Smartphone addiction and motor-cognitive performance among adolescents in Tunisia

Mohamed Yaakoubi[1,2], Ahmed Ghorbel[1,2], Anis Saddoud[3], Liwa Masmoudi[2,3], Omar Trabelsi[1,2,4], Faical Farhat[2,5,6] and Adnene Gharbi[2,3]

[1]High Institute of Sports and Physical Education, University of Jendouba, Kef, Tunisia (Correspondence to Mohamed Yaakoubi: mohamed.yaakoubi@isseps.usf.tn). [2]Research Unit, Physical Activity, Sport and Health, UR18JS01, National Observatory of Sport, Tunis, Tunisia. [3]High Institute of Sports and Physical Education, University of Sfax, Sfax, Tunisia. [4]High Institute of Applied Studies in Humanities, Department of Education Sciences, University of Monastir, Mahdia, Tunisia. [5]High Institute of Sports and Physical Education, University of Gafsa, Tunisia. [6]Faculty of Medicine, University of Sfax, Sfax, Tunisia.

Abstract

Background: Smartphone addiction among adolescents has emerged as a significant public health concern, with potential consequences for motor and cognitive development.

Aim: To examine the associations between smartphone addiction and motor-cognitive performance among adolescents in Tunisia, using validated digital tools.

Methods: Between December 2023 and March 2024, we examined 270 students in 3 public middle schools in urban Tunisia. We assessed smartphone addiction using the validated Arabic version of the smartphone addiction scale short version; motor function using the Takei Grip-D dynamometer, MySprint app and the Flamingo balance test; and cognitive function using the Vienna test system. Group comparisons were conducted using nonparametric tests; associations were examined using Spearman's correlations; and predictive effects were assessed using separate linear regression analyses adjusted for age, sex and body mass index ($P > 0.05$).

Results: Adolescents classified as addicted ($n = 120$) demonstrated significantly higher daily smartphone use (454.8 ± 104.8 vs 172.1 ± 108.6 minutes, $P < 0.001$), slower sprint time (6.09 ± 0.70 vs 5.63 ± 0.54 seconds, $P < 0.001$), reduced grip strength (22.3 ± 3.5 vs 25.7 ± 4.1 kg, $P < 0.001$), and lower cognitive accuracy despite faster reaction time ($P < 0.01$). Addiction severity independently predicted slower sprinting (β = 0.32) and poorer postural stability (β = 0.35, both $P < 0.001$).

Conclusion: Smartphone addiction is linked to significant motor and cognitive impairment among adolescents in Tunisian schools, with addiction severity predicting slower sprinting and poorer postural stability. Early school-based interventions to promote healthy smartphone habits and physical activity may help prevent long-term motor-cognitive decline among adolescents in Tunisia.

Keywords: adolescent health, smartphone addiction, motor skills, cognitive function, Tunisia

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Introduction

Smartphone use is deeply embedded in adolescents' daily lives, supporting entertainment, socialization and academic tasks (*1*). However, excessive use has created public health concerns, particularly around smartphone addiction, a compulsive, uncontrolled pattern of use that leads to psychological, physical and functional impairments. Similar to other behavioural addictions, smartphone addiction involves withdrawal, tolerance and disruption to everyday functioning (*2,3*). Smartphone addiction is increasing rapidly among adolescents; particularly in urban areas with high digital access and limited supervision (*4*). This pattern is troubling given the strong associations between smartphone overuse and reduced physical activity, increased sedentary behaviour and elevated risk of obesity and metabolic syndrome (*5*). The American Academy of Pediatrics recommends limiting recreational screen time to 1 hour daily for children aged 2–5 years and 2 hours for those aged ≥ 6 years, emphasizing offline activities such as sleep and play (*6*). However, adolescents often exceed these limits. Beyond health and behavioural effects, smartphone addiction is also linked to emerging motor and cognitive deficits during adolescence, which is a key stage of neurological and sensorimotor maturation.

Smartphone addiction may impair motor function by decreasing overall physical activity, diminishing neuromuscular efficiency and compromising motor performance (*2*). Neuroimaging links these impairments to decreased cerebellar grey matter volume and reduced activity in sensorimotor regions. Excessive screen exposure is associated with declines of up to 14% in proprioceptive accuracy among adolescents with smartphone addiction (*7,8*). Excessive smartphone use impairs dynamic balance by altering cervical posture, increasing neck pain and causing upper-body muscle fatigue, which disrupts proprioceptive input and postural reflexes, leading to gait and coordination issues (*9*).

Handgrip strength, a key indicator of motor development, may decrease with excessive smartphone use due to sedentary behaviour and reduced resistance activity. Although repetitive use can enhance endurance, it may diminish maximal strength and increase the risk of overuse injuries such as tendonitis (*10*). Prolonged smartphone use is associated with reduced hand- and pinch-grip strength, suggesting that it is a contributing factor to muscle weakness (*11*).

