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RESEARCH ARTICLE

FACTORS INFLUENCING SCHOOL-BASED PHYSICAL ACTIVITY PARTICIPATION AMONG EARLY ADOLESCENTS IN ETHIOPIA

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Abstract

Many studies have confirmed the health benefits of participating in physical activity during childhood and adolescence that are known to track into their adult lifespan. Therefore, the current research focused on exploring the level of physical activity and influencing factors among early adolescents. A cross-sectional study design was employed. Multi-stage sampling techniques were used to select schools and students. Eight hundred thirty-five students were recruited from 14 schools, grades five to eight, aged 11 to 14, with a mean age of 12.95 \pm 0.937 S.D. The PAQ-C and SEM measures were analyzed using IBM SPSS (Ver. 29). The findings were significantly correlated, and the internal consistency was acceptable ($\alpha = 0.828$). Physical activity participation has a mean average score of 2.49 and $t(833) = 7.465$, with a p-value of $0.000 < 0.05$. The results of this study demonstrated that participation in physical activity lowers in early adolescence, but levels remain higher in boys than girls. Furthermore, intrapersonal factors were more influential than other related factors. As a result, the study's findings revealed that early adolescents did not meet the minimum requirements of the WHO physical activity recommendation level to sustain a healthy lifestyle in the Gamo Zone, southern Ethiopia.

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Introduction:-

Recently, less attention has been paid to early adolescents' participation in school-based physical activity in Ethiopia[1]–[5]. However, children's and adolescents' physical activity participation in school settings[6] has been growing and gaining more global attention[7] with each passing year due to its physical health benefits[8], reduced risk of non-transmitted disease[9], prevention of weight gain[10], obesity[11], enhanced social interaction[12], better academic performance[13], building vital mental health[14], and improved ability to perform daily activities[10], with the goal of the overall development of a healthy society[15]–[19].

Considering these facts, Early adolescence is the time when physical activity is sensitive to influence[20], and it is also the time when attitudes concerning participation in physical activity develop that will become permanent[21]. Adolescence at an early age is a critical period for acquiring physical-related activities[22], habits that children receive, and childhood practices that are known to track into their adult lifespan [23].

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Physical activity is considered a significant health factor and is an essential part of an early adolescent's daily life[24], [25]. Studies have shown that different concepts describe physical activity, exercise, and physical fitness[26]. Nevertheless, physical activity and exercise are often confused, and the names are interchangeably used[27] since both physical activity and exercise include any bodily movement produced by skeletal muscles that consumes energy [28]. In this context, it is related to school-based physical activity[29], [30], which focuses on any body movement activities produced by skeletal muscles that result in energy expenditure during recess time, physical education class or any school-based activities[31], [32].

In addition, physical activity is essential for maintaining overall health and well-being in children and adolescents, particularly during early adolescence, between the ages of 11 and 14; it's a crucial time for cognitive and physical development[33]. However, early adolescents worldwide are experiencing declining levels of physical activity, leading to increased risks of obesity, cardiovascular diseases, and other health problems[34].

Besides, it is believed that schools have been the primary provider of physical education and sports activity to children and adolescents for over a century [33]–[35]. Previous study indicates that the quality of life of school-aged children and adolescents is directly related to physical activity, health opportunities and academic performance[38], [39].

School-based physical activity is crucial in promoting physical activity among early adolescents, providing structured and supervised opportunities for participation in physical activity [37], [40]. However, in Ethiopia, school-based physical activity participation among early adolescents remains suboptimal, particularly in the primary schools of the southern part of Ethiopia[4], [41], [42].

On the contrary, physical inactivity has a severe and multidimensional effect, especially as a known risk factor for non-communicable diseases worldwide[43], [44]. For this reason, World Health Organization member states have agreed to eliminate physical inactivity by 10% by 2025[45], [46]. The global 2030 agenda for sustainable development includes encouraging physical activity as a crucial component to guaranteeing healthy lives and advancing everyone's overall health and well-being[9].

In such a way, many African countries[5], including Ethiopia, do not meet the current World Health Organization requirement for children and adolescents to have 60 minutes of daily physical activity participation[47].

