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Excessive Screen Media Use in Preschoolers Is Associated with Poor Motor Skills

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Abstract

Excessive screen media use exposure is a robust childhood predictor of sedentary behavior. The association between excessive exposure to sedentary behaviors (e.g., screen media use) and motor skills and how this association differs across sociodemographic strata is an important knowledge gap that needs to be addressed. The study aims to investigate the association of motor skills and screen media use in preschool children, taking into account sociodemographic variables, physical activity, and sleep profile. A cross-sectional survey of 926 children from 27 preschools was performed. The main outcome was defined as motor skills assessed using the general motor quotient (GMQ). Independent variables included sociodemographic variables, screen media use, screen habits, physical activity, and sleep duration. Logistic regression models were used to estimate the associations between the children's motor skills and each exposure factor. More than 55 percent of the children ate while watching television and 28 percent spent a long time watching television, playing video games, or using a computer, tablet, or cell phone. Excessive screen media use increased the risk of a low GMQ by 72 percent and inactivity in children increased the odds by 90 percent; sleep duration at night decreased the odds of a low GMQ by 51 percent and daytime sleep decreased the odds by 33 percent. Excessive screen media use has been associated with poor motor skills and increased physical inactivity in children, especially among those with prolonged exposure. Our findings can alert parents to the consequences of excessive screen media use and can motivate policymakers to encourage sports and other health-promotion strategies.

Keywords: motor skills, screen media use, physical activity, children, preschool

Introduction

Motor development is a sequential process related to an individual's chronological age and interactions among task requirements, environmental conditions, and biological characteristics.[1] The preschool period is a phase of motor acquisition and serves as the basis for gross and fine motor skill development. It is in childhood that a substantial increase in motor skills occurs, which enables the child to acquire the mastery of the body and coordination of movement essential for future high performance in activities such as reading, writing, running, jumping, and handling objects.[2] The acquisition of motor skills is linked to the development of bodily, spatial, and temporal perception, and these skills are important components of both motor learning and cognitive activities.[3,4]

Engagement in physical activity in childhood is a decisive component of motor performance. Studies suggest that participation in play and physical activity may provide one way of supporting the development of children's social and motor skills, as these behaviors offer opportunities for interaction and for children to observe and practice such skills.[5] Thus, preschool children's level of physical activity and the time that they spend on sedentary activities may be associated with health outcomes, such as overweight and obesity later in life.[6,7]

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Sedentary behaviors defined as low-energy expenditure activities are typically performed in a seated or reclined position, such as watching television, using a computer, and sitting.[8] Screen media use refers to the amount of time children spend each day watching television, playing video games, and using computers. Screen media use is one of the most common parameters used to define sedentary behavior in children.[5,9–12]

Television is the most common type of media device used among preschool children,[13,14] particularly among those who stay with nonparental caregivers and/or nannies.[15] Excessive screen media use can have adverse effects on child development, especially on the development of gross motor skills such as running, jumping, and kicking and fine motor skills such as dressing, buttoning, tying, and balance.[16–19] For each additional hour of TV watched at age 5, the risk of adult obesity increased by seven percent.[7]

Preschoolers are now growing up in environments saturated with a variety of technologies. More children are using interactive and mobile media, on a daily basis.[20] The American Academy of Pediatrics (AAP)[21] recommends limits on screen-based media, citing developmental and health risks with excessive and inopportune use. These risks include language delay, poor sleep, impaired executive function, and general cognition.[22] In addition, screen media use has been associated with health problems such as obesity, low school performance, decreased social interaction, and lower levels of physical activity.[4,6] The U.K. Millennium Cohort Study[23] analyzed data from 13,740 children born between 2000 and 2002 to study their leisure physical activity, screen media use, and mental health. Self-rated questionnaires were completed by mothers when each child was 5 years old. The study found that 61 percent of children had excessive screen media use and 45 percent did not engage in physical activity.[23,24]

Data from the National School Health Survey (Pesquisa Nacional de Saúde do Escolar—PeNSE)[25] showed that 78 percent of Brazilian school children between 11 and 15 years old watch television for 2 hours or more per day. Brazil ranks 39th among countries in terms of the percentage of households with a television[26] (97 percent of households), placing it close in rank to high-income countries such as Canada (99 percent), the United Kingdom (99 percent), and the United States (98 percent).