Smartphone addiction may impair locomotor performance, as shown by slower sprint speeds in adolescents with high night-time phone use (*12*). This decline is likely due to reduced anaerobic capacity and underuse of fast-twitch muscle fibres linked to sedentary behaviour (*13*). However, some studies support these effects, while others report minimal impact, likely due to differences in screen activity type, such as active gaming compared to passive browsing, as well as regional usage patterns (*14*).

Smartphone addiction is associated with alterations in executive functioning, particularly in tasks demanding attention, response inhibition and decision-making (*15*). This behavioural profile reflects impulsivity and weakened top-down control, as neuroimaging links it to heightened striatal activity and reduced dorsolateral prefrontal cortex activation, which are key for error monitoring and inhibition (*16*). Emerging evidence indicates that habitual smartphone use induces neural adaptations, with visuomotor tasks such as scrolling or tapping, altering electroencephalography coherence patterns, particularly in the gamma band, reflecting adaptation to delayed temporal feedback (*17*).

During early adaptation, smartphone-related tasks engage frontal executive regions to inhibit dominant motor responses. Over time, decreased prefrontal activation suggests neural efficiency gains (*18*), yet this may come at the cost of reduced cognitive flexibility and impaired error monitoring. This pattern raises concerns about cognitive trade-offs, as frequent smartphone use may boost reaction speed but impair key executive functions including attention, working memory and emotional control (*19*). Beyond that, dual-task interference, common during multitasking on digital platforms, places a heavy load on executive control networks and can degrade performance accuracy (*20*).

Despite these challenges, adolescents may exhibit some degree of neuroplastic compensation. Short-term deprivation from smartphones can partially reverse attention and impulse control deficits, indicating an adaptive capacity of the adolescent brain (*7,19*). However, prolonged exposure to multitasking environments may disrupt prefrontal development, especially given the extended maturation window of this region (*21*). During adolescence, a phase of high brain plasticity, excessive smartphone use may foster sensorimotor gains but often impairs cognitive control due to overstimulation and poor regulation.

Despite increasing interest, most research isolates variables like grip strength or screen time, rarely examining how motor and cognitive domains interact in addiction contexts (*22*). The directionality of these links remains uncertain, whether addiction drives decline, or existing deficits increase vulnerability (*23*). Cultural patterns, such as gaming in East Asia versus social media in North Africa, further complicate generalizability (*24*). Previous research has primarily depended on self-reported screen time, which may be biased by recall inaccuracies or social desirability. Few studies have integrated objective assessments of motor-cognitive function, particularly in low- and middle-income countries. In North Africa, such cross-sectional investigations remain rare, despite increasing smartphone penetration and limited adolescent access to physical activity resources (*25*). This indicates the urgent need for context-specific, performance-based data to support culturally tailored intervention strategies.

This study examined the association between smartphone addiction and motor–cognitive performance in Tunisian adolescents. It incorporated objective assessments, including sprinting, balance, grip strength and cognitive accuracy, to explore the extent to which smartphone addiction may compromise physical and mental functioning. We hypothesized that smartphone addiction would be associated with slower and less accurate reaction times, as well as reduced physical fitness, characterized by impaired balance, decreased grip strength and slower sprint times. We expected an inverse association between screen time and motor proficiency and cognitive accuracy, with prolonged exposure exacerbating sensorimotor deficits through neurobehavioural mechanisms.

Methods

Study design

This cross-sectional study aimed to examine the relationship between smartphone addiction and motor–cognitive performance in adolescents. Validated, culturally adapted psychometric tools were used alongside objective physical fitness assessments and device-based smartphone usage tracking to ensure methodological rigour.

This study was conducted between December 2023 and March 2024 in 3 Tunisian public middle schools during routine health screenings. A total of 960 adolescents (aged 14–16 years) were initially recruited. Smartphone addiction was assessed using the validated Arabic Smartphone Addiction Scale–Short Version (SAS-SV), with sex-specific cutoffs (≥ 31 for males, ≥ 33 for females) (*26*). Exclusion criteria included: absence of personal smartphone use; low physical activity (International Physical Activity Questionnaire - Short Form < 25th percentile); > 1 year of organized sports, tobacco use, sensory or motor impairments; and irregular sleep (< 7 or > 9 hours/night). After applying these criteria, 350 participants remained (145 addicted, 205 nonaddicted). Following additional exclusions due to attrition (n = 23) and outlier body mass index (BMI) values (< 16.3 or > 23.5 kg/m2 according to WHO standards; n = 57), the final sample comprised 270 adolescents. BMI Z-scores were calculated using WHO AnthroPlus, with no significant group differences in age, height, weight or BMI ($P > 0.05$). See Figure 1 for recruitment flow.

Participants were selected using a convenience sampling approach from co-operating secondary schools. Data collection was conducted over 4 weeks in a controlled school laboratory between 08:00 and 11:00 hours to minimize circadian variability (27). Anthropometric data (height and weight) were recorded using a calibrated stadiometer and digital scale. Motor performance was assessed using standardized tests: Flamingo Balance Test for static balance; handgrip strength with a Takei Grip-D dynamometer; and sprint speed via a 30-m sprint using the MySprint app. Each participant performed 2 trials per motor test, with a 3-minute rest between attempts; the best result was retained for analysis (28).

