effects for GROUP (F=16.84, P<0.001, η2=0.12), TIME (F=6.45, P<0.001, η2=0.09), and the interaction effect between GROUP and TIME (F=23.54, P<0.001, η2=0.15). These findings imply that the intervention aimed at enhancing social support has substantially improved the perceived level of parental social support among children.

3.3.2. Physical Activity Pattern

Table 4 presents the comparative analysis of pre-test and post-test outcomes for the research variables across both the intervention and control groups. The findings reveal that participants in the intervention group exhibited an increase in daily MVPA alongside a reduction in sedentary behavior during the post-test period, with a mean difference of 8.97 minutes and a decrease of 7.84%, respectively. Moreover, the ANOVA results for MVPA indicated significant main effects for GROUP (F=18.94, P<0.001, η2=0.13), TIME (F=8.74, P<0.001, η2=0.06), and the interaction between GROUP and TIME (F=7.16, P<0.001, η2=0.08). These results imply that the intervention has substantially improved MVPA levels among children. In addition, the analysis of sedentary behavior also demonstrated significant main effects for GROUP (F=10.58, P<0.001, η2=0.07), TIME (F=23.64, P<0.001, η2=0.19), and the interaction between GROUP and TIME (F=14.85, P<0.001, η2=0.12), suggesting that the intervention has effectively decreased sedentary time in children.

Table 4. Mean Difference of Pre-Test and Post-Test of Research Variables across Groups.

	Intervention	Control	Comparison
Social support	5.26	0.10	GROUP (F=16.84, P<0.001, η^2=0.12) TIME (F=6.45, P< 0.001, η^2=0.09), Interaction (F=23.54, P<0.001, η^2=0.15).
Physical activity			
% Sedentary Time	- 7.84%	-0.32%	GROUP (F=10.58, P<0.001, η^2=0.07) TIME (F=23.64, P<0.001, η^2=0.19) Interaction (F=14.85, P<0.001, η^2=0.12)
% Light Physical Activity	1.56%	1.41%	GROUP (F=0.25, P=0.742) TIME (F=0.14, P=0.893) Interaction (F=0.30, P=0.769)
% MVPA	6.28%	- 1.09	GROUP (F=17.85, P<0.001, η^2=0.12) TIME (F=7.99, P<0.001, η^2=0.05) Interaction (F=7.08, P<0.001, η^2=0.06)
Daily MVPA (Minutes)	8.97	1.05	GROUP (F=18.94, P<0.001, η^2=0.13) TIME (F=8.74, P<0.001, η^2=0.06) Interaction (F=7.16, P<0.001, η^2=0.08)

3.4. Association between Social Support and Physical Activity

Pearson correlation analyses were conducted to evaluate the relationships between social support, PA, and sedentary behavior during both the pre-test and post-test phases across the groups. The findings revealed a direct and significant correlation between social support and MVPA in the pre-test (r=0.527, P<0.001) and post-test (r=0.473, P<0.001). Additionally, a significant inverse relationship was observed between social support and sedentary time in both the pre-test (r= -0.419, P<0.001) and post-test (r= -0.367, P<0.001). These results underscore the critical influence of parental social support in promoting MVPA and reducing sedentary behavior among children.

4. Discussion

The objective of this research was to investigate the effects of a social support-oriented intervention on children's participation in PA. Analysis of the accelerometer data at baseline showed that the intervention group averaged 26.74 minutes of MVPA per day, in contrast to the control group's average of 25.14 minutes. These results suggest that the children participating in this study fell short of the recommended guideline of 60 minutes of MVPA daily. This observation is consistent with earlier research (30-34), which underscores a troublingly low engagement in health-related PA among children. As a result, it can be inferred that inadequate mobility is a widespread concern within this population. Factors that may contribute to this issue include limitations in educational programs, restricted availability of sports facilities and equipment, the financial burden of specific sports, and dominant cultural attitudes (31,33). Therefore, it is essential to give particular attention to children's PA behaviors within the framework of health-related interventions and programs.

The results of this investigation revealed that individuals in the intervention group reported an increased perception of social support from their parents during the post-test assessment. This finding implies that the intervention designed to enhance social support has successfully elevated the perceived level of parental involvement among children. Additionally, the data indicated that the social support-focused intervention led to a significant rise in MVPA levels, while also contributing to a decrease in sedentary behavior among the participants. Finally, the correlational analysis underscored the essential influence of parental social support in fostering higher levels of MVPA and reducing sedentary time in children. These findings are consistent with earlier correlational studies and highlight the beneficial effects of

parental social support on children's participation in health-promoting PA.

