

Multiverse analysis

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The authors made the following contributions. First Author: Conceptualization, Writing - Original Draft Preparation, Writing - Review & Editing; Ernst-August Doelle: Writing - Review & Editing, Supervision.

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Abstract

One or two sentences providing a **basic introduction** to the field, comprehensible to a scientist in any discipline.

Keywords: keywords

Word count: X

Multiverse analysis

Results

Model diagnostics

The model diagnostics for the main analysis, and for all models presented in this document are in Table 1

Multiverse

In this document we show the results using another analytic technique. Namely treating study ID as a fixed effect. This is what we wrote in the protocol originally.

The effects of physical activity volume on sleep

We estimated the effects of physical activity on sleep (RQ1) using mixed-effects models. We estimated the effect of physical activity volume on sleep by age, and the results are presented in Table 2 and Figure 1

The effects of physical activity intensity on sleep

We estimated how physical activity intensity affects sleep across different age groups. We present the results controlling for sex, SES, and BMI, in Table 2 and Figure 2.

The effects of sleep duration on physical activity

We estimated the effect of sleep duration on physical activity by age. Results, controlling for sex, SES, and BMI are presented in Table 3 and Figure 3.

The effects of sleep efficiency on physical activity

We estimated the effect of sleep efficiency on physical activity by age. Results, controlling for sex, SES, and BMI are presented in Table 3 and Figure 4.

The effects of sleep onset on physical activity

We estimated the effect of sleep onset on physical activity by age. Results, controlling for sex, SES, and BMI are presented in Table 3 and Figure 5.

The effects of sleep regularity on physical activity

We estimated the effect of sleep regularity on physical activity by age. Results, controlling for sex, SES, and BMI are presented in Table 3 and Figure 6.

Moderation

In the following section we present models for a range of moderators which were pre-defined in our protocol.

BMI

The effects of physical activity volume on sleep by BMI. We estimated the effects of physical activity on sleep (RQ1) using mixed-effects models. We estimated the effect of physical activity volume on sleep by BMI, and the results are presented in Table 4 and Figure 7.

The effects of physical activity intensity on sleep by BMI. We estimated how physical activity intensity affects sleep across BMI. We present the results in Table 4 and Figure 8.

The effects of sleep duration on physical activity. We estimated the effect of sleep duration on physical activity by BMI. Results, controlling for sex, SES, and BMI are presented in Table 5 and Figure 9.

The effects of sleep efficiency on physical activity. We estimated the effect of sleep efficiency on physical activity by BMI. Results, controlling for sex, SES, and BMI are presented in Table 5 and Figure 10.

The effects of sleep onset on physical activity. We estimated the effect of sleep onset on physical activity by BMI. Results, controlling for sex, SES, and BMI are presented in Table 3 and Figure 11.

The effects of sleep regularity on physical activity. We estimated the effect of sleep regularity on physical activity by BMI. Results are presented in Table 5 and Figure 12.

SES

The effects of physical activity volume on sleep by SES. We estimated the effects of physical activity on sleep (RQ1) using mixed-effects models. We estimated the effect of physical activity volume on sleep by SES, and the results are presented in Table 6 and Figure 13.

The effects of physical activity intensity on sleep by SES. We estimated how physical activity intensity affects sleep across SES. We present the results in Table 6 and Figure 14.

The effects of sleep duration on physical activity. We estimated the effect of sleep duration on physical activity by SES. Results, controlling for sex, SES, and BMI are presented in Table 7 and Figure 15.

The effects of sleep efficiency on physical activity. We estimated the effect of sleep efficiency on physical activity by SES. Results, controlling for sex, SES, and BMI are presented in Table 7 and Figure 16.

The effects of sleep onset on physical activity. We estimated the effect of sleep onset on physical activity by SES. Results, controlling for sex, SES, and BMI are presented in Table 3 and Figure 17.

The effects of sleep regularity on physical activity. We estimated the effect of sleep regularity on physical activity by SES. Results are presented in Table 7 and Figure 18.

sex

The effects of physical activity volume on sleep by sex. We estimated the effects of physical activity on sleep (RQ1) using mixed-effects models. We estimated the effect of physical activity volume on sleep by sex, and the results are presented in Table 8 and Figure 19.

The effects of physical activity intensity on sleep by sex. We estimated how physical activity intensity affects sleep across sex. We present the results in Table 8 and Figure 20.

The effects of sleep duration on physical activity. We estimated the effect of sleep duration on physical activity by sex. Results, controlling for sex, SES, and BMI are presented in Table 9 and Figure 21.

The effects of sleep efficiency on physical activity. We estimated the effect of sleep efficiency on physical activity by sex. Results, controlling for sex, SES, and BMI are presented in Table 9 and Figure 22.

The effects of sleep onset on physical activity. We estimated the effect of sleep onset on physical activity by sex. Results, controlling for sex, SES, and BMI are presented in Table 3 and Figure 23.

The effects of sleep regularity on physical activity. We estimated the effect of sleep regularity on physical activity by sex. Results are presented in Table 9 and Figure 24.

weekday

The effects of physical activity volume on sleep by weekday. We estimated the effects of physical activity on sleep (RQ1) using mixed-effects models. We estimated the effect of physical activity volume on sleep by weekday, and the results are presented in Table 10 and Figure 25.

The effects of physical activity intensity on sleep by weekday. We estimated how physical activity intensity affects sleep across weekday. We present the results in Table 10 and Figure 26.

The effects of sleep duration on physical activity. We estimated the effect of sleep duration on physical activity by weekday. Results, controlling for sex, SES, and BMI are presented in Table 11 and Figure 27.

The effects of sleep efficiency on physical activity. We estimated the effect of sleep efficiency on physical activity by weekday. Results, controlling for sex, SES, and BMI are presented in Table 11 and Figure 28.

The effects of sleep onset on physical activity. We estimated the effect of sleep onset on physical activity by weekday. Results, controlling for sex, SES, and BMI are presented in Table 3 and Figure 29.

The effects of sleep regularity on physical activity. We estimated the effect of sleep regularity on physical activity by weekday. Results are presented in Table 11 and Figure 30.

season

The effects of physical activity volume on sleep by season. We estimated the effects of physical activity on sleep (RQ1) using mixed-effects models. We estimated the effect of physical activity volume on sleep by season, and the results are presented in Table 12 and Figure 31

The effects of physical activity intensity on sleep by season. We estimated how physical activity intensity affects sleep across season. We present the results in Table 12 and Figure 32.

The effects of sleep duration on physical activity. We estimated the effect of sleep duration on physical activity by season. Results, controlling for sex, SES, and BMI are presented in Table 13 and Figure 33.

The effects of sleep efficiency on physical activity. We estimated the effect of sleep efficiency on physical activity by season. Results, controlling for sex, SES, and BMI are presented in Table 13 and Figure 34.

The effects of sleep onset on physical activity. We estimated the effect of sleep onset on physical activity by season. Results, controlling for sex, SES, and BMI are presented in Table 3 and Figure 35.

The effects of sleep regularity on physical activity. We estimated the effect of sleep regularity on physical activity by season. Results are presented in Table 13 and Figure 36.

region

The effects of physical activity volume on sleep by region. We estimated the effects of physical activity on sleep (RQ1) using mixed-effects models. We estimated the effect of physical activity volume on sleep by region, and the results are presented in Table 14 and Figure 37

The effects of physical activity intensity on sleep by region. We estimated how physical activity intensity affects sleep across region. We present the results in Table 14 and Figure 38.

The effects of sleep duration on physical activity. We estimated the effect of sleep duration on physical activity by region. Results, controlling for sex, SES, and BMI are presented in Table 15 and Figure 39.

The effects of sleep efficiency on physical activity. We estimated the effect of sleep efficiency on physical activity by region. Results, controlling for sex, SES, and BMI are presented in Table 15 and Figure 40.

The effects of sleep onset on physical activity. We estimated the effect of sleep onset on physical activity by region. Results, controlling for sex, SES, and BMI are presented in Table 3 and Figure 41.

The effects of sleep regularity on physical activity. We estimated the effect of sleep regularity on physical activity by region. Results are presented in Table 15 and Figure 42.

daylight hours

The effects of physical activity volume on sleep by daylight hours. We estimated the effects of physical activity on sleep (RQ1) using mixed-effects models. We estimated the effect of physical activity volume on sleep by daylight hours, and the results are presented in Table 16 and Figure 43.

The effects of physical activity intensity on sleep by daylight hours. We estimated how physical activity intensity affects sleep across daylight hours. We present the results in Table 16 and Figure 44.

The effects of sleep duration on physical activity. We estimated the effect of sleep duration on physical activity by daylight hours. Results, controlling for sex, SES, and BMI are presented in Table 17 and Figure 45.

The effects of sleep efficiency on physical activity. We estimated the effect of sleep efficiency on physical activity by daylight hours. Results, controlling for sex, SES, and BMI are presented in Table 17 and Figure 46.

The effects of sleep onset on physical activity. We estimated the effect of sleep onset on physical activity by daylight hours. Results, controlling for sex, SES, and BMI are presented in Table 3 and Figure 47.

The effects of sleep regularity on physical activity. We estimated the effect of sleep regularity on physical activity by daylight hours. Results are presented in Table 17 and Figure 48.

wear location

The effects of physical activity volume on sleep by wear location. We estimated the effects of physical activity on sleep (RQ1) using mixed-effects models. We estimated the effect of physical activity volume on sleep by wear location, and the results are presented in Table 18 and Figure 49.

The effects of physical activity intensity on sleep by wear location. We estimated how physical activity intensity affects sleep across wear location. We present the results in Table 18 and Figure 50.

The effects of sleep duration on physical activity. We estimated the effect of sleep duration on physical activity by wear location. Results, controlling for sex, SES, and BMI are presented in Table 19 and Figure 51.

The effects of sleep efficiency on physical activity. We estimated the effect of sleep efficiency on physical activity by wear location. Results, controlling for sex, SES, and BMI are presented in Table 19 and Figure 52.

The effects of sleep onset on physical activity. We estimated the effect of sleep onset on physical activity by wear location. Results, controlling for sex, SES, and BMI are presented in Table 3 and Figure 53.

The effects of sleep regularity on physical activity. We estimated the effect of sleep regularity on physical activity by wear location. Results are presented in Table 19 and Figure 54.

most active hour

The effects of physical activity volume on sleep by most active hour. We estimated the effects of physical activity on sleep (RQ1) using mixed-effects models. We estimated the effect of physical activity volume on sleep by most active hour, and the results are presented in Table 20 and Figure 55.

The effects of physical activity intensity on sleep by most active hour. We estimated how physical activity intensity affects sleep across most active hour. We present the results in Table 20 and Figure 56.

The effects of sleep duration on physical activity. We estimated the effect of sleep duration on physical activity by most active hour. Results, controlling for sex, SES, and BMI are presented in Table 21 and Figure 57.

The effects of sleep efficiency on physical activity. We estimated the effect of sleep efficiency on physical activity by most active hour. Results, controlling for sex, SES, and BMI are presented in Table 21 and Figure 58.

The effects of sleep onset on physical activity. We estimated the effect of sleep onset on physical activity by most active hour. Results, controlling for sex, SES, and BMI are presented in Table 3 and Figure 59.

The effects of sleep regularity on physical activity. We estimated the effect of sleep regularity on physical activity by most active hour. Results are presented in Table 21 and Figure 60.

Table 1

Model diagnostics

Model name	Skewness	Kurtosis	Converged (%)
Models moderated by age			
Scale sleep duration by PA volume	-0.01	-1.91	100.00%
Scale sleep efficiency by PA volume	-1.02	-4.34	100.00%
Scale sleep onset by PA volume	0.52	-1.87	100.00%
Scale sleep regularity by PA volume	-0.37	-1.62	100.00%
Scale sleep duration by PA intensity	-0.01	-2.13	100.00%
Scale sleep efficiency by PA intensity	-1.08	-4.37	100.00%
Scale sleep onset by PA intensity	-0.01	-3.57	100.00%
Scale sleep regularity by PA intensity	-0.40	-1.67	100.00%
Scale PA volume by sleep duration(lagged)	0.91	-10.85	100.00%
Scale PA intensity by sleep duration(lagged)	-0.17	-1.00	100.00%
Scale PA volume by sleep efficiency(lagged)	0.91	-10.86	100.00%
Scale PA intensity by sleep efficiency(lagged)	-0.19	-1.01	100.00%
Scale PA volume by sleep onset(lagged)	0.96	-10.77	100.00%
Scale PA intensity by sleep onset(lagged)	-0.11	-0.92	100.00%
Scale PA volume by sleep regularity(lagged)	1.00	-11.03	100.00%
Scale PA intensity by sleep regularity(lagged)	-0.20	-1.00	100.00%
Models moderated by bmi			
Scale sleep duration by PA volume	-0.01	-1.90	100.00%
Scale sleep efficiency by PA volume	-1.03	-4.35	100.00%
Scale sleep onset by PA volume	0.52	-1.88	100.00%
Scale sleep regularity by PA volume	-0.36	-1.61	100.00%
Scale sleep duration by PA intensity	0.00	-2.02	100.00%
Scale sleep efficiency by PA intensity	-1.07	-4.34	100.00%
Scale sleep onset by PA intensity	0.17	-2.38	100.00%
Scale sleep regularity by PA intensity	-0.39	-1.64	100.00%
Scale PA volume by sleep duration(lagged)	0.91	-10.91	100.00%
Scale PA intensity by sleep duration(lagged)	-0.19	-1.01	100.00%
Scale PA volume by sleep efficiency(lagged)	0.91	-10.89	100.00%
Scale PA intensity by sleep efficiency(lagged)	-0.21	-1.01	100.00%
Scale PA volume by sleep onset(lagged)	0.94	-10.83	100.00%
Scale PA intensity by sleep onset(lagged)	-0.14	-0.95	100.00%
Scale PA volume by sleep regularity(lagged)	0.98	-11.02	100.00%
Scale PA intensity by sleep regularity(lagged)	-0.21	-1.01	100.00%

Table 1 continued

Model name	Skewness	Kurtosis	Converged (%)
Models moderated by ses			
Scale sleep duration by PA volume	-0.01	-1.91	100.00%
Scale sleep efficiency by PA volume	-1.03	-4.35	100.00%
Scale sleep onset by PA volume	0.52	-1.89	100.00%
Scale sleep regularity by PA volume	-0.36	-1.60	100.00%
Scale sleep duration by PA intensity	0.00	-2.02	100.00%
Scale sleep efficiency by PA intensity	-1.06	-4.32	100.00%
Scale sleep onset by PA intensity	0.21	-2.21	100.00%
Scale sleep regularity by PA intensity	-0.39	-1.63	100.00%
Scale PA volume by sleep duration(lagged)	0.91	-10.94	100.00%
Scale PA intensity by sleep duration(lagged)	-0.20	-1.01	100.00%
Scale PA volume by sleep efficiency(lagged)	0.91	-10.90	100.00%
Scale PA intensity by sleep efficiency(lagged)	-0.22	-1.01	100.00%
Scale PA volume by sleep onset(lagged)	0.94	-10.85	100.00%
Scale PA intensity by sleep onset(lagged)	-0.15	-0.95	100.00%
Scale PA volume by sleep regularity(lagged)	0.98	-11.03	100.00%
Scale PA intensity by sleep regularity(lagged)	-0.22	-1.01	100.00%
Models moderated by sex			
Scale sleep duration by PA volume	-0.01	-1.91	100.00%
Scale sleep efficiency by PA volume	-1.03	-4.36	100.00%
Scale sleep onset by PA volume	0.52	-1.87	100.00%
Scale sleep regularity by PA volume	-0.36	-1.60	100.00%
Scale sleep duration by PA intensity	0.00	-2.01	100.00%
Scale sleep efficiency by PA intensity	-1.06	-4.33	100.00%
Scale sleep onset by PA intensity	0.21	-2.23	100.00%
Scale sleep regularity by PA intensity	-0.39	-1.63	100.00%
Scale PA volume by sleep duration(lagged)	0.91	-10.94	100.00%
Scale PA intensity by sleep duration(lagged)	-0.20	-1.02	100.00%
Scale PA volume by sleep efficiency(lagged)	0.91	-10.90	100.00%
Scale PA intensity by sleep efficiency(lagged)	-0.22	-1.01	100.00%
Scale PA volume by sleep onset(lagged)	0.94	-10.86	100.00%
Scale PA intensity by sleep onset(lagged)	-0.15	-0.96	100.00%
Scale PA volume by sleep regularity(lagged)	0.98	-11.03	100.00%
Scale PA intensity by sleep regularity(lagged)	-0.22	-1.01	100.00%
Models moderated by weekday			