Cognitive performance was measured using the Vienna Test System, including both simple and choice reaction time tasks administered via computer. Participants were instructed to abstain from caffeine and vigorous activity for 12 hours prior to testing (29). All assessments were conducted by trained, blinded examiners to ensure unbiased data collection.

Ethics considerations

Ethics approval was obtained from the Regional Ethics Committee (Anonymized Institution; Ref. No. 0554/2023). Written informed consent was secured from school

Figure 1 **Flowchart experimental design and participant progression**

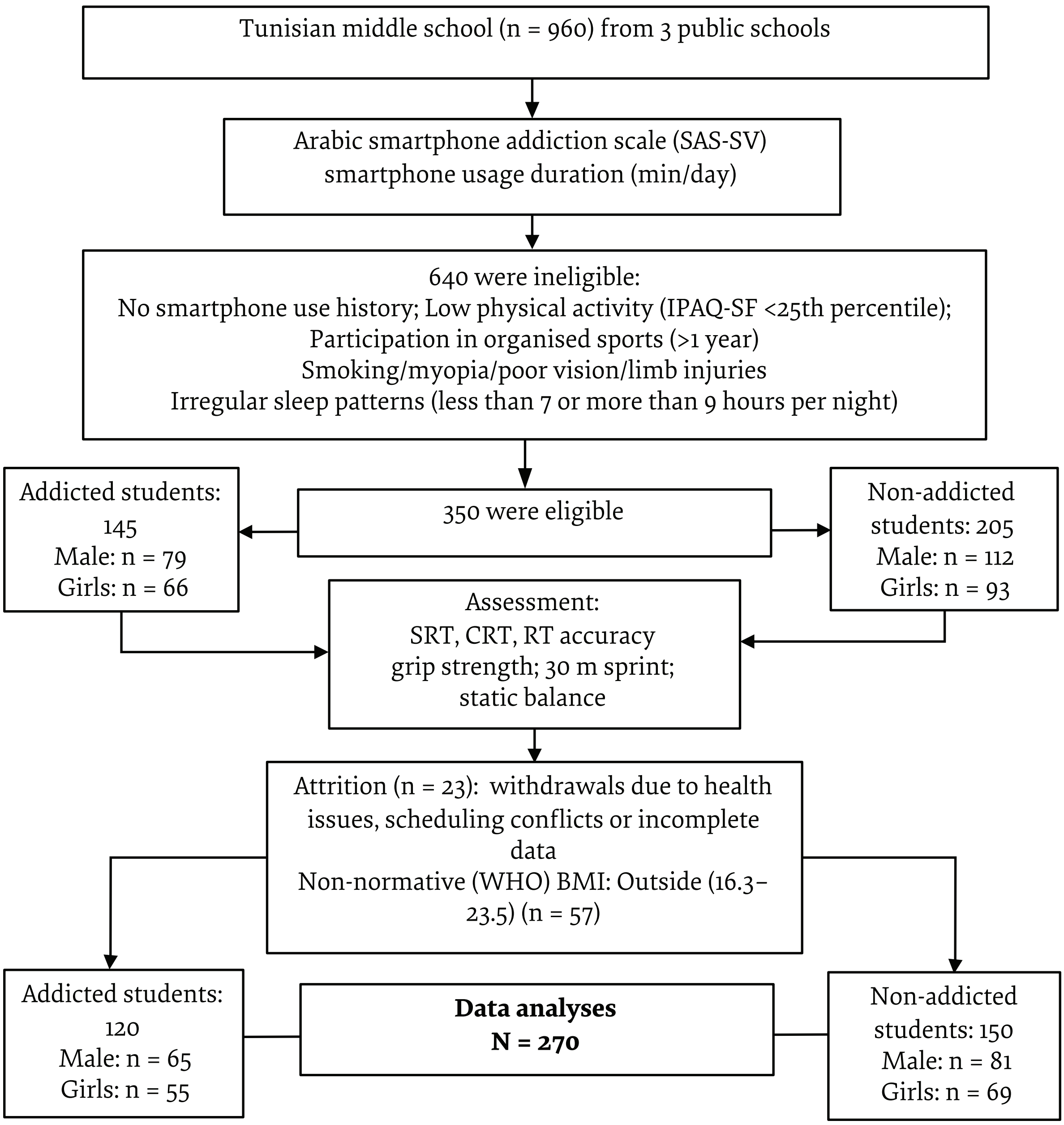


Table 1 **Comparison of smartphone use and motor and cognitive performance between addicted and non-addicted adolescents**

