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Problematic media use, screen time, and literacy-related motor skills in first-grade children

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ABSTRACT

Increasing exposure to digital media has raised concerns about its developmental correlates. This cross-sectional study examined screen time duration and problematic media use in relation to literacy-related motor skills in 196 first-grade children. Parents reported weekday and weekend screen time and completed the Problematic Media Use Scale, while teachers rated motor performance. Nearly half of the children exceeded two hours of screen time on weekdays, rising to 77% on weekends. Weekday screen time above two hours was associated with lower fine motor scores ($B = -1.67$, $p = 0.011$). Higher problematic media use scores were also associated with poorer fine motor performance ($B = -0.061$, $p = 0.006$), including after adjustment for hyperactivity/inattention symptoms. Associations with body awareness were inconsistent. These findings suggest that screen duration and problematic media use capture partly distinct aspects of media engagement, with problematic use showing a more consistent association with fine motor performance.

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Children; child development; literacy; motor skills; problematic media use; screen time

Introduction

In recent years, the rapid advancement of technology has significantly increased the accessibility of screen-based media and the frequency of their usage in daily life. Beyond traditional media devices, smartphones, tablets, and computers are now ubiquitous in households, leading to earlier and more frequent exposure to digital content during critical stages of brain development (Brushe et al., 2023; Chen & Adler, 2019). As media use has become embedded in daily routines, increasing attention has focused on its associations with children's social, emotional, cognitive, and motor development(-Madigan et al., 2019a). Prolonged screen exposure has been linked to a range of health and developmental outcomes, such as obesity, sleep disturbances, and myopia(Foreman et al., 2021; Liu et al., 2022; Nagata et al., 2022; Priftis & Panagiotakos, 2023). As well as delayed language acquisition, impaired executive function, and emotional-behavioural difficulties(Madigan et al., 2019b; Tremblay et al., 2011).

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Systematic reviews have consistently demonstrated an inverse relationship between screen exposure and academic performance, with studies showing that watching television for more than two hours daily (Tremblay et al., 2011), as well as greater durations of television viewing and video game playing, are associated with lower academic achievement in children(Adelantado-Renau et al., 2019).

Motor proficiency plays a significant role in children's academic performance and the acquisition of early literacy skills (Cameron et al., 2016; Li et al., 2025; Macdonald et al., 2018, 2020; Pienaar et al., 2014; Vuijk et al., 2011). Fine motor skills—defined as small, precise movements requiring hand–eye coordination, such as holding a pencil, cutting, and drawing – are fundamental to early academic and developmental functioning. Their proficiency is closely linked to writing performance, influencing letter formation, writing speed, and legibility(Burns et al., 2022; Dinehart & Manfra, 2013; Suggate et al., 2023), and is also associated with mathematical competencies such as number recognition, arithmetic operations, and spatial reasoning(Flores et al., 2023; Luo et al., 2007). Similarly, gross motor skills, involving larger muscle groups for actions such as walking, running, and jumping (Burns et al., 2022), have been associated with attentional processes, behavioural regulation, and spatial awareness. Components such as balance and rhythmic movement have been shown to correlate positively with cognitive flexibility and mathematical problem-solving abilities (Cameron et al., 2016; Zhou & Tolmie, 2024).

In recent years, the relationship between motor skills and screen exposure in children has been studied, yet findings remain inconsistent. Some studies report that increased screen time in preschoolers is associated with declines in both fine and gross motor skills (André & Cochetel, 2022; Cadoret et al., 2018; Zheng & Sun, 2022), while others have reported no significant correlation in similar age groups (Operto et al., 2020). A recent systematic review similarly concluded interactive technology use was negatively associated or unrelated to motor proficiency (Arabiat et al., 2023). A study conducted in school-aged children also reported no significant relationship between fine motor skills and media viewing (Nobusako et al., 2020). These conflicting findings may stem from the heterogeneous nature of the studies, the variety of digital devices measured, and difficulties in accurately measuring screen time (Operto et al., 2020). Moreover, reliance on time-based measures may not adequately capture qualitative differences in media engagement that could be relevant for motor development. In this regard, problematic media use may provide complementary information beyond exposure duration by reflecting behavioural characteristics of media engagement, such as preoccupation with media, difficulty disengaging, and dysregulated patterns of use.