Table 1 continued

Model name	Skewness	Kurtosis	Converged (%)
Scale sleep duration by PA volume	-0.02	-1.88	100.00%
Scale sleep efficiency by PA volume	-1.02	-4.39	100.00%
Scale sleep onset by PA volume	0.52	-1.89	100.00%
Scale sleep regularity by PA volume	-0.36	-1.58	100.00%
Scale sleep duration by PA intensity	-0.02	-2.01	100.00%
Scale sleep efficiency by PA intensity	-1.05	-4.36	100.00%
Scale sleep onset by PA intensity	0.21	-2.21	100.00%
Scale sleep regularity by PA intensity	-0.39	-1.65	100.00%
Scale PA volume by sleep duration(lagged)	0.92	-11.06	100.00%
Scale PA intensity by sleep duration(lagged)	-0.21	-1.06	100.00%
Scale PA volume by sleep efficiency(lagged)	0.92	-11.08	100.00%
Scale PA intensity by sleep efficiency(lagged)	-0.22	-1.05	100.00%
Scale PA volume by sleep onset(lagged)	0.95	-11.03	100.00%
Scale PA intensity by sleep onset(lagged)	-0.15	-1.00	100.00%
Scale PA volume by sleep regularity(lagged)	0.98	-11.18	100.00%
Scale PA intensity by sleep regularity(lagged)	-0.23	-1.02	100.00%
Models moderated by season			
Scale sleep duration by PA volume	-0.01	-1.91	100.00%
Scale sleep efficiency by PA volume	-1.03	-4.36	100.00%
Scale sleep onset by PA volume	0.52	-1.87	100.00%
Scale sleep regularity by PA volume	-0.36	-1.59	100.00%
Scale sleep duration by PA intensity	0.00	-2.02	100.00%
Scale sleep efficiency by PA intensity	-1.06	-4.34	100.00%
Scale sleep onset by PA intensity	0.21	-2.21	100.00%
Scale sleep regularity by PA intensity	-0.39	-1.64	100.00%
Scale PA volume by sleep duration(lagged)	0.91	-10.90	100.00%
Scale PA intensity by sleep duration(lagged)	-0.20	-1.01	100.00%
Scale PA volume by sleep efficiency(lagged)	0.91	-10.89	100.00%
Scale PA intensity by sleep efficiency(lagged)	-0.21	-1.01	100.00%
Scale PA volume by sleep onset(lagged)	0.94	-10.82	100.00%
Scale PA intensity by sleep onset(lagged)	-0.15	-0.96	100.00%
Scale PA volume by sleep regularity(lagged)	0.98	-11.03	100.00%
Scale PA intensity by sleep regularity(lagged)	-0.22	-1.01	100.00%
Models moderated by region			
Scale sleep duration by PA volume	-0.01	-1.92	100.00%

Table 1 continued

Model name	Skewness	Kurtosis	Converged (%)
Scale sleep efficiency by PA volume	-1.04	-4.43	100.00%
Scale sleep onset by PA volume	0.45	-1.99	100.00%
Scale sleep regularity by PA volume	-0.36	-1.59	100.00%
Scale sleep duration by PA intensity	-0.01	-2.09	100.00%
Scale sleep efficiency by PA intensity	-1.05	-4.34	100.00%
Scale sleep onset by PA intensity	0.13	-2.94	100.00%
Scale sleep regularity by PA intensity	-0.40	-1.68	100.00%
Scale PA volume by sleep duration(lagged)	0.92	-10.63	100.00%
Scale PA intensity by sleep duration(lagged)	-0.15	-0.98	100.00%
Scale PA volume by sleep efficiency(lagged)	0.95	-10.79	100.00%
Scale PA intensity by sleep efficiency(lagged)	-0.19	-1.02	100.00%
Scale PA volume by sleep onset(lagged)	1.02	-10.62	100.00%
Scale PA intensity by sleep onset(lagged)	-0.05	-0.96	100.00%
Scale PA volume by sleep regularity(lagged)	1.03	-11.08	100.00%
Scale PA intensity by sleep regularity(lagged)	-0.19	-0.97	100.00%
Models moderated by daylight			
Scale sleep duration by PA volume	-0.01	-1.90	100.00%
Scale sleep efficiency by PA volume	-1.03	-4.35	100.00%
Scale sleep onset by PA volume	0.52	-1.87	100.00%
Scale sleep regularity by PA volume	-0.36	-1.60	100.00%
Scale sleep duration by PA intensity	0.00	-2.02	100.00%
Scale sleep efficiency by PA intensity	-1.06	-4.33	100.00%
Scale sleep onset by PA intensity	0.21	-2.22	100.00%
Scale sleep regularity by PA intensity	-0.39	-1.63	100.00%
Scale PA volume by sleep duration(lagged)	0.91	-10.91	100.00%
Scale PA intensity by sleep duration(lagged)	-0.20	-1.02	100.00%
Scale PA volume by sleep efficiency(lagged)	0.91	-10.90	100.00%
Scale PA intensity by sleep efficiency(lagged)	-0.22	-1.01	100.00%
Scale PA volume by sleep onset(lagged)	0.94	-10.84	100.00%
Scale PA intensity by sleep onset(lagged)	-0.15	-0.96	100.00%
Scale PA volume by sleep regularity(lagged)	0.97	-11.02	100.00%
Scale PA intensity by sleep regularity(lagged)	-0.22	-1.01	100.00%
Models moderated by wear location			
Scale sleep duration by PA volume	0.00	-1.91	100.00%
Scale sleep efficiency by PA volume	-1.04	-4.41	100.00%

Table 1 continued

Model name	Skewness	Kurtosis	Converged (%)
Scale sleep onset by PA volume	0.46	-1.96	100.00%
Scale sleep regularity by PA volume	-0.36	-1.59	100.00%
Scale sleep duration by PA intensity	0.00	-2.13	100.00%
Scale sleep efficiency by PA intensity	-1.09	-4.48	100.00%
Scale sleep onset by PA intensity	-0.12	-4.09	100.00%
Scale sleep regularity by PA intensity	-0.39	-1.64	100.00%
Scale PA volume by sleep duration(lagged)	0.91	-10.92	100.00%
Scale PA intensity by sleep duration(lagged)	-0.19	-1.05	100.00%
Scale PA volume by sleep efficiency(lagged)	0.92	-10.85	100.00%
Scale PA intensity by sleep efficiency(lagged)	-0.21	-1.02	100.00%
Scale PA volume by sleep onset(lagged)	0.97	-10.78	100.00%
Scale PA intensity by sleep onset(lagged)	-0.14	-0.98	100.00%
Scale PA volume by sleep regularity(lagged)	0.98	-11.02	100.00%
Scale PA intensity by sleep regularity(lagged)	-0.22	-1.02	100.00%
Models moderated by PA mostactivehr			
Scale sleep duration by PA volume	0.00	-1.90	100.00%
Scale sleep efficiency by PA volume	-1.03	-4.37	100.00%
Scale sleep onset by PA volume	0.50	-1.89	100.00%
Scale sleep regularity by PA volume	-0.37	-1.61	100.00%
Scale sleep duration by PA intensity	0.00	-2.01	100.00%
Scale sleep efficiency by PA intensity	-1.07	-4.34	100.00%
Scale sleep onset by PA intensity	0.19	-2.31	100.00%
Scale sleep regularity by PA intensity	-0.39	-1.64	100.00%
Scale PA volume by sleep duration(lagged)	0.93	-10.92	100.00%
Scale PA intensity by sleep duration(lagged)	-0.17	-0.99	100.00%
Scale PA volume by sleep efficiency(lagged)	0.93	-10.88	100.00%
Scale PA intensity by sleep efficiency(lagged)	-0.18	-0.99	100.00%
Scale PA volume by sleep onset(lagged)	0.95	-10.84	100.00%
Scale PA intensity by sleep onset(lagged)	-0.13	-0.94	100.00%
Scale PA volume by sleep regularity(lagged)	0.99	-11.02	100.00%
Scale PA intensity by sleep regularity(lagged)	-0.19	-0.99	100.00%

Table 2

Physical activity predicting sleep controlling for SES, sex, BMI, and the fixed effects of study IDs.

Term	Physical Activity Volume			Physical Activity Intensity				
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Sleep duration								
(Intercept)	0.74 [0.53, 0.94]	0.11	6.90	< .001	0.69 [0.47, 0.90]	0.11	6.24	< .001
Physical activity	0.08 [0.04, 0.12]	0.02	4.17	< .001	0.25 [0.22, 0.28]	0.02	15.83	< .001
Age	0.00 [-0.01, 0.00]	0.00	-1.42	.156	0.00 [-0.01, 0.00]	0.00	-1.82	.068
Physical activity ²	0.00 [-0.01, 0.01]	0.00	-0.87	.387	-0.05 [-0.07, -0.03]	0.01	-4.16	< .001
Physical activity × age	0.00 [0.00, 0.00]	0.00	-2.52	.012	0.00 [0.00, 0.00]	0.00	-9.77	< .001
Age × Physical activity ²	0.00 [0.00, 0.00]	0.00	0.76	.449	0.00 [0.00, 0.00]	0.00	1.83	.068
Sleep efficiency								
(Intercept)	-0.09 [-0.27, 0.09]	0.09	-0.96	.338	-0.15 [-0.31, 0.01]	0.08	-1.80	.073
Physical activity	0.09 [0.05, 0.13]	0.02	4.58	< .001	-0.31 [-0.34, -0.28]	0.02	-20.56	< .001
Age	0.00 [-0.01, 0.00]	0.00	-0.41	.684	0.00 [0.00, 0.01]	0.00	0.92	.358
Physical activity ²	-0.02 [-0.03, -0.01]	0.00	-4.52	< .001	0.13 [0.10, 0.15]	0.01	10.54	< .001
Physical activity × age	0.00 [0.00, 0.00]	0.00	-3.39	.001	0.00 [0.00, 0.01]	0.00	11.49	< .001
Age × Physical activity ²	0.00 [0.00, 0.00]	0.00	0.52	.604	0.00 [0.00, 0.00]	0.00	-7.98	< .001
Sleep onset								
(Intercept)	-0.68 [-0.90, -0.46]	0.11	-6.12	< .001	-0.67 [-0.87, -0.47]	0.10	-6.50	< .001
Physical activity	-0.02 [-0.05, 0.01]	0.02	-1.20	.229	-0.66 [-0.68, -0.63]	0.01	-52.18	< .001
Age	0.00 [0.00, 0.00]	0.00	-0.46	.646	0.00 [0.00, 0.01]	0.00	2.01	.048
Physical activity ²	-0.01 [-0.02, -0.01]	0.00	-3.42	.001	0.20 [0.18, 0.22]	0.01	20.43	< .001
Physical activity × age	0.00 [0.00, 0.00]	0.00	-3.20	.001	0.01 [0.01, 0.01]	0.00	28.16	< .001
Age × Physical activity ²	0.00 [0.00, 0.00]	0.00	1.84	.066	0.00 [0.00, 0.00]	0.00	-12.49	< .001
Sleep regularity								

Table 2 continued

Term	Physical Activity Volume				Physical Activity Intensity					
	β	[95% CI]	SE	t	p	β	[95% CI]	SE	t	p
(Intercept)	0.11	[0.12, 0.33]	0.12	0.95	.353	0.07	[-0.16, 0.30]	0.12	0.60	.555
Physical activity	0.24	[0.21, 0.28]	0.02	12.93	< .001	0.16	[0.13, 0.19]	0.02	10.73	< .001
Age	0.00	[0.00, 0.01]	0.00	0.65	.519	0.00	[-0.01, 0.00]	0.00	-1.00	.317
Physical activity ²	-0.02	[-0.03, -0.01]	0.00	-4.33	< .001	-0.03	[-0.05, -0.01]	0.01	-2.58	.010
Physical activity × age	0.00	[0.00, 0.00]	0.00	-0.88	.379	0.00	[0.00, 0.00]	0.00	-5.88	< .001
Age × Physical activity ²	0.00	[0.00, 0.00]	0.00	-4.96	< .001	0.00	[0.00, 0.00]	0.00	-0.38	.706

Note. Adjusted for SES, sex, BMI, and the fixed effects of study IDs. Outcomes variables are listed in the column headers.

Table 3

Sleep predicting physical activity controlling for SES, sex, BMI, and the fixed effects of study IDs

Term	Physical Activity Volume			Physical Activity Intensity				
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Sleep duration								
(Intercept)	0.13 [-0.10, 0.37]	0.12	1.12	.265	0.67 [0.41, 0.94]	0.14	4.95	< .001
Sleep duration	0.01 [-0.02, 0.03]	0.01	0.61	.542	0.06 [0.04, 0.09]	0.01	4.71	< .001
Age	-0.02 [-0.02, -0.01]	0.00	-7.82	< .001	-0.02 [-0.03, -0.01]	0.00	-6.93	< .001
Sleep duration ²	-0.01 [-0.02, 0.00]	0.01	-2.53	.012	-0.03 [-0.05, -0.02]	0.01	-5.93	< .001
Sleep duration × age	0.00 [0.00, 0.00]	0.00	-2.28	.023	0.00 [0.00, 0.00]	0.00	-2.89	.004
Age × Sleep duration ²	0.00 [0.00, 0.00]	0.00	-2.18	.029	0.00 [0.00, 0.00]	0.00	0.46	.648
Sleep efficiency								
(Intercept)	0.12 [-0.11, 0.36]	0.12	1.03	.305	0.68 [0.41, 0.95]	0.14	4.96	< .001
Sleep efficiency	-0.04 [-0.06, -0.01]	0.01	-3.06	.002	-0.05 [-0.09, -0.02]	0.02	-3.27	.002
Age	-0.02 [-0.02, -0.01]	0.00	-8.04	< .001	-0.02 [-0.03, -0.02]	0.00	-7.01	< .001
Sleep efficiency ²	-0.01 [-0.01, 0.00]	0.00	-2.16	.031	-0.01 [0.02, -0.01]	0.00	-3.32	.001
Sleep efficiency × age	0.00 [0.00, 0.00]	0.00	3.20	.001	0.00 [0.00, 0.00]	0.00	3.38	.001
Age × Sleep efficiency ²	0.00 [0.00, 0.00]	0.00	-0.24	.813	0.00 [0.00, 0.00]	0.00	1.05	.294
Sleep onset								
(Intercept)	0.16 [-0.07, 0.40]	0.12	1.37	.174	0.70 [0.43, 0.96]	0.14	5.08	< .001
Sleep onset	-0.06 [-0.09, -0.03]	0.01	-4.52	< .001	-0.07 [-0.10, -0.04]	0.02	-4.77	< .001
Age	-0.02 [-0.02, -0.02]	0.00	-8.05	< .001	-0.02 [0.03, -0.02]	0.00	-6.89	< .001
Sleep onset ²	-0.06 [-0.08, -0.04]	0.01	-5.45	< .001	-0.04 [-0.06, -0.01]	0.01	-3.10	.002
Sleep onset × age	0.00 [0.00, 0.00]	0.00	3.34	.001	0.00 [0.00, 0.00]	0.00	4.30	< .001
Age × Sleep onset ²	0.00 [0.00, 0.00]	0.00	2.62	.009	0.00 [0.00, 0.00]	0.00	1.64	.101
Sleep regularity								

Table 3 continued

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
(Intercept)	0.13 [-0.10, 0.37]	0.12	1.14	.256	0.69 [0.42, 0.95]	0.14	5.06	< .001
Sleep regularity	0.13 [0.11, 0.15]	0.01	10.77	< .001	0.14 [0.11, 0.16]	0.01	9.55	< .001
Age	-0.02 [-0.02, -0.01]	0.00	-7.73	< .001	-0.02 [-0.03, -0.01]	0.00	-6.67	< .001
Sleep regularity ²	0.00 [-0.02, 0.01]	0.01	-0.35	.728	0.01 [0.00, 0.03]	0.01	1.51	.131
Sleep regularity × age	0.00 [0.00, 0.00]	0.00	-4.02	< .001	0.00 [0.00, 0.00]	0.00	-5.30	< .001
Age × Sleep regularity ²	0.00 [0.00, 0.00]	0.00	-1.21	.230	0.00 [0.00, 0.00]	0.00	-1.76	.079

Note. Adjusted for SES, sex, BMI, and the fixed effects of study IDs. Outcomes variables are listed in the row headers.

Table 4

Physical activity predicting sleep controlling for SES, age, and sex.

Term	Physical Activity Volume				Physical Activity Intensity					
	β	[95% CI]	SE	t	p	β	[95% CI]	SE	t	p
Sleep duration										
(Intercept)	0.34	[0.10, 0.58]	0.12	2.77	.008	0.37	[0.11, 0.62]	0.13	2.76	.010
Physical activity	0.14	[0.06, 0.22]	0.04	3.55	< .001	0.29	[0.17, 0.41]	0.06	4.77	< .001
Physical activity ²	-0.01	[-0.04, 0.03]	0.02	-0.36	.719	-0.06	[-0.10, -0.01]	0.02	-2.51	.013
Age	0.00	[-0.01, 0.00]	0.00	-2.45	.014	0.00	[-0.01, 0.00]	0.00	-1.39	.164
Physical activity × bmi	0.00	[-0.01, 0.00]	0.00	-2.36	.019	-0.01	[-0.01, 0.00]	0.00	-2.95	.009
Sleep efficiency										
(Intercept)	0.36	[0.15, 0.56]	0.11	3.34	.001	0.36	[0.14, 0.59]	0.11	3.15	.002
Physical activity	-0.01	[-0.13, 0.12]	0.06	-0.11	.917	-0.37	[-0.45, -0.30]	0.04	-10.16	< .001
Physical activity ²	0.01	[-0.04, 0.06]	0.02	0.30	.768	0.11	[0.06, 0.17]	0.03	4.18	< .001
Age	0.00	[0.00, 0.00]	0.00	0.77	.444	0.00	[-0.01, 0.00]	0.00	-1.41	.160
Physical activity × bmi	0.00	[0.00, 0.01]	0.00	0.70	.494	0.01	[0.01, 0.01]	0.00	6.17	< .001
Sleep onset										
(Intercept)	0.16	[-0.13, 0.45]	0.15	1.09	.278	0.09	[-0.20, 0.38]	0.15	0.59	.553
Physical activity	-0.21	[-0.45, 0.02]	0.12	-1.78	.108	-0.76	[-0.84, -0.68]	0.04	-19.03	< .001
Physical activity ²	0.02	[-0.04, 0.08]	0.03	0.58	.569	0.20	[0.16, 0.25]	0.02	8.39	< .001
Age	0.00	[0.00, 0.00]	0.00	-0.49	.623	-0.01	[-0.01, 0.00]	0.00	-3.22	.002
Physical activity × bmi	0.00	[-0.01, 0.02]	0.01	0.85	.415	0.02	[0.01, 0.02]	0.00	12.78	< .001
Sleep regularity										
(Intercept)	0.22	[-0.01, 0.44]	0.11	1.89	.064	0.44	[0.17, 0.70]	0.14	3.24	.002
Physical activity	0.04	[-0.42, 0.51]	0.24	0.17	.866	0.11	[-0.02, 0.25]	0.07	1.62	.134
Physical activity ²	0.02	[-0.05, 0.08]	0.03	0.45	.660	-0.02	[-0.07, 0.02]	0.02	-0.92	.362

Term	Physical Activity Volume				Physical Activity Intensity					
	β	[95% CI]	SE	t	p	β	[95% CI]	SE	t	p
Age	0.00	[0.00, 0.00]	0.00	1.03	.302	0.00	[0.00, 0.00]	0.00	0.19	.848
Physical activity \times bmi	0.01	[-0.01, 0.03]	0.01	0.94	.375	0.00	[-0.01, 0.01]	0.00	0.03	.976

Note. Adjusted for SES, age, and sex. Outcomes variables are listed in the column headers.

