

Supplemental material S1. Data analysis report.

The full data analysis report including the used R script and functions is available from: <https://sri-human-sleep.github.io/CST-performance/FC3performance-dataAnalysisReport.html>

Supplemental material S2. Group-level absolute error matrix in the sample of healthy sleepers and adolescents with insomnia symptoms.

		Fitbit Charge 3™				
		Wake	“light”	“deep”	REM	PSG tot
Wake	Healthy sleepers	1,481	678	39	229	2,427
	Insomnia symptoms	858	141	2	64	1,065
“light”	Healthy sleepers	930	9,508	857	877	12,172
	Insomnia symptoms	437	3,941	441	706	5,525
“deep”	Healthy sleepers	91	2,047	2,959	14	5,111
	Insomnia symptoms	51	973	1,422	40	2,486
REM	Healthy sleepers	137	829	44	3,316	4,326
	Insomnia symptoms	109	576	8	1,531	2,224
FC3 tot	Healthy sleepers	2,639	13,062	3,899	4,436	24,036
	Insomnia symptoms	1,455	5,631	1,873	2,341	11,300

“light”, PSG-based N1 + N2; “deep”, PSG-based N3; **REM**, Rapid-Eye-Movement sleep; **PSG**, polysomnography; **FC3**, Fitbit Charge 3™.

Supplemental material S3. Model comparison and estimated parameters for the factors potentially affecting absolute discrepancies between Fitbit Charge 3™ and polysomnography (PSG), and epoch-by-epoch agreement in the sample of healthy. Statistics are reported with and without (as in S1) considering PSG measures as an additional predictor accounting for the size of measurement.

N obs.	Predictor	Without considering PSG measures					Considering also PSG measures				
		AICw	R ²	Coeff. (St. Err.)	t value	p value	AICw	R ²	Coeff. (St. Err.)	t value	p value
Absolute discrepancies TST (min)	Intercept		.000	-7.20 (12.70)	-.57	.576		.000	-7.20 (12.70)	-.57	.576
	PSG TST						.49	.073			
	Sex	.28	.004				.28	.004			
	25 Age	.29	.008				.29	.008			
	Body mass index	.67	.126	1.01 (.56)	1.82	.080	.67	.126	1.01 (.56)	1.82	.080
	Firmware version	.09	.135				.09	.135			
	Time of data collection	.29	.127				.29	.127			
Absolute discrepancies SE (%)	Intercept		.000	3.52 (.47)	7.49	<.001		.000	3.52 (.47)	7.49	<.001
	PSG SE						.40	.045			
	Sex	.32	.018				.32	.018			
	25 Age	.33	.021				.33	.021			
	Body mass index	.48	.072				.48	.072			
	Firmware version	.15	.020				.15	.020			
	Time of data collection	.27	<.001				.27	<.001			

