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PHYSICAL ACTIVITY AND SCREEN TIME IN PRESCHOOL CHILDREN IN CROATIA

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ABSTRACT

This research investigates how disparities in physical activity and screen time among preschoolers can be influenced by parental education and involvement, as well as the involvement of the extended family in child-rearing. The study involved 231 parents who provided information about their children from the three (out of four) regions in Croatia. The analysis revealed statistically significant differences in children's screen time based on the parents' educational level ($p<0.000$) and involvement in joint physical activity ($p<0.000$). No differences were found in the children's screen time or physical activity depending on the involvement of extended family members (grandparents). Less screen time does not automatically mean higher levels of physical activity in preschool children. It is essential to determine the factors that influence physical activity in preschool children and the time they spend in front of screens.

Keywords: *preschool children, family, screen time, children's physical activity*

TELESNA DEJAVNOST IN ČAS PRED ZASLONI PREDŠOLSKIH OTROK NA HRVAŠKEM

IZVLEČEK

Raziskava preučuje, kako na razlike v telesni dejavnosti in času pred zasloni pri predšolskih otrocih vplivajo izobrazba in vključenost njihovih staršev ter vključenost razširjene družine v vzgojo otrok. Zajela je 231 staršev iz treh (od štirih) hrvaških regij, ki so posredovali podatke o svojih otrocih. Analiza je pokazala statistično značilne razlike v času pred zasloni glede na izobrazbo staršev ($p<0,000$) in vključenost staršev v skupne telesne dejavnosti ($p<0,000$). V zvezi z vključenostjo razširjene družine (starih staršev) raziskava ni pokazala razlik glede časa pred zasloni ali telesne dejavnosti otrok. Manj časa pred zasloni pri predšolskih otrocih ne pomeni nujno več telesne dejavnosti. Ključno je prepoznati dejavnike, ki vplivajo na telesno dejavnost predšolskih otrok in na čas, ki ga preživijo pred zasloni.

Ključne besede: *predšolski otroci, družina, čas pred zaslonom, telesna dejavnost otrok*

INTRODUCTION

Physical activity (PA) is beneficial for maintaining and enhancing health (Hawlader et al., 2023; Chen et al., 2024) and influences the proper growth and development of children (Sterdt, Liersch & Walter, 2014; Bingham et al., 2016; Zeng et al., 2017; Piercy et al., 2018). Although promoting a healthy lifestyle is particularly crucial during early childhood (Jones, Hinkley, Okely & Salmon, 2013; Hinkley, Brown, Carson & Teychenne, 2018; Tran et al., 2025), children are becoming increasingly less physically active (Sobchuk, Connolly & Sheehan, 2019; Husu et al., 2024; Phipps et al., 2024). Lifestyles are changing and modern parenting involves greater supervision of children (Holt et al., 2016; Day, 2024). Unstructured, free active play outdoors is declining, despite its importance for child development (Holt et al., 2016; Bento & Dias, 2017; Sobchuk et al., 2019; Dankiw, Tsiros, Baldock & Kumar, 2020; Lee, Shih & Tremblay, 2024; Lee, Flouri & Jackson, 2025). For preschool-aged children, free outdoor play is the most natural way to engage in PA and is critical for promoting healthy development (Caroli et al., 2011; Bento & Dias, 2017).

Still, participation in structured sports activities is often promoted among children, which can pose an additional burden for parents (Day, 2024). The demands of employment may prevent parents from providing consistent support for their children's PA (Balkó, Balkó, Valter & Jelínek, 2017). For some children, daily routines include time spent in kindergarten, and grandparents are also often involved in childcare (Budden et al., 2024; Hu et al., 2023). Simultaneously, technology is highly accessible to children (Sharkins, Newton, Albaiz & Ernest, 2016). While society promotes the importance of screen use (Määttä et al., 2017), the development and accessibility of technology provide endless entertainment opportunities (Schmidt-Persson et al., 2024). Additionally, some parents use screens for educational and parenting purposes (Griffith, 2023) and the term "digital babysitter" is becoming increasingly common (Rhodes, 2017; Lev & Elias, 2020).

