Innovations

Physical activity and sedentary behaviour among kindergarten children during covid-19 in Ethiopia

Melkamu Dugassa[1],Jaleta Sileshi[1], Md Babul Akhtar[1]

[1]Jimma University Sports Academy, Exercise Science, Health and Fitness, Department of Sports Science.

Corresponding author:**Melkamu Dugassa**

Abstract

Introduction*: Regular participation in physical activity (PA) accelerates bone, muscle, and mental growth of children thereby maintaining a healthy lifestyle. However, the numerous health reimbursements of bodilymovement for children's health and growth are overwhelmed by the COVID-19 pandemic outbreak.* ***Objective: -****the current investigation emphasises therelationshipbetween physical activity and sedentary behavior among preschool kids with the Socio-demographic variables of Parents during COVID-19 in Ethiopia.* ***Method****: Employing a cross-sectional study design, quantitative data was collected from purposefully selected (n=322) kindergarten parents in Jimma Zone selected towns administration. To obtain adequate and relevant data from the respondents a standardized data collection questionnaire was used. Statistical models such as frequency, percentage, and bivariate binary logistic regression were applied to employ a statistical package for social science (SPSS version 26) for the analysis of the data.* ***Result****: The results show that a greater number of the respondents 282(87.60%) and 165 (51.24%) spent a sedentary lifestyle with passive sitting and watching TV for greater than 180 minutes a day respectively. Being male (OR: 2.035, CI: 1.261-3.282, p=0.004) and children of those who had a divorced marital status (OR: 2.111, CI: 1.172-3.805, p=0.013) had a significant association with being physically active.* ***Conclusion****: The finding of this study shows physical activity participation among kindergarten School children in Jimma Zone is very low and the sedentary lifestyle of children is very high requiring a cost-effective and cooperative physical activity promotion program among various stakeholders.*

Keywords*:Children, COVID-19, Kindergarten, Physical Activity, Sedentary behavior, Ethiopia*

Introduction

Regular participation in physical activity (PA) facilitates bone growth, muscle development, and mental improvement among children thereby maintaining a healthy lifestyle (Bikomeye, Balza, and Beyer, 2021). Physical activity (PA), refers to *"any bodily movement produced by skeletal muscles that result in energy expenditure"*World Health Organization (WHO, 2018), and long periods of being inactive spending time watching mobile, computer monitors, and television screens (screen time, ST) have been linked with impaired bodily, psychosocial, and mental health, particularly among kindergarten children (Chaput *et al.*, 2020). To maintain and remain healthy, different organizations such as WHO and the American college of sports medicine (ACSM) recommended 60 minutes of moderate-to-vigorous daily PA for preschool children and shortperiods of playful digital screen time (ST) (Schwarzfischer *et al.*, 2017; Cliff and Janssen, 2019; Chaput *et al.*, 2020). Improvement of regular participation in physical

exercise aiming to improve levels of cardiorespiratory fitness and maintaining health is very important for all age groups, races, ethnicities, and gender thereby helping to prevent numerous chronic conditions, in particular cardiovascular disease (Bacon and Lord, 2021).

Shreds of evidence witnessed that partakingregularly in PA helps kindergarten students and preschool kids to acquire enhanced health benefits such as physical development, bone growth, cognitive development, and reduced risk of associated diseases such as obesity, overweight, heart and lung diseases(Hatfield and Chomitz, 2015). Anemergentsherd of the study suggests that regular participation in physical exercise contributes greater to the mental development and escalated academic achievement of kindergarten children (Hatfield and Chomitz, 2015; Schneller *et al.*, 2017). In contrast, sedentary behavior and frequent inactivity are associated with the possibility of developingnon-communicable diseases (NCDs) such as overweight, obesity, cardiovascular disease, diabetics, and high blood pressure globally regardless of age, race, gender, and religious affiliations (Wachira, 2018; Pearson *et al.*, 2022). Current pieces of evidence show the escalation of sedentary lifestyles among the children of the Sub-Saharan Africa (SSA) population, whose exceptionaltraditions and socio-economicdynamicsprovided them with a highly active way of lifeformerly(Wachira, 2018). Up on the escalating sedentary behavior, the recent COVID-19 disease outbreak overwhelmed the lifestyle of kindergarten children in Africa due to the restrictive preventive measures that stopped children from having active lifestyles (Kassa and Grace, 2020; Matsungo and Chopera, 2020). Pieces of studies show that kindergarten children'slevels of PA in initialinfancyand preschool care settingsremain inadequate and influence their adolescent stage lifestyle (Nigg *et al.*, 2022). However, children physical activity levels decreased significantly in many countries increasing sedentary behavior and screen time during the lock-down(Al Sabbah *et al.*, 2022; Benmerzoug *et al.*, 2022; Hadianfard *et al.*, 2021).

