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RESEARCH ARTICLE

PHYSICAL ACTIVITY IN PRIMARY SCHOOLS: A KEY MEDICINE TO HEALTH PROMOTION IN ETHIOPIA

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Abstract

Engaging in physical activity within school settings improves early adolescents' overall health status as well as their academic achievements. Therefore, the current study, aimed at primary schools, has been considered an essential medicine for promoting physical activity among older children. Eight hundred thirty-five older children aged 11 to 14 with a mean age of 12.95 ± 0.937 SD were selected. A cross-sectional study was utilized to achieve the objective of this survey. Self-reported PAQ-C measure was conducted. The PAQ-C survey was analyzed using IBM SPSS (Ver. 26) to achieve this study's intended physical activity goal. The internal coherence of the data was assessed by Cronbach's alpha (0.819). The finding indicated a low level of participation with an average mean score of 2.49 (SD 0.63). A significant mean difference was observed between grades five and eight with 0.18461 (CI = 0.0066, 0.3626), P-value = $0.039 < 0.05$, and Kola Shara primary school had the most significant mean difference (mean value = 0.78975, P = $0.000 < 0.05$). As a result, grade five was more active than grade level, and Shara Primary School had better participation. However, the overall composite mean score was below the average. Therefore, the study demonstrated low participation in physical activity among the selected schools in the Gamo zone, southern Ethiopia. Finally, the study suggests that further research is needed to understand the factors that hinder the promotion of physical activity in school settings.

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Introduction:-

The decreasing level of physical activity among older children is Ethiopian and an international epidemic[1]–[3]. Incorporating physical activity into the school setting can effectively boost children's physical activity levels and academic achievement[4]. At an early age, sedentary behaviour is linked to non-communicable diseases and chronic conditions in school settings[5]–[7]. The best way to get older children involved in physical activity for better overall health and academic achievement is to conduct scientific research in school[4][8].

Primary schools have been considered medicine and a significant driver of physical activity for children and adolescents for more than a century[9]–[11]. Prior studies have demonstrated a connection between school-age

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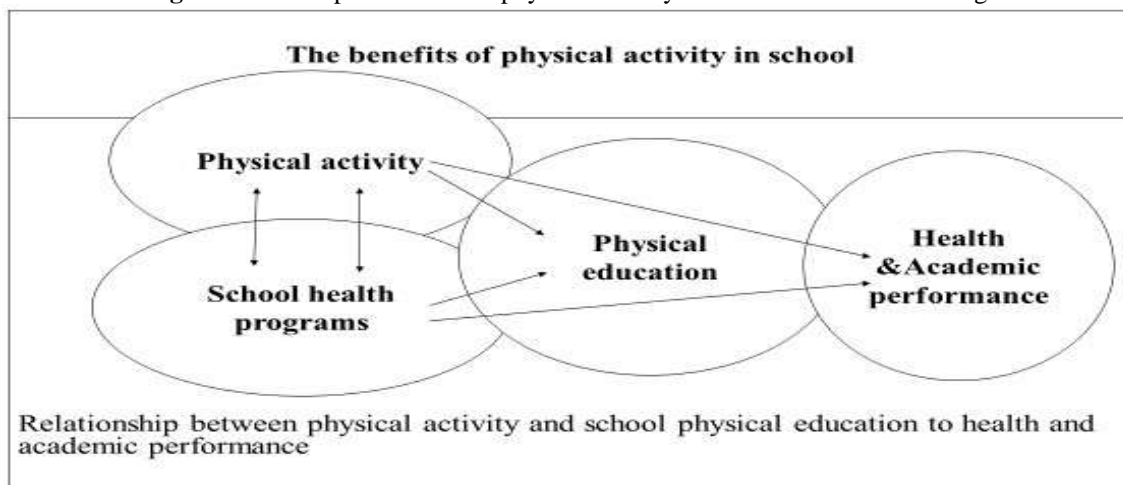
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children's academic success, physical activity, and health opportunities[12], [13]. For students to maintain a healthy lifestyle in the school setting, older children must be encouraged to engage in physical activity and school-based physical education initiatives[14], [15]. Several countries embrace the WHO's recommendations and standards for healthy physical activity. However, not all areas effectively promote physical activity[16]. The same is true in Ethiopia[17], [18]. In Ethiopia, older children's involvement in school-based physical activity has received less emphasis[3], [17], [19]–[21]. However, the engagement of teenagers in physical activity within educational environments[22] has been growing and gaining worldwide attention[23] due to increasing academic performance[24], reduced risk of non-transmitted disease[25], decreased risk of obesity[2] and its overall health benefits[26].