Given the inconsistent findings in the literature and the established role of motor skills in early academic functioning, further research is needed to clarify these relationships during the early school years. Because literacy-related motor skills are closely linked to the acquisition of reading and writing, first grade represents a particularly relevant developmental period in which these skills are actively developing and may be sensitive to environmental influences. To address gaps in prior research, the present study adopted a multi-informant design, combining teacher-reported assessments of literacy-related motor skills with parent-reported measures of screen time duration and problematic media use. The study aimed to examine whether screen exposure duration and problematic media use are associated with literacy-related motor skills in first-grade children, while accounting for hyperactivity/inattention symptoms.

Methods

Participants and procedure

This study employed a school-based cross-sectional design and was conducted between January and February 2024 with parents and teachers of first-grade students in the province of Rize during the 2023–2024 academic year. A power analysis was conducted using *G*-Power 3.1 software to determine the minimum required sample size. Based on a regression model with a fixed effects R^2 of approximately 0.15, an effect size of 0.12, a power of 0.95, an alpha of 0.05, and five predictor variables, the required sample size was estimated as 144 participants.

Prior to the study, necessary written permissions were obtained from the Rize Provincial Directorate of National Education. Ethical approval for the study was obtained from the Recep Tayyip Erdogan University Non-Interventional Clinical Research Ethics Committee with decision number 2023/284 on 28/12/2023. The study was conducted in accordance with the principles of the Declaration of Helsinki. Written consents were obtained from families who voluntarily participated in the study.

Six primary schools were visited, and meetings were held with classroom teachers to identify eligible children. Teachers were asked to nominate students whose academic performance was consistent with grade-level expectations and who were not experiencing difficulties in cognitive, physical, or language development related to reading and writing skills. This approach was intended to minimize factors that could independently influence literacy-related motor skills and make it more difficult to examine their associations with media use. Parents were contacted through these teachers, and those who consented were enrolled in the study. Inclusion criteria for the study were being a first-grade student, not having repeated a grade, having attended pre-school education, having no history of psychiatric diagnosis and treatment, not having received special education, having no chronic disease (such as epilepsy, diabetes, asthma, etc.) or continuously used medication, and not being in a risky group in terms of socioeconomic level. Initially, data from a total of 245 children were collected. However, children with missing sociodemographic information (n = 9), at risk for Attention Deficit Hyperaticvity Disorder (n = 8), and with incomplete forms (n = 23) were excluded from the study. The research was completed with a total of 196 students studying in primary education institutions under the Rize Provincial Directorate of National Education. All participants were administered the Sociodemographic and Clinical Characteristics Data Form, the Problematic Media Use Scale, and the Motor Skills Rating Scale (MSRS) for Reading and Writing.

Measures

Sociodemographic and clinical characteristics were collected from parents using a data form developed by the authors. This form included questions regarding sociodemographic characteristics, medical history, and motor-mental development (*e.g.* 'At what age did your child walk?' and 'At what age did your child say their first words?'). Within the same form, children's screen time, which included television viewing and other digital media device use (*e.g.* tablets, smartphones, and computers), was queried and evaluated separately for weekdays and weekends. Total daily screen time was calculated separately for weekdays and weekends by summing the average time spent on television

and other digital devices. The 2-hour threshold was used to facilitate interpretation of the findings in relation to commonly used paediatric screen-time recommendations and to allow comparison with previous studies using the same cut-off. Additionally, it was asked whether participants could meet their independent daily needs, if they experienced difficulties in motor activities aimed at assessing fine and gross motor skills, and if they rode a bicycle without support (and at what age, if they had learned).

Problematic Media Use Scale (PMUS)

The PMUS was developed by Domoff et al. to evaluate problematic patterns of screen-based media use among children aged 4–11 years (Domoff et al., 2019). It consists of 27 items rated on a 5-point Likert scale (1 = never to 5 = always). The total score is obtained by averaging all item scores, with higher scores indicating more problematic use. Rather than focusing on a single type of device, the PMUS captures children's overall problematic engagement with screen-based media, including television, tablets, smartphones, and computers. The Turkish adaptation and validation were conducted by Furuncu and Öztürk (Furuncu & Öztürk, 2020), demonstrating good internal consistency.