Parameter	AS (*n* = 120)	NAS (*n* = 150)	U	ES (r) (95% CI)	*P*
Smartphone use					
SAS-SV score	46.25 ± 8.23	17.85 ± 9.74	1	0.86 (0.81–0.91)	<0.001
SUD (min/d)	454.8 ± 104.8	172.1 ± 108.6	443.5	0.82 (0.76–0.88)	<0.001
Motor performance					
FBT (falls/min)	10.92 ± 7.51	10.03 ± 6.52	8670.5	0.03 (-0.04, 0.10)	0.603
DH grip (kg)	28.71 ± 6.77	28.81 ± 8.13	8928.5	0.01 (-0.06, 0.08)	0.911
NDH grip (kg)	24.83 ± 7.15	24.85 ± 8.27	8873	0.01 (-0.06, 0.08)	0.842
30 m Sprint (s)	6.09 ± 0.70	5.63 ± 0.54	5553	0.33 (0.25–0.40)	<0.001
Cognitive performance					
SRT (ms)	309.6 ± 63.0	349.1 ± 87.4	6694.5	0.22 (0.15–0.29)	<0.001
CRT (ms)	469.6 ± 87.5	526.3 ± 109.0	6015	0.28 (0.21–0.35)	<0.001
Accuracy (errors)	3.62 ± 3.53	2.52 ± 2.77	7372	0.16 (0.09–0.23)	0.010

AS = addicted students; CI = confidence interval; CRT = choice reaction time; DH/NDH = dominant/non-dominant hand grip; FBT = Flamingo Balance Test; NAS = nonaddicted students; SAS-SV = Smartphone Addiction Scale–Short Version; SRT = simple reaction time; SUD = smartphone usage duration.

authorities, parents and participants, in line with the ethics standards of the 2013 Declaration of Helsinki.

Measurements

Smartphone addiction

Smartphone addiction was measured by the validated Arabic SAS-SV, comprising 10 Likert-scale items (1, strongly disagree to 6, strongly agree). Cutoffs (males: ≥ 31; females: ≥33) categorized participants as addicted to smartphone (AS) or nonaddicted to smartphone (NAS) (*26*).

Smartphone usage duration

Smartphone usage duration was assessed using self-reports verified by iOS Screen Time and Android Digital Wellbeing, enhancing accuracy despite self-report limitations (*30*).

Simple reaction time

Participants were instructed to press a designated keyboard key as quickly as possible upon the appearance of a visual stimulus, measured using OpenSesame software (v3.3.12) (*31*).

Choice reaction time

Participants responded to coloured visual stimuli by pressing key "A" for green and key "P" for pink. Accuracy and reaction time were recorded, with higher error rates reflecting reduced cognitive control (*31*).

Static balance

The Flamingo Balance Test required standing on a 50 × 3 × 4 cm beam for ≤ 60 seconds, with shoes removed and arms extended (*32*).

Grip strength

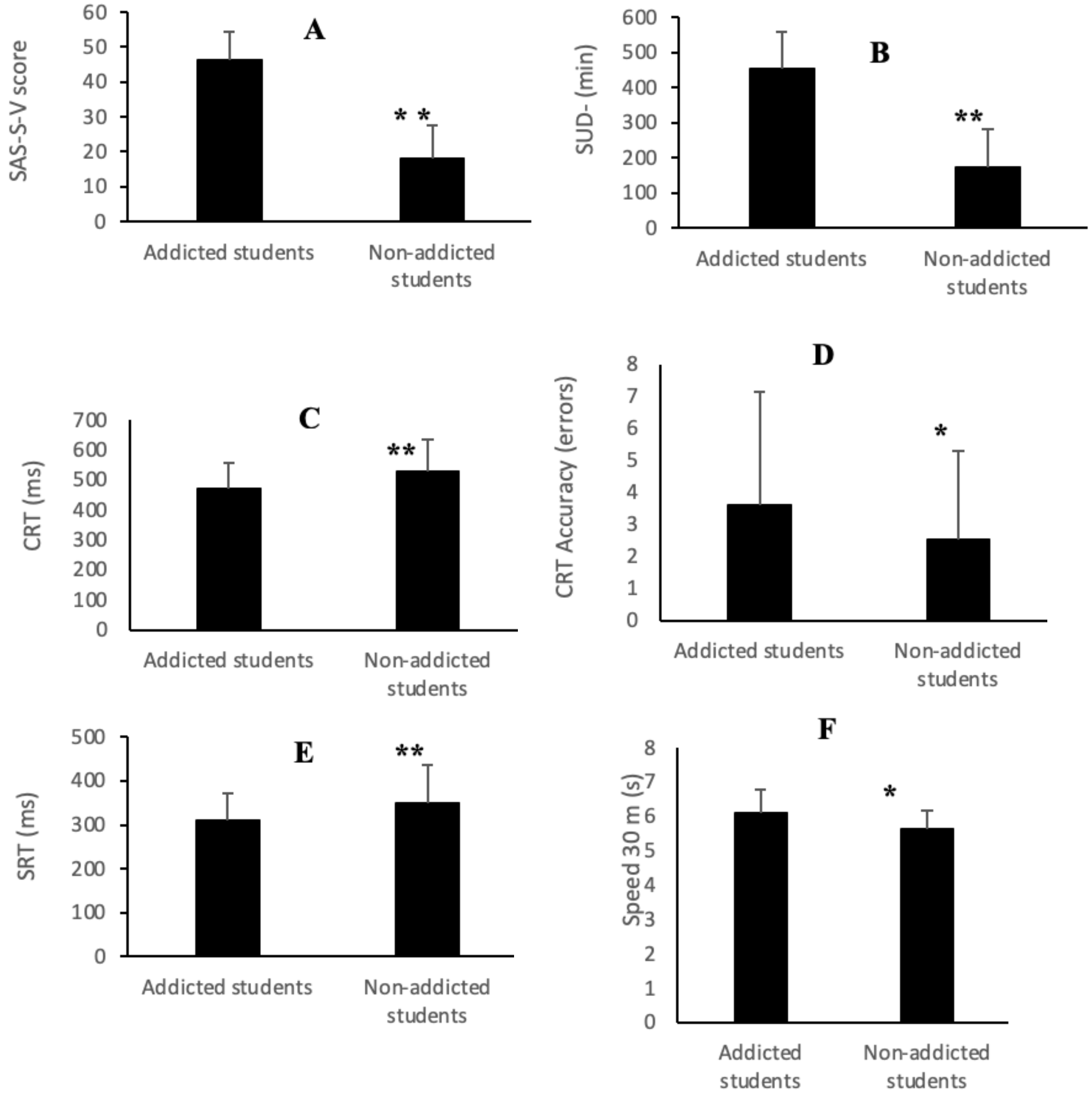
A Takei Grip-D dynamometer (5–100 kg) measured dominant and nondominant hand strength. Handles were adjusted for comfort, with 90° elbow flexion during testing (*33*).