Older children's involvement in physical activity at school in Ethiopia is still below the expected level, especially in the country's primary schools[21], [27], [28]. Research indicates that more than 80% of children in Ethiopia do not achieve this minimal need[18], [28], [29]. The results suggest that sedentary behaviours by older children, including extended sitting, taking school buses sometimes, studying sedentarily, watching TV for extended periods, playing mobile games for too long time, and other sedentary behaviours, may be independent risk factors for older children[30], [31][32]. Due to the physical education curriculum[33], limited resources[10], lack of knowledge on the benefits of physical activity[47], lack of motivation[34]–[36], lack of trained physical education teachers[37]–[39]and associated variables influencing Ethiopian older children's incorporation of successful school-based physical activity participation. **Advantages of physical activity in schools**

Integrating health programs in the setting of schools is the crucial and most accessible strategy to encourage older children to be active in school at an early age, which tracks their overall healthy lifespan[40], [41]. Engagement in physical activity in school settings improves the student's physical health and enhances their academic performance[4][8]. For students in primary schools, especially from grades five to eight, the fundamental concept is that students need time during the day to have fun and enjoy[42][43]. During these grades, students must participate in recess, playtime activities and physical education lessons[44]. This is the best strategy in primary school to encourage children to participate in physical activity, especially in grades five through eight, which corresponds to ages eleven to fourteen[8][45]. As a result, the school-based approach to promoting physical activity has numerous advantages, such as raising students' physical awareness and enhancing their academic performance(See **Figure 1 below**)[7][13], [46]. Therefore, the current study aimed to understand primary schools' physical activity levels and integrate physical activity into the educational environment among older children in the Gamo Zone, southern Ethiopia.

Figure 1:- Conceptual model on physical activity benefits in the school setting.



Source: Han G., 2018 and Allender S. 2006

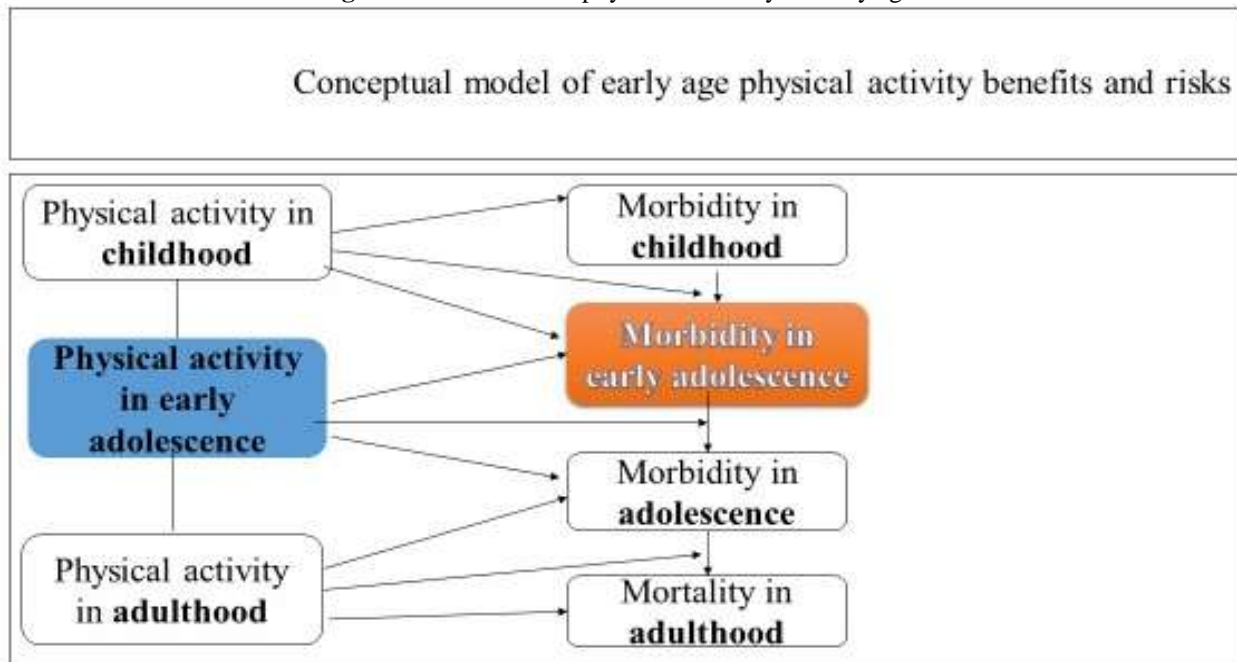
Physical activity is a medicine[47], [48].

