

Sports Medicine - Open

Sleep behaviour and subjective sleep quality in esports athletes: a multilevel analysis of night-to-night variability

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Table S1 Overview of Survey Instruments and Measures Used in Baseline Questionnaire

Participant Characteristics and Esports Involvement

Section	Construct	Item description	Response format
Participant ID	Unique ID	Participant-generated code using initials and birth date to link survey, sleep diary, and actigraphy data.	Open text
Demographics	Gender	Self-reported gender.	Multiple choice
	Age	Age in years.	Ordinal categories, with open entry for >50
	Education	Highest level of education completed.	Multiple choice
	Country	Current country of residence.	Dropdown list
Health	Medication use	Use of prescribed medications known to cause sleepiness (e.g., antihistamines, benzodiazepines).	Yes / No / Prefer not to disclose
Esports participation	Gaming platform	Primary platform used to compete in esports (e.g., PC, console, mobile).	Multiple choice

Supplementary Table S1 (continued)

Section	Construct	Item description	Response format
Esports participation	Primary esports	Main competitive esports title.	Multiple choice with open response option
	Competitive rank	Current in-game rank for selected esports.	Game-specific ranked tiers
	Tournament participation	Active participation in organised tournaments or leagues.	Yes / No
Gameplay behaviour	Weekly play frequency	Days per week playing primary esports.	0–7 days
	Weekly play duration	Total hours playing esports per week.	Ordinal categories
	Daily gameplay behaviour	Average daily gameplay hours on weekdays and weekends.	Ordinal categories
Caffeine intake	Beverage consumption	Regular consumption of caffeinated beverages (coffee, tea, soft drinks, energy drinks, powdered supplements).	Multiple selection with daily serving categories

Supplementary Table S1 (continued)

Sleep Measures

Instrument	Construct	Items	Response format
Brief version of the Pittsburgh Sleep Quality Index	Habitual sleep behaviour and perceived sleep quality	Bedtime, sleep latency, wake time, total sleep time, night awakenings, and overall sleep quality during the past month.	Ordinal categorical responses
Sleep Hygiene Index	Sleep-related behaviours	13 items assessing behaviours that may impair sleep (e.g., irregular sleep timing, caffeine before bed, stimulating activities, worrying in bed).	5-point Likert scale (Never – Always)
Pediatric Daytime Sleepiness Scale	Daytime sleepiness	8 items assessing sleepiness during daily activities, morning alertness, difficulty waking, and perceived need for sleep.	5-point Likert scale (Never – Always)

Supplementary Table S1 (continued)

Instrument	Construct	Items	Response format
Morningness- Eveningness Questionnaire – Reduced scale	Chronotype	5 items assessing preferred wake time, evening sleepiness, peak alertness time, and self- identified chronotype.	Multiple choice categorical responses

Contact and Follow-Up

Actigraphy participation Prize draw	Participants provided their name and email to arrange sleep monitoring using a wrist-worn actigraph. Optional contact information also used for entry into a prize draw for gift cards.
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Table S2 Primary Linear Multilevel Model Predicting Subjective Sleep Quality

Predictor	<i>B</i>	<i>SE</i>	95% CI		<i>p</i>
			Lower	Upper	
<i>Level 1: Within-person</i>					
Sleep duration deviation	.003	.002	.001	.007	.046
Bedtime deviation	.029	.091	-.150	.207	.753
Wake time deviation	-.013	.094	-.200	.173	.890
Gameplay category: < 1 hr	.101	.163	-.220	.423	.535
Gameplay category: 1-2 hrs	-.451	.199	-.844	-.059	.025
Gameplay category: > 2 hrs	.019	.142	-.261	-.299	.893
<i>Level 2: Between-person</i>					
Habitual sleep duration	.001	.003	-.007	.007	.933
Habitual bedtime	.375	.180	.020	.731	.039
Habitual wake time	-.237	.182	-.595	.122	.194
Sleep hygiene	-.041	.016	-.074	-.009	.012
Age	-.035	.027	-.087	.018	.190

Note. Level 1 predictors represent nightly deviations (group-mean centred); Level 2 predictors represent person-level averages (grand-mean centred). Gameplay variables refer to the time elapsed before bedtime; reference category = no gameplay. Estimates are presented to three decimal places to facilitate the interpretation of small coefficients.

Table S3 Ordinal Multilevel Model Predicting Subjective Sleep Quality

Predictor	Log-odds	SE	<i>p</i>	Odds ratio (95% CI)
<i>Level 1: Within-person</i>				
Sleep duration deviation	.010	.005	.035	1.01 (1.00 – 1.02)
Bedtime deviation	.089	.238	.709	1.09 (0.68 – 1.75)
Wake time deviation	-.044	.249	.859	0.96 (0.59 – 1.56)
Gameplay category: < 1 hr	-.383	.433	.377	0.68 (0.29 – 1.60)
Gameplay category: 1-2 hrs	1.066	.533	.047	2.90 (1.01 – 8.31)
Gameplay category: > 2 hrs	-.109	.376	.772	0.90 (0.43 – 1.88)
<i>Level 2: Between-person</i>				
Habitual sleep duration	.001	.011	.888	1.00 (0.98 – 1.02)
Habitual bedtime	1.206	.552	.030	3.34 (1.12 – 9.93)
Habitual wake time	-.793	.551	.152	0.45 (0.15 – 1.34)
Sleep hygiene	-.111	.050	.026	0.90 (0.81 – 0.99)
Age	-.092	.080	.251	0.91 (0.78 – 1.07)

Note. Ordinal mixed-effect model with cumulative logit link and random intercept for participant.

Level 1 predictors represent nightly deviations (group-mean centred); Level 2 predictors represent person-level averages (grand-mean centred). Gameplay variables refer to the time elapsed before bedtime; reference category = no gameplay. Estimates are presented to three decimal places to aid interpretation of small coefficients.

Table S4 Linear Multilevel Model with AR(1) Residual Covariance Predicting Sleep Quality

Predictor	<i>B</i>	<i>SE</i>	95% CI		<i>p</i>
			Lower	Upper	
<i>Level 1: Within-person</i>					
Sleep duration deviation	.003	.002	.001	.007	.044
Bedtime deviation	.029	.091	-.150	.208	.747
Wake time deviation	-.015	.094	-.201	.171	.874
Gameplay category: < 1 hr	.105	.162	-.216	.426	.519
Gameplay category: 1-2 hrs	-.447	.199	-.839	-.055	.026
Gameplay category: > 2 hrs	.027	.141	-.252	.307	.847
<i>Level 2: Between-person</i>					
Habitual sleep duration	.001	.003	-.008	.007	.940
Habitual bedtime	.375	.181	-.006	.756	.053
Habitual wake time	-.237	.182	-.622	.147	.210
Sleep hygiene	-.041	.016	-.076	-.007	.022
Age	-.035	.027	-.091	.021	.208

Note. Linear mixed-effects model with AR(1) within-person residual covariance structure.

Level 1 predictors represent nightly deviations (group-mean centred); Level 2 predictors represent person-level averages (grand-mean centred). Gameplay variables refer to the time elapsed before bedtime; reference category = no gameplay. Coefficient estimates are presented to three decimal places to aid interpretation of small effects.