Physical activity participation has not yet been seriously promoted in school settings[8], [48], [49]. The schools face unique challenges in promoting physical activity participation due to limited resources[31], inadequate infrastructure[47], physical education curriculum[50], peer pressure[51], and family permission to engage in [52], cultural norms[53], time constraints[42], gender disparities[32], [54], lack of knowledge on the benefits of physical activity[47], lack of motivation[55]–[57] and a lack of trained physical education teachers[58]–[60] and related factors hindering the implementation of effective School-based physical activity participation among early adolescents in the region[57], [58] Therefore, this is a problematic and critical issue which hinders the development of my county's physical activity and health industry[5] [48].

As a result, minimizing the influencing factors and promoting school-based physical activity participation among early adolescents has been identified as a big challenge and a needed immediate solution in primary schools in the Gamo Zone, the southern part of Ethiopia.

Study Objectives:-

This study aimed to investigate factors influencing early adolescents' physical activity participation in primary school settings. As a result, the objectives of this study are as follows:

1. To understand the current level of school-based physical activity participation among early adolescents
2. To compare the level of physical activity participation between boys and girls among early adolescents
3. To identify the socio-ecological model factors affecting early adolescent participation in physical activity in school settings.

Materials and Methods:-

Participants

A multi-stage sampling technique selected 14 primary schools from eighteen governmental and ten private schools. The primary schools were stratified as either public or private, assumed to see differences in physical activity participation levels, and expected to give both government and private schools equal chances. Then, nine government and five private schools were chosen using a simple random sample technique. Next, a proportionate sample of male and female students, aged 11 to 14, from grades five through eight in each primary school was assigned based on the overall student population.

The Sample Size was determined by using a single population proportion formula. Therefore, the current study selected 835 early adolescents, with a 95% confidence level, a 3% margin of error and an expected 30% response rate from the target population from the selected primary schools in the Gamo zone, southern parts of Ethiopia.

Research Design

A cross-sectional study on primary schools was conducted. The main focus of the research was to understand the level of physical activity and to identify the influencing factors among primary school students using SEM and PAQ-C questionnaires, which were developed by KC Kowalski, 2004 and verified under the requirement for a feasible and trustworthy self-report instrument for significant research involving children and adolescents[63]. As a result, a cross-sectional study is appropriate for the current survey study.

Measurements:-

Physical activity (PAQ-C) and socio-ecological model (SEM) questionnaires examined the independent and dependent factors. The dependent variable is physical activity level, while the independent variables are socio-ecological model variables, including individual, family support, and school-related factors.

The PAQ-A is a seven-day recall questionnaire used to evaluate the participation of moderate-to-intense physical activity in school settings[64]. Furthermore, a socio-ecological model (SEM) questionnaire was implemented to assess the influencing factors in three different models. Si, Wang, Kim, and Zhu (2017) developed the first SEM items with four subscales and thirteen components to investigate the factors influencing school-based physical activity in children and adolescents.[65], [66]. However, a modified version of 12 items was utilized for this study to identify intrapersonal, interpersonal and school-related factors. It aimed to know the factors hindering school-based physical activity participation. The reliability and validity of the measurements were checked using Cronbach's Alpha[67].

Data analysis:-

IBM SPSS software (ver. 29) was utilized to analyze the survey data. Basically, the data was analyzed using Pearson correlation, independent T-test, ANOVA, factor analysis, and multiple linear regression analysis with statistical significance at a P-value less than 0.05.

Results and Analysis:-

Demographic characteristics of respondents

Table 1:- Age ranges of the respondents.

Age range	Freq.	Per.	V. Percent	Cum. Percent
11	66	7.9	7.9	7.9
12	191	22.9	22.9	30.8
13	299	35.8	35.8	66.6
14	279	33.4	33.4	100.0
Total	835	100.0	100.0	

Table 1 above displays the participants' age range. Early adolescents aged 11 to 14 were selected from 14 primary schools for the aim of this study. For this study, early adolescents were recruited with ages ranging from 11 (7.9%), 12 (22.9%), 13 (35.8%), to 14 (33.4%), with a mean age of 12.95 (± 0.937 S.D). It indicates that early adolescents, with an average age of 13, participated more than the other age categories in this study.