The effect of non-communicable disease at an early age and its prevention is a hot issue worldwide[49], [50]. However, the best solution is physical activity[6], [51]. According to the WHO regular physical activity prescription, teenagers are required to engage in at least an hour per day[52], [53].

However, sedentary children can harm their health now and in the future[25]. Engaging in physical activity during childhood may impact overall health advancement. Young people who are overweight have an increased risk of developing type 2 diabetes, high blood pressure, and cancer, among other health issues[25], [54]. And that's only the start. According to the study, 70% of overweight teenagers and 40% of overweight children grow up to be obese adults. Early adolescent obesity is independently linked to chronic illnesses that show effects in maturity[55] (See **Figure 2 below**).

As a result, there is a current trend of rapidly increasing rates of morbidity and mortality[30], [52], [55], [56].

Figure 2:- The effect of physical inactivity on early age.



Source: Hallal P. et al., 2006 and Must A. et al., 1992

Research Questions and Hypothesis:-

The study intended to address the following research questions:

Q1: what is the current level of primary school participation in physical activity?

Q2: Does the mean score for physical activity vary much between school levels and grades?

H1: There is a variation in the physical activity engagement of older children in primary school environments.

H2: The mean physical activity level score varies significantly between school levels and grades.

Materials and Methods:-

Participant and School selection methods

A multi-stage sampling technique was used, and selected methods were implemented to choose students and primary schools. Eight hundred thirty-five older children aged 11 to 14 with a mean age of 12.95 ± 0.937 S.D were recruited from fourteen primary schools (grades five to eight), attending their class in the 2022/23 academic year. From these schools, nine government (Chamo, A.M.U. Community, A.M. Limat, Garo, Yetnebresh, HibretLelimat, Sikela, Kulfo, Kola Shara) and five private (BiruhTesfa/Mahatot, Wisdom Academy, Rehoboth, Future Hope, Abenezer) primary schools were selected from Arba Minch Districts, Gamo Zone, the southern parts of Ethiopia.

Research Design

The study's main goal was to evaluate the level of physical activity among students in primary schools by employing PAQ-C questionnaires and, after that, to provide possible solutions. As a result, A cross-sectional study was conducted on primary schools from August to September 2022/23.