Consequently, physical inactivity is increasing across all domains (Pišot, 2022). The number of children with weight issues (Bentham, Di Cesare, Bllano & Boddy, 2017; Jin, Zhou & Chen, 2025), type 2 diabetes mellitus (Temneanu, Trandafir & Purcarea, 2016; Serbis, Giapros, Kotanidou, Galli-Tsinopoulou & Siomou, 2021), poor posture (Balkó et al., 2017), mental health problems (Liang et al., 2024; Schmidt-Persson et al., 2024) and other issues is growing.

Various factors influence children's PA and screen time (ST). Increasing attention is being paid to the socio-ecological model, which considers a child's individuality, as well as societal and environmental influences on PA and

sedentary behaviour (SB) (Bronfenbrenner, 1995; Crawford et al., 2010; Lopes, Rodrigues, Maia & Malina, 2011; Paudel, Marshall, Veitch, Paudel & Hesketh, 2025). Accordingly, the aim of this study is to examine differences in PA and ST among preschool children, which can be attributed to different levels of parental education and the participation of parents and the wider family in upbringing.

METHODS

The research was anonymous and conducted in 2022 in Croatia, encompassing three of the country's four statistical regions (City of Zagreb, Pannonian and Northern Croatia) using a snowball sampling method on a randomly selected sample. The questionnaire included four questions related to descriptive data (the gender and age of the children, parental education level and the county of residence) and two questions related to the involvement of the immediate (parents) and extended family (grandparents) in joint physical activities with children, using a Likert scale (ranging from occasionally to often).

To assess the children's physical (kinesiological) activity, the Netherlands Physical Activity Questionnaire (NPAQ) was used (Janz, Broffitt & Levy, 2005). The first 7 questions are answered using a Likert scale (range 1 to 5). The result is the average of the entered responses. Higher values indicate higher amounts of children's PA.

The eighth question in this questionnaire is open-ended and pertains to the time children spend using screens.

The study posed the following hypotheses:

H1: There are differences in children's PA and ST depending on the parental education level.

H2: There are differences in children's PA and ST depending on the frequency of parental participation in joint physical activities.

H3: There are differences in children's PA and ST depending on the frequency of grandparental participation in joint physical activities.

The study included 231 parents who provided data for their children (51.9% girls (N=120) and 48.1% boys (N=111)), aged between 2 and 7 years (M=5.07±1.36).

Depending on the statistical needs of the hypotheses, the children were assigned to different categories. For the analysis of the first hypothesis, the sample was divided based on parental education level. Of the participants, 64.9%

(N=150) had parents with tertiary education (university degree) and 35.1% (N=81) had parents with secondary education (high school degree).

For the second hypothesis, children were divided based on the frequency of parental participation in joint physical activities. Parental activities with children were infrequent in 58.4% (N=135) and frequent in 41.6% (N=96) of cases.

For the third hypothesis, children were divided based on the frequency of grandparental participation in physical activities. Grandparents' activities with children were infrequent in 73.2% (N=169) and frequent in 26.8% (N=62) of cases.

For statistical data processing, we used IBM SPSS Statistics 19.0. To examine the data distribution, the Kolmogorov-Smirnov test was employed. Because the distribution of the results was non-normal, we used the Mann-Whitney U for group comparisons. Hypotheses were accepted at $p<0.05$.

RESULTS

Most respondents reside in Pannonian Croatia (41.6%, N=96), followed by the City of Zagreb (35.1%, N=81) and Northern Croatia (23.4%, N=54).

The age range of the children participating in the study was from 2 to 7 years (M=5.07, ±1.36), with 70 (30.3%) children aged 2–4 years and 161 (69.7%) aged 5–7 years. The average PA level of the children, as assessed using the NPAQ, was 3.75 (range 1.29–5, ±0.66). The parents reported that children aged 5–7 years were slightly more physically active (M=3.77, ±0.67) than children aged 2–4 years (M=3.70, ±0.63).

Children aged 2–4 years spent an average of 69.07 min/day in front of screens (range 0–210 min/day, ±44.46, N=70), while children aged 5–7 years spent 79.32 min/day (range 0–240 min/day, ±44.06, N=161). The average ST for all the children was 76.21 min/day, ±44.34.

Parental involvement in joint physical activities with children had an average score of M=3.24 (range 1–5, ±0.92), while the involvement of grandparents averaged M=2.72 (range 1–5, ±1.12).