Table 2 **Spearman correlations between smartphone use, cognitive and motor performance**

Variable	SAS-SV score [ρ (95% CI)]	*P*	SUD (min/d) [ρ (95% CI)]	*P*
Cognitive performance				
SRT (ms)	-0.12 (-0.22, -0.02)	0.044	-0.11 (-0.21, 0.01)	0.072
CRT (ms)	-0.18 (-0.28, -0.08)	0.003	-0.19 (-0.29, -0.09)	0.002
Accuracy (errors)	0.33 (0.23–0.43)	<0.001	0.34 (0.24–0.44)	<0.001
Motor performance				
FBT (falls/min)	0.38 (0.28–0.47)	<0.001	0.45 (0.36–0.53)	<0.001
DH grip (kg)	-0.15 (-0.25, -0.05)	0.013	-0.19 (-0.29, -0.09)	0.002
NDH grip (kg)	-0.15 (-0.25, -0.05)	0.015	-0.18 (-0.28, -0.08)	0.003
30m sprint (s)	0.37 (0.27–0.47)	<0.001	0.38 (0.28–0.48)	<0.001

Nonsignificant correlations (e.g., SRT vs SUD) are retained for transparency. AS = addicted students; CI = confidence interval; CRT = choice reaction time; NAS = nonaddicted students; DH/NDH = dominant/non-dominant hand grip; FBT = Flamingo Balance Test; SAS-SV = Smartphone Addiction Scale–Short Version; SRT = simple reaction time; SUD = smartphone usage duration.

Figure 2 Comparisons between addicted students and non-addicted students groups for smartphone addiction score (A: SAS S-V); smartphone usage duration (B: SUD); choice reaction time (C: CRT) reaction time accuracy (D: RT accuracy); simple reaction time (E: SRT); and (F: 30 m speed)



**P < 0.05, **P < 0.001: significantly different compared with AS. AS = addicted students; CRT = choice reaction time; NAS = nonaddicted students; SAS-SV = Smartphone Addiction Scale–Short Version; SRT = simple reaction time; SUD = smartphone usage duration*

The 30-m sprint

Sprint times were recorded using the MySprint app on an iPad positioned at a height of 1.5 and 10 m laterally, following the protocol validated in school-based adolescent populations (34).

Statistical analysis

Data were analysed using SPSS, version 26.0. Normality was tested with the Shapiro–Wilk test, necessitating nonparametric analyses due to non-normal distributions (W = 0.92–0.97, $P < 0.05$). The Mann–Whitney U test was used for comparison between the AS and NAS groups, with effect sizes calculated via Rosenthal's r. Bootstrapped 95% confidence intervals were generated using 1000 resamples. Correlations were examined using Spearman's rank correlation coefficient. To address potential multicollinearity (VIF = 8.2), separate linear regression models were fitted for SAS-SV scores and smartphone usage duration as predictors. Models controlled for age, sex and BMI to reduce confounding effects. Model assumptions, including residual normality and homoscedasticity, were verified. A priori power analysis via G*Power 3.1 determined that a minimum of 230 participants was necessary to achieve $\alpha = 0.05$ and 80% power, confirming the adequacy of the sample size for statistical analyses (35).