Continue below

N obs.	Predictor	Without considering PSG measures					Considering also PSG measures				
		AICw	R ²	Coeff. (St. Err.)	t value	p value	AICw	R ²	Coeff. (St. Err.)	t value	p value
Absolute discrepancies SOL (min)	Intercept		.000	4.41 (.59)	7.48	<.001		.000	4.41 (.59)	7.48	<.001
	PSG SOL						.27	.002			
	Sex	.41	.046				.41	.046			
	Age	.43	.051				.43	.051			
	Body mass index	.28	.005				.28	.005			
	Firmware version	.40	.112				.40	.112			
	Time of data collection	.31	.015				.31	.015			
Absolute discrepancies WASO (min)	Intercept		.000	-13.61 (13.29)	-1.03	.314		.000	-13.61 (13.29)	-1.03	.314
	PSG WASO						.33	.024			
	Sex	.32	.019				.32	.019			
	Age	.27	.001				.27	.001			
	Body mass index	.76	.159	1.21 (.58)	2.087	.048	.76	.159	1.21 (.58)	2.087	.048
	Firmware version	.15	.023				.15	.023			
	Time of data collection	.27	.001				.27	.001			
Absolute discrepancies Light sleep duration (min)	Intercept		.000	36.56 (5.33)	6.86	<.001		.000	80.98 (27.93)	2.90	.01
	PSG "light" duration						.58	.095	-.20 (.12)	-1.62	.12
	Sex	.42	.048				.42	.172			
	Age	.38	.036				.26	.128			
	Body mass index	.27	.002				.20	.095			
	Firmware version	.38	.105				.20	.129			
	Time of data collection	.49	.068				.22	.113			
Absolute discrepancies Deep sleep duration (min)	Intercept		.000	27.18 (4.74)	5.73	<.001		.000	-32.67 (15.49)	-2.19	.04
	PSG "deep" duration						.99	.388	.63 (.16)	3.89	<.001
	Sex	.28	.005				.27	.388			
	Age	.28	.005				.03	.390			
	Body mass index	.39	.041				.30	.395			
	Firmware version	.12	.004				.13	.394			
	Time of data collection	.27	<.001				.27	.388			
Absolute discrepancies REM sleep duration (min)	Intercept		.000	18.11 (2.17)	.64	.530		.000	4.72 (7.35)	.64	.53
	PSG REM duration						.69	.126	.17 (.09)	1.90	.07
	Sex	.28	.002				.22	.133			
	Age	.29	.006				.26	.147			
	Body mass index	.32	.017				.23	.134			
	Firmware version	.14	.015				.13	.153			
	Time of data collection	.29	.006				.23	.135			
N obs.	Predictor	AICw	R ²	Coeff. (St. Err.)	z value	p value	AICw	R ²	Coeff. (St. Err.)	z value	p value
Epoch-by-epoch agreement (logit)	Intercept		.000	.96 (.07)	12.77			.000	.96 (.07)	12.77	
	PSG TST						.44	.003			
	Sex	.39	.002				.39	.002			
	Age	.27	<.001				.27	<.001			
	Body mass index	.33	.001				.33	.001			
	Firmware version	.48	.006				.48	.006			
	Time of data collection	.40	.002				.40	.002			
	Mean FC3 HR	.40	.002				.40	.002			

Aw, Aikake weight resulting from the comparison of each model with the null model (with intercept only), and with any model showing higher Aw than the null; **Coeff.**, unstandardized coefficient estimated by the selected model (only predictors included in the selected model are showed).

Supplemental material S4. Number of epochs and magnitude (absolute percentage) of heart rate acceleration/deceleration detected by the Fitbit Charge 3™ in response to polysomnographic epoch-by-epoch (EBE) transitions by EBE transition agreement and the type of transition in the sample of healthy sleepers.

PSG EBE transition	Total N	FC3 accurately detected PSG EBE transitions		FC3 inaccurately detected EBE PSG transitions	
		N	Abs. % HR change Mean (SD)	N	Abs. % HR change Mean (SD)
wake ↔ wake	1,756	967 (55.07%)	7.24 (3.60)	789 (44.93%)	8.67 (5.35)
light ↔ light	11,250	8,763 (77.89%)	2.46 (.35)	2,487 (22.11%)	3.75 (1.06)
deep ↔ deep	4,798	2,837 (59.13%)	1.30 (.30)	1,961 (40.87%)	2.08 (1.33)
REM ↔ REM	4,088	3,104 (75.93%)	3.78 (1.06)	984 (24.07%)	3.17 (1.01)
wake → light	556	147 (26.44%)	11.42 (5.41)	409 (73.56%)	9.34 (4.03)
wake ← light	428	127 (29.67%)	8.04 (4.02)	301 (70.33%)	7.21 (4.45)
light → deep	264	2 (.76%)	1.41 (.82)	262 (99.24%)	2.25 (1.01)
light ← deep	186	0 (0%)		186 (100%)	3.99 (2.64)
light → REM	147	7 (4.76%)	2.57 (1.81)	140 (95.24%)	5.03 (2.32)
light ← REM	1,756	967 (2.15%)	7.24 (3.60)	789 (97.85%)	8.67 (5.35)
wake ← deep	91	21 (23.08%)	4.73 (5.04)	70 (76.92%)	9.09 (12.12)
wake ← REM	106	24 (22.64%)	6.75 (3.59)	82 (77.36%)	9.36 (11.51)
wake → REM	49	7 (14.29%)	7.90 (8.58)	42 (85.71%)	9.77 (7.36)
wake → deep	16	0 (0%)		16 (100%)	10.46 (7.60)
deep → REM	4	0 (0%)		4 (100%)	2.44 (1.30)
N	23,832	16,008 (67.17%)		7,824 (32.83%)	

PSG, polysomnography; EBE, epoch-by-epoch; FC3, Fitbit Charge 3™, HR, Heart Rate; REM, Rapid-Eye-Movement; N, number of PSG sleep stage transitions.