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MOVEMENT BEHAVIOURS OF PRESCHOOL CHILDREN IN BOSNIA AND HERZEGOVINA [1] [2]

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Abstract: The World Health Organization (WHO) released guidelines for physical activity, sedentary behaviour, and sleep for children under 5 years of age in 2019. In response to these guidelines, this study aimed to determine the proportion of preschool children (ages 3-5 years) who met the WHO guidelines. The time spent in physical activity, sedentary behaviour and sleep were objectively measured using accelerometer (ActiGraph wGT3x-BT). Screen time and sleep quality were assessed via parent questionnaire. Focus groups were con-

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ducted with parents and childcare staff to determine the feasibility of the protocol. The results showed that only 23% of the children met all three guidelines, and compliance rates varied for each guideline. The physical activity time guideline was met by 64% of children, the sleep duration guideline was met by 74% of children, and the screen time guideline was met by 53% of children. Only a low proportion of children met the WHO guidelines. The methods and devices used in this pilot study proved to be feasible and this has paved the way to conduct the main SUNRISE study in Bosnia and Herzegovina.

Keywords: *movement behaviours, preschool children, screen time, sleep, sedentary behaviour*

INTRODUCTION

The worldwide outbreak of childhood obesity continues to pose a significant challenge to public health. Over the course of four decades, the number of girls and boys affected by obesity has surged from 5 million to 50 million and from 6 million to 74 million, respectively (NCD-RisC, 2017). The repercussions of childhood obesity are grave, including heightened likelihood of adult obesity and other health complications (Park et al., 2012; Ward et al., 2017).

Physical inactivity is recognized as a significant contributor to the prevalence of obesity. Previous research has established positive correlations between healthy levels of physical activity, screen time, sleep, and adiposity in middle and late childhood. Recently, systematic reviews have focused on the relationship between these factors in early childhood, as movement behaviours may persist from this period into middle or late childhood (Malina, 1996; Janz et al., 2005). These reviews have indicated either favourable or neutral associations. However, the majority of studies have been conducted in high or upper-middle-income countries, with limited data available from less-developed nations.

In addition to impacting their immediate health and quality of life, children who suffer from obesity are also at an increased risk of developing various non-communicable diseases, including diabetes, cardiovascular diseases, hypertension, stroke, and cancer (Park et al., 2012; Hu, 2008). Furthermore, obesity during childhood often persists into adolescence and adulthood, leading to chronic illness and premature death (Ward et al., 2017).

The World Health Organization (WHO) issued global guidelines in 2019 for children under the age of five concerning movement behaviours. The guidelines suggest that children aged three and four should engage in 180 minutes of physical activity, out of which 60 minutes should be of moderate to vigorous intensity (WHO, 2019). Additionally, they should limit their sedentary screen time to no more than one hour and strive to get 10 to 13 hours of quality sleep. The guidelines were developed based on systematic reviews conducted in this age group. Since their release, several studies have evaluated the prevalence of adherence to these guidelines and their correlation with adiposity and other health indicators (Chaput et al., 2017; Berglind et al., 2018; Draper et al., 2020; Tanaka et al., 2020).

Against this backdrop, this study endeavours to determine the proportion of Bosnian pre-schoolers who adhere to the WHO global guidelines and to explore the associations between guideline adherence, obesity, and motor development in this group of young children.

METHOD

Study setting and participants

The study was conducted in eight preschools in the city of Tuzla and Tuzla Canton: five preschools were in an urban area three in a rural-like setting (less-developed part of Tuzla Canton). The principal of each preschool was contacted, informed, and permission was granted for the study. The parents of eligible children were contacted through preschool class teachers to participate in the study. Interested parents were gathered in a hall room of the respective preschool. A team of ten data collectors (professors from the Faculty of Physical Education and Sport) was involved, conducting various measurements (height, weight, executive functions, and motor skills) and plac-

ing accelerometers on children. The purpose of the study was explained to the parents. Once the parents provided informed written consent, children aged between 3 and 5 took part in the study. Each preschool supported to make an arrangement in case a participating child became unsettled during the study.

The study was conducted between December 2022 and March 2023. All data collectors underwent extensive training prior to conducting field-level data collection. The parents/caregivers were asked to complete a questionnaire (in the local language) which provided demographic information for both the parent/caregiver and the child, as well as the movement behaviours of their child, within five days while the children wore accelerometers.

Measures and procedures

Anthropometrics

The height of the children was measured using a portable anthropometer (Martin Type Anthropometer) and the weight was measured barefoot using a digital scale (EGER www.eger.com). All measurements were taken twice and an average was used for analysis.