Parents' performances and child-care follow probably play an essential role in developing healthy behaviors in kindergarten children in particular father's role are very high in the advance of PAand dietary habits of their children (Latomme *et al.*, 2021). The Participation of fathers and kids in the healthy dad's healthy kid activity program has a positive impact on the fathers' co-physical activity with their kids and beliefs about a healthy diet which facilitated changes in children's diet and physical activity performances (Morgan and Young, 2017). In Ethiopia, the incidence of diseases associated with lifestyle such as overweight and obesity among kindergarten children, particularly in the study area is less known. Therefore, interferences on the improvement of nourishing practices and involvement in PA regularly are important for the control of overweight and obesity among children in urban settings (Lopez *et al.*, 2022). However, the relationshipbetween PA and remain being inactive among kindergarten children with the Socio-demographic variables of Parents throughout COVID-19 is less known in Ethiopia. Inadequate amounts of PA and escalated periods of remaining inactive habits (IH) among kindergarten children apply to equal times spent within and outside of preschool (Kippe and Lyngstad, 2022).Prominencein educationalachievementemerged as animportantfundamentalissue that was expressed by teachers (Gomes *et al.*, 2017).

The wide spread of cities and town life increases the explosion of children to mobile games, watching TV programs and paperwork for a long period, which has a great negative impact on kindergarten children's daily PA engagement (Webster, Martin, and Staiano, 2019; Tamana *et al.*, 2019). In Ethiopian kindergarten schools, English, Amharic, maths, and other general learning subjects (composed of natural science and social science) are subjects delivered for all kindergarten students (from KG1-KG3). However, there is no specific schedule allocated for PA

involvement and teaching physical education in almost all kindergarten schools.

The health benefit gained from Physical activity has a very strong relationship with the social and demographic dynamics of parents including age, sex, educational background, marital status, and income level to which future community health involvements should be aimed to increase physical activity levels in society (Aguilar-Farias *et al.*, 2021; Lau *et al.*, 2021). Therefore, this study is designed to scrutinize the association of physical activity and sedentary behavior among kindergarten children with the Socio-demographic variables of Parents during COVID-19 in Ethiopia.

Methods

In this study, a cross-sectional study design was employed to collect actual data to describe the Socio-demographic correlation between physical activity and sedentary behavior among kindergarten children in the Jimma zone, Ethiopia. It is also relevant to gather detailed data on the topic. Moreover, in this design quantitative data collection and analysis were conducted.

The study was conducted in the Jimma Zone (JZ) of the Oromia Regional state on some selected town administrations. The main reason for selecting the zone for the study is that the researchers have been working for many years and still have a close working relationship with kindergarten schools and parents as professionals in the Jimma zone. In town administrations, the number of kindergarten schools and students is higher than the woredas of the zone. Hence, the researcher believed that adequate information could be easily fetched out. Moreover, expenses like allowances and transport can be minimized.

Sample size and technique

The population of the study was comprised of twenty-two Jimma zone town administration kindergarten students' parents. Among twenty-two administration towns of the Jimma zone, three administrative towns (Jimma, Seka, and Shebe) were selected to take part in the study thereby meeting the objective of the study. According to the Zonal educational office revealed, there are 16 governmental and 45 private kindergarten schools in Jimma Zone. From the selected numbers of kindergarten schools, all kindergarten children's parents (N=322) were selected by an objective-based purposeful sampling technique. The parents of these kids participated in the quantitative data collection of the research and responded to the questionnaire.

Data collection

To obtain adequate and relevant data from the respondents a standardized data collection questionnaire was used. The questionnaire involves three parts where the first part collects information on socio-demographic variables of kindergarten children's parents such as gender (male or female), age (20-30 or 31-40 or 41-50), marital status (single or married or divorced), educational background (diploma or first degree or masters degree), monthly income (1000-1500 or 1500-2000 or 2000-2500 or >2500). Secondly, the minutes of times kindergarten children spend sedentary and doing physical activity per day was calculated employing four scales such as *"≤60 minutes", "60-120 minutes", "120-180 minutes", and ">180 minutes"*. Thirdly, the associates of PA and inactive behavior were calculated using bivariate binary logistic regression based on the information obtained in part one and part two of the data gathering items. The purpose of the questionnaire on each scale is to collect data from kindergarten students' parents about the relationshipbetween PA participation and inactive behavior of children with Socio-demographic variables of children's parents. Statistical models such as frequency, percentage, and bivariate binary logistic regression were applied to employ a statistical package for social science (SPSS version 26) for the analysis of the data.