Results

Group comparison

The addicted students group showed significantly higher SAS-SV scores (46.25 ± 8.23) and longer screen time

Table 3 **Regression models predicting physical performance outcomes (adjusted for age, sex and body mass index)**

Outcome variable	Predictor	β (95% CI)	*P*	R^2
Balance (FBT falls/min)	SAS-SV score	0.35 (0.27–0.43)	<0.001	0.15
Balance (FBT falls/min)	SUD (min/day)	0.33 (0.25–0.41)	<0.001	0.15
30m sprint (s)	SAS-SV score	0.32 (0.24–0.40)	<0.001	0.13
30m sprint (s)	SUD (min/day)	0.30 (0.22–0.38)	<0.001	0.11

Separate models were adjusted for age, sex, and body mass index. AS = addicted students; CI = confidence interval; CRT = choice reaction time; DH/NDH = dominant/non-dominant hand grip; FBT = Flamingo Balance Test; NAS = nonaddicted students; SAS-SV = Smartphone Addiction Scale–Short Version; SRT = simple reaction time; SUD = smartphone usage duration.

(454.8 ± 104.8 min/day) compared to the non-addicted students group (17.85 ± 9.74; 172.1 ± 108.6 min/day) (both $P < 0.001$), with large effect sizes (r = 0.86 and r = 0.82) (Table 1). Sprint performance was significantly slower in the addicted students group (6.09 ± 0.70 s vs 5.63 ± 0.54 s in non-addicted students group) ($P < 0.001$, r = 0.33), indicating reduced anaerobic motor performance. No significant group differences were found for balance or grip strength. In cognitive tests, the addicted students group responded faster (simple reaction time and choice reaction time; both $P < 0.01$) but committed significantly more errors (3.62 vs 2.52; $P < 0.01$), suggesting a speed–accuracy trade-off and impaired cognitive control.

Correlations between smartphone use and performance

Higher smartphone addiction scores (SAS-SV) and smartphone usage duration were moderately correlated with poorer balance (ρ = 0.38 and 0.45), slower sprinting (ρ = 0.37 and 0.38) and lower grip strength (ρ = -0.15 to -0.19; all $P < 0.05$), suggesting a negative impact on physical performance (Table 2). Cognitive measures also showed associations: smartphone addiction correlated negatively with choice reaction time (ρ = -0.18) and positively with error rates (ρ = 0.33–0.34), indicating reduced cognitive accuracy in more complex tasks.

Regression analyses

Adjusted linear regression models (controlling for age, sex and BMI) confirmed that SAS-SV and smartphone usage duration were significant predictors of sprint speed and balance scores (β = 0.30–0.35; R^2 = 0.11–0.15; all $P < 0.001$), reinforcing their contribution to physical performance deficits (Table 3). SAS-SV scores strongly predicted screen time (R^2 = 0.935; $P < 0.001$), supporting the convergent validity of the scale with objective usage data.

Visual comparisons

Graphic comparisons highlight that the addicted students group scored significantly higher for smartphone addiction (Figure 2A) and daily screen time (Figure 2B). They also demonstrated faster choice reaction time (Figure 2C) and simple reaction time (Figure 2E), but lower accuracy (Figure 2D), reinforcing the observed cognitive impulsivity. Sprint times were significantly slower in the addicted students group (Figure 2F), visually underscoring motor performance impairments.

Discussion

This study examined how smartphone addiction relates to motor and cognitive performance in Tunisian adolescents. Those identified as addicted reported longer screen time, slower sprint speeds and more cognitive errors. Static balance did not differ significantly between the addicted students and non-addicted students groups, although there was a moderate correlation between higher screen time and postural instability, suggesting an emerging effect. Regression analysis confirmed that smartphone addiction predicted reduced sprint performance and compromised balance, indicating the behavioural consequences of excessive digital use. Our findings align with recent research highlighting the negative impact of smartphone addiction on neuromuscular function, motor coordination and attention in adolescents (*2*).

The slower 30-m sprint time observed in the addicted students group than the non-addicted students group may reflect early neuromuscular decline associated with excessive screen use, particularly when it replaced vigorous physical activity. Prolonged sedentary behaviour contributes to the deconditioning of type IIb fast-twitch muscle fibres, essential for explosive, anaerobic efforts like sprinting (*13*). A recent Tunisian study supports this view, reporting that night-time smartphone use correlates with reduced sprint performance, potentially due to circadian rhythm disruption and impaired physiological recovery (*12*).

These motor deficits may also arise from neuro-structural alterations, including reduced cerebellar grey matter and diminished activation in parietal–occipital sensorimotor regions, which are crucial for visual–motor coordination and lower-limb control. Such changes likely compromise central motor planning, particularly in high-speed tasks like sprinting (*8*).

The Flamingo Balance Test results did not differ significantly between the addicted students and non-addicted students groups; however, adolescents with excessive smartphone use showed signs of emerging postural instability. This discrepancy may be due to the limited sensitivity of the test to detect subtle neuromotor deficits under static conditions. Neuroimaging evidence supports this, linking high screen exposure to reduced cerebellar grey matter and hypoactivation of parietal–occipital sensorimotor regions, which are essential for proprioceptive integration and spatial orientation. These areas are still developing during adolescence, and may be disrupted by chronic digital posture, such as "text neck", which compromises cervical proprioception. Ghosh found up to a 14% decline in joint position sense among adolescents with high screen time (*7*). This suggests that postural instability develops progressively (*32*), potentially preceding overt balance dysfunction. These impairments may remain subclinical on static tasks but manifest during dynamic or reactive postural demands.