Measurements:-

Self-reported activity questionnaires for older children (PAQ-C) were examined to identify the student's level of engagement in physical activity[57]. A questionnaire known as the PAQ-A evaluates the amount of moderate to intense physical activity that students have engaged in over the previous seven days[58]. However, the main focus of the current research was to understand the level of physical activity among grades and primary schools. As a result, the modified version of PAQ-C, developed by KC Kowalski in 2004, was more appropriate for this study[58]. Since the beginning of the twenty-first century, PAQ-C (for ages 8 to 14) and PAQ-A (for ages 14 to 20) have been used to assess children's and teenagers' levels of physical activity[28], [40], [59]. Nevertheless, to monitor the physical activity levels of students in primary schools between the ages of 11 and 14, specifically those in grades 5 to 8, it is more suitable to utilize the self-reported PAQ-C questionnaire. This survey is intended to evaluate their current level of physical activity by asking them to recall their last seven days of school-related activities. Additionally, the validity and reliability of PAQ-C measures were checked[28], [60], [61] and previously have been carried out in a variety of countries, including Ethiopia and African nations [28], [40], [61], [62].

Scoring system of PAQ-C

There were ten modified PAQ-C items. The following five stages were performed to conduct the scoring system: First item (spare-time activity): The average of every action on the activity checklist—which ranges from "no" activity (score 1) to "7 times or more" (score 5)—was used to determine the composite score for **item 1**. **Items 2** through **8** (PE, lunch, playtime, after-school activities, weekends and what best explains you): The responses to every question include the lowest activity response being 1 and the highest activity response being 5. For these components, the average mean was determined. Item 9- Calculate the average of the ratings for each day of the week (ranging from "none" as 1 to "very often" as 5) to get an average mean score for item 9. **Item 10** - This item was utilized to ascertain children who demonstrated sick or abnormal behaviour in the preceding week; however, it is not included in the calculation of the summary activity score. Subsequently, the PAQ-C components ranging from 1 to 9 were utilized to calculate the final **composite mean** score to interpret the findings.

Data analysis:-

IBM SPSS version 26 software was used to analyze the data for physical activity levels among older children. Distributions of tables, graphs, and numerical summary statistics often showed the data. Specifically, independent T-test, analysis of variance, post-hoc multiple comparisons and Pearson correlation analysis were used as descriptive and inferential statistics, taking into account the statistical significance of a P-value less than 0.05.

Results and Analysis:-

Demographic characteristics of students (Older children)

This section describes the demographic characteristics of students, including sex and grade level **Table 1:-** Demographic profiles of the respondents.

Variables	Category	Number of students	Percent
Sex	Male	398	47.7
	Female	437	52.3
Grades Level	Grade Five	228	27.3
	Grade Six	334	40.0
	Grade Seven	146	17.5
	Grade Eight	127	15.2

Table 1 demonstrates the sex and grade level of students (older children). In total, 835 students took part in this research study. Among them, 398 (47.7%) were male, and 437 (52.3%) were female participants with a mean age of 12.95 (± 0.937 S.D) selected from grades five 27.3% (228), grades six 40% (334), grades seven 17.5% (146) and grades eight 15.2% (127) were picked for this study. This shows that most respondents who participated in the survey were chosen from grade six from all selected primary schools.