Before data collection, written informed consent was granted from the parents of kindergarten children. The purpose of the study was fully communicated to the children, parents and their teachers. The participants were informed to be withdrawn from the study at any time and any stage. The confidentiality, anonymity, andsafeguard ofindividualdata, benefits and drawbacks of participation in the study were also briefly communicated to the participants before the commencement of data collection.

Kindergarten Children and COVID-19 Infection

The outbreak of COVID-19 infection breaks the bond between kindergarten children and their teachers. The teachers start respecting the individual involvement of kindergarten children on the playground without their involvement. The close contact between teachers and kindergarten children was abolished. Kindergarten children start to engage in their school playground and public recreational park equipment close to their homes. However, sterilization accomplishments in the community recreational gardens and school playgrounds facility were substandard. Therefore, children used only homemade play equipment and playgrounds which narrowed the possibility of partaking in physical activity.

Furthermore, the families of the children discourage the participation of children in different schoolplaygrounds and public recreational gardens frightening the violation of the COVID-19 prevention protocol declared by the government. Any form of activity at the school playground and public recreational gardens is conducted individually toescape physical contact among children. Sanitizing playground pieces of equipment,and regular hand cleaning, among others, were very important earlier and nextapieceof action to avoidcontamination.

However, this was challenging due to the scarcity of sanitisers and shortage of water among kindergarten schools. Also, behaviorslikeemploying hand towels were changed to using sanitized throwawaytissues towels, which improved teachers' burden and maintained the kindergartenchildren's PA. Ethical clearance was obtained from Jimma University Sports Academy Research Ethics Review Board (JUSA, RERB) reference number JUSA/RERB/B04/2022.

Result

Table 1 shows that from 322 respondents, The majority 201(62.4%) were female, and below average 121(37.6%) are males. The majority of the participants, 181(56.2%) were aged between 20-30 years. Those aged between 31 to 40 years old were below average 116(36.0%), while a few 25(7.8%) were aged between 41to 50 years old. A greater number of the participants 125(38.8%) were single whereas, whereas a few 74(23.0%) of them were divorced. Regarding the academic rank of the respondents, the majority 196(60.9%) have 1st degree, and a smaller number 21(6.5%) were master's holders. Few number of the respondents 55(1.6%) income was above 2500 birr per month, while 67(20.8%) and 167(51.9%) of the respondents have 1000 to1500 and 1500-2000 birr monthly income.

Table 1.Demographic characteristics of respondents (N=322)

Item	Scales	n(%)
Gender	Male	121 (37.6%)
	Female	201 (62.4%)
Age	20-30	181 (56.2%)
	31-40	116 (36.0%)
	41-50	25 (7.8%)
Marital status	Single	125 (38.8%)
	Married	123 (38.2%)
	Divorced	74 (23.0%)
Status of Education	Diploma	105 (32.6%)
	B.Sc.	196 (60.9%)
	M.Sc.	21 (6.5%)
Monthly income	1000-1500	67 (20.8%)
	1500-2000	167 (51.9%)

	2000-2500	83 (25.8%)
	>2500	5 (1.6%)

The time kindergarten children spend sedentary and doing physical activity per day is depicted in Table 2. Results show that a greater number of the respondents 282(87.60%) and 165 (51.24%) spent a sedentary lifestyle with passive sitting and watching TV for greater than 180 minutes a day respectively. The results reveal that the majority of the respondents' children 220 (68.30%), 182(56.50%), and 162(50.30%) spent time taking part in moderate physical activity, playing active games and participating in strike-through vagarious physical activity for less than 60 minutes. Only a few 47(14.60%) and very few 7(2.20%) respondents children spent time on vagarious physical activity for 120-180 minutes and active games for greater than 180 minutes respectively.