Smartphone use is associated with altered gait, neck pain, and muscle fatigue (*9*), which may further erode balance. Regression analysis confirmed that smartphone addiction significantly predicted poorer balance, reinforcing concerns about subtle but progressing neuromotor effects in adolescent users. Narayan et al (*36*) demonstrated that interventions combining screen-time reduction with proprioceptive and balance training can partially restore postural control, highlighting adolescent neuroplasticity. Thus, although group-level static balance appears preserved, correlational and neurophysiological evidence indicates emerging subclinical deficits that may progress into functional impairments with continued overuse. Regression analyses further identified smartphone addiction as a significant predictor of slower sprint speed and reduced balance, highlighting the behavioural cost of excessive screen exposure during key developmental stages.

Handgrip strength showed a weak inverse correlation with smartphone use, suggesting that increased screen time reduces muscle strength, in line with similar global findings (*11*). These subtle associations may reflect adolescent neuromuscular resilience. Electromyography suggests that repetitive smartphone use fosters maladaptive muscle co-contraction, reducing force efficiency despite higher superficial strength (*10*). Thus, even modest decreases in grip strength may signal early musculoskeletal strain linked to excessive screen exposure.

Adolescents with smartphone addiction showed faster reaction times but 36% more errors, indicating impulsive responding and weakened executive control (*15*). Neuroimaging links this to striatal hyperactivity and prefrontal hypoactivation, reflecting a trade-off favouring motor speed over cognitive regulation (*16*). Electroencephalography data confirm reduced prefrontal engagement with habitual tapping/swiping, suggesting increased automaticity at the cost of control. The dual-task cost is due to neural interferences disrupting the optimal spatiotemporal dynamics of the competing tasks. These adaptations may impair attention, memory and emotional regulation, especially during critical phases of prefrontal development (*20*).

The nearly balanced gender distribution (52% male, 48% female) in our study minimized the risk of sex bias in the overall findings. However, the literature reports sex-specific patterns in smartphone behaviour, with girls often exhibiting higher addiction severity and boys demonstrating greater usage time and impulsivity (*37*). The strong correlation between SAS-SV scores and tracked screen time (R^2 = 0.935) supports the convergent validity of the scale.

Our study improved measurement accuracy by combining self-reported screen time with device-based tracking (iOS Screen Time/Android Digital Wellbeing), which reduced recall bias. However, some degree of self-reporting bias may have persisted despite using digital tools. Excluding low-activity adolescents clarified smartphone-related effects, and standardized tests strengthened methodological rigor. The strong correlation between SAS-SV and screen time may reflect shared method variance, as both assessed related behaviours. Although device-based validation was used, construct overlap and potential inflation remain concerns. Socioeconomic status and nutritional factors were not directly assessed, limiting interpretation of potential confounders. Consequently, our findings mainly apply to urban Tunisian adolescents and may not be generalized to rural areas or regions beyond the Middle East and North Africa.

Future research should use objective device analytics to better characterize smartphone use patterns, including time of use and posture during device interaction, to clarify their impact on neuromotor outcomes. Longitudinal and neuroimaging studies can clarify causal pathways. Interventions should combine posture-focused apps, community activities and culturally relevant messaging (e.g. comics and videos). Reinforcing regular physical activity, adequate rest and posture awareness should be integral components of these strategies to counteract the sedentary and musculoskeletal consequences of excessive screen use. Tailored programmes and school-based, active-play initiatives may offer cost-effective ways to curb adolescent sedentary habits and support healthy neuromotor development.

Conclusion

This study demonstrated that adolescents with high smartphone addiction scores exhibit slower sprint speeds, impaired postural control, and a speed-accuracy trade-off in cognitive tasks, characterized by faster but less-accurate responses, with addiction severity predicting slower sprinting and poorer postural stability. Although static balance and handgrip strength were less affected, these findings indicate measurable changes in motor and cognitive performance linked to excessive smartphone use. Evidence-based, multimodal interventions are critical to safeguarding adolescent physical and cognitive health. Priority actions include integrating posture-awareness tools and educational programmes, promoting structured physical activity, and using culturally relevant media to enhance engagement. These initiatives should be complemented by systematic screen-time limits, device-free routines, and comprehensive education on digital wellness and musculoskeletal health.

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Conflict of interests: None declared.

Addiction au smartphone et performances cognitives et motrices chez les adolescents en Tunisie

Résumé

Contexte : L'addiction aux smartphones chez les adolescents est devenue un problème de santé publique majeur, entraînant des conséquences potentielles sur le développement moteur et cognitif.

Objectif : Examiner les associations entre l'addiction au smartphone et les performances cognitives et motrices chez les adolescents en Tunisie, à l'aide d'outils numériques validés.