The results indicate no statistically significant difference in the children's PA ($Z=-0.075$, $p>0.941$) based on parental education level (Table 1). The children of parents with tertiary education were no more physically active than the children of parents with secondary education (M=3.75±0.61, N=150 vs. M=3.74±0.75, N=81). However, a statistically significant difference was found in ST ($Z=-3.83$, $p<0.000$), with the children of parents with tertiary education spending less time in front of screens compared to those of parents with

Table 1. Descriptive Statistics and Mann-Whitney U Test Results for Physical Activity and Screen Time by Parental Education and Coactivity with Parents and Grandparents

Variables	Grouping variable		N	Mean	SD	Mann-Whitney U	Z	p
PA	Parental education	secondary	81	3.74	0.75	6039.00	-0.075	0.941
		tertiary	150	3.75	0.61			
ST	Parental education	secondary	81	91.67	46.54	4268.50	-3.825	0.000*
		tertiary	150	67.87	40.89			
PA	Parent-child coactivity	less frequently	135	3.71	0.66	5777.50	-1.408	0.159
		more frequently	96	3.81	0.65			
ST	Parent-child coactivity	less frequently	135	83.93	43.26	4724.00	-3.600	0.000*
		more frequently	96	65.35	43.77			
PA	Grandparents-child coactivity	less frequently	169	3.75	0.66	5192.50	-0.104	0,917
		more frequently	62	3.74	0.66			
ST	Grandparents-child coactivity	less frequently	169	75.66	43.51	5170.50	-0.156	0.876
		more frequently	62	77.73	46.87			

Legend: N – number of participants; SD – standard deviation; Z – standardised value from Mann-Whitney U test; PA – Physical activity; ST – Screen time (min/day); *p < 0.05

secondary education (M=67.87±40.89, N=150 vs. M=91.67±46.54, N=81) (Table 1). Therefore, hypothesis 1 is partially supported.

There was no statistically significant difference in the children's PA (Z=-1.408, p>0.159) based on the frequency of parental participation in joint physical activities (Table 1). Children whose parents participated more frequently were no more physically active than those whose parents participated less frequently (M=3.81±0.65, N=96 vs. M=3.71±0.66, N=135). However, a statistically significant difference was found in ST (Z=-3.600, p<0.000), (Table 1). Children whose parents participated more frequently in joint physical activities spent less time in front of screens compared to those whose parents participated less frequently (M=65.35±43.77, N=96 vs. M=83.93±43.26, N=135). Therefore, hypothesis 2 is partially supported.

There were no significant statistical differences in the children's PA (Z=– 0.104, p>0.917) based on the frequency of their grandparents' participation in joint physical activities (Table 1). Children whose grandparents participated more frequently were equally active compared to those whose grandparents participated less frequently (M=3.74±0.66, N=62 vs. M=3.75±0.66, N=169). Similarly, no significant difference was observed in ST (Z=-0.156, p>0.876), (Table 1). Children whose grandparents were more frequently involved spent a similar amount of time in front of screens compared to children whose grandparents participated less frequently (M=77.73±46.87, N=62 vs. M=75.66±43.51, N=169). Therefore, hypothesis 3 is not supported.

DISCUSSION

Based on parental self-reports using the NPAQ, the mean score was 3.75 (out of 5), with older children showing slightly higher levels of PA than younger ones (3.77 vs 3.70). Given the high NPAQ scores obtained, we conclude that the children who participated in the study tend to be physically active. However, numerous studies show that preschool children are not sufficiently physically active (Matarma et al., 2017; Arts et al., 2023). Self-assessment using questionnaires is the most common method of assessing PA (Sallis & Saelens, 2000), with the possibility of bias (Warnecke, 1997; Ghanamah, 2025; Jin et al., 2025). ST is most commonly measured by the parents' self-reports of the amount of time their child spends on screens throughout a typical day (Barr et al., 2020). However, this method is imprecise (Barr et al., 2020). Thus, careful interpretation of the results is recommended. According to the World Health Organisation (2019), children between the ages of 2 and 4 should use

screens for no more than 60 min/day. Our results show that children aged 2-4 years exceed the recommendations, using screens for an average of 69.07 min/day (range 0-210 min/day). Daily screen exposure for children aged 5 and older should not exceed 120 min/day (Tremblay et al., 2014). The average ST in this age group in our study is 79.32 min/day (range 0-240 min/day), indicating that the recommendations are generally being followed. It is concerning that some preschool children use screens for up to 240 min/day. Previous research in Croatia (Rogović, Šalaj & Puharić, 2022) and worldwide (Määttä et al., 2017; Ma, Li & Chen, 2022; Carballo-Fazanes, Díaz-Pereira, Fernández-Villarino, Abelairas-Gómez & Rey, 2023) show that the average ST regularly exceeds the recommended values. Extended interaction with digital screens can have detrimental implications for children's development (Lin, Cherng, Chen, Chen & Yang, 2015) and social competencies (Ma et al., 2022). Despite the necessity of monitoring children's screen usage (Ma et al., 2022), findings from a study in Australia revealed that 50% of young and preschool children use screens without supervision (Rhodes, 2017).

