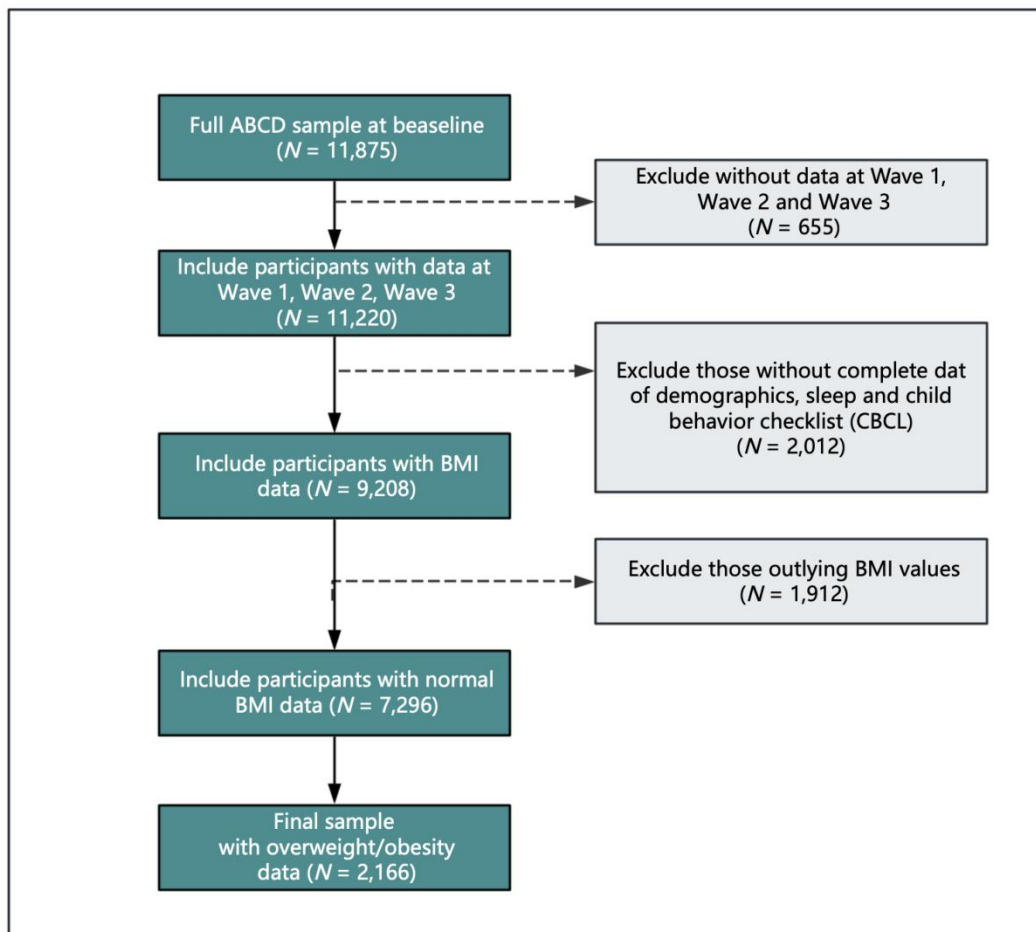
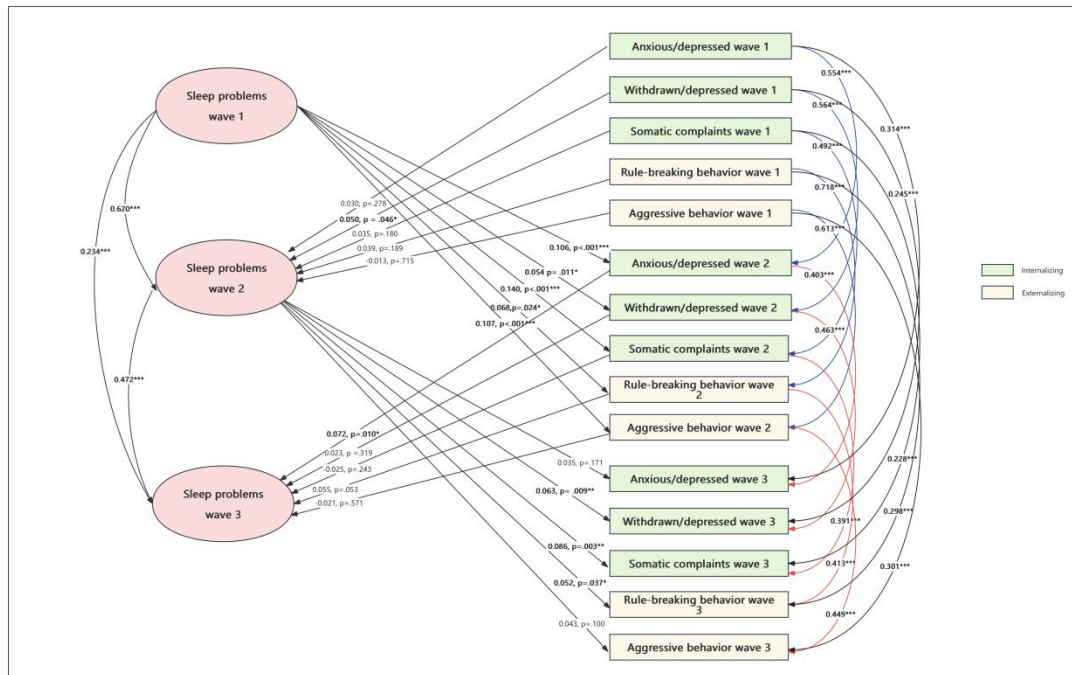