Table 2. Minutes of times KG children spend sedentary and doing physical activity per day (N=322)

Times children spend	≤60 minutes n(%)	60-120 minutes n(%)	120-180 minutes n(%)	> 180 minutes n(%)
Passive sitting	0(0.00)	5(1.60)	35(10.90)	282(87.60)
Moderate PA	220 (68.30)	85(26.40)	17(5.30)	0(0.00)
Watching TV	30(9.30)	35(10.90)	92 (28.60)	165 (51.24)
Playing active games	182(56.50)	94(29.20)	39(12.00)	7(2.20)
Vagarious PA	162(50.30)	113(35.10)	47(14.60)	0(0.00)

The Bivariate binary logistic regression of PA level and inactivehabitsamong kindergarten children is illustrated in Table 3. The results show that being male (OR: 2.035, CI: 1.261-3.282, p=0.004) and children of those who had a divorced marital status (OR: 2.111, CI: 1.172-3.805, p=0.013) had a significant association with being physically active. Kids of these, divorced parents had two times more likely to be physically active compared with those of single and married marital status.

In contrast, children whose parents and teachers age group 31-40 years old (OR: 0.433, CI: 0.174-1.078, p=0.072), B.Sc. education level(OR: 0.317, CI: 0.129-0.776, p=0.012), married marital status (OR: 0.23, CI: 0.121-0.436, p<0.000), and income level 1500 to 2000 per month (OR: 0.292, CI: 0.158-0.542, p<0.000) less likely to be physically active compared to above 40 years old, M.Sc. education level, single marital status and less than 1500 birr income per month.

Table 3. Associates of PA and sedentary behavior using bivariate binary logistic regression

Items	S.E	Df	Exp(B)	95% CI		p
Gender				Lower	Upper	
Male	0.244	1	2.035	1.261	3.282	0.004
Age		2				0.018
(20-30)	0.436	1	0.903	0.384	2.122	0.814
(31-40)	0.465	1	0.433	0.174	1.078	0.072
Marital Status		2				0.000
Married	0.327	1	0.23	0.121	0.436	0.000

Divorced	0.301	1	2.111	1.172	3.805	0.013
Status Education		2				0.024
Diploma	0.474	1	0.48	0.189	1.215	0.121
B.Sc	0.457	1	0.317	0.129	0.776	0.012
Monthly income		3				0.000
1500-2000	0.315	1	0.292	0.158	0.542	0.000
2000-2500	0.331	1	1.203	0.629	2.303	0.576
> 2500	0.872	1	0.493	0.089	2.725	0.418

Note: *B=Beta, S.E:=Standard Error, Df=difference, p=p-value, EX(B)=Odds Ratio, CI=confidence interval*

Discussion

This study investigates the Socio-demographic correlation between physical activity levels and inactivehabitsamong kindergarten children in Jimma Zone. The results of our study show that being male (OR: 2.035, CI: 1.261-3.282, p=0.004) and children of those who had a Divorced marital status (OR: 2.111, CI: 1.172-3.805, p=0.013) had a significant association with being physically active. Kids of these, divorced parents had two times more likely to be physically active compared with those of single and married marital status. In line with the results of our study, research conducted in Latin American countries by Brazo-Sayavera *et al.*, (2021) reveals that gender differences in compliance with physical activity guidelines and the <3 hours recreational sedentary behavior cut-point is evident among children, with boys being more active than girls. The results of our study show that a greater number of the respondents 282(87.60%) and 165 (51.24%) spent a sedentary lifestyle with passive sitting and watching TV for greater than 180 minutes a day respectively. Substantiating the results of our study, (Vukelja, Milanovic, and Salaj, 2022) reported geographic variation in bodilyaction and inactive habit in Croatia with children from a continental area that gravitates to the capital city are least physically active, while, while children from a southern coastal region are the most active. Sedentary behavior is the greatest in the rural eastern Croatian continental region.

Our finding reveals that children whose parents age group 31-40 years old (OR: 0.433, CI: 0.174-1.078, p=0.072), B.Sc. education level (OR: 0.317, CI: 0.129-0.776, p=0.012), married marital status (OR: 0.23, CI: 0.121-0.436, p<0.000), and income level 1500 to 2000 per month (OR: 0.292, CI: 0.158-0.542, p<0.000) less likely to be physically active compared to parents with older age (above 40 years old, Masters degree education background, divorced marital status and low monthly income (less than 1500 birr). Contrasting the findings of our study, research finding conducted among school-going children in Uganda, Kampala depicts that socio-demographic factors such as younger age parents, low education background of parents, and children with poor family care associated with meeting physical activity guidelines for children (Nakabazzi *et al.*, 2020). However, supporting the results of our study Kariippanon *et al.*, (2022) reveal that in kindergarten children with high-income parents, obesity and multi-morbidityremainedlinked with greaterinactive behavior compared to children from low-income parents. Kindergarten children with parents aged between 35 to 45 years old, advanced educational background and living in apartments showed an escalating decrease in total physical activity and growing digital screen time. Corroborating our findings, a study among low middle income countries (LMICs) by Okely *et al.*, (2021) highlights that possibility of meeting the PA guidelines of WHO for children which recommends 180 minutes of active lifestyle per