The Motor Skills Rating Scale (MSRS) for reading and writing

The MSRS, developed by Cameron et al.(Cameron et al., 2012), assesses classroom motor skills relevant to reading and writing, based on teachers' observations. Each item is rated on a 5-point Likert scale (0 = not observed, 1 = never, 2 = rarely, 3 = often, 4 = almost always). The original scale includes three subdimensions; however, in the Turkish validation study, only two subscales were retained: Fine Motor Skills (8 items) and Body Awareness (8 items) (Kara & Filikci, 2022). The Fine Motor subscale evaluates dexterity and precision in academic tasks, whereas the Body Awareness subscale reflects gross motor coordination and postural control (Kim et al., 2015). Higher scores on the Fine Motor subscale indicate better motor proficiency, whereas higher scores on the Body Awareness subscale represent poorer motor performance, consistent with the original scoring system.

The Strengths and Difficulties Questionnaire (SDQ). The SDQ**,** developed by Goodman, is a 25-item screening instrument used to assess emotional and behavioural difficulties in children and adolescents (Goodman, 2001). In the present study, the parent-report version was administered. The SDQ comprises five subscales: Conduct Problems, Hyperactivity/Inattention, Emotional Symptoms, Peer Problems, and Prosocial Behaviour. The sum of the first four subscales yields the Total Difficulties score. Higher scores on the Prosocial scale reflect strengths, whereas higher scores on the other subscales indicate greater behavioural or emotional difficulties. The Turkish validity and reliability study was conducted by Güvenir et al. (Güvenir et al., 2008). In the current study, the Hyperactivity/Inattention subscale was included as a covariate in hierarchical regression analyses to account for behavioural regulation difficulties. As a sensitivity analysis, the Total Difficulties score was additionally tested to examine whether findings remained robust when adjusting for broader behavioural symptomatology.

Statistical analysis

The Anderson–Darling test was applied to assess the normality of continuous variables. As normality assumptions were met, continuous variables were presented as mean ± standard deviation, and categorical variables as count (%). Comparisons between two independent groups were conducted using independent samples t-tests for continuous variables and chi-square tests for categorical variables. For comparisons involving more than two groups, one-way analysis of variance (ANOVA) was applied. Statistical significance was set at $p < 0.05$.

Bivariate associations between dependent and independent variables were examined using Pearson's correlation coefficients. Hierarchical multiple linear regression analyses were conducted to examine the independent associations of problematic media use and screen duration with motor outcomes. Covariates (demographic and motor-related variables) were entered in the first block, weekday screen time in the second block, PMUS scores in the third block, and SDQ Hyperactivity/Inattention scores in the final block. Changes in explained variance (ΔR^2) were evaluated at each step to determine the incremental contribution of each predictor. Sensitivity analyses were performed by replacing the SDQ Hyperactivity/Inattention subscale with the SDQ Total Difficulties score. Regression assumptions were examined prior to model estimation. Multicollinearity diagnostics were acceptable (all VIF < 2.5), and residual independence was supported (Durbin–Watson $\approx$ 2.0). Regression coefficients were evaluated using unstandardized regression coefficients (B), standard errors, and corresponding *p*-values. All analyses were conducted using Jamovi (Version 2.4.6).

Results

A total of 196 first-grade students participated in the study (99 females, 50.5%; 97 males, 49.5%). Screen time patterns revealed significant weekday-weekend differences. On weekdays, 14.8% of children watched television for more than two hours, while 11.2% used smart devices beyond this threshold. These proportions increased substantially on weekends to 37.3% for television viewing and 26% for smart device use. When examining total combined screen time, 48% (n = 94) of participants exceeded two hours daily on weekdays, rising to 77% (n = 151) on weekends. According to SDQ cut-off values, 23.6% of children scored within the borderline/abnormal range for hyperactivity (≥6), of whom 11.8% were in the abnormal range (≥7). For the Total Difficulties score, 12.3% of participants were in the borderline/abnormal range (≥14), including 4.6% in the abnormal range (≥17). Descriptive statistics for screen times and scale scores are presented in Table 1.