The association between excessive exposure to sedentary behaviors (e.g., screen media use) and motor skills and how this association may differ across sociodemographic strata is an important knowledge gap that needs to be addressed. In this study, we aimed to investigate the association between motor skills and screen media use among preschool children, taking into account sociodemographic variables, physical activity, and sleep profile.

Methods

Study design, setting, and participants

The data came from a cross-sectional survey of preschools that was part of the Brazilian Preschool Mental Health Study (PreK),[27] which was designed to determine the prevalence of internalizing and externalizing disorders in preschoolers. The data were collected in 2016, and the population was composed of preschool children 4–6 years old from 30 of the 33 preschools in the city of Embu das Artes, São Paulo, Brazil. The study was approved by the Human Ethics Committee at the Health Sciences Centre at the Universidade Federal de São Paulo (Protocol No. 1402.726/2016). Before participation, all the children's primary caregivers (parents or guardians) provided informed consent, and the children assented to participate.

Study sample size

The study sample comprised 926 children, together with their parents, recruited from among those included in a cross-sectional epidemiological study known as the Brazilian Preschool Mental Health Study (PreK).[28] The subjects included in the PreK study were randomly selected from public preschools in the urban area of the city of São Paulo, Brazil, with a probability proportional to the number of children between 4 and 6 years of age at each school. After the randomization of each class and school, a total of 1,292 children (22 percent of eligible children from 23 preschools) were assessed. The intracluster correlation coefficient ranged from 0.001 to 0.1, which corresponds to effect sizes of 1.49–5.90. The sample was calculated to achieve a power of 80 percent to identify internalizing and externalizing behaviors in children, weighted for sex and differences among neighborhoods in terms of socioeconomic level. The preschools included in this subsample were those that were the largest and closest to the city center. The sample weight was recalculated for the smaller sample size. The design weight is the inverse of the sampling fraction, the sample weight for each student in each class and each preschool being thus obtained. There were no statistical differences between our subsample and the total PreK study sample in terms of the sociodemographic variables ($p = 0.93$).

The caregivers (parents or legal guardians) of the children were interviewed regarding the sociodemographic characteristics of the children, including age, sex, birth weight, screen media use, screen habits, physical activity, sleep duration, externalizing behaviors, and internalizing behaviors, and those of socioeconomic status of the family. Data were obtained regarding the children's places and times of play, types of play, caregivers' perceptions of children's physical activity levels, participation in sports outside school, number of hours of sleep obtained during the night and day, screen media use, and eating while watching television (screen habits) on both weekdays and weekend days, all indicating children's activity profiles; these data were parent-reported through a physical activity and child habits questionnaire.[28] A sample question is ''What does your son like to play? ball/bike, playing outdoors/indoors, playing video games and watching TV.'' There were four response options for screen media use: <1 h/day, >1 but <2 h/day, 2 h/day, or >2 h/day. The interviews were conducted at the preschools and were ~90 minutes in duration.

Children were assessed directly regarding their motor skills using the Motor Development Scale (MDS).[29] The assessments were carried out by trained health professionals during school hours. It took ~30 minutes to evaluate each child.

Variables and measurements

Outcome (dependent variable). The MDS has been shown to be a reliable and valid instrument for assessing

motor development in the Brazilian population.[1,30,31] The main outcome was categorical motor skills assessed using the general motor quotient (GMQ). The GMQ is based on an MDS test battery,[1,29] designed to directly assess children in the following domains: (a) fine and global motricity, (b) balance, (c) body schema and spatial organization, and (d) temporal organization. It is used to evaluate the level of motor development in 2- to 11-year-old children. The children examined proceed to tasks at the previous or next developmental age depending on task completion success. Fine motricity assesses fine motor and visuomotor skills and was based on the performance of tasks such as tying a knot, drawing trail, threading, throwing a small ball at a target, and touching the finger tips with the thumb. The global motricity domain involves gross motor and dynamic balance tasks including jumping on one foot and walking on a straight line. Balance includes static balance tasks of standing on tiptoe, standing on one foot with eyes open and closed, and stork balance. Body schema includes tasks such as imitation of gestures and graphic speed. Spatial organization comprises laterality tasks (self and others' body perspective) and constructing a rectangle from two triangles. Temporal organization includes tasks such as repeating verbal phrases and reproducing visual or auditory stimuli.