Table 5

Sleep predicting physical activity controlling for SES, age, and sex

Term	Physical Activity Volume				Physical Activity Intensity					
	β	[95% CI]	SE	t	p	β	[95% CI]	SE	t	p
Sleep duration										
(Intercept)	1.23	[0.88, 1.57]	0.18	6.93	< .001	0.92	[0.68, 1.16]	0.12	7.39	< .001
Sleep duration	0.09	[0.04, 0.14]	0.03	3.30	.001	0.27	[0.20, 0.33]	0.03	7.61	< .001
Sleep duration ²	0.01	[-0.02, 0.03]	0.01	0.40	.694	0.03	[-0.02, 0.07]	0.02	1.18	.257
Age	-0.02	[-0.02, -0.01]	0.00	-8.16	< .001	-0.02	[-0.03, -0.02]	0.00	-8.36	< .001
Sleep duration × bmi	0.00	[-0.01, 0.00]	0.00	-2.49	.018	-0.01	[-0.01, 0.00]	0.00	-5.22	< .001
Sleep efficiency										
(Intercept)	1.27	[0.92, 1.62]	0.18	7.11	< .001	1.05	[0.81, 1.30]	0.13	8.32	< .001
Sleep efficiency	-0.07	[-0.13, -0.02]	0.03	-2.75	.007	-0.25	[-0.32, -0.18]	0.04	-6.89	< .001
Sleep efficiency ²	-0.02	[-0.04, 0.00]	0.01	-2.14	.035	-0.04	[-0.06, -0.02]	0.01	-4.52	< .001
Age	-0.02	[-0.02, -0.01]	0.00	-8.28	< .001	-0.02	[-0.03, -0.02]	0.00	-8.40	< .001
Sleep efficiency × bmi	0.00	[0.00, 0.00]	0.00	1.74	.087	0.01	[0.00, 0.01]	0.00	3.17	.006
Sleep onset										
(Intercept)	1.31	[0.96, 1.66]	0.18	7.33	< .001	1.04	[0.77, 1.30]	0.13	7.74	< .001
Sleep onset	-0.10	[-0.20, 0.00]	0.05	-1.92	.078	-0.28	[-0.33, -0.22]	0.03	-10.03	< .001
Sleep onset ²	-0.07	[-0.10, -0.03]	0.02	-3.69	< .001	-0.02	[-0.10, 0.06]	0.04	-0.51	.618
Age	-0.02	[-0.02, -0.01]	0.00	-8.16	< .001	-0.02	[-0.03, -0.02]	0.00	-8.13	< .001
Sleep onset × bmi	0.00	[0.00, 0.01]	0.00	1.01	.332	0.01	[0.00, 0.01]	0.00	4.55	< .001
Sleep regularity										
(Intercept)	1.18	[0.85, 1.52]	0.17	6.90	< .001	0.87	[0.63, 1.10]	0.12	7.23	< .001
Sleep regularity	0.16	[0.04, 0.27]	0.06	2.72	.020	0.17	[0.07, 0.27]	0.05	3.23	.007
Sleep regularity ²	0.00	[-0.04, 0.05]	0.02	0.18	.862	0.06	[0.01, 0.11]	0.02	2.40	.022

Table 5 continued

Term	Physical Activity Volume				Physical Activity Intensity					
	β	[95% CI]	SE	t	p	β	[95% CI]	SE	t	p
Age	-0.02	[-0.02, -0.01]	0.00	-8.06	< .001	-0.02	[-0.03, -0.02]	0.00	-8.25	< .001
Sleep regularity × bmi	0.00	[0.01, 0.00]	0.00	-0.92	.373	0.00	[0.01, 0.00]	0.00	-1.56	.137

Note. Adjusted for SES, age, and sex. Outcomes variables are listed in the row headers.

Table 6

Physical activity predicting sleep controlling for BMI, age, and sex.

Term	Physical Activity Volume			Physical Activity Intensity				
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Sleep duration								
(Intercept)	0.32 [0.07, 0.57]	0.13	2.49	.017	0.25 [0.00, 0.50]	0.13	1.94	.062
Physical activity	0.05 [0.01, 0.10]	0.02	2.40	.017	0.13 [0.10, 0.16]	0.02	8.20	< .001
Physical activity ²	0.00 [-0.01, 0.02]	0.01	0.51	.609	0.02 [0.00, 0.04]	0.01	1.62	.106
Age	0.00 [-0.01, 0.00]	0.00	-2.42	.016	0.00 [-0.01, 0.00]	0.00	-1.42	.155
Physical activity × sesmedium	-0.02 [-0.08, 0.04]	0.03	-0.62	.533	0.00 [-0.04, 0.05]	0.02	0.23	.818
Physical activity × seshigh	0.00 [-0.06, 0.06]	0.03	0.02	.984	0.02 [-0.02, 0.06]	0.02	0.95	.345
Sleep efficiency								
(Intercept)	0.39 [0.18, 0.60]	0.11	3.63	< .001	0.55 [0.33, 0.76]	0.11	4.98	< .001
Physical activity	0.04 [0.00, 0.09]	0.02	1.78	.077	-0.16 [-0.19, -0.13]	0.02	-10.54	< .001
Physical activity ²	-0.02 [-0.04, -0.01]	0.01	-3.03	.003	-0.01 [-0.03, 0.01]	0.01	-0.97	.333
Age	0.00 [0.00, 0.00]	0.00	0.78	.435	0.00 [-0.01, 0.00]	0.00	-1.42	.156
Physical activity × sesmedium	-0.02 [-0.08, 0.05]	0.03	-0.52	.607	0.01 [-0.03, 0.05]	0.02	0.42	.673
Physical activity × seshigh	-0.01 [-0.07, 0.05]	0.03	-0.26	.795	-0.04 [-0.08, 0.00]	0.02	-2.14	.033
Sleep onset								
(Intercept)	0.20 [-0.09, 0.49]	0.15	1.38	.168	0.42 [0.13, 0.71]	0.15	2.82	.005
Physical activity	-0.15 [-0.19, -0.11]	0.02	-7.27	< .001	-0.38 [-0.41, -0.36]	0.01	-29.68	< .001
Physical activity ²	-0.01 [-0.02, 0.01]	0.01	-0.75	.453	-0.02 [-0.03, 0.00]	0.01	-1.79	.074
Age	0.00 [0.00, 0.00]	0.00	-0.47	.638	-0.01 [-0.01, 0.00]	0.00	-3.88	< .001
Physical activity × sesmedium	0.03 [-0.03, 0.08]	0.03	0.91	.364	0.00 [-0.03, 0.04]	0.02	0.06	.951
Physical activity × seshigh	0.06 [0.01, 0.11]	0.03	2.18	.030	-0.06 [-0.09, -0.02]	0.02	-3.30	.001
Sleep regularity								

Table 6 continued

Term	Physical Activity Volume			Physical Activity Intensity				
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
(Intercept)	0.31 [0.07, 0.56]	0.12	2.51	.017	0.42 [0.16, 0.69]	0.14	3.11	.003
Physical activity	0.24 [0.20, 0.28]	0.02	11.22	< .001	0.10 [0.07, 0.13]	0.02	6.20	< .001
Physical activity ²	-0.04 [-0.05, -0.02]	0.01	-4.76	< .001	-0.01 [-0.03, 0.01]	0.01	-0.63	.529
Age	0.00 [0.00, 0.00]	0.00	1.04	.299	0.00 [0.00, 0.00]	0.00	0.20	.840
Physical activity × sesmedium	0.03 [-0.03, 0.08]	0.03	0.97	.332	0.02 [-0.02, 0.05]	0.02	0.93	.351
Physical activity × seshigh	-0.01 [-0.06, 0.04]	0.03	-0.32	.745	0.02 [-0.02, 0.06]	0.02	0.99	.325

Note. Adjusted for BMI, age, and sex. Outcomes variables are listed in the column headers.

Table 7

Sleep predicting physical activity controlling for BMI, age, and sex

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Sleep duration								
(Intercept)	1.23 [0.88, 1.58]	0.18	6.94	< .001	0.93 [0.68, 1.18]	0.13	7.29	< .001
Sleep duration	0.01 [-0.02, 0.04]	0.01	0.58	.561	0.10 [0.07, 0.13]	0.02	6.44	< .001
Sleep duration ²	-0.02 [-0.03, 0.00]	0.01	-2.65	.008	-0.01 [-0.02, 0.01]	0.01	-1.25	.212
Age	-0.02 [-0.02, -0.01]	0.00	-8.17	< .001	-0.02 [-0.03, -0.02]	0.00	-8.36	< .001
Sleep duration × sesmedium	0.00 [-0.04, 0.04]	0.02	-0.16	.875	0.03 [0.02, 0.07]	0.02	1.23	.220
Sleep duration × seshigh	0.02 [-0.02, 0.06]	0.02	0.89	.374	0.04 [0.00, 0.08]	0.02	2.02	.044
Sleep efficiency								
(Intercept)	1.24 [0.89, 1.59]	0.18	6.95	< .001	1.01 [0.76, 1.25]	0.13	7.96	< .001
Sleep efficiency	-0.02 [-0.05, 0.01]	0.02	-1.17	.243	-0.09 [-0.12, -0.06]	0.02	-5.59	< .001
Sleep efficiency ²	-0.01 [-0.02, 0.01]	0.01	-0.92	.359	-0.02 [-0.03, -0.01]	0.01	-3.62	< .001
Age	-0.02 [-0.02, -0.01]	0.00	-8.18	< .001	-0.02 [-0.03, -0.02]	0.00	-8.23	< .001
Sleep efficiency × sesmedium	-0.01 [-0.05, 0.04]	0.02	-0.23	.818	0.01 [-0.04, 0.06]	0.03	0.40	.688
Sleep efficiency × seshigh	-0.02 [-0.06, 0.03]	0.02	-0.76	.448	-0.04 [-0.08, 0.01]	0.02	-1.65	.102
Sleep onset								
(Intercept)	1.27 [0.91, 1.62]	0.18	6.98	< .001	0.97 [0.70, 1.23]	0.14	7.12	< .001
Sleep onset	-0.04 [-0.07, -0.02]	0.01	-3.37	.001	-0.12 [-0.15, -0.09]	0.01	-8.18	< .001
Sleep onset ²	-0.04 [-0.05, -0.02]	0.01	-4.35	< .001	0.01 [0.01, 0.03]	0.01	1.29	.199
Age	-0.02 [-0.02, -0.01]	0.00	-8.14	< .001	-0.02 [-0.03, -0.02]	0.00	-8.08	< .001
Sleep onset × sesmedium	-0.01 [-0.04, 0.03]	0.02	-0.47	.639	-0.03 [-0.07, 0.00]	0.02	-1.75	.083
Sleep onset × seshigh	0.00 [-0.03, 0.03]	0.02	-0.01	.995	-0.05 [-0.08, -0.01]	0.02	-2.47	.014
Sleep regularity								

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
(Intercept)	1.19 [0.85, 1.53]	0.17	6.86	< .001	0.90 [0.66, 1.14]	0.12	7.31	< .001
Sleep regularity	0.09 [0.06, 0.13]	0.02	5.34	< .001	0.09 [0.06, 0.12]	0.02	5.44	< .001
Sleep regularity ²	-0.01 [-0.03, 0.01]	0.01	-1.08	.280	0.01 [-0.01, 0.03]	0.01	0.79	.430
Age	-0.02 [-0.02, -0.01]	0.00	-8.07	< .001	-0.02 [-0.03, -0.02]	0.00	-8.23	< .001
Sleep regularity × sesmedium	0.02 [-0.03, 0.06]	0.02	0.72	.478	0.01 [-0.03, 0.05]	0.02	0.33	.745
Sleep regularity × seshigh	0.03 [-0.03, 0.08]	0.03	1.00	.330	0.03 [0.01, 0.07]	0.02	1.31	.192

Note. Adjusted for BMI, age, and sex. Outcomes variables are listed in the row headers.

Table 8

Physical activity predicting sleep controlling for SES, age, and BMI.

Term	Physical Activity Volume			Physical Activity Intensity				
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Sleep duration								
(Intercept)	0.31 [0.06, 0.56]	0.13	2.47	.018	0.25 [0.00, 0.50]	0.13	1.98	.057
Physical activity	0.03 [0.00, 0.07]	0.02	1.95	.051	0.15 [0.12, 0.17]	0.01	11.62	< .001
Physical activity ²	0.01 [0.00, 0.02]	0.00	1.91	.056	0.02 [0.00, 0.03]	0.01	1.86	.063
Age	0.00 [-0.01, 0.00]	0.00	-2.43	.015	0.00 [-0.01, 0.00]	0.00	-1.40	.161
Physical activity × sexmale	0.03 [-0.02, 0.07]	0.02	1.20	.231	-0.02 [-0.05, 0.01]	0.02	-1.19	.235
Sleep efficiency								
(Intercept)	0.40 [0.19, 0.60]	0.11	3.69	< .001	0.54 [0.32, 0.75]	0.11	4.84	< .001
Physical activity	0.05 [0.02, 0.09]	0.02	2.92	.004	-0.19 [-0.21, -0.17]	0.01	-15.46	< .001
Physical activity ²	-0.03 [-0.04, -0.02]	0.01	-5.59	< .001	0.01 [-0.01, 0.02]	0.01	0.58	.560
Age	0.00 [0.00, 0.00]	0.00	0.75	.452	0.00 [-0.01, 0.00]	0.00	-1.48	.141
Physical activity × sexmale	-0.04 [-0.09, 0.01]	0.02	-1.68	.094	0.03 [0.00, 0.06]	0.02	1.67	.095
Sleep onset								
(Intercept)	0.22 [-0.07, 0.51]	0.15	1.48	.139	0.40 [0.10, 0.69]	0.15	2.64	.009
Physical activity	-0.09 [-0.12, -0.06]	0.02	-5.29	< .001	-0.42 [-0.44, -0.40]	0.01	-41.97	< .001
Physical activity ²	-0.02 [-0.03, -0.01]	0.00	-4.23	< .001	0.01 [0.00, 0.03]	0.01	1.35	.176
Age	0.00 [0.00, 0.00]	0.00	-0.47	.636	-0.01 [-0.01, 0.00]	0.00	-3.98	< .001
Physical activity × sexmale	-0.06 [-0.11, -0.02]	0.02	-3.04	.002	0.04 [0.02, 0.07]	0.01	3.27	.001
Sleep regularity								
(Intercept)	0.31 [0.07, 0.56]	0.12	2.49	.017	0.42 [0.15, 0.69]	0.14	3.08	.004
Physical activity	0.25 [0.22, 0.29]	0.02	14.69	< .001	0.10 [0.08, 0.13]	0.01	8.30	< .001
Physical activity ²	-0.03 [-0.04, -0.02]	0.00	-7.08	< .001	0.00 [-0.02, 0.01]	0.01	-0.46	.643

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Age	0.00 [0.00, 0.00]	0.00	1.05	.293	0.00 [0.00, 0.00]	0.00	0.26	.792
Physical activity \times sexmale	-0.02 [-0.06, 0.03]	0.02	-0.68	.500	0.01 [-0.02, 0.04]	0.02	0.71	.480

Note. Adjusted for SES, age, and BMI. Outcomes variables are listed in the column headers.