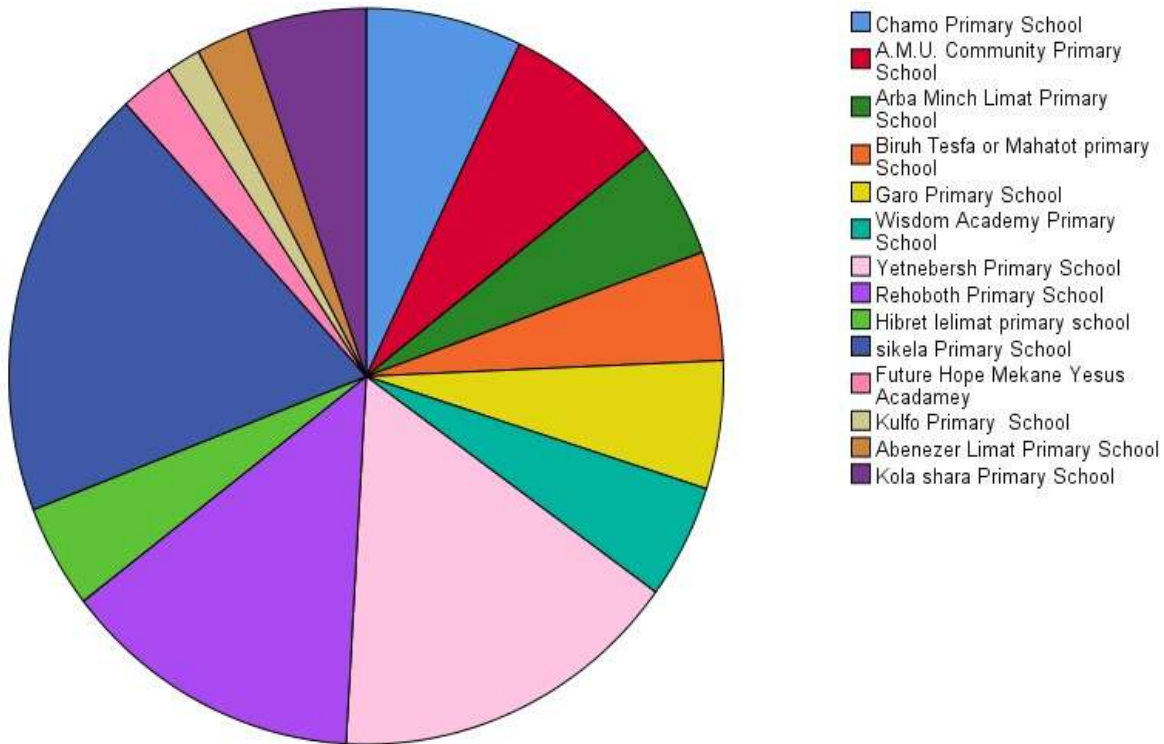


Figure 3:- Summary chart for selected primary Schools.

Figure 3: Above demonstrates 14 primary schools selected from the Gamo Zone. From these schools, a high number of participants were chosen from Sikela primary school, 19.2%(160), and a low number of students were selected from Abenezzer and Future Hope primary schools, 2.4%(20), according to the single population percentage calculation from the total number of students in each primary school from grades five to eight. As a result, the participants were recruited from 14 schools, nine government (Chamo, A.M.U. Community, A.M Limat, Garo, Yetnebresh, HibretLelimat, Sikela, Kulfo, Kola Shara) and five private (BiruhTesfa/Mahatot, Wisdom Academy, Rehoboth, Future Hope, Abenezzer) primary schools, who were attending their class system in 2022/2023 in Arba Minch Districts, Gamo Zone, the southern parts of Ethiopia. **Table 2:-** Scale Reliability Statistics.

Cr. Alpha	Category	Cr. Alpha score	N of items
Cronbach's Alpha on Standardized Items	Male	0.815	47.7
	Female	0.823	52.3
	Average	0.819	24

The result is displayed in **Table 2**; the scale reliability for PAQ-C was determined to be 0.819, which is acceptable. The reliability of the physical activity questionnaire was evaluated by the Cronbach's alpha scale test for both sexes of older children, females ($\alpha = 0.823$) and men ($\alpha = 0.815$). This shows that PAQ was reliable and had excellent internal consistency in conducting descriptive correlation and multiple comparison analysis.