Table 2:- Sex of the participants.

Sex	Freq.	Per.	V. Percent	Cum. Percent
Male	398	47.7	47.7	47.7
Female	437	52.3	52.3	100.0
Total	835	100.0	100.0	

A total of 835 early adolescents were involved in this study. Among them, 398 (47.7%) were male, and 437 (52.3%) were female from grades five 27.3% (228), grades six 40% (334), grades seven 17.5% (146) and grades eight 15.2% (127) were picked using a single population proportion procedure shows as table 2 above.

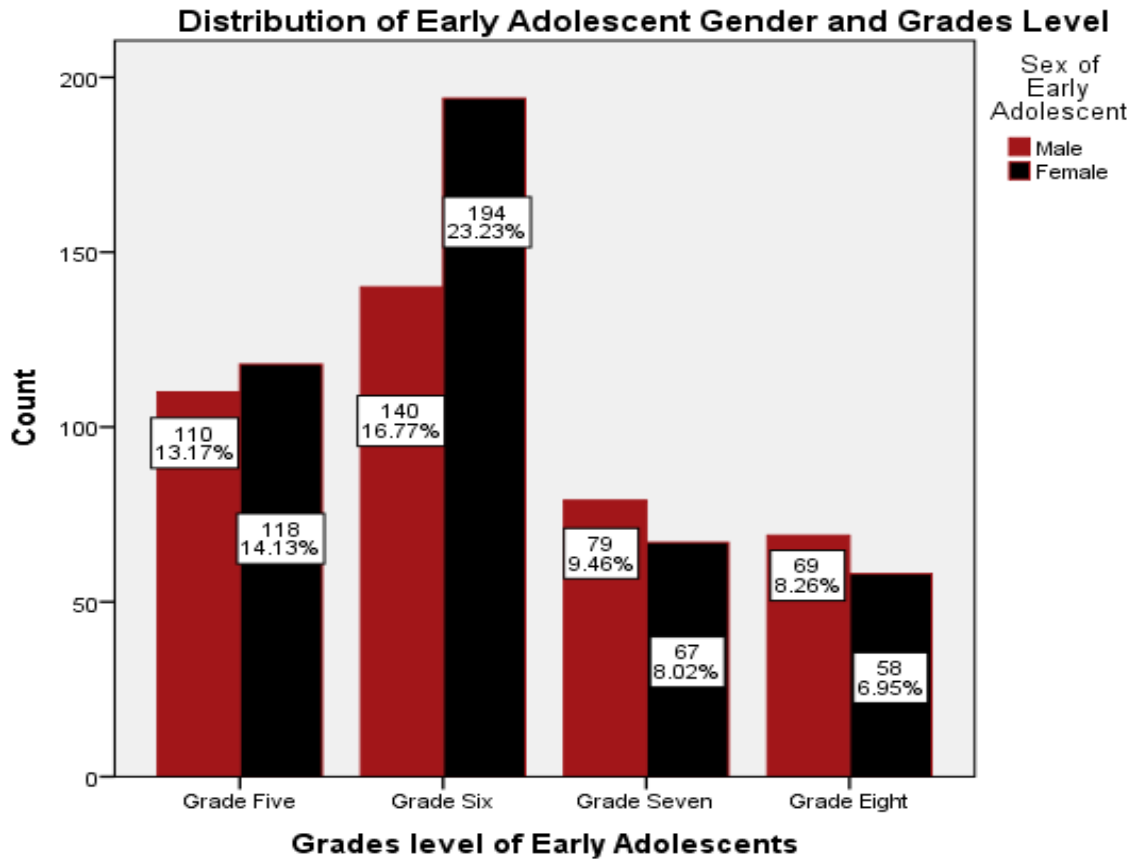


Figure 1:- Diagram of gender and grade level distribution.