No significant gender differences were found for screen time duration or scale scores (all $p > 0.05$) or in PMUS and MSRS scores (PMUS: $p = 0.789$; MSRS-Fine Motor: $p = 0.350$; MSRS-Body Awareness: $p = 0.254$).

The distribution of weekday and weekend TV and other smart device use durations, as well as PMUS and MSRS scores by gender, is presented in Figure 1.

Correlation analyses (Table 2) demonstrated significant associations between screen time and motor outcomes. Significant negative correlations emerged between MSRS-Fine Motor scores and both weekday TV ($r = -0.236$, $p < 0.001$) and other device use (r

Table 1. Distribution of screen exposure, behavioural measures, and motor skill scores.

Variable	Mean	Median	SD	Minimum	Maximum
Screen time(minute/ day)					
Weekdays-TV	88.7	60	69.34	0	480
Weekdays-other devices	69.7	60	61.85	0	300
Weekends-Tv	129.8	120	87.70	0	600
Weekends-other devices	109.7	120	88.77	0	720
Problematic media use Measure	44.5	41	15.46	27	98
Motor Skills Rating Scale					
Fine motor	26.4	27	4.67	13	32
Body awareness	12.2	11	4.02	8	27
Strengths and difficulties Questionnaire					
Hyperactivity/inattention	4.02	4	2.06	0	10
Total difficulties	8.74	8	4.29	2	25

= −0.234, $p < 0.001$), suggesting poorer fine motor performance with increased weekday screen time. Weekend screen time showed negative associations (TV: r = −0.169; devices: r = −0.146, both $p < 0.05$). For Body Awareness (where higher scores indicate poorer performance), only weekday other device use showed a positive correlation (r = 0.248, $p < 0.001$), with no other significant associations (all $p > 0.05$).

The relationships between the total screen times (0-2 h/over 2 h) of the cases on weekdays and weekends and their PMUS and MSRS scores are presented in Table 3. Significant differences emerged for PMUS ($p < 0.001$) and MSRS subscales – fine motor ($p < 0.001$) and body awareness ($p = 0.008$) – based on weekday screen exposure.

The correlation matrix analyses presented in Figure 2 reveal the relationships between screen time and PMUS and MSRS scores. Weekday screen time showed: (1) a positive correlation with PMUS scores (r = 0.265, $p < 0.001$), (2) a negative correlation with fine motor skills (r = −0.247, $p < 0.001$), and (3) a positive correlation with body awareness (r = 0.188, $p = 0.008$), indicating an association with poorer gross motor proficiency. Weekend screen time only demonstrated a positive association with PMUS (r = 0.277, $p < 0.001$), while showing no significant relationships with either fine motor (r = −0.086, $p = 0.23$) or

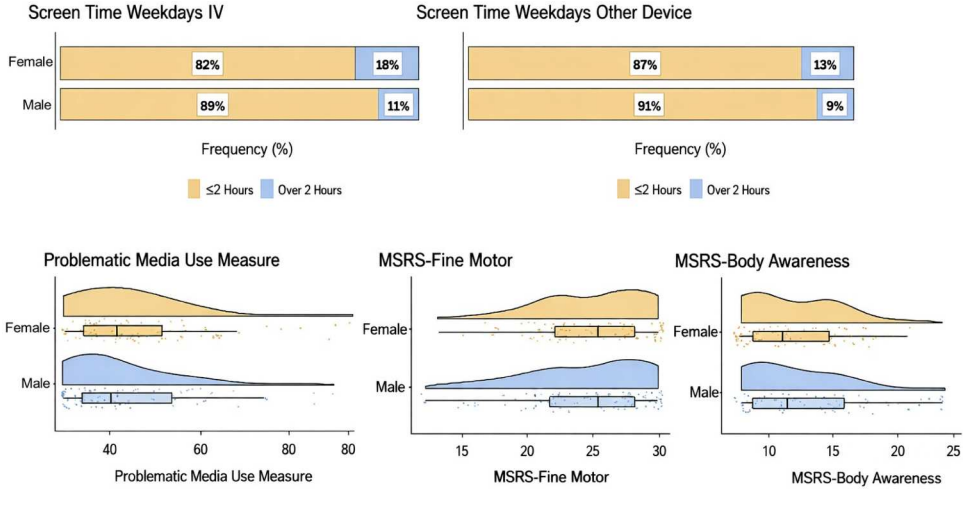


Figure 1. The distribution of screen times and scale scores by gender.