Accelerometry

Children's movements were assessed using Actigraph GT3X+ accelerometers following the evidence-guided recommendation (Cliff et al., 2009). The devices were attached to an elastic belt and positioned on the right side of the child's body, just above the iliac crest. The sampling intervals, or epochs, were set at 15s and the sampling rate at 30Hz. The children, their teachers, and their parents were instructed to keep the accelerometers continuously on their waist for at least 72 h and only remove them for any water-based activities. The children and their parents were asked to make sure the children wear the accelerometers for 5 days.

Children who had at least one full day of 'valid' data were included in the later analysis. A valid day (i.e. 24 h) of data was confirmed by visual inspection of the acceleration graph via the ActiLife 6 software to ensure there were acceleration peaks throughout the monitoring days. Sleep time and non-wear time were excluded from the analysis. Sleep time was predetermined based on the average parent-reported wake-up time and bedtime of the sample. Non-wear time was defined as > 20 min of consecutive zero counts during waking hours. This included the time when the monitor was taken off for water activities and daytime naps. The final time was used to calculate the time spent in total physical activity (TPA), sedentary behaviour (SB), light physical activity (LPA), and moderate to vigorous physical activity (MVPA).

Sleep, screen-time, and sedentary activities

A self-administered parent questionnaire was used to assess sedentary screen time, sleep time, and demographic characteristics. Screen time was reported in hours and minutes, for example: "In 24 h in the past week, how much time did your child who is participating in this study spend using any electronic screen device (e.g., smartphone, tablet, video game) or watching television or movies, videos on the Internet while they were sitting or lying down?" Sleep time was reported in hours and minutes, for example: "How many hours of sleep does this child get in a typical 24-h day (including naps)?" The times to go to bed and wake up were included in order to exclude sleep time from the accelerometer data. The parents also reported the time spent outside, screen time and the use of screens before bedtime; the time spent restrained (strapped and unable to move), and the time spent sitting.

Sample size

According to the study protocol, the primary aim of this study was to determine the feasibility of recruiting children from urban and rural settings. In this study we had a sample of 115 children, 65 from urban and 50 from rural area.

Data analysis

All statistical analyses were performed using SPSS Statistics for Windows version 26.0 (IBM Corp, Armonk, NY). Descriptive statistics (mean and standard deviation) were calculated for all study variables. T-test for independent sample was conducted to examine differences in movement behaviours between the sexes and residential settings..

RESULTS

The study analysed a final sample of 115 child/parent pairs (52 boys and 63 girls) from urban (n = 66) and rural (n = 49) areas.

The results of the accelerometry are presented in Table 1. According to the findings, boys exhibited a significantly higher level of physical activity than girls (SED, p<0.009; MPA, p<0.007; VPA, p<0.007, and MVPA, p<0.004). However, there was no significant difference in physical activity levels between urban and rural children.

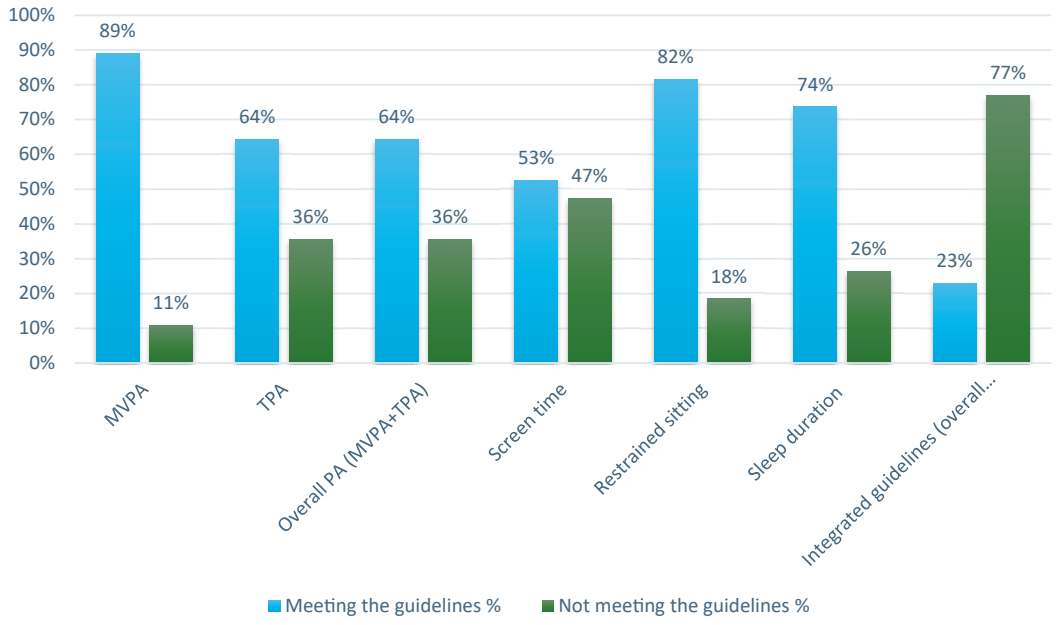
Table 1. *Accelerometry by sex and area*