Table 9

Sleep predicting physical activity controlling for SES, age, and BMI

Term	Physical Activity Volume				Physical Activity Intensity					
	β	[95% CI]	SE	t	p	β	[95% CI]	SE	t	p
Sleep duration										
(Intercept)	1.23	[0.88, 1.57]	0.18	6.90	< .001	0.92	[0.67, 1.17]	0.13	7.24	< .001
Sleep duration	0.00	[-0.02, 0.02]	0.01	-0.05	.958	0.10	[0.08, 0.13]	0.01	9.38	< .001
Sleep duration ²	-0.01	[-0.02, 0.00]	0.00	-2.20	.028	0.00	[-0.01, 0.01]	0.01	-0.56	.574
Age	-0.02	[-0.02, -0.01]	0.00	-8.17	< .001	-0.02	[-0.03, -0.02]	0.00	-8.36	< .001
Sleep duration × sexmale	0.03	[0.00, 0.06]	0.02	1.83	.068	0.04	[0.00, 0.07]	0.02	2.16	.031
Sleep efficiency										
(Intercept)	1.24	[0.89, 1.59]	0.18	6.92	< .001	1.00	[0.75, 1.25]	0.13	7.88	< .001
Sleep efficiency	-0.01	[-0.04, 0.01]	0.01	-1.10	.275	-0.09	[-0.11, -0.06]	0.01	-6.57	< .001
Sleep efficiency ²	-0.01	[-0.01, 0.00]	0.00	-1.87	.063	-0.02	[-0.03, -0.01]	0.00	-5.31	< .001
Age	-0.02	[-0.02, -0.01]	0.00	-8.18	< .001	-0.02	[-0.03, -0.02]	0.00	-8.23	< .001
Sleep efficiency × sexmale	-0.02	[-0.06, 0.01]	0.02	-1.28	.206	-0.02	[-0.06, 0.01]	0.02	-1.21	.229
Sleep onset										
(Intercept)	1.26	[0.90, 1.61]	0.18	6.93	< .001	0.98	[0.71, 1.24]	0.14	7.20	< .001
Sleep onset	-0.02	[-0.04, 0.00]	0.01	-2.07	.039	-0.13	[-0.15, -0.11]	0.01	-12.49	< .001
Sleep onset ²	-0.03	[-0.04, -0.02]	0.01	-4.01	< .001	0.00	[-0.02, 0.01]	0.01	-0.28	.777
Age	-0.02	[-0.02, -0.01]	0.00	-8.17	< .001	-0.02	[-0.03, -0.02]	0.00	-8.07	< .001
Sleep onset × sexmale	-0.06	[-0.08, -0.03]	0.01	-4.22	< .001	-0.03	[-0.06, -0.01]	0.01	-2.31	.021
Sleep regularity										
(Intercept)	1.19	[0.85, 1.52]	0.17	6.88	< .001	0.89	[0.66, 1.13]	0.12	7.33	< .001
Sleep regularity	0.09	[0.07, 0.11]	0.01	7.87	< .001	0.09	[0.07, 0.12]	0.01	7.72	< .001
Sleep regularity ²	-0.01	[-0.03, 0.00]	0.01	-1.66	.099	0.02	[0.00, 0.03]	0.01	1.98	.048

Table 9 continued

Term	Physical Activity Volume				Physical Activity Intensity					
	β	[95% CI]	SE	t	p	β	[95% CI]	SE	t	p
Age	-0.02	[-0.02, -0.01]	0.00	-8.05	< .001	-0.02	[-0.03, -0.02]	0.00	-8.24	< .001
Sleep regularity \times sexmale	0.04	[0.00, 0.07]	0.02	1.95	.061	0.02	[-0.02, 0.06]	0.02	0.94	.351

Note. Adjusted for SES, age, and BMI. Outcomes variables are listed in the row headers.

Table 10

Physical activity predicting sleep controlling for BMI, age, and sex.

TITLE

Term	Physical Activity Volume						Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p		
Sleep duration										
(Intercept)	0.31 [0.07, 0.56]	0.12	2.49	.017	0.24 [-0.01, 0.49]	0.13	1.92	.064		
Physical activity	0.04 [-0.01, 0.09]	0.03	1.56	.118	0.17 [0.13, 0.20]	0.02	10.16	<.001		
Weekday xmonday	-0.07 [-0.12, -0.02]	0.02	-2.76	.006	-0.07 [-0.12, -0.01]	0.03	-2.27	.023		
Weekday xsaturday	0.07 [0.02, 0.12]	0.02	2.97	.003	0.08 [0.02, 0.13]	0.03	2.70	.007		
Weekday xsunday	0.05 [0.00, 0.10]	0.02	2.04	.041	0.06 [0.00, 0.11]	0.03	2.07	.038		
Weekday xthursday	-0.03 [-0.08, 0.02]	0.02	-1.18	.237	-0.01 [-0.06, 0.05]	0.03	-0.23	.816		
Weekday xtuesday	-0.03 [-0.07, 0.02]	0.02	-1.15	.249	-0.04 [-0.10, 0.02]	0.03	-1.34	.182		
Weekday xwednesday	-0.06 [-0.11, -0.02]	0.02	-2.58	.010	-0.05 [-0.10, 0.01]	0.03	-1.59	.112		
Physical activity ²	0.00 [-0.01, 0.02]	0.01	0.34	.735	0.01 [-0.02, 0.04]	0.01	0.79	.431		
Age	0.00 [-0.01, 0.00]	0.00	-2.39	.017	0.00 [0.00, 0.00]	0.00	-1.29	.198		
Physical activity × weekday xmonday	0.02 [-0.05, 0.08]	0.03	0.57	.568	-0.02 [-0.07, 0.02]	0.02	-1.10	.273		
Physical activity × weekday xsaturday	0.02 [-0.05, 0.09]	0.03	0.59	.552	-0.08 [-0.12, -0.03]	0.02	-3.46	.001		
Physical activity × weekday xsunday	0.04 [-0.02, 0.11]	0.03	1.23	.219	-0.07 [-0.12, -0.03]	0.02	-3.31	.001		
Physical activity × weekday xtuesday	-0.02 [-0.08, 0.05]	0.03	-0.49	.621	-0.02 [-0.06, 0.02]	0.02	-0.84	.403		
Physical activity × weekday xtuesday	0.01 [-0.05, 0.08]	0.03	0.43	.665	-0.03 [-0.07, 0.02]	0.02	-1.14	.256		
Physical activity × weekday xwednesday	-0.04 [-0.11, 0.03]	0.04	-1.08	.283	-0.01 [-0.05, 0.03]	0.02	-0.40	.692		
Weekday xmonday × Physical activity ²	0.01 [-0.01, 0.02]	0.01	0.52	.606	0.00 [-0.04, 0.03]	0.02	-0.06	.951		
Weekday xsaturday × Physical activity ²	-0.01 [-0.03, 0.01]	0.01	-1.22	.222	-0.03 [-0.06, 0.01]	0.02	-1.46	.144		
Weekday xsunday × Physical activity ²	-0.01 [-0.03, 0.01]	0.01	-0.83	.406	-0.03 [-0.06, 0.01]	0.02	-1.52	.129		
Weekday xthursday × Physical activity ²	0.01 [-0.01, 0.03]	0.01	1.00	.320	-0.02 [-0.05, 0.02]	0.02	-0.84	.400		
Weekday xtuesday × Physical activity ²	0.00 [-0.02, 0.02]	0.01	0.12	.905	0.01 [-0.03, 0.04]	0.02	0.41	.680		

Table 10 continued

TITLE

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Weekday xwednesday \times Physical activity ²	0.02 [0.00, 0.04]	0.01	1.53	.127	0.00 [-0.03, 0.04]	0.02	0.17	.863
Sleep efficency								
(Intercept)	0.39 [0.18, 0.59]	0.10	3.70	< .001	0.57 [0.36, 0.78]	0.11	5.27	< .001
Physical activity	-0.01 [-0.06, 0.04]	0.03	-0.46	.643	-0.19 [-0.22, -0.15]	0.02	-11.20	< .001
Weekday xmunday	0.00 [-0.05, 0.05]	0.03	0.03	.974	-0.03 [-0.09, 0.02]	0.03	-1.18	.237
Weekday xsaturday	-0.06 [-0.11, -0.01]	0.02	-2.35	.019	-0.10 [-0.16, -0.04]	0.03	-3.40	.001
Weekday xsunday	-0.08 [-0.13, -0.03]	0.03	-3.22	.001	-0.15 [-0.21, -0.09]	0.03	-5.29	< .001
Weekday xthursday	0.02 [-0.02, 0.07]	0.03	0.98	.325	0.01 [-0.04, 0.07]	0.03	0.49	.627
Weekday xtuesday	0.00 [-0.05, 0.05]	0.02	-0.02	.983	-0.02 [-0.07, 0.04]	0.03	-0.54	.587
Weekday xwednesday	0.05 [0.00, 0.10]	0.03	2.02	.044	0.02 [-0.04, 0.08]	0.03	0.74	.458
Physical activity ²	-0.01 [-0.02, 0.01]	0.01	-0.74	.458	0.00 [-0.03, 0.02]	0.01	-0.32	.746
Age	0.00 [0.00, 0.00]	0.00	0.79	.432	0.00 [-0.01, 0.00]	0.00	-1.47	.142
Physical activity \times weekday xmonday	0.05 [-0.02, 0.11]	0.03	1.37	.170	0.04 [0.00, 0.08]	0.02	1.74	.081
Physical activity \times weekday xsaturday	0.09 [0.02, 0.15]	0.03	2.60	.009	-0.04 [-0.09, 0.00]	0.02	-1.81	.071
Physical activity \times weekday xsunday	0.12 [0.05, 0.18]	0.03	3.49	< .001	0.02 [-0.02, 0.07]	0.02	1.07	.282
Physical activity \times weekday xtuesday	0.03 [-0.04, 0.10]	0.04	0.83	.404	0.03 [-0.01, 0.08]	0.02	1.51	.131
Physical activity \times weekday xtuesday	-0.01 [-0.08, 0.06]	0.03	-0.33	.745	0.01 [-0.04, 0.05]	0.02	0.34	.737
Physical activity \times weekday xwednesday	-0.02 [-0.09, 0.06]	0.04	-0.43	.670	-0.01 [-0.05, 0.03]	0.02	-0.42	.675
Weekday xmunday \times Physical activity ²	-0.02 [-0.04, 0.00]	0.01	-1.53	.125	0.01 [-0.02, 0.05]	0.02	0.71	.479
Weekday xsaturday \times Physical activity ²	-0.03 [-0.05, 0.00]	0.01	-2.34	.019	0.00 [-0.04, 0.03]	0.02	-0.16	.872
Weekday xsunday \times Physical activity ²	-0.04 [-0.07, -0.02]	0.01	-3.59	< .001	0.01 [-0.03, 0.04]	0.02	0.51	.612
Weekday xthursday \times Physical activity ²	-0.02 [-0.04, 0.00]	0.01	-1.67	.095	0.00 [-0.04, 0.03]	0.02	-0.05	.964
Weekday xtuesday \times Physical activity ²	0.00 [-0.02, 0.02]	0.01	-0.07	.945	0.02 [-0.02, 0.05]	0.02	0.90	.366

Table 10 continued

TITLE

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Weekday xwednesday \times Physical activity ²	-0.01 [-0.03, 0.02]	0.01	-0.52	.604	0.02 [-0.02, 0.05]	0.02	0.88	.381
Sleep onset								
(Intercept)	0.22 [-0.07, 0.51]	0.15	1.52	.131	0.45 [0.15, 0.74]	0.15	2.99	.003
Physical activity	-0.15 [-0.20, -0.10]	0.02	-6.07	< .001	-0.40 [-0.43, -0.37]	0.01	-28.30	< .001
Weekday xmunday	-0.06 [-0.11, -0.02]	0.02	-2.78	.005	-0.07 [-0.11, -0.02]	0.02	-2.67	.008
Weekday xsaturday	0.06 [0.02, 0.10]	0.02	2.80	.005	0.04 [-0.01, 0.09]	0.02	1.60	.109
Weekday xsunday	0.06 [0.02, 0.10]	0.02	2.66	.008	-0.02 [-0.07, 0.03]	0.02	-0.82	.414
Weekday xthursday	-0.02 [-0.06, 0.02]	0.02	-0.95	.345	-0.03 [-0.08, 0.02]	0.02	-1.35	.178
Weekday xtuesday	-0.04 [-0.08, 0.01]	0.02	-1.63	.102	-0.04 [-0.09, 0.01]	0.03	-1.45	.146
Weekday xwednesday	0.02 [-0.02, 0.07]	0.02	1.09	.274	0.00 [-0.05, 0.05]	0.03	-0.09	.931
Physical activity ²	0.00 [-0.01, 0.02]	0.01	0.53	.596	0.01 [-0.01, 0.03]	0.01	0.81	.419
Age	0.00 [0.00, 0.00]	0.00	-0.51	.613	-0.01 [-0.01, 0.00]	0.00	-4.17	< .001
Physical activity \times weekday xmonday	-0.01 [-0.07, 0.05]	0.03	-0.20	.844	0.01 [-0.02, 0.05]	0.02	0.76	.445
Physical activity \times weekday xsaturday	0.11 [0.05, 0.17]	0.03	3.51	< .001	0.03 [-0.01, 0.06]	0.02	1.45	.147
Physical activity \times weekday xsunday	0.14 [0.07, 0.20]	0.03	4.38	< .001	0.03 [-0.01, 0.07]	0.02	1.64	.101
Physical activity \times weekday xthursday	-0.02 [-0.09, 0.04]	0.03	-0.70	.483	-0.03 [-0.07, 0.01]	0.02	-1.63	.102
Physical activity \times weekday xtuesday	-0.02 [-0.08, 0.04]	0.03	-0.71	.476	0.01 [-0.03, 0.04]	0.02	0.31	.759
Physical activity \times weekday xwednesday	-0.04 [-0.11, 0.02]	0.03	-1.31	.191	-0.05 [-0.09, -0.02]	0.02	-2.81	.005
Weekday xmunday \times Physical activity ²	-0.01 [-0.03, 0.01]	0.01	-0.79	.432	0.00 [-0.03, 0.03]	0.02	-0.08	.939
Weekday xsaturday \times Physical activity ²	-0.02 [-0.04, 0.00]	0.01	-1.87	.062	-0.01 [-0.04, 0.02]	0.02	-0.50	.615
Weekday xsunday \times Physical activity ²	-0.05 [-0.07, -0.03]	0.01	-4.30	< .001	0.01 [-0.02, 0.04]	0.02	0.86	.390
Weekday xthursday \times Physical activity ²	-0.01 [-0.03, 0.01]	0.01	-0.89	.373	0.00 [-0.03, 0.03]	0.02	0.30	.761
Weekday xtuesday \times Physical activity ²	0.00 [-0.02, 0.01]	0.01	-0.40	.689	0.01 [-0.03, 0.04]	0.02	0.40	.688

Table 10 continued

TITLE

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Weekday xwednesday \times Physical activity ²	-0.01 [-0.03, 0.01]	0.01	-0.82	.412	0.00 [-0.03, 0.04]	0.02	0.26	.798
Sleep regularity								
(Intercept)	0.30 [0.07, 0.53]	0.12	2.59	.013	0.42 [0.17, 0.67]	0.13	3.27	.002
Physical activity	0.21 [0.16, 0.26]	0.03	8.32	< .001	0.05 [0.02, 0.08]	0.02	3.18	.002
Weekday xmunday	0.04 [-0.01, 0.09]	0.02	1.58	.116	0.03 [-0.03, 0.08]	0.03	0.93	.355
Weekday xsaturday	-0.11 [-0.15, -0.06]	0.02	-4.47	< .001	-0.11 [-0.16, -0.05]	0.03	-3.72	< .001
Weekday xsunday	-0.11 [-0.15, -0.06]	0.02	-4.61	< .001	-0.15 [-0.21, -0.10]	0.03	-5.65	< .001
Weekday xthursday	0.13 [0.09, 0.18]	0.02	5.72	< .001	0.17 [0.11, 0.22]	0.03	5.97	< .001
Weekday xtuesday	0.15 [0.10, 0.19]	0.02	6.51	< .001	0.16 [0.10, 0.21]	0.03	5.61	< .001
Weekday xwednesday	0.13 [0.08, 0.18]	0.02	5.49	< .001	0.17 [0.12, 0.23]	0.03	6.02	< .001
Physical activity ²	-0.02 [-0.03, -0.01]	0.01	-2.92	.004	0.00 [-0.02, 0.03]	0.01	0.05	.960
Age	0.00 [0.00, 0.00]	0.00	0.85	.395	0.00 [0.00, 0.00]	0.00	0.11	.916
Physical activity \times weekday xmonday	0.05 [-0.02, 0.12]	0.03	1.51	.134	0.08 [0.03, 0.12]	0.02	3.44	.001
Physical activity \times weekday xsaturday	0.01 [-0.05, 0.08]	0.03	0.37	.708	-0.04 [-0.08, 0.01]	0.02	-1.66	.097
Physical activity \times weekday xsunday	0.07 [0.00, 0.13]	0.03	2.09	.037	-0.02 [-0.06, 0.02]	0.02	-1.05	.295
Physical activity \times weekday xtuesday	0.02 [-0.05, 0.08]	0.03	0.47	.636	0.12 [0.08, 0.16]	0.02	6.06	< .001
Physical activity \times weekday xwednesday	0.02 [-0.05, 0.08]	0.03	0.53	.597	0.11 [0.07, 0.15]	0.02	5.36	< .001
Physical activity \times weekday xsaturday	-0.03 [-0.09, 0.04]	0.03	-0.78	.435	0.09 [0.05, 0.13]	0.02	4.22	< .001
Weekday xmunday \times Physical activity ²	-0.02 [-0.03, 0.00]	0.01	-1.53	.127	-0.02 [-0.05, 0.01]	0.02	-1.11	.268
Weekday xsaturday \times Physical activity ²	-0.02 [-0.04, 0.01]	0.01	-1.43	.152	-0.03 [-0.07, 0.01]	0.02	-1.68	.094
Weekday xsunday \times Physical activity ²	-0.03 [-0.05, -0.01]	0.01	-2.49	.013	-0.01 [-0.05, 0.02]	0.02	-0.77	.442
Weekday xthursday \times Physical activity ²	0.00 [-0.03, 0.02]	0.01	-0.46	.646	-0.02 [-0.06, 0.01]	0.02	-1.39	.165
Weekday xtuesday \times Physical activity ²	-0.01 [-0.02, 0.01]	0.01	-0.56	.577	-0.01 [-0.04, 0.03]	0.02	-0.52	.601

Table 10 continued

Term	Physical Activity Volume			Physical Activity Intensity				
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Weekday x wednesday x Physical activity ²	0.00 [-0.02, 0.02]	0.01	0.19	.847	-0.03 [-0.07, 0.01]	0.02	-1.53	.128

Note. Adjusted for BMI, age, and sex. Outcomes variables are listed in the column headers.