To operationalize the outcomes, the GMQ was dichotomized into two categories, namely, low motor skills and normal/superior motor skills, based on the quartile distribution. The first quartile was bounded by values ≤ 89.86, the second by values between 89.87 and 95.72, the third by values between 95.73 and 101.82, and the fourth by values >101.83. The distribution of the quartiles was dichotomized into low values (GMQ ≤ 89.86) that, according to the MDS, correspond to the risk for motor development delay and normal/superior values (GMQ > 89.86).

Associated factors (independent variables). The sociodemographic variables analyzed included sex; age in years ethnicity; primary caregiver education level; socioeconomic status including parental level of education and socioeconomic status of the family (according to the Associação Brasileira de Empresas de Pesquisa—ABEP),[32] grouped into classes A-B (upper), C (middle), and D-E (lower); and gestational age and birthweight, both of which were self-reported by the caregivers.

Statistical analysis

The data were first analyzed using descriptive statistics (frequency distributions, quartile ranges, and 95% confidence intervals [95% CIs]). To determine the associations between the categorical variables, the chi-square test was used.

A simple regression was used to evaluate the association between motor skills and the predictor variables. The regression coefficients were exponential and interpreted as odds ratios for inferior motor skills relative to those of children with normal/superior motor skills (the reference category).

A multivariate regression model was used to fit all the independent variables to control potential confounders and to test the robustness of the univariate model. Variables with $p < 0.20$ were included in the multivariate model.

The backward selection method was applied for variable selection in the multivariate model. Both the chi-square tests and the regression models were performed using the statistical software SPSS 20 while taking into account sampling plan structure (''Complex Samples'' module).[33,34] The results are presented as weighted proportions (wt%), crude odds ratios, adjusted odds ratios, and 95% CI.

Results

The proportion of boys and girls was similar, with a predominance of 5- to 6-year-olds (72.8 percent). A total of 57.5 percent of the children were nonwhite, and 73.0 percent and 90.3 percent were born at term and had a normal birth weight, respectively. In addition, 61.4 percent of the children's caregivers had at least a high school education, and 62.6 percent of the families were classified as middle class. Most (96.7 percent) of the children were classified as inactive, and 90.0 percent did not participate in sports regularly. More than 55 percent of the children ate while watching television and 28 percent spent >2 hours per day watching television, playing video games, or using a computer, tablet, or cell phone.

The distribution and associations between the GMQ classes and the variables are given in Table 1. All these variables were significantly associated with the GMQ, with the exception of ethnicity ($p = 0.807$) and caregiver education level ($p = 0.056$). Higher odds of a lower GMQ were observed for boys, children 5–6 years of age, and those born prematurely or with a low weight than for female children, children in other age groups, and children without these conditions. In addition, there were higher odds of having inferior motor skills in children belonging to the middle and lower classes than in children in the upper class. There was also a significant association between the GMQ and leisure activity ($p < 0.001$), caregiver perceptions of active behavior ($p < 0.001$), time spent watching television ($p < 0.001$), eating while watching television ($p = 0.032$), regular participation in sports ($p = 0.001$), sleep at night ($p < 0.001$), and sleep during the day ($p < 0.001$).

The multivariate model showed that motor skills are associated with sex, age, caregiver education level, socioeconomic class, gestational age at birth, leisure activity, caregiver perception of active behavior, regular participation in sports, sleep at night, and sleep during the day. All variables remained significant and tended to maintain the direction of the estimates in the multivariate model, except for ethnicity, birth weight, and activity in relation to ''where the child plays'' and ''eating while watching television'' (Table 2). Excessive screen media use increased the risk of a low GMQ by 72% and inactivity in children increased the odds by 90 percent; sleep duration at night decreased the odds of a low GMQ by 51 percent and daytime sleep decreased the odds by 33 percent.

Discussion

In this study, we aimed to investigate the association between motor skills and screen media use in preschool children, taking into account sociodemographic variables, physical activity, and sleep profile. We found a significant association between motor skills and various behaviors, including screen media use, engagement in physical activity