Supplementary Figure S1. Flowchart of the study cohort selection and procedure.



Supplementary Figure S2. Unadjusted Cross-Lagged model of sleep problems and behavioral Problems on overweight and obesity in children and adolescents. * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

Supplementary Table S1. Characteristics of the sample ($N = 2166$)

Variables		Mean $\pm$ SD or n (%)
Sex	Male	1113 (51.4)
	Female	1053 (48.6)
^a Household income	Less than \$5,000	101 (4.60)
	\$5,000 through \$11,999	115 (5.30)
	\$12,000 through \$15,999	58 (2.67)
	\$16,000 through \$24,999	129 (5.96)
	\$25,000 through \$34,999	155 (7.16)
	\$35,000 through \$49,999	224 (10.34)
	\$50,000 through \$74,999	303 (13.99)
	\$75,000 through \$99,999	297 (13.71)
	\$100,000 through \$199,999	437 (20.18)
	\$200,000 and greater	127 (5.86)
	Don't know/Refuse to answer	220 (10.16)
Race/Ethnicity	White (%)	1326 (61.22)
	Black (%)	538 (24.84)
	India (%)	77 (3.55)
	Asia (%)	100 (4.62)
	Other (%)	125 (5.77)

Note. ^aFor reference, the US median Household income in 2016 was \$60,309 (Fontenot et al., 2018).

Supplementary Table S2. Bivariate correlations for sleep problems behavioral problems across the three waves

[illegible]

10. Withdrawn/depressed w2	0.262 *	0.375 *	0.321 *	0.399 *	0.619 *	0.284 *	0.263 *	0.343 *	0.580 *	--								
11. Somatic complaints w2	0.362 *	0.431 *	0.346 *	0.383 *	0.350 *	0.571 *	0.258 *	0.310 *	0.500 *	0.431 *	--							
12. Rule-breaking behavior w2	0.321 *	0.341 *	0.320 *	0.312 *	0.319 *	0.248 *	0.637 *	0.541 *	0.400 *	0.392 *	0.372 *	--						
13. Aggressive behavior w2	0.370 *	0.423 *	0.369 *	0.428 *	0.398 *	0.304 *	0.551 *	0.681 *	0.584 *	0.487 *	0.447 *	0.719 *	--					
14. Anxious/depressed w3	0.303 *	0.327 *	0.375 *	0.590 *	0.389 *	0.346 *	0.253 *	0.367 *	0.644 *	0.422 *	0.411 *	0.286 *	0.416 *	--				
15. Withdrawn/depressed w3	0.268 *	0.314 *	0.384 *	0.370 *	0.541 *	0.291 *	0.259 *	0.327 *	0.431 *	0.636 *	0.349 *	0.306 *	0.377 *	0.585 *	--			
16. Somatic complaints w3	0.318 *	0.338 *	0.419 *	0.319 *	0.280 *	0.498 *	0.219 *	0.253 *	0.360 *	0.297 *	0.583 *	0.257 *	0.304 *	0.487 *	0.430 *	--		
17. Rule-breaking behavior w3	0.291 *	0.286 *	0.345 *	0.257 *	0.279 *	0.214 *	0.576 *	0.477 *	0.318 *	0.281 *	0.307 *	0.635 *	0.539 *	0.377 *	0.413 *	0.336 *	--	
18. Aggressive behavior w3	0.312 *	0.341 *	0.383 *	0.378 *	0.327 *	0.258 *	0.523 *	0.630 *	0.455 *	0.339 *	0.334 *	0.558 *	0.700 *	0.515 *	0.460 *	0.373 *	0.74 2*	--

Note. * $P < 0.05$; w1, wave 1; w2, wave 2; w3, wave 3.