Table 2. Correlation of screen times with motor skills.

Variable	Weekdays TV*	Weekends TV*	Weekdays other devices*	Weekends other devices*
MSRS-fine motor	−0.236***	−0.169*	−0.234***	−0.146*
MSRS-body awareness	0.130	0.112	0.248***	0.130

*The screen time is given in minutes/day. All correlations were calculated using Pearson's r. *$p < .05$, **$p < .01$, ***$p < .001$. MSRS: Motor Skills Rating Scale, n = 196.

Table 3. Associations between screen time and PMUS and MSRS.

		WeekdaysCount (%)			WeekendsCount (%)		
Variable		Descriptive Statistics ($\overline{Mean} \pm$ SD)	Test Statistics	*p*-value*	Descriptive Statistics ($\overline{Mean} \pm$ SD)	Test Statistics	*p*-value
PMUS	0-2 h	40.6 ± 12.8	−3.83	**< 0.001**	36.7 ± 10.7	−4.018	**< 0.001**
	Over 2 h	48.8 ± 16.9			46.8 ± 15.9		
MSRS-Fine Motor	0-2 h	27.5 ± 4.1	3.55	**< 0.001**	27.1 ± 4.0	1.20	0.232
	Over 2 h	25.2 ± 4.9			26.1 ± 4.8		
MSRS-Body Awareness	0-2 h	11.5 ± 3.6	−2.66	**0.008**	11.8 ± 4.2	−0.813	0.417
	Over 2 h	13.0 ± 4.3			12.3 ± 3.9		

SD standard deviation, *MSRS* Motor Skills Rating Scale.

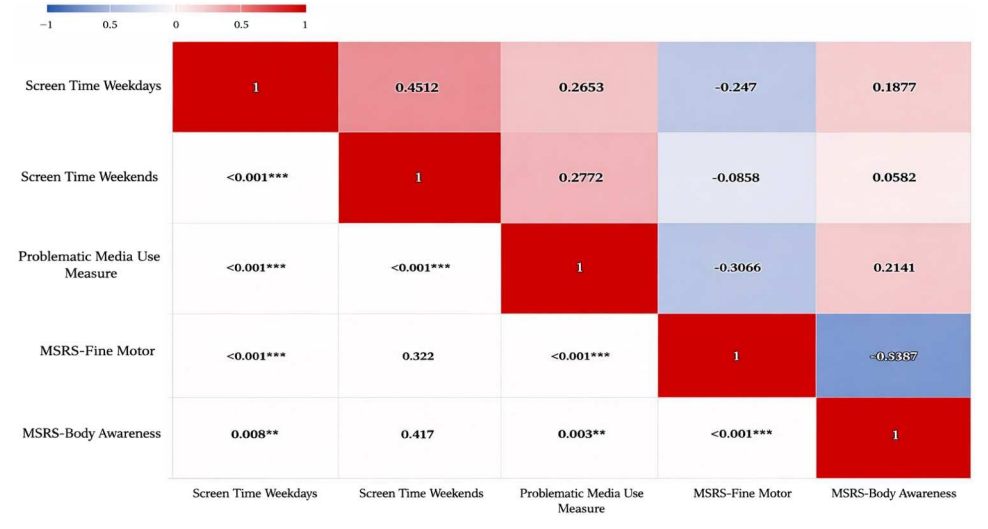


Figure 2. Correlation of screen times with PMUS and MSRS.

body awareness scores (r = 0.058, $p = 0.417$). Notably, PMUS scores exhibited a moderate negative correlation with fine motor skills (r = −0.307, $p < 0.001$) and a positive correlation with body awareness (r = 0.214, $p = 0.003$).