Our study does not show a difference in the children's PA with respect to parental education, which is confirmed by some other studies (Kippe & Lagestad, 2018). It is possible that the lack of a significant correlation between the children's PA and parental education is influenced by the relatively homogeneous sample of parents in terms of socioeconomic status and access to PA opportunities or similar early care and education programmes (similar PA and outdoor play standards), which limits variation based on education level. Furthermore, parents across different educational levels may have similar perceptions of their child's activity.

It is important to recognise that when self-assessing PA, inaccurate perception (overestimation or underestimation) of the activities performed is possible (Medina, Jáuregui, Hernández, Shamah, & Barquera, 2021). Warnecke (1997) found that individuals exaggerate their participation in PA due to social acceptance. Recent findings indicate that parents are not sufficiently familiar with the established guidelines for recommended ST and PA for children (Csima, Podráczky, Keresztes, Soós, & Finánczc, 2024), potentially contributing to misperceptions and assessments related to these behaviours.

Our analysis did not consider whether the relationship between parental education and outcomes is moderated by the gender of the child and/or parents. Thus, Ré et al. (2025) found that sons of highly educated mothers were less physically active, since they played with a ball less in their free time. In this study, playing with a ball proved to be an important item for meeting the recommendations regarding children's PA. Furthermore, Güven, Dönmez,

İncedere and Taşar (2025) found that higher parental health literacy was greater among highly educated parents and it was associated with the more frequent participation of children in sports activities. Other studies have also found that children of highly educated parents are more physically active (Dawson-Hahn, Fesinmeyer & Mendoza, 2015; Lampinen et al., 2017; Muñoz-Galiano, Connor, Gómez-Ruano & Torres-Luque, 2020; Vorlíček et al., 2025). Conversely, Vale et al. (2014) found that more than half of the children of highly educated parents do not meet the recommendations for PA. Some parents believe that it is important to engage in joint activities, but they do not prioritise PA over some sedentary activities, including joint ST (Thompson et al., 2010). Parents cite various factors, such as a fast-paced lifestyle, adverse weather conditions and unfavourable socioeconomic status, among others (Thompson et al., 2010). We believe that highly educated parents prioritise intellectual activities over physical ones and emphasise their children's academic success. It is also possible that these children participate in additional activities during their free time that further promote academic success. Thus, academic and sports activities replace children's free play (Bento & Dias, 2017). However, numerous other factors can also influence children's PA, such as parental attitudes (Tandon, Saelens & Copeland, 2017), parental stress (Maher et al., 2017), adequate family functioning (Loprinzi, 2015), etc.

Our study found that the children of highly educated parents spend less time in front of screens, which aligns with the findings from several previous research projects (Carson & Janssen, 2012; Lin et al., 2015; Määttä et al., 2017; Burnett et al., 2023). More educated parents tend to be more effective in organising their children's leisure time, ensuring a balance between PA and SB (Muñoz-Galiano et al., 2020). In addition, during sedentary time, various quiet activities can be conducted without the use of media, such as reading, drawing, driving, dining, etc. (Aubert et al., 2022; Chaput et al., 2020). The study by Lampinen et al. (2017) identified a gender-specific trend, where lower parental education was associated with more sedentary behaviour from screen use in boys only. Parents with lower educational attainment may see screen use in early childhood as beneficial for future educational and career success (Määttä et al., 2017). However, LeBlanc et al. (2015) found that, overall, children whose fathers have more than a high school education spend more time in sedentary activities and using screens. When analysed by gender, this pattern is only evident among daughters, not sons (LeBlanc et al., 2015).