Supplementary Table S3. CLPM effects – relationships between sleep problems and emotional and behavioral problems on overweight and obesity in children and adolescents

Paths	Coefficient (unstandardized)	Coefficient (standardized)	SE	<i>P</i>^a
Sleep problems W1 → Anxious/depressed W2	0.073	0.113	0.027	<0.001
Sleep problems W1 → Withdrawn/depressed W2	0.044	0.062	0.024	0.011
Sleep problems W1 → Somatic complaints W2	0.1	0.144	0.026	<0.001
Sleep problems W1 → Rule-breaking behavior W2	0.073	0.144	0.027	<0.001
Sleep problems W1 → Aggressive behavior W2	0.077	0.134	0.027	<0.001
Sleep problems W2 → Anxious/depressed W3	0.04	0.059	0.024	0.015
Sleep problems W2 → Withdrawn/depressed W3	0.06	0.086	0.029	0.003
Sleep problems W2 → Somatic complaints W3	0.035	0.073	0.025	0.003
Sleep problems W2 → Rule-breaking behavior W3	0.032	0.057	0.026	0.031
Sleep problems W2 → Aggressive behavior W3	0.04	0.059	0.024	0.015
Anxious/depressed W1 → Sleep problems W2	0.041	0.027	0.043	0.342
Withdrawn/depressed W1 → Sleep problems W2	0.082	0.056	0.038	0.031
Somatic complaints W1 → Sleep problems W2	0.046	0.033	0.037	0.205
Rule-breaking behavior W1 → Sleep problems W2	0.045	0.025	0.055	0.411
Aggressive behavior W1 → Sleep problems W2	-0.013	-0.009	0.057	0.815
Anxious/depressed W2 → Sleep problems W3	0.112	0.076	0.04	0.005
Withdrawn/depressed W2 → Sleep problems W3	0.025	0.019	0.031	0.417
Somatic complaints W2 → Sleep problems W3	-0.03	-0.022	0.03	0.306
Rule-breaking behavior W2 → Sleep problems W3	0.092	0.049	0.053	0.082

Aggressive behavior W2→ Sleep problems W3	-0.033	-0.02	0.06	0.589
Sleep problems W1 → Sleep problems W2	0.614	0.625	0.031	<0.001
Sleep problems W2 → Sleep problems W3	0.456	0.474	0.036	<0.001
Sleep problems W1→ Sleep problems W3	0.217	0.229	0.032	<0.001
Anxious/depressed W1→ Anxious/depressed W2	0.543	0.542	0.027	<0.001
Withdrawn/depressed W1→Withdrawn/depressed W2	0.584	0.552	0.027	<0.001
Somatic complaints W1→ Somatic complaints W2	0.484	0.486	0.023	<0.001
Rule-breaking behavior W1→ Rule-breaking behavior W2	0.504	0.533	0.027	<0.001
Aggressive behavior W1→ Aggressive behavior W2	0.513	0.57	0.027	<0.001
Anxious/depressed W2 → Anxious/depressed W3	0.386	0.405	0.031	<0.001
Withdrawn/depressed W2→Withdrawn/depressed W3	0.416	0.44	0.032	<0.001
Somatic complaints W2→ Somatic complaints W3	0.385	0.391	0.029	<0.001
Rule-breaking behavior W2→ Rule-breaking behavior W3	0.379	0.404	0.031	<0.001
Aggressive behavior W2→ Aggressive behavior W3	0.425	0.442	0.031	<0.001
Anxious/depressed W1→ Anxious/depressed W3	0.302	0.315	0.03	<0.001
Withdrawn/depressed W1→Withdrawn/depressed W3	0.252	0.251	0.031	<0.001
Somatic complaints W1→ Somatic complaints W3	0.223	0.228	0.027	<0.001
Rule-breaking behavior W1→ Rule-breaking behavior W3	0.232	0.262	0.032	<0.001
Aggressive behavior W1→ Aggressive behavior W3	0.253	0.292	0.028	<0.001

Note. ^a *P* values < 0.05 are reported in bold characters. CLPM – Cross-lagged Panel model; W1 – Wave 1; W2 – Wave 2; W3 – Wave 3; W4 – Wave 4; SE – Standard Error.

Supplementary Table S4. RI-CLPM effects – relationships between sleep problems and emotional and behavioral problems on overweight and obesity in children and adolescents