Parent-reported data indicated that 6.6% of children had general motor difficulties and 2.6% reported specific challenges (e.g. pencil use, cutting, jumping). Fine motor scores

were significantly lower in children with specific motor challenges ($p = 0.016$), whereas body awareness scores did not differ significantly. Bicycle acquisition timing was associated with body awareness scores ($p = 0.012$), but not with fine motor performance ($p = 0.073$) (Tables 4 and 5).

Hierarchical linear regression analyses were conducted to examine predictors of MSRS–Fine Motor performance. Demographic and motor-related variables were entered in Model 1, weekday screen exposure (>2 h) in Model 2, PMUS scores in Model 3, and SDQ Hyperactivity/Inattention scores in Model 4. Exceeding two hours of weekday screen exposure was associated with lower fine motor performance (B = −1.67, SE = 0.65, $p = 0.011$). Higher PMUS scores were significantly associated with poorer fine motor competence (B = −0.061, SE = 0.022, $p = 0.006$). After adjusting for parent-rated hyperactivity symptoms, PMUS remained a statistically significant independent predictor, although the association was slightly attenuated. The inclusion of SDQ Hyperactivity/Inattention resulted in a small increase in explained variance ($\Delta R^2 = 0.014$). SDQ Hyperactivity itself was not a significant independent predictor in the final model ($p = 0.078$). The final model explained 15.1% of the variance in fine motor performance ($R^2 = 0.151$). In sensitivity analyses replacing the Hyperactivity/Inattention subscale with the SDQ Total Difficulties score, PMUS remained a significant predictor of fine motor performance, and the overall pattern of results was unchanged. These associations were observed despite the exclusion of children with diagnosed ADHD.

Hierarchical multiple linear regression analyses were conducted to examine predictors of MSRS–Body Awareness scores (higher scores indicate poorer performance). Demographic variables (gender and bicycle acquisition category) were entered in Model 1, weekday screen exposure (>2 h) in Model 2, PMUS scores in Model 3, and SDQ Hyperactivity/Inattention scores in Model 4. Exceeding two hours of weekday screen exposure was associated with higher (worse) body awareness scores in the fully adjusted model (B = 1.2422, SE = 0.5709, $p = 0.031$). PMUS scores showed a positive association with body awareness that approached statistical significance after adjustment for SDQ Hyperactivity/Inattention (B = 0.0374, SE = 0.0194, $p = 0.055$). SDQ Hyperactivity/Inattention was not a significant independent predictor in the final model (B = 0.2139, SE = 0.1444, $p = 0.140$). Among the covariates, later bicycle acquisition (school-age vs. preschool) was significantly associated with lower body awareness scores (B = −2.0774, SE = 0.8079, $p =$

Table 4. Hierarchical multiple linear regression analysis predicting MSRS–Fine Motor Scores.

Predictor	B	SE	t	*p*	95% CI
Intercept	30.9169	1.1065	27.940	<.001	28.75–33.09
Gender (Female vs. Male)	0.3604	0.6442	0.559	0.577	−0.90–1.62
Reported Motor Difficulty (Yes vs. No)	−2.4205	2.0654	−1.172	0.243	−6.47–1.63
Weekday Screen Time (>2 h vs. 0–2 h)	−1.6834	0.6525	−2.580	0.011	−2.96 to −0.40
Problematic Media Use	−0.0612	0.0222	−2.757	0.006	−0.11 to −0.02
SDQ Hyperactivity/Inattention	−0.2873	0.1622	−1.771	0.078	−0.6–0.03

Hierarchical multiple linear regression analyses were conducted to examine predictors of MSRS-Fine Motor scores. Model 1 included demographic and motor-related covariates (gender and motor difficulty status). Model 2 additionally adjusted for weekday screen exposure (>2 h vs. 0–2 h). Model 3 further adjusted for Problematic Media Use (PMUS) scores. Model 4 additionally adjusted for SDQ Hyperactivity/Inattention symptoms. B: unstandardized regression coefficient; SE: standard error; CI: confidence interval. The final model represents the fully adjusted estimates. Multicollinearity diagnostics were acceptable (all VIF < 2.5) and residual independence was supported (Durbin–Watson ≈ 2.0). The percentage of variation in the dependent variable explained by the significant independent variables (R^2) was found to be 19.0%.