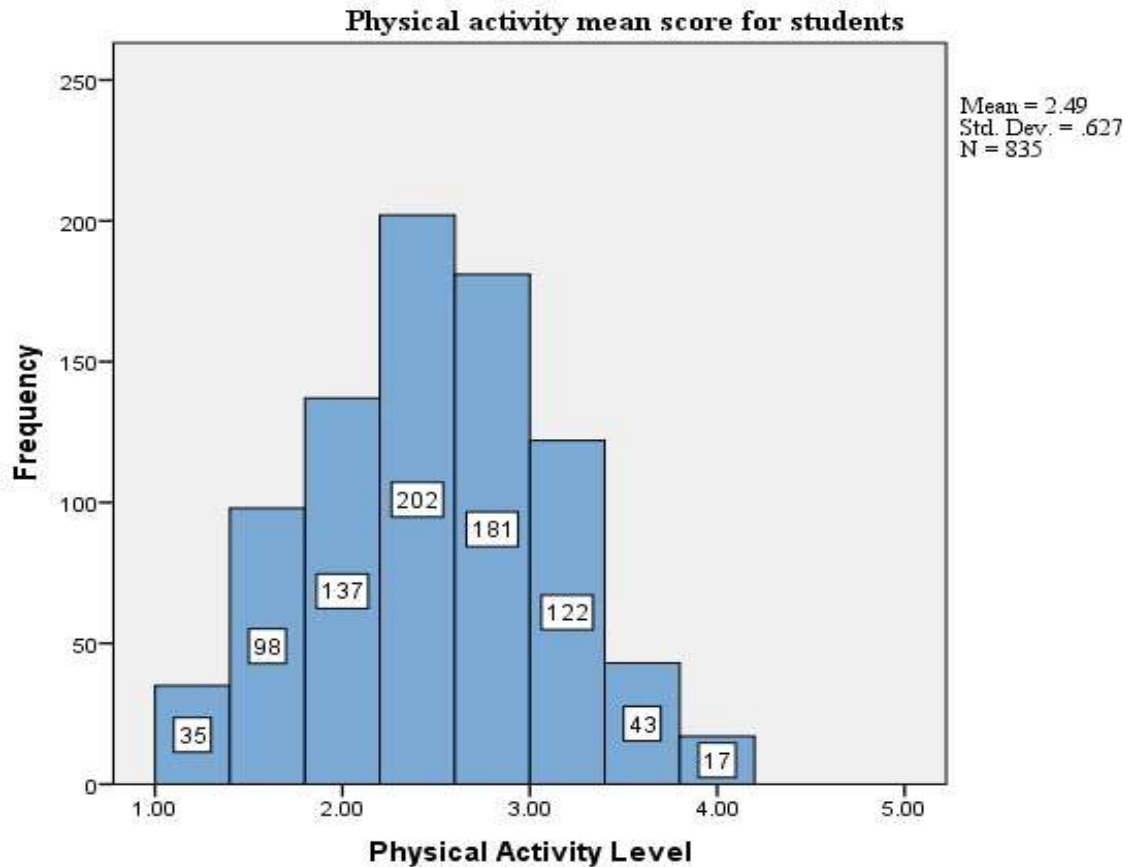


Figure 4:- Mean score for PAQ items.

Figure 4 shows the composite mean score of physical activity participation among 835 students. Specifically, the mean score for 35 early adolescents lies between (1.0-1.04), 98(1.4-1.8), 137 (1.8-2.2), 202 (2.2-2.6), 181 (2.6-3.0), 122 (3.0-3.4), 43 (3.4-3.8) and for 17 (>3.8) respectively. The 35 students' mean score was deficient, 202 was medium, and 17 participants' mean score was relatively high. This implies that a few students have a mean physical activity score between 2.2 and 2.4. According to a few older children's PAQ response composite mean scores, results of PAQ-C items were in the middle of the range, indicating that the participants met the WHO's recommendation with an acceptable level from the remaining 581 (97.46%) participants. However, most participants did not meet the required level because, with 835 students, the composite mean score was 2.49 (SD 0.63), below the average.

Therefore, the study indicated that older students (early adolescents) in the chosen primary schools had a generally low engagement level of physical activity.

Table 3:- Descriptive statistics of the mean score by grade levels for students.