To interpret these findings, it can be sated that social support is structured within a conceptual framework that encompasses four distinct categories of functions characterized by supportive behaviors. The identified categories consist of emotional support, characterized by expressions of sympathy, affection, trust, and concern; instrumental support, which refers to the delivery of practical help that an individual may need; informational support, involving the provision of advice, guidance, and pertinent information that can assist an individual in overcoming difficulties; and evaluative support, which offers insights that are advantageous for self-assessment (21,22,26). Consequently, when children receive social support from their families, they benefit from various forms of emotional, instrumental, and informational assistance. This type of support fosters an environment in which children feel loved, cared for, and valued, thereby enhancing their self-esteem. As a result, family-based social support instills a sense of worth in children, leading to greater inner satisfaction and increased adaptability. Furthermore, it is important to note that access to family-based social support enables children to perceive a network of social resources surrounding them, allowing them to cultivate constructive and supportive relationships when needed. This process naturally contributes to the improvement of children's social and communication skills (26,28).

Social support, characterized by feelings of gratitude and connections within social networks, significantly contributes to enhancing individuals' health-related behaviors. Conversely, diminished feelings of support can lead to adverse effects on psychological well-being. It can be observed that individuals experience greater tranquility and a more favorable emotional state when engaged in community settings compared to periods of solitude or social isolation (20,23,26). This sense of calm and positive emotionality can, in turn, positively influence health-oriented behaviors. In the current study, we observed an enhancement in PA behaviors of students who felt supported by their families and other significant individuals. Consequently, it is essential to foster effective interactions among students, parents, teachers, peers, and various educational environments (24).

Social support can be enhanced through both direct and indirect approaches. Direct social support involves engaging in PA together or collaborating on household chores, thereby providing opportunities for individuals to partake in PA. This allows other family members to join in sports activities, fostering a collaborative environment (21,27). Tangible support is acknowledged as a highly effective strategy for encouraging PA, significantly shaped by parental behaviors that directly enable participation. This type of support can include parents engaging in activities alongside their children, such as playing together and allocating family time for PA (21,26).

The beneficial connection between parental support and children’s engagement in sports and leisure PA can manifest through both direct and tangible forms of assistance from parents, such as transporting the child, enrolling them in sports clubs, or supervising their activities. Additionally, more subtle forms of support, including verbal encouragement and a positive outlook on PA, can also be influential (21,25). Recent systematic reviews have highlighted that family support contributes to increased participation in PA within the school setting, indicating that parental influence extends beyond the home. Furthermore, this research has demonstrated that the social support offered by parents and other significant individuals plays a crucial role in motivating students to engage in sports and PA (25,28).

The primary strength of this research lies in the employment of an accelerometer for the assessment of PA and sedentary behavior, offering a level of precision that surpasses that of traditional questionnaires. Conversely, a notable limitation of this study is its exclusive focus on male participants, which poses challenges in extrapolating the findings to female populations.

4.1. Conclusion

This study represents one of the pioneering investigations employing an intervention approach to assess the impact of social support on children's engagement in PA. The findings indicate that praise rooted in social support from parents, who typically offer minimal encouragement for their children's PA participation, is effective. Specifically, this intervention not only enhanced the level of support parents provided but also led to an increase in the time children spent in PA while reducing their engagement in sedentary behaviors. Utilizing an accelerometer to monitor PA patterns, the research suggests that social support-based encouragement can significantly enhance health-oriented PA behaviors among children. Consequently, the study advocates for parents to increase their support for their children's involvement in PA. Furthermore, intervention strategies may yield beneficial outcomes in educating parents on how to better support their children. Future investigations ought to focus on the comparative impact of various and more specific forms of social support, particularly instrumental support concerning transportation to PA. The creation of multi-item scales with robust psychometric properties that differentiate between the distinct types of social support, along with the incorporation of items that offer greater diversity and specificity regarding the sources of social support (for instance, siblings, mother and father versus the broader family unit), would enhance the examination of social support in relation to PA and sedentary behavior. Furthermore, subsequent research should delve into the causal and potentially reciprocal relationships between social influences and PA in children.

Acknowledgments

The authors are grateful to all participants who participated in this research.

Footnotes

Authors’ Contribution: This study was carried out solely by the corresponding author.

Conflict of Interests: The researchers confirms that there is no conflict of interests in this study with any participant.

Data Availability: The data that support the findings of this study are openly available upon request from the corresponding author.

Ethical Approval: The author confirms that all steps and requirements of this study comply with ethical guidelines. Participants were informed about the characteristics of the study and gave written informed consent.

Funding/Support: This research received no external funding.

Informed Consent: Informed written consent was obtained from all participants.

Supplementary Information accompanies this paper at doi: 10.61186/PACH.2024.484890.1035

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