Méthodes : Entre décembre 2023 et mars 2024, nous avons examiné 270 élèves dans trois collèges publics en zone urbaine en Tunisie. Nous avons évalué l'addiction au smartphone à l'aide de la traduction arabe validée de la version courte de l'échelle d'addiction au smartphone ; la fonction motrice en utilisant un dynamomètre numérique à main Takei, l'application MySprint et le test d'équilibre de Flamingo ; et la fonction cognitive à l'aide du système de test de Vienne. Les comparaisons de groupes ont été effectuées en recourant à des tests non paramétriques. Les associations ont été examinées au moyen de corrélations de Spearman et les effets prédictifs ont été évalués à l'aide d'analyses de régression linéaire distinctes, ajustées pour l'âge, le sexe et l'indice de masse corporelle ($p > 0{,}05$).

Résultats : Les adolescents classés comme dépendants ($n = 120$) présentaient une durée quotidienne d'utilisation du smartphone significativement plus élevée (454,8 ± 104,8 contre 172,1 ± 108,6 minutes, $p < 0{,}001$), un temps de sprint plus lent (6,09 ± 0,70 contre 5,63 ± 0,54 secondes, $p < 0{,}001$), une force de préhension réduite (22,3 ± 3,5 contre 25,7 ± 4,1 kg, $p < 0{,}001$) ainsi qu'une précision cognitive inférieure malgré un temps de réaction plus rapide ($p < 0{,}01$). La gravité de l'addiction a permis de prédire indépendamment un sprint plus lent ($\beta = 0{,}32$) et une moins bonne stabilité posturale ($\beta = 0{,}35$), la valeur p étant inférieure à 0,001 pour les deux.

Conclusion : L'addiction au smartphone est associée à des déficits moteurs et cognitifs importants chez les adolescents dans les écoles tunisiennes, la gravité de l'addiction prédisant un sprint plus lent et une moins bonne stabilité posturale. Des interventions en milieu scolaire précoces visant à promouvoir des habitudes saines en matière d'utilisation du smartphone et de pratique d'activité physique pourraient contribuer à prévenir un déclin cognitif et moteur à long terme chez les adolescents en Tunisie.

إدمان الهواتف الذكية والأداء الحَرَكي المعرفي بين المراهقين في تونس

محمد اليعقوبي، أحمد غربال، أنيس صدود، لواء المصمودي، عمر الطرابلسي، فيصل فرحات، عدنان الغربي

الخلاصة

الخلفية: برز إدمان الهواتف الذكية بين المراهقين بوصفه شاغلاً مهماً من شواغل الصحة العامة، مع احتمال تأثيره على نموهم الحركي والمعرفي.

الأهداف: هدفت هذه الدراسة الى دراسة الروابط بين إدمان الهواتف الذكية والأداء الحركي المعرفي لدى المراهقين في تونس، باستخدام أدوات رقمية معتمدة.

طرق البحث: في الفترة بين ديسمبر/ كانون الأول 2023 ومارس/ آذار 2024، قمنا بفحص 270 طالبًا في 3 مدارس متوسطة عامة في المناطق الحضرية بتونس. كما أجرينا تقييماً لإدمان الهواتف الذكية باستخدام النسخة العربية المُعتمدة من مقياس إدمان الهواتف الذكية – النسخة المختصرة؛ والوظائف الحركية باستخدام جهاز دينامومتر Takei Grip-D، وتطبيق MySprint واختبار توازن Flamingo؛ والوظائف المعرفية باستخدام نظام اختبار Vienna. وأُجريت مقارنات بين المجموعات باستخدام اختبارات غير مُتثابتة؛ وفُحصت الارتباطات باستخدام معاملات ارتباط Spearman؛ كما قُيِّمت التأثيرات التنبؤية باستخدام تحليلات انحدار خطِّي منفصلة جرى تعديلها حسب العمر والجنس ومنسب كتلة الجسم (قيمة الاحتمال > 0.05).

النتائج: أظهر المراهقون المصنَّفون على أنهم مدمنون (العدد = 120) استخدامًا يوميًّا أعلى بكثير للهاتف الذكي (454.8 ± 104.8 مقابل 172.1 ± 108.6 دقيقة، قيمة الاحتمال < 0.001)، ووقت أبطأ للجري (6.09 ± 0.70 مقابل 5.63 ± 0.54 ثانية، قيمة الاحتمال < 0.001)، وقبضة أقل قوة (22.3 ± 3.5 مقابل 25.7 ± 4.1 كيلوجرامات، قيمة الاحتمال < 0.001)، ودقة معرفية أقل على الرغم من زمن التفاعل الأسرع (قيمة الاحتمال < 0.01). كذلك ارتبطت شدة الإدمان بشكل مستقل ببطء أكبر في سرعة الجري (β = 0.32) وضعف في القدرة على ثبات الوضع (β = 0.35، وقيمة الاحتمال لكليهما < 0.001).

الاستنتاجات: يرتبط إدمان الهواتف الذكية بحدوث ضعف حركي معرفي ملحوظ لدى المراهقين في المدارس التونسية، إذ تنبئ شدة الإدمان عن تباطؤ في الجري وضعف في القدرة على ثبات الوضع. ومن شأن التدخلات المبكرة في المدارس التي تستهدف تعزيز العادات الصحية لاستخدام الهواتف الذكية والنشاط البدني أن تساعد في الوقاية من التدهور الحركي المعرفي على المدى الطويل بين المراهقين في تونس.

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