Table 5. Hierarchical multiple linear regression analysis predicting MSRS-Body Awareness Scores.

Predictor	B	SE	t	*p*	95% CI
Intercept	9.6314	1.0440	9.225	<.001	7.59–11.68
Gender (male vs. female)	0.4933	0.5595	0.882	0.379	−0.60–1.59
Bicycle acquisition					
Has not learned vs. preschool	−0.7010	0.6456	−1.086	0.279	−1.97–0.56
School-age vs. preschool	−2.0774	0.8079	−2.571	0.011	−3.66–−0.49
Weekday screen time (>2 h vs. 0–2 h)	1.2422	0.5709	2.176	0.031	0.12–2.36
Problematic media use (PMUS)	0.0374	0.0194	1.929	0.055	−0.006–0.0754
SDQ Hyperactivity/inattention	0.2139	0.1444	1.481	0.140	−0.07–0.50

Hierarchical multiple linear regression analyses were conducted to examine predictors of MSRS–Body Awareness scores. Model 1 included demographic covariates (gender and bicycle acquisition category). Model 2 additionally adjusted for weekday screen exposure (>2 h vs. 0–2 h). Model 3 further adjusted for Problematic Media Use (PMUS) scores. Model 4 additionally adjusted for SDQ Hyperactivity/Inattention symptoms. B: unstandardized regression coefficient; SE: standard error; CI: confidence interval. The final model represents the fully adjusted estimates. Multicollinearity diagnostics were acceptable (all VIF < 2.5) and residual independence was supported (Durbin–Watson ≈ 2.0). The percentage of variation in the dependent variable explained by the significant independent variables (R^2) was found to be 11.0%.

0.011). The final model explained 12.4% of the variance in body awareness performance ($R^2 = 0.124$; $R = 0.352$).

Discussion

In this study of first-grade children, problematic media use was associated with lower fine motor performance, and this association remained statistically significant after adjustment for hyperactivity/inattention symptoms. Although exceeding two hours of weekday screen exposure was also related to reduced fine motor scores, the association observed for problematic media use remained more stable across adjusted models. Findings related to body awareness were less consistent across analyses and should therefore be interpreted with caution. Taken together, these findings suggest that problematic media use and screen duration may capture different aspects of children's media engagement, with problematic media use showing more consistent associations with fine motor performance in the present study.

The relationship between screen exposure and motor development in childhood has been marked by inconsistent findings, particularly in school-aged samples. Some studies report no significant association between screen time and motor skills(Keller & Govender, 2019; Nobusako et al., 2020), whereas others describe negative associations with motor proficiency(Páez-Herrera et al., 2025). A systematic review in younger children similarly concluded that digital media use was either negatively related to or not significantly associated with motor outcomes (Arabiat et al., 2023). Observational studies in preschool populations have also yielded mixed results, with some linking greater screen exposure to poorer motor skills(Lin, 2019; Suggate & Martzog, 2021; Yuan et al., 2024), while others found no meaningful association(Operto et al., 2020). Such variability likely reflects differences in study design, measurement strategies, device types, and developmental stages examined. Collectively, this literature suggests that screen duration alone may not fully capture the aspects of media use that are most relevant to motor development.

The displacement hypothesis proposes that screen use may affect development by replacing time otherwise spent in physical, social, or cognitively engaging

activities(Kostyrka-Allchorne et al., 2017; Shin, 2004). In the present study, exceeding two hours of weekday screen exposure was associated with lower fine motor performance, whereas weekend screen time was not significantly related to motor outcomes. This pattern may reflect differences in daily structure, as weekday screen use occurs within a more time-constrained routine. However, these interpretations remain speculative, and the cross-sectional design does not allow conclusions regarding underlying mechanisms.