Figure 1 indicates that among 835 sampled students, grades five were 110 (13.7%) males and 118 (14.13%) female students; grades six, 140 (16.77%) males and 194 (23.23%) females; grades seven 79 (9.46%) males and 67 (8.02%) females and grades eight 69 (8.26%) males and 58 (6.95%) females were selected from each of fourteen primary schools in the southern part of Ethiopia. However, the diagram distribution reveals that a maximum number of respondents were taken from grades six, whilst a smaller number of participants were selected from grades eight according to the proportion sample size calculation and the availability of students per primary school.

Table 3:- Selected Schools of the respondents.

Adolescent's School Name	Frequency	Percent	Valid Percent	Cumulative Percent
School Name				
Chamo Primary School	59	7.1	7.1	7.1
A.M.U. Community Primary School	61	7.3	7.3	14.4
Arba Minch Limat Primary School	43	5.1	5.1	19.5
Biruh Tesfa or Mahatot Primary School	40	4.8	4.8	24.3
Garo Primary School	47	5.6	5.6	29.9
Wisdom Academy Primary School	42	5.0	5.0	35.0
Yetnebersh Primary School	133	15.9	15.9	50.9

Rehoboth Primary School	114	13.7	13.7	64.6
Hibret Lelimat Primary School	38	4.6	4.6	69.1
sikela Primary School	160	19.2	19.2	88.3
Future Hope Mekane Yesus Acadamey	20	2.4	2.4	90.7
Kulfo Primary School	13	1.6	1.6	92.2
Abenezer Limat Primary School	20	2.4	2.4	94.6
Kola shara Primary School	45	5.4	5.4	100.0
Total	835	100.0	100.0	

Table 3 above indicates that fourteen primary schools were selected for this study. From these schools, a high number of participants were chosen from Sikela primary school, 19.2%(160),

A low number were selected from Abenezer and Future Hope primary schools, 2.4%(20), according to the single population proportion formula from the total number of students in each primary school from grades five to eight, aged 11 to 14.

As a result, the participants were recruited from 14 schools, nine government (Chamo, A.M.U. Community, A.M Limat, Garo, Yetnebresh, Hibret Lelimat, Sikela, Kulfo, Kola Shara) and five private (Biruh Tesfa/Mahatot, Wisdom Academy, Rehoboth, Future Hope, Abenezer) primary schools, who were attending their class system in 2022/2023 in Gamo Zone/region and Arba Minch Districts the southern parts of Ethiopia.

Table 4:- Physical Activity Questionnaire's Scale Reliability Statistics.

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha on Standardized Items	N of Items
.828	.823	24

The result is shown in **Table 4**; the scale reliability for PAQ was found to be 0.828, which is acceptable. The reliability of physical activity surveys were validated by the Cronbach's alpha scale test for both sexes of early adolescents, females ($\alpha = 0.823$) and males ($\alpha = 0.815$). This shows that PAQ was reliable and had high internal consistency in the PAQ items.

In addition, the correlation between PAQ items was checked. The items correlate significantly between each item. However, recess items had a low correlation with others.

Table 5:- The composite mean score for PAQ-C items.

PAQ-C Items	Activity category	mean	SD
Item 1	Physical activity in spare time	2.36	0.69
Item 2	physical education class	2.97	1.28
Item 3	Recess time	1.63	0.93
Item 4	Lunchtime	3.22	1.32
Item 5	After School	2.68	1.37
Item 6	Evening time	2.59	1.35
Item 7	Last weekend	2.83	1.33
Item 8	Describes best in last week	2.35	1.38
Item 9	weekly average time per activity	2.48	0.93
Items 1 to 9	Composite scores	2.49	0.63

The composite score was based on all nine items.

Table 5 shows the average mean value of each PAQ item for all 835 participants. The composite mean value was 2.49 (SD 0.63). However, from the whole 10 PAQ-C, item 4 (physical activity during lunchtime) has the highest mean score, 3.22 (SD 1.32), and item 4 (recess time physical activity) has the lowest mean score, 1.63 (SD 0.93). It indicates that early adolescents were more active during lunchtime and less active at recess time. It means the students were not exposed to being physically active at other times across all days of the week except during lunchtime. Furthermore, according to item 10, 167% of participants reported being impacted by illness or different situations in the last week, which decreased their usual level of participation in physical activity. However, 668 (80%) of participants reported participating in regular physical activity.