Descriptive Analysis								
Physical activity level								
	N	Mean	Std. Deviation	Std. Error	95% CI for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Grade Five	228	2.5598	.56345	.03732	2.4863	2.6333	1.26	4.03
Grade Six	334	2.5068	.62101	.03398	2.4400	2.5737	1.08	4.16

Grade Seven	146	2.4419	.63772	.05278	2.3376	2.5462	1.16	4.09
Grade Eight	127	2.3752	.71683	.06361	2.2493	2.5011	1.07	3.97
Total	835	2.4899	.62657	.02168	2.4473	2.5325	1.07	4.16

Table 3 above shows the descriptive analysis of the mean score between grades five, six, seven and eight. As a result, regarding the participants' grade level, the result of physical activity for grades five mean scores of 2.5598 (SD=0.56345), six of 2.5068 (SD=0.62101), seven of 2.4419 (SD=0.63772) and eight of 2.3752 (SD=0.71683).

Table 4:- Post-hoc Multiple Comparisons tests for grade levels.

Multiple Comparisons						
Dependent Variable: Physical activity						
Tukey HSD						
(I) Grade levels	(J) Grade levels	Mean Difference (I-J)	Std. Error	Sig.	95% CI	
					Lower Bound	Upper Bound
Grade Five	Grade Six	.05299	.05366	.757	-.0851	.1911
	Grade Seven	.11791	.06621	.283	-.0525	.2883
	Grade Eight	.18461*	.06916	.039	.0066	.3626
Grade Six	Grade Five	-.05299	.05366	.757	-.1911	.0851
	Grade Seven	.06492	.06197	.721	-.0946	.2244
	Grade Eight	.13162	.06512	.181	-.0360	.2992
Grade Seven	Grade Five	-.11791	.06621	.283	-.2883	.0525
	Grade Six	-.06492	.06197	.721	-.2244	.0946
	Grade Eight	.06670	.07579	.815	-.1284	.2618
Grade Eight	Grade Five	-.18461*	.06916	.039	-.3626	-.0066
	Grade Six	-.13162	.06512	.181	-.2992	.0360
	Grade Seven	-.06670	.07579	.815	-.2618	.1284

*. The mean difference is significant at the 0.05 level.

Above **Table 4** indicates multiple mean comparisons. However, the findings of this study show that a significant difference of 0.18461 (CI= (0.0066, 0.3626), p-value=0.039<0.05) was observed between grades five and eight in the post-hoc multiple mean comparison. According to the mean values, it was determined that early adolescents in grade five were more physically active than the other students. In contrast, students in grade eight from the selected fourteen primary schools had a moderately lower level of participation in physical activity during the previous seven days.

Table 5:- Descriptive statistics of the mean score by school level.

Descriptive Analysis								
Physical activity status								
Primary Schools	N	Mean	Std. Deviation	Std. Error	95% CI for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Chamo	59	2.3988	.55476	.07222	2.2542	2.5434	1.26	3.40

Community	61	2.4807	.56394	.07220	2.3363	2.6251	1.08	3.67
A.M Limat	43	2.5499	.60765	.09267	2.3629	2.7369	1.43	4.03
BiruhTesfa	40	2.2143	.84433	.13350	1.9443	2.4843	1.07	3.91
Garo	47	2.5863	.78298	.11421	2.3564	2.8162	1.40	3.97
Wisdom Academy	42	2.6287	.65324	.10080	2.4252	2.8323	1.33	4.09
Yetnebersh	133	2.5254	.66645	.05779	2.4111	2.6397	1.20	4.16
Rehoboth	114	2.4965	.52448	.04912	2.3991	2.5938	1.26	3.91
HibretLelimat	38	2.4410	.61347	.09952	2.2393	2.6426	1.10	3.71
Sikela	160	2.4698	.60491	.04782	2.3753	2.5642	1.16	3.91
Future Hope	20	2.0482	.66411	.14850	1.7374	2.3590	1.24	3.76
Kulfo	13	2.3003	.54020	.14982	1.9738	2.6267	1.10	3.20
Abenezzer School	20	2.4537	.60882	.13614	2.1688	2.7387	1.48	3.58
Kola shara	45	2.8379	.35769	.05332	2.7305	2.9454	2.20	3.80
Total	835	2.4899	.62657	.02168	2.4473	2.5325	1.07	4.16