day is high among children from LMICs compared to their high-income country (HIC) counterparts. Other pieces of evidence witnessed that the probability of meeting WHO global physical activity guidelines for children is high among children who violate COVID-19 restricted rules and perform movement activities around their neighbourhood is higher compared to those who were not. However, a study by Kippe and Lagestad, (2018)confirmedthat the amount of physical activity performed during preschool age is the main base for the development of positive physical activity behavior during adolescence. Moreover, the level of PA is greater among boys than girls, and this variation is not related to kindergarten children's socio-demographic variables such as sex, age, educational background, and monthly income level.

Results show that a greater number of the respondents 282(87.60%) and 165 (51.24%) spent a sedentary lifestyle with passive sitting and watching TV for greater than 180 minutes a day respectively. A study in Spain by (Sanz-mart, Zurita-Ortega, and Ruiz-tendero, 2023) directs that kindergarten children had an average of 68 ± minutes of modest to heavy PA, 113 minutes of digital screen time and 549 minutes of sleep time per day. More studies substantiate the results of our study revealing that 62% reported less total physical activity. Kindergarten children continue inactive and experience highly sedentary behavior with screen time dominating their lifestyle, and throughout and afterwards the school closingsfollowing the COVID-19 lockdown(Velde *et al.*, 2021). According to McCormack *et al.*, (2020), a greater number of preschool childrenaugmentedTVviewing (59%), played mobile games (56%), and frequently employ digital screen-based devices (76%). Astoundingly, following the restrictions of covid-19 and playgrounds closing, nearly one-half of children declinedactivity at the recreational gardens (53%) and in communityplaces (54%). The results reveal that the majority of the respondents' children 220 (68.30%), 182(56.50%), and 162(50.30%) spent time doing moderate physical activity, playing active games, and participating in vigorous physical activity for less than 60 minutes. A study in Singapore among kindergarten children shows that a small number of kindergarten children (23.5%) partook in additionalschool sports, where as greater number (94.5%) describedviewingdigital screens for 90 minutes to 180 minutes per day (Chen *et al.*, 2020). Only a few 47(14.60%) and very few 7(2.20%) respondents children spent time on vigorous physical activity for 120-180 minutes and active games for greater than 180 minutes respectively.

The percentage of kids who met participation in PA for (≥180 minutes per day, including ≥60 minutes daily moderateto vigorous-intensity PA (MVPA)), inactive screen time (<60 minutes per day) were 65.4, 88, and 29.5%, correspondingly(Guan *et al.*, 2020). A study conducted among Chinese children shows that nearly 70% of kindergarten children spent 17.2 minutes per day on domestic physical activity. A majority of kindergarten children spent 174 minutes per day on recreational inactive lifestyles and 86% of them wereinvolved in sittingand inactive per day. The results highlight that boys are better active in school and recreational PA than girls who spent time doing habitual physical activity and homework (Song *et al.*, 2019). The low physical activity levels among kids could be associated with the deficiency of trained professionals in the field of PA, playing materials, a supportive environment, and physical guidelines prepared, which might be important for children's physical activity involvement.

Implications

Kindergarten children's PA participation remains decreased and highly affected by the COVID-19infection at the stage that maintaining physical activity is more crucial than ever for the overall development and growth of kindergarten children. The overall implication of our study on PA and the inactive behavior of kindergarten children covers the academic year 2021/2022. The key results show that there is an overall decrease in activity levels and an increase in

sedentary behavior compared to the academic year before COVID-19. The occurrence of the COVID-19 infection escalates the pre-existing inequalities, widened the disparity of PA levels among kindergarten children and decreased enjoyment and confidence in participating in PA and active recreation. The COVID-19 viruspreventive restrictions make families and children frustrated and maintain children at home engaging in playing mobile games and watching kids' TV programs. Families and kindergarten teachers lack confidence in establishing even novel, indigenous, and temporary measures to make children active.