As a result, according to the participants' response rate of PAQ composite mean score, the average mean scores of the PAQ-C items were below the range. Therefore, early adolescents did not meet the WHO's recommendation for an hour of regular participation in physical activity. overall, the study found that early adolescents in the chosen primary schools had a generally low participation level in physical activity.

Table 6:- Group statistics for physical activity by Sex.

Group Statistics					
Item	Sex	N	Mean	Std. Dev.	Std. Error Mean
PAQ	Male	398	2.6542	.61268	.03071
	Female	437	2.3403	.60173	.02878

The mean level of participation in physical activity for both male and female early adolescents is displayed in Table 6. Consequently, the mean physical activity score for boys and girls across all study participants was 2.65 (SD = 0.61) and 2.34 (SD = 0.60) respectively.

Table 7:- Independent samples test for physical activity by Sex.

Physical activity level		t-test for mean equality						
		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% CI of the difference	
PA	Equal variances assumed	7.465	833	.000	.31396	.04206	.23141	.39651

The T-test is shown in Table 7 to verify that the means of boys and girls are equal. Hence, the mean score for boys was 2.65 (SD = 0.61) and for girls was 2.34 (SD = 0.60), as shown above in the group statistics table 6; $df(833) = 7.465, p = 0.000 < 0.05$. This indicates that compared to girls, boys were substantially more physically active in primary school.

Furthermore, between the upper and lower mean values of the items for boys and girls, a 95% confidence interval was calculated.

Table 8:- Sample adequacy test for Socio-ecological model (SEM) variables.

KMO and Bartlett's Test	
The Kaiser-Meyer-Olkin Sampling Adequacy Measure	.805
Bartlett's Test of Sphericity	Approx. Chi-Square
	df
	Sig.
	1359.791
	66
	.000

As shown above in Table 8, The model is sufficient. P value is therefore $=0.000 < 0.05$. The sample was determined to be adequate for doing the factor analysis for SEM data.

Table 9:- Factor analysis for socio-ecological model (SEM) variables.

Descriptive Statistics			
SEM Variables	Mean	Std. D.	Analysis N
I'm physically active when I'm feeling depressed	2.25	1.203	835
I think physical activity is fun and makes me happy	1.54	.899	835
I am active when there are other more exciting things to do	1.89	1.040	835
I Participate in physical activity even though I lack time	2.10	1.117	835
My family support me to participate in physical activity	2.10	1.144	835
My peers often encourage me to be physically active	2.08	1.147	835
My family provides me with physical activity equipment	2.55	1.232	835
I think physical activity can promote interaction with others	1.75	.987	835
PE teachers encourage me to be involved in physical activity at school	1.97	1.115	835
The school principals support me to take part in school physical activity events	2.49	1.154	835
The school facilities can meet my needs for physical activity	2.61	1.148	835

The school physical education teacher provides more opportunities for physical activity participation	2.42	1.166	835
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Table 9 shows descriptive statistics on socio-ecological model questionnaires for early adolescents. The variables listed above were designed to assess factors influencing physical activity participation in primary school settings. The SEM was aimed to indicate intrapersonal, interpersonal and school community-level influence hindering physical activity participation in primary schools.

The highest mean score of 2.61 (SD =1.148) was for "the school facilities can meet my needs for physical activity," and the lowest mean score of 1.54 (SD = 0.899) was "I think physical activity is fun and makes me happy." This indicates that the availability of facilities in a primary school setting affected school-based physical activity participation more.

Table 10:- Model adequacy for multiple regression analysis.

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	19.041	3	6.347	17.103	.000 ^b
	Residual	308.380	831	.371		
	Total	327.421	834			
A. Dependent Variable: Physical activity						
B. Predictors (Constant): Intrapersonal, Interpersonal and school-related factors						

Table 10 above aims to confirm the model eligibility of the data for multiple regression analysis. It was determined that F=17.103 with a p-value of 0.000<0.05. As a result, this implies the data of SEM and PAQ-C were fit for multiple regression analysis.