Table 11

Sleep predicting physical activity controlling for BMI, age, and sex

TITLE

Term	Physical Activity Volume			Physical Activity Intensity				
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Sleep duration								
(Intercept)	1.28 [0.92, 1.63]	0.18	7.13	< .001	0.97 [0.72, 1.22]	0.13	7.64	< .001
Sleep duration	0.05 [0.01, 0.09]	0.02	2.67	.008	0.19 [0.15, 0.23]	0.02	8.71	< .001
Weekday xmonday	-0.17 [-0.21, -0.13]	0.02	-8.20	< .001	-0.04 [-0.09, 0.00]	0.02	-1.85	.064
Weekday xsaturday	-0.09 [-0.12, -0.05]	0.02	-4.45	< .001	-0.04 [-0.08, 0.00]	0.02	-1.82	.070
Weekday xsunday	-0.17 [-0.21, -0.13]	0.02	-8.72	< .001	-0.08 [-0.12, -0.04]	0.02	-3.63	< .001
Weekday xthursday	-0.03 [-0.07, 0.01]	0.02	-1.44	.149	0.02 [-0.03, 0.06]	0.02	0.82	.415
Weekday xtuesday	-0.07 [-0.10, -0.03]	0.02	-3.32	.001	0.00 [-0.05, 0.04]	0.02	-0.21	.834
Weekday xwednesday	-0.07 [-0.11, -0.03]	0.02	-3.67	< .001	-0.03 [-0.08, 0.01]	0.02	-1.39	.165
Sleep duration ²	-0.01 [-0.03, 0.01]	0.01	-1.03	.303	0.04 [0.02, 0.07]	0.01	3.52	< .001
Age	-0.02 [-0.02, -0.01]	0.00	-8.15	< .001	-0.02 [-0.03, -0.02]	0.00	-8.37	< .001
Sleep duration × weekday xmonday	-0.05 [-0.10, 0.00]	0.02	-1.98	.048	-0.12 [-0.18, -0.07]	0.03	-4.22	< .001
Sleep duration × weekday xsaturday	-0.06 [-0.11, -0.02]	0.02	-2.65	.008	-0.10 [-0.15, -0.05]	0.03	-3.66	< .001
Sleep duration × weekday xsunday	-0.07 [-0.12, -0.03]	0.02	-3.04	.002	-0.11 [-0.16, -0.06]	0.03	-4.01	< .001
Sleep duration × weekday xtuesday	0.01 [-0.04, 0.06]	0.03	0.32	.751	0.00 [-0.06, 0.06]	0.03	0.10	.917
Sleep duration × weekday xtuesday	0.00 [-0.05, 0.05]	0.03	0.18	.859	-0.03 [-0.09, 0.03]	0.03	-0.96	.339
Sleep duration × weekday xwednesday	0.00 [-0.05, 0.06]	0.03	0.17	.868	-0.03 [-0.09, 0.02]	0.03	-1.17	.244
Weekday xmonday × Sleep duration ²	0.00 [-0.02, 0.03]	0.01	0.11	.911	-0.06 [-0.09, -0.03]	0.02	-3.70	< .001
Weekday xsaturday × Sleep duration ²	0.00 [-0.03, 0.02]	0.01	-0.34	.731	-0.05 [-0.08, -0.02]	0.01	-3.63	< .001
Weekday xsunday × Sleep duration ²	0.00 [-0.03, 0.03]	0.01	-0.30	.763	-0.07 [-0.09, -0.04]	0.01	-4.78	< .001
Weekday xtuesday × Sleep duration ²	0.02 [-0.01, 0.04]	0.01	1.15	.251	-0.02 [-0.06, 0.01]	0.02	-1.42	.156
Weekday xtuesday × Sleep duration ²	0.02 [-0.01, 0.04]	0.01	1.15	.251	-0.01 [-0.04, 0.02]	0.02	-0.43	.670

Table 11 continued

TITLE

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Weekday xwednesday \times Sleep duration ²	0.02 [-0.01, 0.05]	0.01	1.56	.118	-0.02 [-0.05, 0.01]	0.02	-1.46	.145
Sleep efficiency (Intercept)	1.31 [0.96, 1.66]	0.18	7.32	< .001	1.09 [0.84, 1.33]	0.12	8.74	< .001
Sleep efficiency	-0.07 [-0.10, -0.03]	0.02	-3.64	< .001	-0.16 [-0.20, -0.12]	0.02	-7.42	< .001
Weekday xmunday	-0.19 [-0.23, -0.15]	0.02	-9.04	< .001	-0.09 [-0.14, -0.04]	0.02	-3.78	< .001
Weekday xsaturday	-0.11 [-0.15, -0.07]	0.02	-5.31	< .001	-0.08 [-0.13, -0.04]	0.02	-3.41	.001
Weekday xsunday	-0.20 [-0.24, -0.16]	0.02	-9.76	< .001	-0.12 [-0.17, -0.08]	0.02	-5.19	< .001
Weekday xthursday	-0.05 [-0.09, 0.00]	0.02	-2.13	.034	-0.01 [-0.06, 0.04]	0.03	-0.31	.754
Weekday xtuesday	-0.07 [-0.11, -0.03]	0.02	-3.23	.001	-0.02 [-0.07, 0.03]	0.03	-0.64	.520
Weekday xwednesday	-0.05 [-0.10, -0.01]	0.02	-2.57	.010	-0.04 [-0.09, 0.00]	0.02	-1.82	.069
Sleep efficiency ²	-0.01 [-0.03, 0.00]	0.01	-2.43	.015	-0.02 [-0.03, 0.00]	0.01	-2.29	.022
Age	-0.02 [-0.02, -0.01]	0.00	-8.13	< .001	-0.02 [-0.03, -0.02]	0.00	-8.21	< .001
Sleep efficiency \times weekday xmonday	0.05 [0.00, 0.11]	0.03	2.04	.043	0.08 [0.02, 0.13]	0.03	2.67	.008
Sleep efficiency \times weekday xsaturday	0.05 [0.00, 0.10]	0.03	1.99	.047	0.08 [0.02, 0.14]	0.03	2.58	.011
Sleep efficiency \times weekday xsunday	0.06 [0.01, 0.11]	0.03	2.29	.022	0.09 [0.03, 0.15]	0.03	3.07	.002
Sleep efficiency \times weekday xthursday	0.05 [0.00, 0.10]	0.03	1.89	.060	0.06 [-0.01, 0.12]	0.03	1.72	.090
Sleep efficiency \times weekday xtuesday	0.03 [-0.02, 0.08]	0.03	1.08	.280	0.02 [-0.05, 0.08]	0.03	0.53	.600
Sleep efficiency \times weekday xwednesday	0.00 [-0.05, 0.05]	0.03	0.08	.935	0.04 [-0.02, 0.10]	0.03	1.33	.185
Weekday xmunday \times Sleep efficiency ²	0.01 [-0.01, 0.03]	0.01	1.22	.224	-0.01 [-0.02, 0.01]	0.01	-0.74	.461
Weekday xsaturday \times Sleep efficiency ²	0.01 [-0.01, 0.03]	0.01	1.20	.232	-0.01 [-0.03, 0.01]	0.01	-0.69	.492
Weekday xsunday \times Sleep efficiency ²	0.01 [0.00, 0.03]	0.01	1.51	.133	-0.02 [-0.04, 0.00]	0.01	-2.46	.014
Weekday xthursday \times Sleep efficiency ²	0.01 [-0.01, 0.02]	0.01	0.64	.524	0.00 [-0.03, 0.02]	0.01	-0.45	.651
Weekday xtuesday \times Sleep efficiency ²	0.00 [-0.01, 0.02]	0.01	0.54	.588	0.00 [-0.02, 0.02]	0.01	0.18	.858

Table 11 continued

TITLE

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Weekday xwednesday \times Sleep efficiency ²	-0.01 [-0.02, 0.01]	0.01	-0.65	.517	-0.01 [-0.03, 0.01]	0.01	-0.91	.362
Sleep onset								
(Intercept)	1.32 [0.96, 1.67]	0.18	7.25	< .001	1.05 [0.79, 1.31]	0.13	7.88	< .001
Sleep onset	-0.09 [-0.12, -0.06]	0.01	-6.14	< .001	-0.24 [-0.28, -0.21]	0.02	-14.71	< .001
Weekday xmunday	-0.16 [-0.21, -0.11]	0.02	-6.58	< .001	-0.09 [-0.14, -0.04]	0.03	-3.22	.001
Weekday xsaturday	-0.12 [-0.16, -0.07]	0.02	-4.95	< .001	-0.09 [-0.15, -0.04]	0.03	-3.48	.001
Weekday xsunday	-0.20 [-0.25, -0.15]	0.02	-8.39	< .001	-0.14 [-0.19, -0.09]	0.03	-5.20	< .001
Weekday xthursday	-0.04 [-0.09, 0.01]	0.02	-1.56	.118	0.00 [-0.06, 0.05]	0.03	-0.04	.971
Weekday xtuesday	-0.06 [-0.11, -0.01]	0.03	-2.41	.016	-0.01 [-0.06, 0.05]	0.03	-0.31	.757
Weekday xwednesday	-0.07 [-0.12, -0.02]	0.03	-2.89	.004	-0.04 [-0.10, 0.02]	0.03	-1.39	.164
Sleep onset ²	-0.03 [-0.06, -0.01]	0.01	-2.49	.013	0.02 [-0.01, 0.05]	0.01	1.31	.191
Age	-0.02 [-0.02, -0.01]	0.00	-8.17	< .001	-0.02 [-0.03, -0.02]	0.00	-8.11	< .001
Sleep onset \times weekday xmonday	0.06 [0.02, 0.10]	0.02	3.12	.002	0.16 [0.12, 0.20]	0.02	7.38	< .001
Sleep onset \times weekday xsaturday	0.07 [0.03, 0.10]	0.02	3.42	.001	0.12 [0.08, 0.17]	0.02	5.63	< .001
Sleep onset \times weekday xsunday	0.10 [0.06, 0.14]	0.02	5.15	< .001	0.18 [0.14, 0.23]	0.02	8.56	< .001
Sleep onset \times weekday xthursday	0.02 [-0.02, 0.06]	0.02	1.15	.250	0.06 [0.01, 0.10]	0.02	2.62	.009
Sleep onset \times weekday xtuesday	0.03 [-0.01, 0.06]	0.02	1.25	.212	0.06 [0.01, 0.10]	0.02	2.49	.013
Sleep onset \times weekday xwednesday	0.02 [-0.02, 0.06]	0.02	0.88	.380	0.08 [0.03, 0.12]	0.02	3.44	.001
Weekday xmunday \times Sleep onset ²	-0.01 [-0.04, 0.02]	0.02	-0.54	.588	-0.02 [-0.06, 0.02]	0.02	-0.93	.352
Weekday xsaturday \times Sleep onset ²	0.01 [-0.02, 0.05]	0.02	0.84	.399	-0.01 [-0.05, 0.03]	0.02	-0.43	.664
Weekday xsunday \times Sleep onset ²	0.01 [-0.03, 0.04]	0.02	0.34	.737	-0.03 [-0.06, 0.01]	0.02	-1.37	.170
Weekday xthursday \times Sleep onset ²	0.01 [-0.03, 0.04]	0.02	0.42	.671	0.00 [-0.05, 0.04]	0.02	-0.23	.821
Weekday xtuesday \times Sleep onset ²	0.00 [-0.04, 0.03]	0.02	-0.16	.870	-0.01 [-0.05, 0.03]	0.02	-0.55	.583

Table 11 continued

TITLE

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Weekday xwednesday \times Sleep onset ²	0.01 [-0.03, 0.05]	0.02	0.47	.637	-0.02 [-0.06, 0.02]	0.02	-1.11	.267
Sleep regularity								
(Intercept)	1.21 [0.87, 1.55]	0.17	7.00	< .001	0.95 [0.72, 1.19]	0.12	7.83	< .001
Sleep regularity	0.13 [0.09, 0.16]	0.02	6.31	< .001	0.11 [0.06, 0.15]	0.02	4.64	< .001
Weekday xmunday	-0.15 [-0.19, -0.11]	0.02	-7.05	< .001	-0.06 [-0.10, -0.01]	0.02	-2.34	.019
Weekday xsaturday	-0.05 [-0.09, 0.00]	0.02	-2.17	.030	-0.05 [-0.10, 0.00]	0.02	-1.94	.052
Weekday xsunday	-0.14 [-0.18, -0.10]	0.02	-6.56	< .001	-0.09 [-0.14, -0.04]	0.02	-3.56	< .001
Weekday xthursday	-0.02 [-0.06, 0.03]	0.02	-0.75	.451	0.00 [-0.05, 0.05]	0.03	0.04	.971
Weekday xtuesday	-0.06 [-0.10, -0.01]	0.02	-2.64	.008	-0.01 [-0.06, 0.04]	0.02	-0.38	.701
Weekday xwednesday	-0.06 [-0.11, -0.02]	0.02	-2.81	.005	-0.06 [-0.11, -0.01]	0.03	-2.34	.019
Sleep regularity ²	0.00 [-0.02, 0.03]	0.01	0.26	.798	0.02 [-0.01, 0.05]	0.02	1.23	.220
Age	-0.02 [-0.02, -0.01]	0.00	-8.06	< .001	-0.02 [-0.03, -0.02]	0.00	-8.27	< .001
Sleep regularity \times weekday xmonday	-0.04 [-0.09, 0.01]	0.03	-1.47	.143	-0.05 [-0.11, 0.01]	0.03	-1.73	.085
Sleep regularity \times weekday xsaturday	-0.03 [-0.08, 0.01]	0.03	-1.38	.169	-0.01 [-0.07, 0.05]	0.03	-0.29	.773
Sleep regularity \times weekday xsunday	0.00 [-0.05, 0.05]	0.03	0.03	.974	-0.02 [-0.08, 0.04]	0.03	-0.65	.518
Sleep regularity \times weekday xthursday	-0.03 [-0.08, 0.03]	0.03	-1.01	.317	0.01 [-0.05, 0.08]	0.03	0.48	.636
Sleep regularity \times weekday xtuesday	-0.02 [-0.07, 0.03]	0.03	-0.67	.505	-0.02 [-0.08, 0.04]	0.03	-0.62	.539
Sleep regularity \times weekday xwednesday	-0.05 [-0.10, 0.00]	0.03	-1.94	.055	0.00 [-0.06, 0.05]	0.03	-0.10	.919
Weekday xmunday \times Sleep regularity ²	0.01 [-0.03, 0.04]	0.02	0.44	.662	0.00 [-0.04, 0.04]	0.02	0.05	.957
Weekday xsaturday \times Sleep regularity ²	-0.05 [-0.08, -0.01]	0.02	-2.51	.012	-0.02 [-0.06, 0.03]	0.02	-0.72	.472
Weekday xsunday \times Sleep regularity ²	-0.01 [-0.04, 0.02]	0.02	-0.52	.601	-0.01 [-0.05, 0.02]	0.02	-0.74	.461
Weekday xthursday \times Sleep regularity ²	-0.02 [-0.06, 0.02]	0.02	-1.00	.315	0.00 [-0.05, 0.04]	0.02	-0.13	.894
Weekday xtuesday \times Sleep regularity ²	0.01 [-0.02, 0.05]	0.02	0.78	.434	0.02 [-0.02, 0.06]	0.02	0.77	.443

Table 11 continued

Term	Physical Activity Volume			Physical Activity Intensity				
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Weekday xwednesday \times Sleep regularity ²	0.00 [-0.04, 0.04]	0.02	0.11	.916	0.02 [-0.02, 0.07]	0.02	1.09	.276

Note. Adjusted for BMI, age, and sex. Outcomes variables are listed in the row headers.

Table 12

Physical activity predicting sleep controlling for BMI, age, and sex.