Table 5 above indicates the descriptive statistics among the selected fourteen primary schools. The analysis reveals that Future Hope Primary School had the lowest mean score (2.0482, SD=0.66411), and Kola Shara Primary School had the highest mean score (2.8379, SD=0.35769). On the other hand, the schools' analysis of variance (ANOVA) table reveals $F = 3.055$ with a p-value of $0.000 < 0.05$. This suggests a notable variation in the average physical activity score between and within the chosen primary schools. Furthermore, the post-hoc test's multiple comparisons identified that Kola Shara primary school had the most significant mean difference (mean value = 0.78975, $P = 0.000 < 0.05$) with Future Hope primary school and that Kola Shara primary school had the most significant mean difference with almost all other primary schools that were chosen. This indicates that Kola Shara Primary School was more physically active than the other selected primary schools. In contrast, Future Hope Primary School had lower participation in physical activity than all fourteen primary schools in the last seven days.

Conclusion:-

The findings of this study indicate that most of the students (older children) failed to achieve the needed level of physical activity due to the results of 835 students' composite mean score value of 2.49 (SD 0.63), which is below the average. In addition, a significant difference of 0.18461 (CI = 0.0066, 0.3626, p-value = $0.039 < 0.05$) was observed between grades five and eight mean comparisons. According to the mean values, it was determined that older children in grade five were more physically active than the other students. On the other hand, throughout the previous seven days, eighth-grade students from the fourteen primary schools showed a deficient level of involvement in physical activity.

On the other hand, the schools' analysis of variance (ANOVA) result indicated $F = 3.055$ with a p-value of $0.000 < 0.05$. This suggests a notable variation in the average physical activity score between and within the chosen primary schools. Furthermore, the post-hoc test's multiple comparisons identified that Kola Shara primary school had the most significant mean difference (mean value = 0.78975, $P = 0.000 < 0.05$) with Future Hope primary school and that Kola Shara primary school had the most significant mean difference with almost all other primary schools that were chosen. This indicates that Kola Shara Primary School was more physically active than the other selected primary schools. In contrast, Future Hope primary school had lower participation in physical activity than all fourteen primary schools in the last seven days. However, overall, the participants' composite mean values were below the average. This is because Kola Shara primary school was found in a rural area among the selected schools in the Gamo zone of southern Ethiopia. The early adolescents who attended their academic classes at Kola Shara School were more active than those at other primary schools. This might be caused by the fact that a small number of students at this school scored highly on physical activity, and they also may have prior awareness of the need to do physical activity. In addition, they had no constant transportation (school bus), and they mostly used to take a walk to return home from school. They were free to be active and move around. They have fewer opportunities to use technology and watch TV. On the contrary, most urban students were inactive for many reasons. Therefore, the study indicated that older students (early adolescents) in the chosen primary schools had a generally low

engagement level in physical activity, and the participants did not meet the minimum WHO physical activity guideline of an hour per day, three days per week, to sustain a healthy lifestyle in the school environment.

Finally, the current study suggests that it is vital that all responsible bodies, including physical education teachers, school principals, parents, regional administrators, education officials, and sports offices, work together to encourage and integrate physical activity within the school curriculum. In addition, more study is needed to promote school-based physical activity in the Gamo zone and Ethiopian schools overall.

Author Note

Physical activity, so-called exercise, is a medicine.

Author Details

I'm MulugetaDebebe, a PhD candidate at Shanghai University of Sports, China, and a lecturer in the sports science department at Arba Minch University, Ethiopia. I'm an instructor for university students as well as a fitness and football coach. Previously, I had publications on fitness and football. I'm currently investigating scientific research on children's and adolescents' development, focusing on school-based physical activity and health promotion. So, as a young scholar, I declare that I will promote physical activity and health worldwide.

Conflict of interest

The authors declare no conflict of interest in this manuscript.

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