	Total (n = 101)	Boys (n = 46)	Girls (n = 55)	p value ¥	Rural (n = 42)	Urban (n = 59)	p value ≠
SED (min/d)	622.0 ± 48.3	608.3 ± 48.5	633.4 ± 45.4	.009*	623.6 ± 6.0	620.8 ± 7.04	.770
LPA (min/d)	97.4 ± 16.5	98.7 ± 18.1	96.3 ± 15.0	.476	17.3 ± 2.6	15.9 ± 2.0	.510
MPA (min/d)	70.5 ± 18.9	76.0 ± 20.7	65.9 ± 16.0	.007*	15.7 ± 2.4	20.8 ± 2.7	.269
VPA (min/d)	24.1 ± 13.3	28.0 ± 15.3	20.8 ± 10.4	.007*	10.4 ± 1.6	25.8 ± 1.9	.136
MVPA (min/d)	94.6 ± 30.5	104.0 ± 34.2	86.8 ± 24.7	.004*	23.5 ± 3.6	34.4 ± 4.4	.181
TPA (min/d)	192.0 ± 41.2	202.7 ± 45.5	183.1 ± 35.2	.017	35.2 ± 5.4	44.7 ± 5.8	.210

Data are presented as mean ± SD for normally distributed data; * significance at p < 0.05; ¥p value for comparison by sex; ≠p value for comparison by area. SED, sedentary behaviour; LPA, light-intensity physical activity; MPA, moderate-intensity physical activity; VPA, vigorous-intensity physical activity; MVPA, moderate-to-vigorous-intensity physical activity; TPA, total physical activity

The number of children meeting the different components of the 24-hour movement guidelines is presented in Figure 1. The proportion of children meeting the physical activity (MVPA + TPA) guidelines was 64%, while the screen time and sleep guidelines were met by 53% and 74% of the sample, respectively. When considering all three guidelines together, only 23% of the sample met the integrated guidelines.

Figure 1. *Proportion of children meeting 24-hour movement guidelines*



DISCUSSION

This study investigated the compliance of Bosnian pre-schoolers with the World Health Organization (WHO) guidelines on movement behaviours. The results showed that only 23% of the children met all three guidelines, with 64%, 74% and 53% complying with the guidelines on physical activity time, sleep duration, and screen time, respectively. This study is the first to provide a comprehensive overview of the movement behaviours of Bosnian pre-schoolers, using an objective assessment of physical activity. Previous studies have reported similarly low compliance rates with the guidelines, ranging from 12.7% to 26%.

The proportion of children meeting the physical activity time guideline in this sample was 64%, similar or lower than the results reported in studies conducted in Canada (61.8%), Australia (89%), China (64.5%), Japan (75.4%), South Africa (84%), and higher than in Vietnam (50.4%) (Hinkley et al., 2020).

Although up to 89% of children in this study met the recommended 60 minutes of moderate-to-vigorous physical activity (MVPA), they only spent an average of 1.6 hours in LPA, much lower than the 3.75 hours, 3.5 hours, or 2.1 hours reported in Chinese, Canadian, and South African samples, respectively.

The study reported a high proportion of children meeting the sleep guideline - 74%, consistent with findings in Canada (83.9%) and Australia (93%) (Chaput et al., 2017; Matarma et al., 2018). In contrast, for screen time, only 53% of the sample met the guideline, which was considerably higher than the rates observed in Canada (24.4%), Australia (23%), and Japan (15.9%) (Chaput et al., 2017; Tanaka et al., 2020; Hinkley et al., 2020).

One of the key strengths of this study is the use of the 24-hour objective physical activity assessment of preschool children, which is uncommon in low-and middle-income countries. Furthermore, early motor development, a significant health indicator, was measured in the study.

The main limitation of this study is its small sample size and the lack of national representativeness of the study settings. In addition, screen time and sleep duration were assessed subjectively through parent questionnaires. However, the research sites were able to engage the community and facilitate data collection and address other methodological considerations.

CONCLUSIONS

The study examined the compliance of Bosnian pre-schoolers with the World Health Organization guidelines on movement behaviours, focusing on physical activity time, sleep duration, and screen time. The results showed that only 23% of the children met all three guidelines, and compliance rates varied for each guideline. However, the study's small sample size and lack of national representativeness were limitations. The findings highlight the need to promote healthy movement behaviours among Bosnian pre-schoolers.

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