Our results show no statistically significant difference in the children's PA concerning the frequency of parental participation in joint PA (coactivity), such as walking together, playing, going to the park, etc. Several explanations are

possible for these results. There is a possible discrepancy between the parents' perceptions and the children's actual behaviour, because the study was conducted using questionnaires, not accelerometers. There is also a possible discrepancy between the parents' perception of joint activity and their actual coactivity with children. It is possible that they overestimate (accidentally or intentionally) the amount of time they spend in coactivity with children. Such uncertainties could be avoided in future research by using accelerometry for both parents and children. We emphasise that the type of PA that parents engage in with their children may vary, so not all shared PA is high-intensity. It is possible that parents, due to a lack of knowledge, do not take into account low-intensity PA achieved during the day when assessing their children's PA. Low-intensity PA is the primary activity level of preschool children, especially girls (Berglind & Tynelius, 2018). We can also ask the following question: Are parents physically active enough? Research indicates that many parents fall short and do not meet the PA recommendations (Guthold, Stevens, Riley & Bull, 2018; WHO, 2020; Bueno et al., 2025). This raises the question of whether parents who may not be active enough themselves can accurately assess physical coactivity with their children. It is possible that some parents have a more sedentary lifestyle, which is then reflected in the adoption of similar habits in their children (developing habits related to SB and physical inactivity). The PA levels and sedentary patterns of children are considerably affected by the example set by their parents (Keyes & Willson, 2021), which has an important influence on their behaviour (Maia, Braz, Fernandes, Sarmento &Machado-Rodrigues, 2025; Paudel et al., 2025). In addition, some children naturally prefer sedentary activities (Andersen et al., 2017). Therefore, it is possible that parents with calmer children encourage them to be more active through joint PA. One possible reason is that children who engage in PA with their parents are more tired and spend less time playing active games in their free time, unlike those who participate in such activities with their parents less often. There is evidence suggesting that children who spend more time outside are more physically active (Sterdt et al., 2014; Hinkley et al., 2018). Parents can take their children to the park, but without other children to play with, the child may not engage in active play. Matarma et al. (2017) found that maternal-child coactivity increases the children's PA levels. Other authors have found that parent-child coactivity influences the likelihood of meeting the recommendations for children's PA (Pyper, Harrington & Manson, 2016; Uijtdewilligen et al., 2017; Hnatiuk, Dwyer, George & Bennie, 2020) and improves communication (Thompson et al., 2010). Bingham et al. (2016) found a positive correlation between the amount of time children spend playing with their parents and their overall

PA levels. Parent-child coactivity is more significant at a younger age than in the period closer to adolescence (Rhodes et al., 2015). Various neighbourhood factors, including parks (Greer, Castrogivanni & Marcello, 2017; Hunter, Leatherdale, Spence & Carson, 2022), and parental stress (Maher et al., 2017) are crucial in coactivity. Thompson et al. (2010) found that the majority of parents believe that joint family PA is important, but despite this, they rarely engage in it. Of all forms of parental behaviour in terms of supporting children's involvement in PA, coactivity is the rarest (as much as 80.5% of parents do not participate in joint PA with their children), (Pyper et al., 2016) and 58.4% in our study. Interventions that encourage parent-child coactivity are justified and very useful (Rhodes & Lim, 2018; Grant et al., 2020). While Rhodes & Lim (2018) consider such interventions to be unsuccessful, a study conducted by Ha, He, Lubans, Chan and Ng (2022) found that coactivity between children and parents increased after an online intervention, namely parent education on so-called physical literacy.

Our research indicates that children with parents who often participate in co-activities tend to spend less time on screens compared to those whose parents are less involved in such activities. Although joint ST can promote positive family relationships, it is necessary to replace this time with some joint family activities that are important for the children's health (Pyper et al., 2016).

There was no identified difference in the children's PA or screen usage associated with the co-activities of grandparents and grandchildren in this study. Parental care for preschool children differs from that of grandparents and is superior in developing fundamental motor skills (Hu et al., 2023). Grandparents often have limited participation in PA with their grandchildren due to age, illness and/or injury, finances and the availability of playgrounds in the neighbourhood (Budden et al., 2024), which contributes to screen use (Jongenelis et al., 2024) increased sedentary activities and reduced moderate PA (Lu, Shen, Huang & Corpeleijn, 2022). Support, the availability of parks/playgrounds in the neighbourhood and play equipment positively influence the PA of grandchildren (Jongenelis et al., 2024).