Table 11:- Multiple regression analysis to correlate physical activity and socio-ecological model factors.

Coefficients ^a						
Models		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		Beta	Std. Error	B		
SEM	(Constant)	2.490	.021		118.109	.000
	Intrapersonal factors	-.131	.021	-.210	-6.227	.000
	Interpersonal factors	-.060	.021	-.096	-2.864	.004
	School-related factors	-.044	.021	-.070	-2.080	.038
a. Dependent Variable: physical activity level						

Table 11 indicates how socio-ecological model (SEM) factors influenced early adolescents' primary school-based physical activity participation. The beta for intrapersonal factors was found with a more significant coefficient of B=-0.131, t= -6.227, with a P-value of 0.000<0.05., while the school-related factors were found with a lower coefficient of B=-0.044, t=-2.080, with a P-value of 0.038<0.05.

This suggests a negative correlation between SEM factors and participation in physical activity. However, the negative beta value was seen among the influencing factors. As a result, it indicates that intrapersonal-related factors highly influenced physical activity participation among early adolescents in school settings. In addition, school community-related factors, including access to facilities, principals, physical education teachers' support, and related school community factors, affect less than the other socio-ecological model factors. Generally, the study revealed that SEM-related factors significantly affect primary school-related physical activity participation among early adolescents.

Overall, 835 students (early adolescents) completed part of this research project. The study revealed moderately low participation in physical activity in selected school settings. As a result, the major influencing factors were correlated to intrapersonal and individual-related factors hindering physical activity participation among early adolescents.

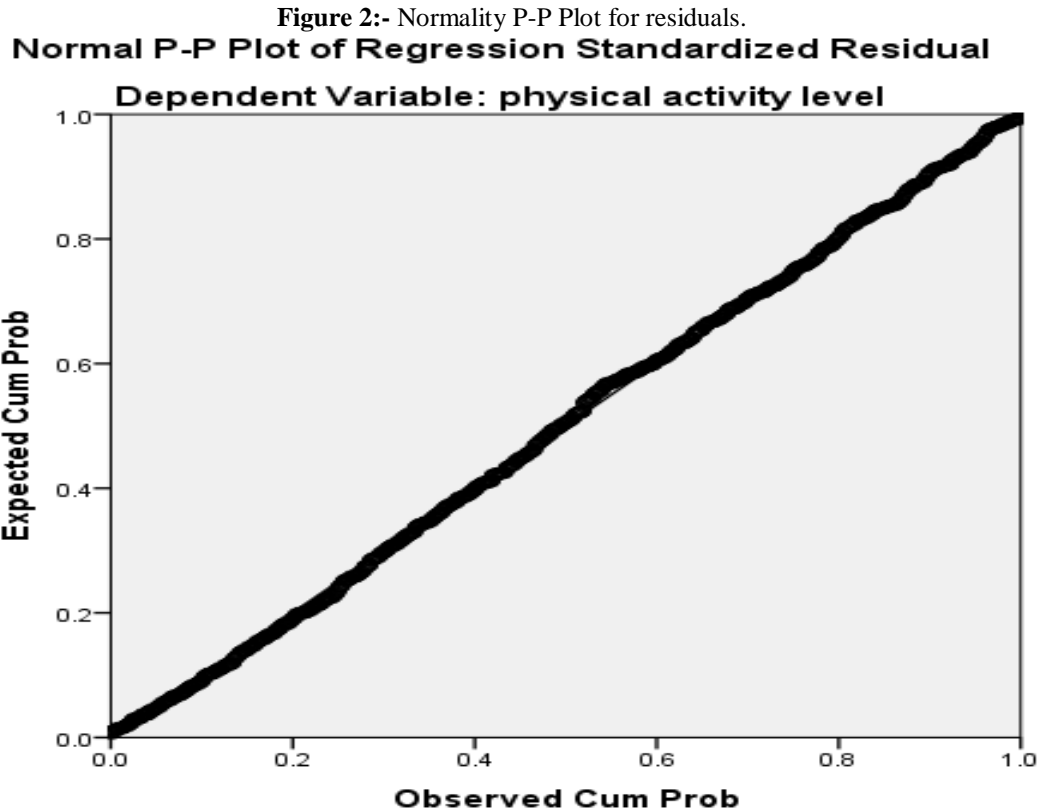


Figure 2 demonstrates the P-P plot. It was employed to check the distribution of multiple regression assumption error terms. As a result, it indicates the P-P plot is a straight line, which suggests that the error terms were normally distributed.