Positively, the results imply that kindergarten children who remain active developed a high level of confidence and holistic well-being compared to inactive children who experienced overall diminished healthstatus and escalated depression. Maintaining the activity level of kindergarten children helps them to do enhanced at school in achievement and success – so there's a twofoldadvantage to taking part incontinuingindecision.

Generally, there were poorer activity levels when there were high COVID-19limits in place–which demonstrates the significance of keeping and supporting PAchances in kindergarten schools, the active transformation to school and the other organised sport in children's lives.

Portentously, our study results imply that presentdisparities have been intensified and there's also been a descent in PA levels even for boys that drag them down the bottom line with girls' PA levels. The decline of PA is an emerging problem that is escalating since the outbreak of COVID-19 and it is deep-rooting to become a chronic trend if not addressed timely by policymakers, developmental organizations, and stakeholders. Surprisingly, due to the inadequate efforts among teachers, parents, and guardians – as well as the kindergarten children themselves – activity levels overall dropped and sedentary behavior mounted during the COVID-19 pandemic outbreak compared to earliereducational years (2019/2020), which similarlycontainedcorona-viruslimits.

Contrasting the results in high-resourced countries, our study result implies that children of poor and fewer-income families maintain PA, – because in part children of poor families have been less affected by COVID-19 pandemic restrictions. This was particularly significant for children of divorced, and low-income families, whose activity levels mount more than children of high-income families.

It is very important that collaborative efforts among governmental, non-governmental, and other stakeholders, revert these variations by helping the community group that demands at most support to partake in regular PA and supporting the people and communities that need the most help to take part in physical activity and active recreation during corona-virusrescue efforts.

The other key point observed from the study is that kindergarten children reported fewer positive attitudes towards physical activity during the COVID-19 pandemic than in previous academic years (2019/2020), with satisfaction and self-relianceto participate showing asubstantialdecline. The factors that may drop the level of physical activity could be a lack of physical literacy and knowledge. This is important because kindergarten children who have a better understanding and awareness about the benefits of physical activity remain active even during the COVID-19 pandemic than kindergarten children with low levels of understanding and knowledge about PA. Therefore, developing a positive outlook and creating awareness among kindergarten children can change the likelihood of increasing PA. If not, the next new generation will remain inactive and will suffer from all burdens associated with physical inactivity andsedentary behavior. Hence, collaborative and instantaneouswork to upsurgePA awareness, employing various channels of communication and responsible parties is required.

Generally, the current engagement of kindergarten children in PA is less when compared to the pre-COVID-19 era. Moreover, approximately 70% of kindergarten children from high-income families areincapable to participate in physical activity for more than 30 minutes daily.

Conclusion

The study results reveal that a large number of kindergarten children spent a sedentary lifestyle with passive sitting and watching TV for greater than 180 minutes a day. Overall, male children of those who had a divorced marital status and children of poor families are more physically active and spent less sedentary lifestyles compared to children of higher-income parents. The finding of this study shows physical activity participation among kindergarten School children in Jimma Zone is very low and the sedentary lifestyle of children is very high requiring a cost-effective and cooperative physical activity promotion program among various stakeholders.

To discourage sedentary behavior and to promote PA that maintains the health and well-being of children, policies have to address the various socio-demographic features within the kindergartenschool setting. Particularly, school programmes and their indigenousapplication, together with the lack of organized physical activity in kindergartens, may permitappraisal to upsurge the amount of PA and outdoor playtime and lower the levels of sedentary behavior.

Limitations

This study is based on the response of kindergarten children and some families may not report the correct information about their children's PA level and sedentary behavior. Also, the study has uncovered qualitative information using interviews and focus group discussions. Therefore, the study would become a more strong andfull-fledged study if it includes mixed methods so that the holistic issue under investigation can be fully revealed. Also, a lack of consistent measurement of PA levels hinders the comparison of results between studies. A comparative study which may cover the levels of PA and inactive behavior of kindergarten children before and during the COVID-19 pandemic outbreak may extract better and strong information. Therefore, a comparative study should be part of the future research agenda to reveal the disparity between physical activity level and sedentary behavior of kindergarten children tracked before and during the COVID-19 pandemic so that a comparison can be made across nationwide and worldwide studies.

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Corresponding Email:
melkamu.dugassa@ju.edu.et