Paths	Coefficient (unstandardized)	Coefficient (standardized)	SE	<i>P</i>^a
Sleep problems W1 → Anxious/depressed W2	0.037	0.023	0.043	0.390
Sleep problems W1 → Withdrawn/depressed W2	0.497	0.331	0.038	<0.001
Sleep problems W1 → Somatic complaints W2	0.004	0.005	0.037	0.914
Sleep problems W1 → Rule-breaking behavior W2	0.02	0.036	0.014	0.150
Sleep problems W1 → Aggressive behavior W2	0.031	0.047	0.025	0.210
Sleep problems W2 → Anxious/depressed W3	0.107	0.075	0.04	0.008
Sleep problems W2 → Withdrawn/depressed W3	0.652	0.512	0.033	<0.001
Sleep problems W2 → Somatic complaints W3	0.028	0.042	0.03	0.350
Sleep problems W2 → Rule-breaking behavior W3	0.006	0.012	0.012	0.620
Sleep problems W2 → Aggressive behavior W3	0.001	0.001	0.015	0.950
Anxious/depressed W1 → Sleep problems W2	0.004	0.006	0.019	0.840
Withdrawn/depressed W1 → Sleep problems W2	0.232	0.293	0.017	<0.001
Somatic complaints W1 → Sleep problems W2	-0.004	-0.005	0.018	0.840
Rule-breaking behavior W1 → Sleep problems W2	0.02	0.036	0.014	0.150
Aggressive behavior W1 → Sleep problems W2	0.031	0.047	0.025	0.210
Anxious/depressed W2 → Sleep problems W3	0.025	0.039	0.025	0.320
Withdrawn/depressed W2 → Sleep problems W3	0.279	0.404	0.017	<0.001
Somatic complaints W2 → Sleep problems W3	0.028	0.042	0.021	0.190
Rule-breaking behavior W2 → Sleep problems W3	0.006	0.012	0.012	0.620

Aggressive behavior W2→ Sleep problems W3	0.001	0.001	0.015	0.950
Sleep problems W1 → Sleep problems W2	0.835	0.763	0.045	<0.001
Sleep problems W2 → Sleep problems W3	0.889	0.967	0.033	<0.001
Sleep problems W1→ Sleep problems W3	0.083	0.082	0.033	0.012
Anxious/depressed W1→ Anxious/depressed W2	0.048	0.046	0.028	0.084
Withdrawn/depressed W1→Withdrawn/depressed W2	0.358	0.331	0.029	<0.001
Somatic complaints W1→ Somatic complaints W2	0.05	0.049	0.024	0.040
Rule-breaking behavior W1→ Rule-breaking behavior W2	0.041	0.042	0.027	0.130
Aggressive behavior W1→ Aggressive behavior W2	0.07	0.072	0.03	0.020
Anxious/depressed W2 → Anxious/depressed W3	0.043	0.044	0.029	0.140
Withdrawn/depressed W2→Withdrawn/depressed W3	0.344	0.359	0.033	<0.001
Somatic complaints W2→ Somatic complaints W3	0.07	0.072	0.03	0.020
Rule-breaking behavior W2→ Rule-breaking behavior W3	0.019	0.02	0.031	0.530
Aggressive behavior W2→ Aggressive behavior W3	0.046	0.047	0.031	0.140
Anxious/depressed W1→ Anxious/depressed W3	0.006	0.006	0.006	0.340
Withdrawn/depressed W1→Withdrawn/depressed W3	0.027	0.026	0.03	0.380
Somatic complaints W1→ Somatic complaints W3	0.043	0.043	0.026	0.100
Rule-breaking behavior W1→ Rule-breaking behavior W3	0.123	0.131	0.029	<0.001
Aggressive behavior W1→ Aggressive behavior W3	0.12	0.127	0.025	<0.001

Note. ^a *P* values < 0.05 are reported in bold characters. RI-CLPM – Random intercept -Cross-lagged Panel model; W1 – Wave 1; W2 – Wave 2; W3 – Wave 3; W4 – Wave 4; SE – Standard Error.

Supplementary Methods

To assess the temporal stability of the factor structure across multiple time points, measurement invariance was tested using changes in Comparative Fit Index (ΔCFI) and Tucker-Lewis Index (ΔTLI) values^[1, 2]. Measurement equivalence was considered acceptable if ΔCFI and ΔTLI were less than or equal to 0.01. Descriptive statistics and Pearson correlations were computed to describe the associations between variables. Stability refers to the effects of one variable at one time point on the same variable later point (autoregressive). CLPM/RI-CLPM analysis was employed to explore the bidirectional relationships between sleep problems and both internalizing (withdrawn/depressed, somatic complaints, and anxious/depressed behavior) and externalizing (rule-breaking and aggressive behaviors) dimensions across waves 1 to 3. Cross-lagged path coefficients were evaluated to determine the directional strength of these associations, indicating how changes in one variable at one time point predicts changes in another variable later point. For all of these coefficients, positive values indicate that an increase in one variable is associated with an increase in the other variable while negative values indicate that the increase in one variable is associated with a decrease in the other variable, with effect sizes categorized as small (0.03), medium (0.07), and large (0.12), following established guidelines^[3]. The model fit was evaluated based on the χ^2 test, Root Mean Square Error of Approximation, CFI, and TLI. CFI and TLI should

be > 0.90 (acceptable fit), and RMSEA should be < 0.08 , and missing values were estimated by complete information Maximum likelihood method^[4].

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