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Sleep duration								
(Intercept)	0.32 [0.08, 0.56]	0.12	2.60	.013	0.26 [0.02, 0.51]	0.13	2.10	.044
Physical activity	0.10 [0.05, 0.14]	0.02	4.48	< .001	0.16 [0.13, 0.19]	0.02	10.43	< .001
Seasonspring	-0.05 [-0.11, 0.01]	0.03	-1.70	.089	-0.04 [-0.11, 0.02]	0.03	-1.29	.198
Seasonsummer	-0.13 [-0.20, -0.07]	0.03	-3.94	< .001	-0.15 [-0.22, -0.08]	0.04	-4.14	< .001
Seasonwinter	0.02 [-0.04, 0.08]	0.03	0.67	.505	0.02 [-0.04, 0.08]	0.03	0.63	.530
Physical activity ²	-0.01 [-0.02, 0.00]	0.01	-1.25	.211	-0.02 [-0.04, 0.01]	0.01	-1.52	.129
Age	0.00 [-0.01, 0.00]	0.00	-2.18	.029	0.00 [0.00, 0.00]	0.00	-1.11	.269
Physical activity × seasonspring	-0.07 [-0.13, -0.01]	0.03	-2.31	.021	-0.05 [-0.09, -0.01]	0.02	-2.20	.028
Physical activity × seasonsummer	-0.09 [-0.16, -0.02]	0.04	-2.65	.008	-0.07 [-0.12, -0.02]	0.02	-2.90	.004
Physical activity × seasonwinter	-0.06 [-0.12, 0.00]	0.03	-1.88	.061	0.01 [-0.04, 0.05]	0.02	0.26	.792
Seasonspring × Physical activity ²	0.01 [0.00, 0.03]	0.01	1.63	.103	0.01 [-0.02, 0.05]	0.02	0.82	.413
Seasonsummer × Physical activity ²	0.03 [0.01, 0.06]	0.01	2.39	.017	0.04 [0.00, 0.08]	0.02	2.21	.027
Seasonwinter × Physical activity ²	0.01 [0.00, 0.03]	0.01	1.66	.097	0.03 [0.00, 0.06]	0.02	1.71	.088
Sleep efficiency								
(Intercept)	0.32 [0.12, 0.53]	0.10	3.16	.002	0.48 [0.27, 0.69]	0.11	4.44	< .001
Physical activity	0.06 [0.02, 0.11]	0.02	2.81	.005	-0.17 [-0.21, -0.14]	0.02	-11.09	< .001
Seasonspring	0.06 [0.00, 0.12]	0.03	1.86	.063	0.07 [0.01, 0.14]	0.03	2.16	.031
Seasonsummer	0.03 [-0.04, 0.10]	0.03	0.79	.429	0.01 [-0.07, 0.08]	0.04	0.16	.871
Seasonwinter	0.07 [0.01, 0.14]	0.03	2.35	.019	0.08 [0.01, 0.14]	0.03	2.21	.027
Physical activity ²	-0.02 [-0.03, -0.01]	0.01	-3.81	< .001	0.02 [-0.01, 0.04]	0.01	1.20	.228
Age	0.00 [0.00, 0.00]	0.00	0.87	.385	0.00 [-0.01, 0.00]	0.00	-1.42	.157

Table 12 continued

Term	Physical Activity Volume					Physical Activity Intensity				
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p		
Physical activity \times seasonspring	-0.07 [-0.13, -0.01]	0.03	-2.17	.031	0.01 [-0.03, 0.05]	0.02	0.38	.700		
Physical activity \times seasonsummer	0.04 [-0.03, 0.11]	0.04	1.03	.304	0.01 [-0.04, 0.06]	0.02	0.48	.634		
Physical activity \times seasonwinter	-0.05 [-0.11, 0.01]	0.03	-1.59	.113	-0.01 [-0.05, 0.03]	0.02	-0.58	.561		
Seasonspring \times Physical activity ²	0.01 [-0.01, 0.03]	0.01	0.97	.331	-0.02 [-0.05, 0.01]	0.02	-1.10	.270		
Seasonsummer \times Physical activity ²	-0.03 [-0.05, 0.00]	0.01	-2.03	.042	-0.01 [-0.04, 0.03]	0.02	-0.29	.773		
Seasonwinter \times Physical activity ²	0.00 [-0.01, 0.02]	0.01	0.41	.684	-0.01 [-0.04, 0.02]	0.02	-0.64	.523		
Sleep onset										
(Intercept)	0.19 [-0.10, 0.48]	0.15	1.30	.196	0.39 [0.10, 0.68]	0.15	2.60	.010		
Physical activity	-0.13 [-0.17, -0.09]	0.02	-6.38	< .001	-0.43 [-0.46, -0.41]	0.01	-33.27	< .001		
Seasonspring	0.05 [0.00, 0.11]	0.03	2.07	.038	0.06 [0.00, 0.12]	0.03	2.04	.042		
Seasonsummer	0.11 [0.05, 0.17]	0.03	3.84	< .001	0.13 [0.07, 0.19]	0.03	4.36	< .001		
Seasonwinter	0.03 [-0.02, 0.09]	0.03	1.29	.196	0.03 [-0.02, 0.09]	0.03	1.16	.248		
Physical activity ²	0.00 [-0.01, 0.01]	0.00	-0.24	.807	0.04 [0.02, 0.07]	0.01	4.10	< .001		
Age	0.00 [0.00, 0.00]	0.00	-0.64	.523	-0.01 [-0.01, 0.00]	0.00	-4.20	< .001		
Physical activity \times seasonspring	0.00 [-0.06, 0.05]	0.03	-0.08	.937	0.06 [0.03, 0.10]	0.02	3.53	< .001		
Physical activity \times seasonsummer	0.09 [0.03, 0.16]	0.03	2.82	.005	0.08 [0.04, 0.12]	0.02	4.08	< .001		
Physical activity \times seasonwinter	0.00 [-0.06, 0.05]	0.03	-0.08	.936	-0.01 [-0.04, 0.03]	0.02	-0.42	.672		
Seasonspring \times Physical activity ²	-0.01 [-0.02, 0.01]	0.01	-0.63	.531	-0.03 [-0.06, 0.00]	0.01	-2.21	.028		
Seasonsummer \times Physical activity ²	-0.05 [-0.07, -0.03]	0.01	-4.41	< .001	-0.07 [-0.10, -0.04]	0.02	-4.30	< .001		
Seasonwinter \times Physical activity ²	-0.01 [-0.02, 0.01]	0.01	-1.10	.269	-0.04 [-0.06, -0.01]	0.01	-2.48	.013		
Sleep regularity										
(Intercept)	0.33 [0.10, 0.56]	0.12	2.85	.006	0.47 [0.22, 0.72]	0.13	3.63	.001		
Physical activity	0.18 [0.14, 0.22]	0.02	8.67	< .001	0.10 [0.06, 0.13]	0.02	5.86	< .001		

Table 12 continued

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Seasonspring	-0.06 [-0.12, 0.00]	0.03	-1.97	.049	-0.11 [-0.17, -0.04]	0.03	-3.20	.001
Seasonsummer	0.02 [-0.05, 0.09]	0.04	0.59	.558	-0.03 [-0.11, 0.04]	0.04	-0.83	.406
Seasonwinter	0.00 [-0.06, 0.06]	0.03	-0.06	.948	-0.05 [-0.11, 0.02]	0.03	-1.31	.192
Physical activity ²	-0.02 [-0.03, -0.01]	0.01	-4.56	< .001	-0.03 [-0.06, -0.01]	0.01	-2.62	.009
Age	0.00 [0.00, 0.00]	0.00	1.18	.239	0.00 [0.00, 0.00]	0.00	0.39	.695
Physical activity × seasonspring	0.09 [0.03, 0.15]	0.03	2.87	.005	0.00 [-0.04, 0.05]	0.02	0.19	.851
Physical activity × seasonsummer	0.11 [0.05, 0.18]	0.03	3.34	.001	0.03 [-0.03, 0.08]	0.03	0.93	.356
Physical activity × seasonwinter	0.07 [0.02, 0.13]	0.03	2.50	.012	0.02 [-0.02, 0.06]	0.02	1.05	.294
Seasonspring × Physical activity ²	-0.02 [-0.03, 0.00]	0.01	-1.89	.060	0.03 [0.00, 0.06]	0.02	1.81	.071
Seasonsummer × Physical activity ²	-0.03 [-0.05, 0.00]	0.01	-2.15	.033	0.03 [0.00, 0.07]	0.02	1.82	.069
Seasonwinter × Physical activity ²	-0.01 [-0.02, 0.01]	0.01	-0.80	.425	0.03 [0.00, 0.07]	0.02	2.06	.040

Note. Adjusted for BMI, age, and sex. Outcomes variables are listed in the column headers.

Table 13

Sleep predicting physical activity controlling for BMI, age, and sex

Term	Physical Activity Volume						Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p		
Sleep duration										
(Intercept)	1.21 [0.86, 1.56]	0.18	6.78	< .001	0.97 [0.72, 1.22]	0.13	7.56	< .001		
Sleep duration	0.03 [0.00, 0.06]	0.01	1.92	.055	0.18 [0.15, 0.21]	0.02	11.29	< .001		
Seasonspring	-0.03 [-0.09, 0.02]	0.03	-1.22	.221	-0.05 [-0.10, 0.00]	0.03	-1.86	.062		
Seasonsummer	-0.01 [-0.07, 0.05]	0.03	-0.44	.661	-0.02 [-0.07, 0.04]	0.03	-0.65	.515		
Seasonwinter	-0.05 [-0.10, 0.01]	0.03	-1.76	.078	-0.05 [-0.10, 0.00]	0.03	-1.81	.071		
Sleep duration ²	-0.01 [-0.02, 0.01]	0.01	-1.22	.222	0.03 [0.01, 0.04]	0.01	3.68	< .001		
Age	-0.02 [-0.02, -0.01]	0.00	-8.22	< .001	-0.02 [-0.03, -0.02]	0.00	-8.41	< .001		
Sleep duration × seasonspring	-0.04 [-0.08, 0.00]	0.02	-2.16	.031	-0.11 [-0.15, -0.07]	0.02	-5.08	< .001		
Sleep duration × seasonsummer	-0.06 [-0.11, -0.01]	0.02	-2.51	.012	-0.10 [-0.15, -0.04]	0.03	-3.65	< .001		
Sleep duration × seasonwinter	0.02 [-0.02, 0.06]	0.02	1.05	.296	-0.04 [-0.09, 0.00]	0.02	-1.96	.050		
Seasonspring × Sleep duration ²	-0.01 [-0.03, 0.01]	0.01	-1.01	.312	-0.04 [-0.06, -0.02]	0.01	-4.36	< .001		
Seasonsummer × Sleep duration ²	-0.02 [-0.04, 0.01]	0.01	-1.45	.147	-0.03 [-0.05, -0.01]	0.01	-2.44	.015		
Seasonwinter × Sleep duration ²	0.01 [-0.01, 0.02]	0.01	0.71	.480	-0.04 [-0.06, -0.02]	0.01	-3.50	< .001		
Sleep efficiency										
(Intercept)	1.23 [0.88, 1.58]	0.18	6.84	< .001	1.09 [0.83, 1.34]	0.13	8.45	< .001		
Sleep efficiency	-0.01 [-0.04, 0.01]	0.01	-0.93	.353	-0.12 [-0.16, -0.09]	0.02	-6.33	< .001		
Seasonspring	-0.04 [-0.09, 0.02]	0.03	-1.22	.223	-0.10 [-0.16, -0.05]	0.03	-3.59	< .001		
Seasonsummer	-0.02 [-0.08, 0.04]	0.03	-0.59	.554	-0.06 [-0.12, 0.00]	0.03	-1.92	.056		
Seasonwinter	-0.04 [-0.09, 0.02]	0.03	-1.28	.202	-0.08 [-0.13, -0.02]	0.03	-2.64	.009		
Sleep efficiency ²	-0.01 [-0.02, 0.00]	0.00	-1.58	.114	-0.03 [-0.04, -0.01]	0.01	-4.38	< .001		
Age	-0.02 [-0.02, -0.01]	0.00	-8.12	< .001	-0.02 [-0.03, -0.02]	0.00	-8.23	< .001		

Table 13 continued

TITLE

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Sleep efficiency \times seasonspring	-0.02 [-0.06, 0.02]	0.02	-0.95	.345	0.05 [0.00, 0.10]	0.03	1.79	.079
Sleep efficiency \times seasonsummer	0.01 [-0.04, 0.06]	0.03	0.24	.812	0.04 [-0.03, 0.10]	0.03	1.13	.265
Sleep efficiency \times seasonwinter	-0.03 [-0.07, 0.01]	0.02	-1.33	.186	0.02 [-0.04, 0.07]	0.03	0.70	.490
Seasonspring \times Sleep efficiency ²	0.00 [-0.01, 0.01]	0.01	-0.12	.906	0.01 [0.00, 0.03]	0.01	1.32	.191
Seasonsummer \times Sleep efficiency ²	0.00 [-0.02, 0.01]	0.01	-0.40	.689	0.01 [-0.01, 0.03]	0.01	0.84	.403
Seasonwinter \times Sleep efficiency ²	0.00 [-0.02, 0.01]	0.01	-0.61	.540	0.00 [-0.02, 0.01]	0.01	-0.25	.799
Sleep onset								
(Intercept)	1.24 [0.89, 1.60]	0.18	6.84	< .001	1.04 [0.77, 1.30]	0.14	7.65	< .001
Sleep onset	-0.04 [-0.06, -0.02]	0.01	-3.29	.001	-0.17 [-0.20, -0.15]	0.01	-13.36	< .001
Seasonspring	-0.04 [-0.10, 0.02]	0.03	-1.37	.172	-0.08 [-0.14, -0.02]	0.03	-2.72	.007
Seasonsummer	-0.03 [-0.09, 0.03]	0.03	-0.96	.338	-0.04 [-0.10, 0.02]	0.03	-1.20	.230
Seasonwinter	-0.03 [-0.08, 0.03]	0.03	-0.86	.391	-0.06 [-0.12, 0.00]	0.03	-2.07	.039
Sleep onset ²	-0.03 [-0.05, -0.01]	0.01	-3.35	.001	0.01 [-0.01, 0.03]	0.01	1.44	.151
Age	-0.02 [-0.02, -0.01]	0.00	-8.19	< .001	-0.02 [-0.03, -0.02]	0.00	-8.14	< .001
Sleep onset \times seasonspring	0.00 [-0.03, 0.04]	0.02	0.09	.927	0.07 [0.03, 0.11]	0.02	3.53	< .001
Sleep onset \times seasonsummer	0.02 [-0.02, 0.06]	0.02	0.88	.379	0.03 [-0.02, 0.07]	0.02	1.14	.254
Sleep onset \times seasonwinter	-0.04 [-0.07, 0.00]	0.02	-2.07	.038	0.03 [-0.01, 0.06]	0.02	1.46	.146
Seasonspring \times Sleep onset ²	0.00 [-0.03, 0.03]	0.01	0.03	.975	-0.02 [-0.05, 0.01]	0.01	-1.24	.213
Seasonsummer \times Sleep onset ²	0.01 [-0.02, 0.04]	0.02	0.35	.724	0.00 [-0.03, 0.03]	0.02	0.03	.979
Seasonwinter \times Sleep onset ²	-0.01 [-0.04, 0.02]	0.01	-0.83	.409	-0.02 [-0.05, 0.01]	0.02	-1.23	.217
Sleep regularity								
(Intercept)	1.16 [0.82, 1.50]	0.17	6.71	< .001	0.95 [0.71, 1.19]	0.12	7.80	< .001
Sleep regularity	0.08 [0.05, 0.11]	0.01	5.55	< .001	0.09 [0.05, 0.12]	0.02	4.96	< .001

Table 13 continued

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Seasonspring	-0.03 [-0.08, 0.03]	0.03	-0.95	.344	-0.07 [-0.12, -0.02]	0.03	-2.50	.012
Seasonsummer	-0.01 [-0.07, 0.05]	0.03	-0.40	.688	-0.03 [-0.09, 0.03]	0.03	-1.05	.296
Seasonwinter	-0.04 [-0.09, 0.02]	0.03	-1.35	.176	-0.07 [-0.13, -0.02]	0.03	-2.64	.008
Sleep regularity ²	-0.01 [-0.03, 0.02]	0.01	-0.54	.590	0.03 [0.00, 0.05]	0.01	2.09	.037
Age	-0.02 [-0.02, -0.01]	0.00	-8.03	< .001	-0.02 [-0.03, -0.02]	0.00	-8.26	< .001
Sleep regularity × seasonspring	0.03 [-0.01, 0.07]	0.02	1.45	.149	0.00 [-0.04, 0.05]	0.02	0.21	.836
Sleep regularity × seasonsummer	0.02 [-0.02, 0.06]	0.02	0.89	.373	-0.01 [-0.07, 0.04]	0.03	-0.46	.645
Sleep regularity × seasonwinter	0.06 [0.02, 0.10]	0.02	2.75	.007	0.05 [0.00, 0.10]	0.02	1.93	.058
Seasonspring × Sleep regularity ²	0.00 [-0.02, 0.03]	0.01	0.21	.833	-0.01 [-0.04, 0.02]	0.02	-0.61	.540
Seasonsummer × Sleep regularity ²	0.00 [-0.03, 0.03]	0.02	-0.08	.940	-0.02 [-0.06, 0.02]	0.02	-1.12	.262
Seasonwinter × Sleep regularity ²	0.01 [-0.02, 0.04]	0.01	0.49	.622	0.01 [-0.02, 0.04]	0.02	0.63	.530

Note. Adjusted for BMI, age, and sex. Outcomes variables are listed in the row headers.

Table 14

Physical activity predicting sleep controlling for SES, age, and sex.