Regression analyses indicated that exceeding two hours of weekday screen exposure was associated with lower fine motor scores, whereas no significant association was observed with body awareness. In contrast, higher PMUS scores were associated with poorer fine motor performance and, to a lesser extent, with higher body awareness scores. Importantly, the association between PMUS and fine motor performance remained statistically significant after adjustment for hyperactivity/inattention symptoms. These findings suggest that screen duration and problematic media use may reflect related but conceptually distinct aspects of children's media engagement. Whereas screen time primarily captures exposure duration, problematic media use additionally reflects behavioural characteristics such as preoccupation with media, difficulty disengaging, and loss of control over use (Domoff et al., 2019). The persistence of the association between PMUS scores and fine motor performance after adjustment for weekday screen exposure suggests that qualitative aspects of media engagement may also be relevant when examining motor outcomes. Consequently, problematic media use may capture aspects of children's media engagement that are not fully represented by time-based measures alone. Given the limited research on problematic media use in younger children(Domoff et al., 2019; Rega et al., 2023), the present findings contribute to a growing body of evidence examining its associations with developmental outcomes. The proportion of variance explained by the final models was modest, suggesting that motor performance in early school years is influenced by multiple factors beyond media use.

This study has several limitations. First, its cross-sectional design precludes causal inferences between screen time and motor skills. Second, the study relied on parent-reported screen time and problematic media use data and teacher-reported motor skill ratings, rather than objective digital tracking data or clinically administered motor assessments. Although the multi-informant design may reduce single-reporter bias, reliance on survey-based measures may still introduce reporting bias and limits comparability with objectively measured studies.

Additionally, we lacked detailed information about timing and content of screen use. Although device categories were examined separately, this distinction does not fully capture qualitative differences in media content or context. However, our focus on both quantitative and qualitative aspects of media use, alongside teacher-reported motor skills, represents a methodological strength. The homogeneous sample, comprising high-achieving children without psychiatric diagnoses, represents both a strength and a limitation. While this design minimizes confounding effects (e.g. socioeconomic disparities or neurodevelopmental disorders), it restricts generalizability to clinical populations or children with varying academic performance levels. Importantly, the observed effects might be more pronounced in at-risk groups (e.g. low socioeconomic

status or neurodevelopmental disorders), suggesting that our findings may underestimate true effect sizes.

Despite these limitations, several strengths should be noted. Motor performance was evaluated using teacher-completed MSRS assessments, allowing ratings based on sustained classroom observations rather than parent report alone. The MSRS has validated Turkish adaptations and specifically targets reading – and writing-related motor competencies. The significant correlations observed between MSRS scores and academic performance (Cameron et al., 2012; Kara & Filikci, 2022) further support its relevance in early school settings. Additional strengths include clearly defined exclusion criteria, an a priori power analysis, and data collection within a defined academic period to reduce contextual variability.

Conclusions

This study identified associations between media exposure and motor performance in first-grade children. Exceeding two hours of weekday screen time was related to lower fine motor scores, whereas problematic media use demonstrated more consistent associations with fine motor performance. Findings related to body awareness were less consistent and should be interpreted cautiously. These findings suggest that characteristics of media engagement, beyond duration alone, may be relevant when examining literacy-related motor competencies in the early school years. Importantly, these associations were observed in typically developing children and remained statistically significant after adjustment for hyperactivity/inattention symptoms, indicating that they are not fully explained by overt behavioural difficulties. Although the proportion of variance explained was modest, the results contribute to the emerging literature on problematic media use in younger populations and its potential developmental correlates.

Ethics approval

This study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Committee of Recep Tayyip Erdoğan University (Approval No: 2023/284; Date: 28 December 2023).

Disclosure statement

No potential conflict of interest was reported by the author(s).

Data availability statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Use of artificial intelligence tools

The authors used ChatGPT (OpenAI, GPT-5.2) for language editing and improvement of readability. The tool was not used for data analysis, interpretation of results, or generation

of scientific conclusions. All outputs were critically reviewed and revised by the authors, who take full responsibility for the final content of the manuscript.

Author contributions

Conceptualization: M.Y., Y.Y.; Methodology: M.Y., Y.Y.; Formal analysis: M.Y., Y.Y., M.K.; Software: M.K.; Investigation: M.Y., Y.Y.; Data curation: M.Y., M.K.; Writing – original draft: M.Y.; Writing – review & editing: M.Y., Y.Y., M.K.; Supervision: Y.Y.; All authors approved the final version of the manuscript.

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