TABLE 1. WEIGHTED PREVALENCE OF EXPOSURE VARIABLES ACCORDING TO GENERAL MOTOR QUOTIENT (GMQ) CLASS

	Lower GMQ scores		*Normal/Upper GMQ scores*		
	wt% (95% CI)	n	*wt% (95% CI)*	n	p
Sex ($n=926$)					**<0.001**
Female ($n=451$)	19.5 (16.1–23.4)	88	80.5 (76.6–83.9)	363	
Male ($n=475$)	31.4 (30.1–37.1)	149	68.6 (64.3–72.6)	326	
Age ($n=925$)					**<0.001**
4 years ($n=233$)	1.7 (0.5–4.5)	4	98.3 (95.5–99.5)	229	
5–6 years ($n=692$)	33.5 (30.1–37.1)	232	66.5 (62.9–69.9)	460	
Ethnicity ($n=925$)					0.807
Nonwhite ($n=532$)	25.4 (21.9–29.3)	135	74.6 (70.8–78.1)	397	
White ($n=393$)	25.7 (21.6–30.3)	101	74.3 (69.8–78.4)	292	
Caregiver education level ($n=924$)					0.056
Illiterate—completed primary school ($n=165$)	26.7 (20.5–33.9)	44	73.3 (66.1–79.5)	121	
Completed middle school—did not complete high school ($n=191$)	27.7 (21.9–34.5)	53	72.3 (65.5–78.1)	138	
Completed high school or college ($n=568$)	24.5 (21.1–28.2)	139	75.5 (71.8–78.9)	429	
ABEP economic class ($n=902$)					**0.004**
Upper ($n=237$)	23.2 (18.3–29.0)	55	76.8 (71.0–81.7)	182	
Middle ($n=564$)	26.1 (22.6–29.8)	147	73.9 (70.2–77.4)	417	
Lower ($n=101$)	26.7 (19.0–36.1)	27	73.3 (63.9–81.0)	74	
Gestational age at birth ($n=921$)					**<0.001**
Preterm ($n=154$)	33.1 (26.2–40.9)	51	66.9 (59.1–73.8)	103	
Term ($n=672$)	24.1 (21.0, 27.5)	162	75.9 (72.5–79.0)	510	
Post-term ($n=95$)	22.1 (14.9–31.5)	21	77.9 (68.5–85.1)	74	
Birth weight ($n=777$)					**<0.001**
Low ($n=75$)	30.7 (21.4, 41.9)	23	69.3 (58.1–78.7)	52	
Normal ($n=702$)	23.6 (20.7, 26.9)	166	76.4 (73.1–79.4)	536	
Leisure time activity ($n=843$)					**<0.001**
Yes ($n=355$)	28.5 (24.0–33.4)	101	71.5 (66.6–76.0)	254	
No ($n=488$)	23.0 (19.4–26.9)	112	77.0 (73.1–80.6)	376	
Where child plays ($n=922$)					**0.848**
Yard/street ($n=31$)	25.8 (13.5–43.5)	8	74.2 (56.5–86.5)	23	
Inside the home ($n=891$)	25.5 (22.7–28.4)	227	74.5 (71.6–77.3)	664	
Caregiver perception of child activity ($n=920$)					**<0.001**
Active ($n=858$)	24.5 (21.7–27.5)	210	75.5 (72.5–78.3)	648	
Inactive ($n=62$)	38.7 (27.6–51.2)	24	61.3 (48.8–72.4)	38	
Screen media use ($n=921$)					**<0.001**
Acceptable (>1–2 h) ($n=660$)	22.9 (19.8–26.2)	151	77.1 (73.8–80.2)	509	
Excessive (≥ 2 h) ($n=261$)	32.2 (26.8–38.1)	84	67.8 (61.9–73.2)	177	
Eats while watching television ($n=921$)					**0.032**
No ($n=411$)	24.3 (20.4–28.7)	100	75.7 (71.3–79.6)	311	
Yes ($n=510$)	26.5 (22.8–30.5)	135	73.5 (69.5–77.2)	375	
Regular sports participation ($n=920$)					**0.001**
Yes ($n=91$)	19.8 (12.8–29.2)	18	80.2 (70.8–87.2)	73	
No ($n=829$)	26.1 (23.2–29.2)	216	73.9 (70.9–76.8)	613	
Duration of sleep at night ($N=920$)					**<0.001**
Appropriate (9–11 hours) ($n=684$)	28.4 (25.1–31.9)	194	71.6 (68.1–74.9)	490	
Inappropriate (7 > 12 hours) ($n=236$)	16.9 (12.7–22.3)	40	83.1 (77.7–87.3)	196	
Sleeps during the day (>2 hours) ($n=922$)					**<0.001**
No ($n=778$)	27.5 (24.5–30.8)	214	72.5 (69.3–75.5)	564	
Yes ($n=144$)	14.6 (9.67–21.3)	21	85.4 (78.7–90.3)	123	

Weighted prevalence of variables according to general motor quotient class.