TITLE

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Sleep duration								
(Intercept)	0.25 [0.05, 0.45]	0.10	2.50	.013	0.23 [0.03, 0.43]	0.10	2.29	.022
Physical activity	0.08 [0.03, 0.14]	0.03	2.93	.004	0.15 [0.10, 0.20]	0.02	6.29	< .001
Regioneurope	-0.19 [-0.34, -0.04]	0.08	-2.47	.014	-0.16 [-0.31, -0.01]	0.08	-2.11	.035
Regionafrica	-0.24 [-0.42, -0.07]	0.09	-2.75	.006	-0.14 [-0.32, 0.04]	0.09	-1.50	.134
Regionasia	-0.44 [-0.64, -0.25]	0.10	-4.42	< .001	-0.34 [-0.52, -0.15]	0.09	-3.58	< .001
Regionnorth america	-0.05 [-0.23, 0.13]	0.09	-0.57	.569	-0.02 [-0.20, 0.16]	0.09	-0.23	.820
Regionsouth america	-0.26 [-0.42, -0.10]	0.08	-3.13	.002	-0.26 [-0.42, -0.10]	0.08	-3.24	.001
Physical activity ²	0.00 [-0.02, 0.01]	0.01	-0.77	.443	0.00 [-0.04, 0.03]	0.02	-0.19	.846
Age	0.00 [-0.01, 0.00]	0.00	-2.60	.009	0.00 [-0.01, 0.00]	0.00	-1.97	.049
Physical activity × regioneurope	-0.06 [-0.12, 0.01]	0.03	-1.71	.088	-0.06 [-0.11, -0.01]	0.03	-2.29	.023
Physical activity × regionafrica	0.00 [-0.12, 0.13]	0.06	0.04	.970	0.24 [0.16, 0.32]	0.04	5.72	< .001
Physical activity × regionasia	0.03 [-0.13, 0.19]	0.08	0.37	.710	0.06 [-0.05, 0.17]	0.06	1.01	.316
Physical activity × regionnorth america	-0.07 [-0.21, 0.06]	0.07	-1.08	.281	0.19 [0.08, 0.30]	0.06	3.31	.002
Physical activity × regionsouth america	-0.01 [-0.10, 0.08]	0.05	-0.23	.820	-0.05 [-0.12, 0.02]	0.04	-1.37	.170
Regioneurope × Physical activity ²	0.02 [0.00, 0.03]	0.01	2.11	.035	0.01 [-0.03, 0.05]	0.02	0.34	.736
Regionafrica × Physical activity ²	0.16 [0.06, 0.26]	0.05	3.25	.001	-0.10 [-0.18, -0.02]	0.04	-2.50	.013
Regionasia × Physical activity ²	0.11 [-0.02, 0.25]	0.07	1.61	.108	-0.10 [-0.22, 0.02]	0.06	-1.61	.109
Regionnorth america × Physical activity ²	0.01 [-0.03, 0.05]	0.02	0.59	.553	-0.09 [-0.18, 0.00]	0.05	-2.00	.046
Regionsouth america × Physical activity ²	-0.01 [-0.04, 0.02]	0.02	-0.73	.465	-0.01 [-0.08, 0.05]	0.03	-0.37	.709
Sleep efficiency								
(Intercept)	0.44 [0.25, 0.64]	0.10	4.43	< .001	0.46 [0.26, 0.67]	0.10	4.52	< .001

Table 14 continued

TITLE

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Physical activity	-0.15 [-0.21, -0.09]	0.03	-5.07	< .001	-0.18 [-0.23, -0.12]	0.03	-6.40	< .001
Regioneurope	-0.13 [-0.29, 0.02]	0.08	-1.70	.089	-0.11 [-0.27, 0.05]	0.08	-1.38	.168
Regionafrica	0.06 [-0.12, 0.24]	0.09	0.66	.512	-0.14 [-0.32, 0.04]	0.09	-1.49	.137
Regionasia	0.12 [-0.08, 0.32]	0.10	1.14	.254	-0.56 [-0.75, -0.37]	0.10	-5.77	< .001
Regionnorth america	-0.02 [-0.21, 0.17]	0.10	-0.22	.826	-0.16 [-0.35, 0.03]	0.10	-1.69	.092
Regionsouth america	-0.33 [-0.50, -0.17]	0.08	-3.99	< .001	-0.49 [-0.65, -0.33]	0.08	-5.83	< .001
Physical activity ²	0.01 [0.00, 0.03]	0.01	2.49	.013	0.04 [0.01, 0.08]	0.02	2.27	.024
Age	0.00 [0.00, 0.00]	0.00	0.15	.881	0.00 [0.00, 0.00]	0.00	-1.00	.316
Physical activity × regioneurope	0.16 [0.09, 0.23]	0.03	4.67	< .001	0.06 [0.00, 0.12]	0.03	1.92	.060
Physical activity × regionafrica	0.18 [0.05, 0.31]	0.07	2.71	.007	-0.24 [-0.33, -0.15]	0.05	-5.23	< .001
Physical activity × regionasia	0.50 [0.33, 0.67]	0.08	5.88	< .001	-0.31 [-0.42, -0.20]	0.06	-5.58	< .001
Physical activity × regionnorth america	0.29 [0.15, 0.43]	0.07	4.19	< .001	-0.15 [-0.25, -0.05]	0.05	-3.03	.003
Physical activity × regionsouth america	0.37 [0.28, 0.46]	0.05	7.96	< .001	-0.15 [-0.23, -0.07]	0.04	-3.63	< .001
Regioneurope × Physical activity ²	-0.03 [-0.05, -0.01]	0.01	-3.65	< .001	-0.07 [-0.11, -0.03]	0.02	-3.26	.001
Regionafrica × Physical activity ²	-0.23 [-0.33, -0.13]	0.05	-4.44	< .001	0.15 [0.07, 0.23]	0.04	3.59	< .001
Regionasia × Physical activity ²	-0.57 [-0.71, -0.43]	0.07	-8.03	< .001	0.30 [0.18, 0.42]	0.06	4.79	< .001
Regionnorth america × Physical activity ²	-0.05 [-0.09, -0.01]	0.02	-2.24	.025	0.15 [0.07, 0.24]	0.04	3.53	< .001
Regionsouth america × Physical activity ²	-0.10 [-0.13, -0.06]	0.02	-5.73	< .001	0.11 [0.05, 0.18]	0.03	3.31	.001
Sleep onset								
(Intercept)	0.30 [0.02, 0.57]	0.14	2.11	.034	0.31 [0.05, 0.57]	0.13	2.36	.018
Physical activity	-0.41 [-0.46, -0.36]	0.03	-16.23	< .001	-0.59 [-0.62, -0.55]	0.02	-31.04	< .001
Regioneurope	0.15 [0.02, 0.29]	0.07	2.18	.030	0.15 [0.01, 0.28]	0.07	2.11	.035
Regionafrica	0.34 [0.18, 0.49]	0.08	4.20	< .001	-0.06 [-0.21, 0.09]	0.08	-0.77	.444
								Σ^2

Table 14 continued

TITLE

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Regionasia	0.61 [0.44, 0.79]	0.09	6.80	< .001	-0.18 [-0.34, -0.01]	0.08	-2.14	.032
Regionnorth america	0.06 [-0.10, 0.23]	0.08	0.78	.438	-0.14 [-0.29, 0.02]	0.08	-1.70	.088
Regionsouth america	-0.08 [-0.22, 0.07]	0.07	-1.01	.311	-0.21 [-0.35, -0.07]	0.07	-2.88	.004
Physical activity ²	0.04 [0.03, 0.05]	0.01	7.93	< .001	0.12 [0.09, 0.15]	0.02	8.21	< .001
Age	0.00 [0.00, 0.00]	0.00	-0.76	.446	0.00 [-0.01, 0.00]	0.00	-2.74	.006
Physical activity × regioneurope	0.29 [0.23, 0.35]	0.03	10.07	< .001	0.32 [0.28, 0.36]	0.02	15.15	< .001
Physical activity × regionafrica	0.40 [0.29, 0.52]	0.06	6.78	< .001	-0.31 [-0.38, -0.25]	0.03	-9.34	< .001
Physical activity × regionasia	0.59 [0.43, 0.75]	0.08	7.18	< .001	-0.14 [-0.23, -0.06]	0.04	-3.44	.001
Physical activity × regionnorth america	0.49 [0.37, 0.62]	0.06	7.92	< .001	-0.15 [-0.23, -0.07]	0.04	-3.67	< .001
Physical activity × regionsouth america	0.43 [0.35, 0.51]	0.04	10.35	< .001	0.08 [0.03, 0.14]	0.03	2.84	.005
Regioneurope × Physical activity ²	-0.05 [-0.06, -0.04]	0.01	-6.90	< .001	-0.14 [-0.18, -0.11]	0.02	-8.75	< .001
Regionafrica × Physical activity ²	-0.43 [-0.52, -0.35]	0.05	-9.53	< .001	0.21 [0.14, 0.27]	0.03	6.11	< .001
Regionasia × Physical activity ²	-0.64 [-0.76, -0.51]	0.06	-10.07	< .001	0.36 [0.26, 0.46]	0.05	6.91	< .001
Regionnorth america × Physical activity ²	-0.08 [-0.12, -0.05]	0.02	-4.45	< .001	0.18 [0.11, 0.25]	0.04	4.92	< .001
Regionsouth america × Physical activity ²	-0.07 [-0.10, -0.04]	0.01	-4.43	< .001	0.09 [0.03, 0.14]	0.03	3.21	.001
Sleep regularity								
(Intercept)	-0.06 [-0.23, 0.12]	0.09	-0.65	.519	0.10 [-0.10, 0.30]	0.10	1.00	.316
Physical activity	0.31 [0.25, 0.36]	0.03	11.17	< .001	0.25 [0.20, 0.29]	0.02	10.49	< .001
Regioneurope	0.20 [0.05, 0.34]	0.07	2.72	.007	0.12 [-0.04, 0.27]	0.08	1.51	.132
Regionafrica	0.29 [0.11, 0.46]	0.09	3.26	.001	0.27 [0.09, 0.45]	0.09	2.94	.003
Regionasia	0.28 [0.09, 0.46]	0.09	2.93	.003	0.12 [-0.07, 0.30]	0.10	1.21	.226
Regionnorth america	0.07 [-0.11, 0.24]	0.09	0.75	.452	0.03 [-0.15, 0.21]	0.09	0.32	.751
Regionsouth america	-0.03 [-0.19, 0.12]	0.08	-0.41	.681	-0.17 [-0.33, -0.01]	0.08	-2.06	.039

Table 14 continued

TITLE

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Physical activity ²	-0.04 [-0.05, -0.02]	0.01	-6.39	< .001	-0.10 [-0.13, -0.06]	0.02	-5.48	< .001
Age	0.00 [0.00, 0.00]	0.00	-0.07	.947	0.00 [0.00, 0.00]	0.00	-0.94	.346
Physical activity × regioneurope	-0.07 [-0.13, -0.01]	0.03	-2.38	.018	-0.15 [-0.20, -0.10]	0.03	-5.97	< .001
Physical activity × regionafrica	-0.16 [-0.28, -0.05]	0.06	-2.73	.006	-0.11 [-0.19, -0.03]	0.04	-2.71	.007
Physical activity × regionasia	-0.22 [-0.37, -0.08]	0.07	-3.06	.002	-0.12 [-0.22, -0.02]	0.05	-2.29	.023
Physical activity × regionnorth america	-0.10 [-0.23, 0.04]	0.07	-1.43	.153	-0.25 [-0.35, -0.15]	0.05	-5.10	< .001
Physical activity × regionsouth america	-0.01 [-0.10, 0.08]	0.05	-0.27	.784	-0.12 [-0.20, -0.05]	0.04	-3.34	.001
Regioneurope × Physical activity ²	0.00 [-0.02, 0.01]	0.01	-0.21	.837	0.10 [0.06, 0.13]	0.02	5.11	< .001
Regionafrica × Physical activity ²	-0.06 [-0.15, 0.03]	0.05	-1.22	.222	0.04 [-0.04, 0.12]	0.04	0.93	.353
Regionasia × Physical activity ²	-0.20 [-0.33, -0.07]	0.07	-2.99	.003	0.15 [0.03, 0.27]	0.06	2.49	.013
Regionnorth america × Physical activity ²	-0.01 [-0.05, 0.03]	0.02	-0.66	.513	0.06 [-0.02, 0.15]	0.04	1.48	.140
Regionsouth america × Physical activity ²	-0.01 [-0.04, 0.03]	0.02	-0.35	.724	0.07 [0.01, 0.13]	0.03	2.21	.028

Note. Adjusted for SES, age, and sex. Outcomes variables are listed in the column headers.

Table 15

Sleep predicting physical activity controlling for SES, age, and sex

TITLE

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Sleep duration								
(Intercept)	0.95 [0.63, 1.26]	0.16	5.94	< .001	0.53 [0.31, 0.75]	0.11	4.73	< .001
Sleep duration	0.23 [0.19, 0.28]	0.02	9.89	< .001	0.34 [0.29, 0.40]	0.03	12.68	< .001
Regioneurope	-0.07 [-0.22, 0.09]	0.08	-0.84	.398	0.09 [-0.05, 0.22]	0.07	1.20	.231
Regionafrica	-0.05 [-0.21, 0.12]	0.09	-0.53	.597	-0.04 [-0.20, 0.12]	0.08	-0.49	.628
Regionasia	-0.24 [-0.42, -0.06]	0.09	-2.68	.007	-0.16 [-0.33, 0.00]	0.08	-2.01	.045
Regionnorth america	-0.13 [-0.30, 0.05]	0.09	-1.39	.164	0.22 [0.05, 0.38]	0.08	2.58	.010
Regionsouth america	-0.18 [-0.34, -0.02]	0.08	-2.21	.027	0.20 [0.05, 0.35]	0.07	2.69	.007
Sleep duration ²	0.03 [0.01, 0.05]	0.01	3.08	.002	0.07 [0.05, 0.08]	0.01	6.56	< .001
Age	-0.02 [-0.02, -0.02]	0.00	-8.84	< .001	-0.02 [-0.03, -0.02]	0.00	-8.92	< .001
Sleep duration × regioneurope	-0.24 [-0.29, -0.19]	0.03	-9.38	< .001	-0.25 [-0.31, -0.19]	0.03	-8.37	< .001
Sleep duration × regionafrica	-0.23 [-0.31, -0.15]	0.04	-5.80	< .001	-0.03 [-0.12, 0.06]	0.05	-0.70	.482
Sleep duration × regionasia	-0.29 [-0.39, -0.19]	0.05	-5.70	< .001	-0.05 [-0.16, 0.06]	0.06	-0.91	.360
Sleep duration × regionnorth america	-0.24 [-0.31, -0.16]	0.04	-5.95	< .001	-0.40 [-0.49, -0.31]	0.05	-8.80	< .001
Sleep duration × regionsouth america	-0.28 [-0.34, -0.22]	0.03	-8.86	< .001	-0.36 [-0.43, -0.29]	0.04	-10.15	< .001
Regioneurope × Sleep duration ²	-0.04 [-0.06, -0.02]	0.01	-4.33	< .001	-0.07 [-0.09, -0.05]	0.01	-6.04	< .001
Regionafrica × Sleep duration ²	-0.03 [-0.06, 0.01]	0.02	-1.51	.131	-0.03 [-0.07, 0.01]	0.02	-1.34	.180
Regionasia × Sleep duration ²	-0.05 [-0.09, 0.00]	0.02	-2.12	.034	0.00 [-0.05, 0.05]	0.03	0.13	.894
Regionnorth america × Sleep duration ²	-0.06 [-0.09, -0.03]	0.02	-3.63	< .001	-0.14 [-0.17, -0.10]	0.02	-7.63	< .001
Regionsouth america × Sleep duration ²	-0.05 [-0.07, -0.02]	0.01	-3.76	< .001	-0.11 [-0.14, -0.09]	0.01	-8.49	< .001
Sleep efficiency								
(Intercept)	1.12 [0.80, 1.44]	0.16	6.94	< .001	0.77 [0.54, 1.00]	0.12	6.63	< .001