We believe that parents and the extended family are key contributors to shaping healthy habits, including PA and ST. However, in our study, physical coactivity between parents/grandparents and children did not prove to be a significant factor influencing children's PA. To gain a better understanding of this issue, future research should examine how parents/grandparents and children engage in physical coactivity, examining the type of activity or play, the location (indoors or outdoors), duration, frequency and other relevant factors.

PA and ST result from complex interactions of numerous socio-ecological factors. Parental influence is multifactorial (support, encouragement, motivation, parental PA, etc.), (Rhodes et al., 2015; Pyper et al., 2016; Garriguet, Bushnik & Colley, 2017; Arts et al., 2023) and is more dominant than the influence of grandparents (Hu et al., 2023). Opportunities for PA at home (Dowda et al., 2011), attending kindergarten (Pate, Pfeiffer, Trost, Ziegler & Dowda, 2004; Dowda et al., 2011; Matarma et al., 2017; Kippe & Lagestad, 2018), siblings (Matarma et al., 2017; Schmutz et al., 2017), place of residence, the proximity and availability of parks/playgrounds, neighbourhood safety, play equipment (Terrón-Pérez, Molina-García, Martínez-Bello & Queralt, 2021; Huang, Luo & Chen, 2022; Lu et al., 2022), playground size, and the availability of sports equipment (Arts et al., 2023) are also some factors that contribute to children being more physically active. Attending kindergarten can affect children's PA (Sigmundová et al., 2016; Matarma et al., 2017; Kippe & Lagestad, 2018) more than family factors (Huang et al., 2022). Individual characteristics of the child, such as gender, often determine higher levels of PA (Pate et al., 2004; Schmutz et al., 2017; Sterdt et al., 2014), temperament (Schmutz et al., 2017), the child's inclination towards PA (Sterdt et al., 2014), the child's enjoyment of PA (Dowda et al., 2011), motor competencies (Robinson et al., 2015; Carballo-Fazanes et al., 2023), etc.

SB includes various activities that can have a complex relationship with health (Aubert et al., 2022). While reading and calm activities are advantageous for cognitive growth, it is not known that ST has health or developmental benefits for young children (Downing, Hnatiuk & Hesketh, 2015). Despite this, SB related to screen use increases at the expense of PA, even among preschool children (Dawson-Hahn et al., 2015). Consequently, children who devote more time to screen use are less likely to engage in PA (Dawson-Hahn et al., 2015; del Pozo-Cruz et al., 2019), which may negatively affect their health. Setting rules, monitoring time, using screens with the child, having meals without screens and encouraging the child to engage in activities can influence ST (Xu, Wen & Rissel, 2015).

Most parents believe that the recommendations regarding children's PA and ST are difficult to meet (Hamilton, Hatzis, Kavanagh & White, 2015), while some parents are not informed about the guidelines (Csima et al., 2024). Due to globalisation and technological development, children are deprived of free play (Bento & Dias, 2017). The study by Tandon et al. (2017) found that some parents associate outdoor play in colder conditions with a risk of illness, and a portion of them prefer their children not to play outside at all. Consequently, empowering parents to manage their children's screen use and foster outdoor PA is essential.

Some countries implement various educational programmes to train educators (Tran et al., 2025) and parents (Ha et al., 2022; Paudel et al., 2025) in leading a healthy lifestyle, as well as interventions that aim to promote PA in children while reducing SB and ST (Yoong et al., 2020). Some interventions are aimed at the entire family (Phipps et al., 2024). Some strategies include educational interventions for parents on the importance of coactivity between parents and children (Ha et al., 2022), as well as other family members who participate in childcare, then developing and strengthening parental awareness of exercise (Song & Ge, 2025), empowering the parents in forming correct views on health awareness and related behaviours (Vrijkotte, Varkevisser, van Schalkwijk & Hartman, 2020). According to Song & Ge (2025), greater parental awareness of PA correlates with greater PA in children. According to Loprinzi (2015), understanding the underlying factors that impact these behaviours is a necessary foundation for creating, applying and evaluating interventions aimed at encouraging PA and limiting sedentary habits in children. Parental awareness of their role in shaping their children's PA is crucial for the creation of effective intervention strategies (Song & Ge, 2025). Based on this, we present some basic suggestions regarding PA and SB for preschool children.