ABEP, Brazilian Association of Research Companies, as described in the Methods section; upper (A–B), middle (C), lower (D–E); nonwhites include mixed (419), Black (78), Asian (26), others (9); gestational age at birth, preterm (<37 weeks), term (37–41 weeks), post-term (>42 weeks); leisure time activity, yes (play football and bike), no (play with toys and draw); *p*, descriptive level of the chi-square test considering the sampling plan. Significant results are shown in bold type.

CI, confidence interval.

Table 2. Estimated Odds Ratios Based on the Multivariate Regression Models for the Outcome Low Motor Skills

	Initial model		*Final model*	
	OR (95% CI)	p	*OR (95% CI)*	p
Female sex (Ref. male)[a]	0.61 (0.52–0.70)	**<0.001**	0.53 (0.47–0.60)	**<0.001**
Age of 4 years (Ref. 5–6 years)[a]	0.04 (0.03–0.05)	**<0.001**	0.04 (0.03–0.06)	**<0.001**
White ethnicity (Ref. nonwhite)	0.97 (0.81–1.17)	0.768		—
Caregiver education (Ref. complete high school or college)[a]				
Illiterate—completed primary school	1.31 (1.05–1.62)	**0.018**	1.31 (1.08–1.59)	**0.008**
Completed middle school—did not complete high school	1.14 (0.95–1.38)	0.156	1.20 (1.01–1.41)	**0.035**
ABEP economic class (Ref. Middle)[a]				
Lower	0.86 (0.73–1.01)	0.066	0.93 (0.83–1.05)	0.245
Upper	0.94 (0.84–1.05)	0.234	0.82 (.74–.90)	**<0.001**
Gestational age at birth (Ref. at term)[a]				
Preterm	1.96 (1.43–2.70)	**<0.001**	1.92 (1.53–2.40)	**<0.001**
Post-term	1.08 (0.83–1.42)	0.550	1.08 (0.82–1.43)	0.556
Birth weight (Ref. normal)	1.09 (0.81–1.48)	0.554		—
Activity performed during leisure time (Ref. active)[a]	0.86 (0.76–0.97)	**0.012**	0.86 (0.78–0.95)	**0.005**
Where child plays (Ref. active)	1.01 (0.76–1.33)	0.967		—
Caregiver perception of active behaviors compared with other children (Ref. active)[a]	2.25 (1.41–3.58)	**0.001**	1.90 (1.27–2.83)	**0.003**
Screen media use (Ref. active)[a]	1.61 (1.44–1.80)	**<0.001**	1.72 (1.54–1.91)	**<0.001**
Eats while watching television (Ref. active)	0.95 (0.82–1.10)	0.502		—
Regular sports participation (Ref. active)[a]	1.89 (1.56–2.28)	**<0.001**	1.85 (1.56–2.20)	**<0.001**
Regular sleeps at night (Ref. not regular)[a]	0.58 (0.49–0.68)	**<0.001**	0.51 (0.43–0.61)	**<0.001**
Sleeps during the day >2 hours (Ref. active)[a]	0.33 (0.27–0.41)	**<0.001**	0.33 (0.27–0.40)	**<0.001**

[a]Simultaneous inclusion of the variables in the multivariate model with $p < 0.20$ from the univariate model; lower (D-E), upper (A-B); $n = 684$ and $n = 813$, respectively for the univariate and multivariate models; excluded from the final model because $p \geq 0.20$. Significant results are shown in bold type.

OR, odds ratio.

during leisure time, caregiver perceptions of children's active behavior (compared with other children), regular participation in sports, sleep at night, and sleep during the day. Nonactive children with longer screen media use who slept less at night had a greater chance of having inferior motor skills. Other important findings in our study included the associations between motor skill level and all sociodemographic characteristics, except for ethnicity and caregiver education level. Low GMQ values were more common among boys, children 5–6 years of age, and children born prematurely or with low birth weights.