Discussion:-

This study aimed to investigate early adolescent physical activity levels and the variables influencing such participation among early adolescents. As a result, PAQ-C and SEM measurements were employed to understand physical activity and associated factors in Gamo zone primary schools.

The current study's findings revealed that early adolescents did not meet the required physical activity participation levels. Based on the early adolescents' physical activity questionnaire, which had a 5-point scoring system, individuals who obtained a high average score or engaged in moderate-to-intense physical activity for a minimum of an hour per day on at least three days within the past week were categorized as physically active [17]. However, the findings did not meet this requirement. This finding is in line with many previous studies in this area. The PAQ-C has been employed in numerous studies [9], [45] that assessed early adolescents' levels of physical activity in schools [4], [11], [13], [68]. The correlation aligns with a prior Brazilian study. Thus, children and adolescents fail to participate in adequate physical activity. According to the Brazilian study report, physical inactivity was 68% [69].

Regarding the type of physical activity items, participation in physical activity during lunchtime had the highest mean score of 3.22 (SD 1.32), and recess time physical activity had the lowest mean score of 1.63 (SD 0.93) compared with the other items (walking quickly for exercise, playing football, evening time, weekend, after school, etc.). The result is consistent with earlier research in Ethiopia in 2020/21. The scholars obtained a low physical activity status among high school students, with a mean score of 2.08 [4].

However, most early adolescents in my country engage in less than an hour daily. The possible reason for these differences might be that they were busy with other things, including school, homework, a lack of awareness, and more factors [50] that limited the expected level of physical activity involvement in school settings. Findings from the other study have also supported this [11], [66], [70].

Additionally, boys and girls had a significant mean difference in physical activity participation. Sex difference also plays a vital influence in implementing adolescents' physical activity participation [54], [71]. However, one possible explanation could be a gender difference in physical activity participation in school settings for many reasons. Earlier studies were conducted among school-aged boys and girls [72]. According to the survey, a lot of children give up on participating in sports and physical activities because of perceived sex differences and a lack of necessary abilities [32], [73]. Furthermore, the results of previous research were conducted in Ethiopia and globally identified difficulties and facilitators of school health promotions [5], [8], [29], [74].

On the other hand, the current study identified socio-ecological factors associated with early adolescents' physical activity participation in school settings. Among them, intrapersonal factors highly influenced early adolescents' status of physical activity engagement. Numerous research supporting this finding [11], [62], [68]. Specifically, China 2022 research found that socio-ecological model elements contributed to 54.7% of the sample, or 605 Chinese people aged 18 to 60, not engaging in the recommended physical activity. This study also corroborated the findings of these investigations [73].

Generally, many studies have tried to demonstrate the strategies to overcome the existing challenges in physical activity participation in primary schools. However, regardless of justification, further research will be needed to encourage physical activity during early adolescence.

Conclusion:-

In conclusion, the study's findings revealed that early adolescents' school-based physical activity participation in the Gamo Zone, southern Ethiopia, did not meet the minimum WHO physical activity requirements to sustain a healthy lifestyle in the school environment. The early adolescents' physical activity participation declined, but boys' levels were higher than girls'. One of the possible reasons was socio-ecological model factors and related school-based challenges.

As a result, primary schools should encourage participation in physical activity by establishing a supportive environment for school-based health programs. It is critical that all concerned bodies, including physical education teachers, school principals, parents, regional administrators, education officials and sports offices, should work together to promote physical activity participation throughout primary school settings. In addition, further research is needed to promote school-based health initiatives and increase physical activity participation in Ethiopia.

Conflict of interest

The authors confirm that there is no conflict of interest in this article.

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