The basic recommendations regarding PA for preschool children are as follows: children aged 1-2 years: a minimum of 180 min of total daily PA; 3-4 years: at least 180 minutes daily as well, with a minimum of 60 min at moderate to vigorous intensity (Jurakić & Pedešić, 2019; WHO, 2019); children aged 5-17 years: an average of 60 min/day of moderate to vigorous PA (Jurakić & Pedešić, 2019; WHO, 2020). Parents also need to be informed about the reasons why children should play outside (Bento & Dias, 2017).

The basic recommendations for ST are as follows: children < 2 years: no ST is recommended; children 2-4 years: 60 min/day (Jurakić & Pedešić, 2019; WHO, 2019); children 5 years and older: 120 min/day (Jurakić & Pedešić, 2019).

We also believe that it is necessary to implement educational interventions aimed at parents, families and kindergarten teachers, providing information on recommendations for children's PA, SB and ST; increase awareness about the negative consequences of physical inactivity and prolonged ST in childhood; increase health literacy; promote coactivity between parents and children and other family members, and free unstructured outdoor play; empower families/teachers to foster physically active lifestyles and stimulate active play in children.

We believe that additional research should be conducted to more precisely determine the various socio-ecological factors (which may also be culturally

conditioned) that influence PA, SB and ST in children in Croatia, which would more precisely target the goals of strategic measures.

Conducting longitudinal studies covering the entire territory of Croatia would allow monitoring changes in children's PA and SB over time, as well as the influence of parents, extended family members and kindergarten teachers. Such designs would allow the identification of cause-and-effect relationships and developmental patterns that cannot be captured by cross-sectional approaches. Furthermore, future research should consider using mixed-method designs, combining objective measurements of PA and SB (e.g., accelerometry) with qualitative methods such as interviews or observations. This would contribute to a better understanding of the multifaceted socio-ecological influences on children's behaviour. By integrating different methodological approaches and extending the follow-up period, future studies could better detect dynamic changes across developmental stages and provide stronger evidence for developing and strategically planning interventions.

Encouraging children to move and reduce ST requires a holistic approach (Chen et al., 2022) and teamwork (Bento & Dias, 2017). A combination of strategies targeting the individual, family, kindergarten and policy levels is needed to improve the effectiveness of preventive measures.

In addition, for more precise and objective results, we recommend measuring PA using more reliable methods in future research (Sterdt et al., 2014), such as accelerometry or smartwatches. We also recommend measuring PA simultaneously in both children and parents to obtain more accurate results.

LIMITATIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

This study (N = 231) was conducted using a questionnaire, which relied on parental self-reporting. This methodology could introduce biases or recall errors. The use of accelerometry (or smartwatches) would have contributed to greater objectivity in the measurement of children's PA and SB. Furthermore, the study included participants from only three of the four regions of Croatia. Limited geographical coverage, as well as potential cultural, socioeconomic and other regional differences, may have influenced the children's PA and SB. Consequently, the generalizability of the findings is restricted. The children's age range in the study (2 to 7 years) was relatively wide. Although this range primarily includes preschool-aged children, developmental differences within this group could affect PA patterns. Future research should aim to increase the

sample size and extend data collection to all the Croatian regions to enable the more reliable comparisons of results. It would also be beneficial to examine in greater detail the impact of parental education, grandparental involvement and family habits on children's PA and SB. Moreover, future questionnaires should be expanded to assess other relevant socio-ecological factors that may influence children's PA, SB and ST, such as the parents' socioeconomic status, area and region of residence, the parents' health literacy, family routines, type of parent-child coactivity, parental attitudes, environmental influences, environmental characteristics, seasonal variations, climatic conditions, children's gender, a narrower developmental age range, kindergarten impact, etc. For greater generalizability and relevance, it is suggested that future studies incorporate participants from varied age groups, demographics and cultural environments.

CONCLUSIONS

PA and the time children spend using screens are influenced by multifactorial factors. Our research shows that ST is lower in the children of more educated parents and parents who spend more time in joint physical activities with their children. It is important to inform parents and family members about recommendations related to PA and ST and to encourage and empower them to proactively manage their children's free time in order to reduce SB and support healthier development. Parents should define clear rules and boundaries and limit ST. During ST, it is recommended to watch educational content, preferably together with children, and play games less. Parents, grandparents and educators should encourage children to play more actively, especially outdoors. The local community and society in general also play a major role (the accessibility of parks, safety in the neighbourhood, etc.). Various campaigns can also be implemented to educate and raise awareness about the importance of children's movement and the harmfulness of SB and physically inactive behaviour in childhood.

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