Childhood is a critical period for motor and cognitive development, and it is significantly influenced by the environment.[3] The fact that children explore the environment through motor activities implies changes in their physical, perceptual-motor, and behavioral development. Thus, it is recommended that children up to 11 years of age perform at least 60 minutes of physical activity per day, have 2 hours or less of leisure screen media use per day, and sleep 9–11 hours per night.[15]

Activities such as playing and learning are vital to a child's motor development.[35] However, in recent decades, children's lifestyles have become more sedentary. For example, 593 four-year-old British children using an accelerometer were less active and more sedentary outside preschool hours.[36] A similar study with 703 Australian 3- to 5-year-old preschool children showed that children were highly sedentary and engaged in low levels of physical activity.[37] A recent study with 899 preschoolers showed that children 3–5 years of age spent ~8 percent of the day in preschool activities, and most of the day (>50 percent) was spent in sedentary activities at home. Many studies have found that physical activity decreases as screen media use increases.[7]

Recently, a systematic review of 67 cross-sectional and longitudinal studies reported a significant association between high exposure to screen media use and poor sleep outcomes in 90 percent of cases.[38] One possible underlying mechanism that could explain these associations is that the bright light from screens suppresses melatonin production, altering aspects of the circadian cycle and increasing mental and physiological arousal.[39] A study conducted in 2017 found that for every hour children spend on electronic gadgets, they lose ~16 minutes of sleep.[40] Similarly, infants and children who spent more time using a screen slept less at night, and although they slept more during the day, they slept less overall and took longer to fall asleep.[40]

Similar to our findings, other studies suggest that while motor skills in children are developing, there may be differences in performance between the sexes based on the type of skill and/or the age of the individual. In our study, 19.5 percent of girls had a lower GMQ compared with 31.4 percent of boys. Motor skill performance should improve with advancing age because motor development is subject to the maturational process, which is a biological mechanism related to chronological age that leads to improvements in all physical and cognitive domains.[41] However, studies have shown that improvements in and mastery of motor skills also depend on factors such as opportunities, stimuli, and quality with respect to these tasks.[42] For example, Gabbard proposed

that girls are more efficient in specific locomotor tasks that require fine motor control, flexibility, and balance.[43] In contrast, boys are more interested in toys that contain mobile components and activities that promote gross motor activity, such as running and playing ball.

Supporting our results, prematurity and low birth weight have been well described in the literature as major risk factors for delays in motor development because of the immature central nervous and sensorimotor systems in premature and low birth weight children.[44] In addition, inferior motor skills were observed more often in children belonging to the middle and lower economic classes (31 percent) than in children in the upper class, which is in agreement with previous findings.[45–47] This trend may be related to the greater opportunity that children in upper classes have to engage in activities such as playing sports and video games and having a tablet or computer at home, especially one with Internet access.[45,48] Brazilian data from the PeNSE[25] showed that, among ninth graders, 95.5 percent of private school students had computers, compared with 59.8 percent of public school students. Many studies have observed that the relationship between screen media use and socioeconomic class varies according to the type of sedentary behavior: adolescents from lower middle socioeconomic backgrounds spent more time watching television and less time engaged in other behaviors, such as doing homework, drawing, using the computer, or playing video games.[3,7,49] Similar results have also been found in other studies.[47,50] Thus, it is likely that the types of sedentary behaviors observed in children from upper socioeconomic classes relate to computer and video game use, whereas children belonging to lower classes may have greater access to televisions. The increased use of devices with screens may be the result of changes that have taken place in society in the last few decades as economic growth has allowed families, especially those from the lower middle classes, greater access to televisions, computers, and leisure Internet use. There has also been a reduction in the number of public spaces available for engagement in physical activities owing to safety concerns in urban areas.[8]

Several limitations of this study should be noted. Using measures reported by caregivers to assess physical activity levels represents a limitation owing to the possibility of the reports being imprecise. However, self-reported measures have been widely employed in recent studies with large population groups, and the results have been shown to be valid.[36] Moreover, considering that this is a cross-sectional survey, we were not able to infer causation, and all the associations found should not be interpreted as cause–effect relationships. Other limitations include a limited range of economic class diversity, lack of geographic variability, and therefore inherent limitations because the cultural dynamics of the country in general may not transfer to United States, United Kingdom, and other European cultures. However, data on children attending preschool suggest that public health interventions based in schools may be more likely to have a beneficial impact on children's activity levels and screen media use.

In summary, excessive screen media use was associated with poorer motor skills, especially among children with long-term exposure. Further longitudinal studies are needed to examine whether the factors identified in this study continue to compromise motor skills in the long term. Our findings are important for alerting parents about the consequences of the excessive use of technology among children and for encouraging public health policymakers to implement health promotion strategies such as sports practice.

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