Table 15 continued

TITLE

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Sleep efficiency	-0.26 [-0.34, -0.19]	0.04	-6.94	< .001	-0.29 [-0.37, -0.22]	0.04	-7.94	< .001
Regioneurope	-0.25 [-0.41, -0.10]	0.08	-3.20	.001	-0.11 [-0.25, 0.03]	0.07	-1.53	.127
Regionafrica	-0.21 [-0.38, -0.05]	0.08	-2.51	.012	-0.12 [-0.27, 0.04]	0.08	-1.48	.139
Regionasia	-0.43 [-0.61, -0.26]	0.09	-4.82	< .001	-0.31 [-0.47, -0.15]	0.08	-3.76	< .001
Regionnorth america	-0.33 [-0.50, -0.16]	0.09	-3.77	< .001	-0.12 [-0.28, 0.04]	0.08	-1.45	.148
Regionsouth america	-0.38 [-0.54, -0.22]	0.08	-4.68	< .001	-0.09 [-0.24, 0.05]	0.07	-1.24	.215
Sleep efficiency ²	-0.06 [-0.08, -0.04]	0.01	-6.24	< .001	-0.06 [-0.08, -0.04]	0.01	-6.06	< .001
Age	-0.02 [-0.02, -0.02]	0.00	-8.63	< .001	-0.02 [-0.03, -0.02]	0.00	-8.65	< .001
Sleep efficiency × regioneurope	0.26 [0.18, 0.33]	0.04	6.49	< .001	0.23 [0.15, 0.30]	0.04	5.88	< .001
Sleep efficiency × regionafrica	0.25 [0.16, 0.35]	0.05	5.25	< .001	0.00 [-0.12, 0.11]	0.06	-0.07	.945
Sleep efficiency × regionasia	0.33 [0.23, 0.44]	0.05	6.23	< .001	0.12 [-0.01, 0.24]	0.06	1.87	.071
Sleep efficiency × regionnorth america	0.27 [0.16, 0.39]	0.06	4.72	< .001	0.30 [0.18, 0.42]	0.06	4.78	< .001
Sleep efficiency × regionsouth america	0.27 [0.19, 0.36]	0.04	6.26	< .001	0.28 [0.19, 0.37]	0.04	6.25	< .001
Regioneurope × Sleep efficiency ²	0.05 [0.03, 0.07]	0.01	4.79	< .001	0.03 [0.01, 0.05]	0.01	2.50	.014
Regionafrica × Sleep efficiency ²	0.05 [0.03, 0.08]	0.01	4.31	< .001	0.01 [-0.02, 0.04]	0.02	0.45	.654
Regionasia × Sleep efficiency ²	0.07 [0.04, 0.10]	0.02	4.20	< .001	0.01 [-0.03, 0.05]	0.02	0.49	.623
Regionnorth america × Sleep efficiency ²	0.05 [0.03, 0.08]	0.01	3.70	< .001	0.05 [0.02, 0.09]	0.02	3.26	.002
Regionsouth america × Sleep efficiency ²	0.06 [0.04, 0.08]	0.01	5.57	< .001	0.06 [0.04, 0.08]	0.01	5.15	< .001
Sleep onset								
(Intercept)	1.07 [0.75, 1.38]	0.16	6.59	< .001	0.72 [0.48, 0.96]	0.12	5.91	< .001
Sleep onset	-0.30 [-0.34, -0.26]	0.02	-14.90	< .001	-0.39 [-0.44, -0.35]	0.02	-18.37	< .001
Regioneurope	-0.17 [-0.33, -0.01]	0.08	-2.11	.035	-0.11 [-0.25, 0.04]	0.07	-1.43	.153
Regionafrica	-0.12 [-0.32, 0.07]	0.10	-1.23	.218	-0.01 [-0.21, 0.19]	0.10	-0.10	.919

Table 15 continued

TITLE

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Regionasia	-0.34 [-0.54, -0.14]	0.10	-3.28	.001	-0.06 [-0.26, 0.14]	0.10	-0.61	.542
Regionnorth america	-0.20 [-0.39, 0.00]	0.10	-2.00	.045	0.01 [-0.17, 0.20]	0.10	0.14	.892
Regionsouth america	-0.24 [-0.41, -0.08]	0.09	-2.87	.004	0.05 [-0.10, 0.21]	0.08	0.67	.501
Sleep onset ²	-0.07 [-0.11, -0.04]	0.02	-4.26	< .001	-0.07 [-0.11, -0.04]	0.02	-3.84	< .001
Age	-0.02 [-0.02, -0.02]	0.00	-8.84	< .001	-0.02 [-0.03, -0.02]	0.00	-8.59	< .001
Sleep onset × regioneurope	0.26 [0.21, 0.30]	0.02	11.57	< .001	0.26 [0.22, 0.31]	0.02	10.83	< .001
Sleep onset × regionafrica	0.29 [0.22, 0.35]	0.03	8.66	< .001	0.02 [-0.05, 0.10]	0.04	0.59	.556
Sleep onset × regionasia	0.37 [0.30, 0.45]	0.04	9.81	< .001	0.09 [0.00, 0.17]	0.04	2.01	.045
Sleep onset × regionnorth america	0.36 [0.29, 0.43]	0.04	9.81	< .001	0.52 [0.44, 0.60]	0.04	12.79	< .001
Sleep onset × regionsouth america	0.31 [0.26, 0.37]	0.03	11.81	< .001	0.43 [0.37, 0.48]	0.03	14.64	< .001
Regioneurope × Sleep onset ²	0.05 [0.02, 0.09]	0.02	2.80	.005	0.10 [0.06, 0.14]	0.02	4.70	< .001
Regionafrica × Sleep onset ²	0.06 [-0.05, 0.16]	0.05	1.08	.279	-0.08 [-0.20, 0.04]	0.06	-1.25	.212
Regionasia × Sleep onset ²	0.08 [-0.03, 0.20]	0.06	1.44	.150	-0.19 [-0.33, -0.05]	0.07	-2.65	.009
Regionnorth america × Sleep onset ²	0.06 [-0.03, 0.14]	0.04	1.34	.181	0.12 [0.02, 0.21]	0.05	2.39	.017
Regionsouth america × Sleep onset ²	0.03 [-0.01, 0.08]	0.02	1.41	.159	0.07 [0.01, 0.12]	0.03	2.46	.014
Sleep regularity								
(Intercept)	1.02 [0.71, 1.33]	0.16	6.38	< .001	0.61 [0.38, 0.84]	0.12	5.21	< .001
Sleep regularity	0.27 [0.22, 0.31]	0.02	11.02	< .001	0.22 [0.17, 0.27]	0.03	8.75	< .001
Regioneurope	-0.20 [-0.35, -0.05]	0.08	-2.54	.011	-0.04 [-0.18, 0.10]	0.07	-0.61	.544
Regionafrica	-0.16 [-0.32, 0.01]	0.08	-1.85	.064	-0.14 [-0.30, 0.02]	0.08	-1.74	.082
Regionasia	-0.36 [-0.54, -0.19]	0.09	-4.09	< .001	-0.25 [-0.42, -0.09]	0.08	-3.03	.002
Regionnorth america	-0.27 [-0.44, -0.10]	0.09	-3.06	.002	0.00 [-0.16, 0.16]	0.08	-0.03	.977
Regionsouth america	-0.32 [-0.48, -0.16]	0.08	-3.98	< .001	0.03 [-0.12, 0.18]	0.07	0.39	.696

Table 15 continued

TITLE

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Sleep regularity ²	0.05 [0.02, 0.07]	0.01	3.62	< .001	0.08 [0.05, 0.11]	0.01	5.50	< .001
Age	-0.02 [-0.02, -0.01]	0.00	-8.45	< .001	-0.02 [-0.03, -0.02]	0.00	-8.54	< .001
Sleep regularity × regioneurope	-0.17 [-0.23, -0.12]	0.03	-6.25	< .001	-0.15 [-0.21, -0.10]	0.03	-5.45	< .001
Sleep regularity × regionafrica	-0.19 [-0.26, -0.12]	0.04	-5.14	< .001	-0.07 [-0.17, 0.04]	0.05	-1.23	.224
Sleep regularity × regionasia	-0.19 [-0.28, -0.11]	0.04	-4.52	< .001	-0.08 [-0.21, 0.04]	0.06	-1.34	.191
Sleep regularity × regionnorth america	-0.22 [-0.32, -0.12]	0.05	-4.20	< .001	-0.15 [-0.26, -0.03]	0.06	-2.43	.019
Sleep regularity × regionsouth america	-0.19 [-0.26, -0.12]	0.03	-5.65	< .001	-0.12 [-0.19, -0.06]	0.03	-3.84	< .001
Regioneurope × Sleep regularity ²	-0.07 [-0.10, -0.04]	0.01	-4.67	< .001	-0.08 [-0.11, -0.05]	0.02	-4.85	< .001
Regionafrica × Sleep regularity ²	-0.08 [-0.13, -0.03]	0.03	-3.08	.002	0.02 [-0.05, 0.08]	0.03	0.57	.573
Regionasia × Sleep regularity ²	-0.07 [-0.12, -0.03]	0.02	-3.02	.003	-0.04 [-0.10, 0.02]	0.03	-1.44	.151
Regionnorth america × Sleep regularity ²	-0.08 [-0.13, -0.03]	0.03	-2.98	.003	-0.09 [-0.15, -0.03]	0.03	-3.01	.003
Regionsouth america × Sleep regularity ²	-0.04 [-0.08, -0.01]	0.02	-2.51	.013	-0.06 [-0.10, -0.03]	0.02	-3.41	.001

Note. Adjusted for SES, age, and sex. Outcomes variables are listed in the row headers.

Table 16

Physical activity predicting sleep controlling for BMI, age, and sex.

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Sleep duration								
(Intercept)	0.63 [0.36, 0.90]	0.14	4.55	< .001	0.58 [0.29, 0.86]	0.14	4.02	< .001
Physical activity	0.22 [0.08, 0.35]	0.07	3.20	.001	0.32 [0.23, 0.41]	0.05	6.79	< .001
Daylight hours	-0.03 [-0.04, -0.02]	0.01	-5.62	< .001	-0.03 [-0.04, -0.02]	0.01	-5.32	< .001
Physical activity ²	-0.03 [-0.07, 0.01]	0.02	-1.35	.177	0.01 [-0.05, 0.07]	0.03	0.21	.833
Age	0.00 [-0.01, 0.00]	0.00	-2.06	.040	0.00 [0.00, 0.00]	0.00	-0.98	.329
Physical activity \times daylight hours	-0.01 [-0.02, 0.00]	0.01	-2.55	.011	-0.02 [-0.02, -0.01]	0.00	-4.06	< .001
Daylight hours \times Physical activity ²	0.00 [0.00, 0.01]	0.00	1.50	.134	0.00 [-0.01, 0.00]	0.00	-0.19	.847
Sleep efficiency								
(Intercept)	0.35 [0.11, 0.58]	0.12	2.89	.004	0.46 [0.21, 0.70]	0.13	3.59	< .001
Physical activity	0.05 [-0.08, 0.19]	0.07	0.81	.418	-0.21 [-0.29, -0.12]	0.04	-4.72	< .001
Daylight hours	0.00 [-0.01, 0.01]	0.01	0.32	.749	0.01 [-0.01, 0.02]	0.01	0.95	.341
Physical activity ²	-0.01 [-0.05, 0.03]	0.02	-0.38	.703	0.05 [-0.01, 0.11]	0.03	1.62	.105
Age	0.00 [0.00, 0.00]	0.00	0.85	.396	0.00 [-0.01, 0.00]	0.00	-1.46	.146
Physical activity \times daylight hours	0.00 [-0.01, 0.01]	0.01	-0.31	.757	0.00 [0.00, 0.01]	0.00	0.76	.447
Daylight hours \times Physical activity ²	0.00 [0.00, 0.00]	0.00	-0.63	.532	0.00 [-0.01, 0.00]	0.00	-1.47	.141
Sleep onset								
(Intercept)	0.04 [-0.26, 0.35]	0.15	0.28	.776	0.20 [-0.11, 0.51]	0.16	1.27	.206
Physical activity	-0.20 [-0.32, -0.09]	0.06	-3.41	.001	-0.56 [-0.63, -0.49]	0.04	-15.49	< .001
Daylight hours	0.02 [0.01, 0.02]	0.00	3.69	< .001	0.02 [0.01, 0.03]	0.00	4.28	< .001
Physical activity ²	0.02 [-0.01, 0.06]	0.02	1.23	.219	0.07 [0.02, 0.12]	0.03	2.60	.009
Age	0.00 [0.00, 0.00]	0.00	-0.79	.428	-0.01 [-0.01, 0.00]	0.00	-4.34	< .001

Table 16 continued

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Physical activity \times daylight hours	0.01 [0.00, 0.02]	0.00	1.40	.160	0.01 [0.01, 0.02]	0.00	4.47	< .001
Daylight hours \times Physical activity ²	0.00 [-0.01, 0.00]	0.00	-1.75	.080	0.00 [-0.01, 0.00]	0.00	-2.20	.028
Sleep regularity								
(Intercept)	0.29 [0.05, 0.53]	0.12	2.34	.021	0.43 [0.16, 0.70]	0.14	3.16	.002
Physical activity	0.16 [0.03, 0.29]	0.06	2.46	.014	0.14 [0.04, 0.24]	0.05	2.78	.008
Daylight hours	0.00 [-0.01, 0.01]	0.01	0.54	.591	0.00 [-0.01, 0.01]	0.01	-0.10	.922
Physical activity ²	0.01 [-0.03, 0.05]	0.02	0.65	.515	-0.02 [-0.08, 0.04]	0.03	-0.79	.430
Age	0.00 [0.00, 0.00]	0.00	1.02	.309	0.00 [0.00, 0.00]	0.00	0.23	.819
Physical activity \times daylight hours	0.01 [0.00, 0.02]	0.01	1.36	.174	0.00 [-0.01, 0.01]	0.00	-0.62	.539
Daylight hours \times Physical activity ²	0.00 [-0.01, 0.00]	0.00	-2.26	.024	0.00 [0.00, 0.01]	0.00	0.54	.590

Note. Adjusted for BMI, age, and sex. Outcomes variables are listed in the column headers.

Table 17

Sleep predicting physical activity controlling for BMI, age, and sex

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Sleep duration								
(Intercept)	1.10 [0.74, 1.46]	0.18	6.01	< .001	1.01 [0.75, 1.28]	0.14	7.49	< .001
Sleep duration	0.13 [0.05, 0.21]	0.04	3.06	.002	0.30 [0.20, 0.39]	0.05	6.30	< .001
Daylight hours	0.01 [0.00, 0.02]	0.00	1.60	.110	-0.01 [-0.01, 0.00]	0.00	-1.39	.165
Sleep duration ²	0.03 [-0.01, 0.07]	0.02	1.29	.196	0.01 [-0.04, 0.05]	0.02	0.36	.716
Age	-0.02 [-0.02, -0.01]	0.00	-8.17	< .001	-0.02 [-0.03, -0.02]	0.00	-8.43	< .001
Sleep duration × daylight hours	-0.01 [-0.02, 0.00]	0.00	-2.81	.005	-0.01 [-0.02, -0.01]	0.00	-3.80	< .001
Daylight hours × Sleep duration ²	0.00 [-0.01, 0.00]	0.00	-1.88	.060	0.00 [0.00, 0.00]	0.00	-0.43	.668
Sleep efficiency								
(Intercept)	1.13 [0.77, 1.49]	0.18	6.12	< .001	1.14 [0.87, 1.41]	0.14	8.32	< .001
Sleep efficiency	-0.03 [-0.13, 0.07]	0.05	-0.64	.522	-0.16 [-0.26, -0.06]	0.05	-3.04	.003
Daylight hours	0.01 [0.00, 0.02]	0.00	1.38	.169	-0.01 [-0.02, 0.00]	0.00	-1.92	.056
Sleep efficiency ²	0.00 [-0.04, 0.03]	0.02	-0.20	.843	-0.05 [-0.08, -0.01]	0.02	-2.36	.019
Age	-0.02 [-0.02, -0.01]	0.00	-8.13	< .001	-0.02 [-0.03, -0.02]	0.00	-8.22	< .001
Sleep efficiency × daylight hours	0.00 [-0.01, 0.01]	0.00	0.15	.885	0.00 [0.00, 0.01]	0.00	1.13	.264
Daylight hours × Sleep efficiency ²	0.00 [0.00, 0.00]	0.00	-0.32	.751	0.00 [0.00, 0.01]	0.00	1.21	.227
Sleep onset								
(Intercept)	1.18 [0.81, 1.55]	0.19	6.30	< .001	1.08 [0.80, 1.36]	0.14	7.54	< .001
Sleep onset	-0.08 [-0.16, 0.00]	0.04	-2.08	.038	-0.19 [-0.28, -0.11]	0.04	-4.59	< .001
Daylight hours	0.00 [-0.01, 0.01]	0.00	0.76	.447	-0.01 [-0.02, 0.00]	0.00	-1.51	.132
Sleep onset ²	-0.06 [-0.11, 0.00]	0.03	-2.09	.036	0.00 [-0.06, 0.06]	0.03	-0.07	.943
Age	-0.02 [-0.02, -0.01]	0.00	-8.17	< .001	-0.02 [-0.03, -0.02]	0.00	-8.11	< .001

Table 17 continued

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Sleep onset × daylight hours	0.00 [0.00, 0.01]	0.00	0.89	.371	0.00 [0.00, 0.01]	0.00	1.16	.248
Daylight hours × Sleep onset ²	0.00 [0.00, 0.01]	0.00	0.90	.368	0.00 [0.00, 0.01]	0.00	0.27	.786
Sleep regularity								
(Intercept)	1.07 [0.72, 1.42]	0.18	5.97	< .001	0.99 [0.74, 1.25]	0.13	7.68	< .001
Sleep regularity	0.13 [0.05, 0.20]	0.04	3.19	.002	0.20 [0.11, 0.28]	0.04	4.62	< .001
Daylight hours	0.01 [0.00, 0.02]	0.00	1.34	.181	-0.01 [-0.02, 0.00]	0.00	-1.49	.137
Sleep regularity ²	0.00 [-0.06, 0.06]	0.03	-0.11	.916	0.03 [-0.03, 0.09]	0.03	1.01	.312
Age	-0.02 [-0.02, -0.01]	0.00	-8.04	< .001	-0.02 [-0.03, -0.02]	0.00	-8.30	< .001
Sleep regularity × daylight hours	0.00 [-0.01, 0.00]	0.00	-0.44	.661	-0.01 [-0.01, 0.00]	0.00	-2.34	.020
Daylight hours × Sleep regularity ²	0.00 [0.00, 0.00]	0.00	-0.04	.967	0.00 [-0.01, 0.00]	0.00	-0.33	.742

Note. Adjusted for BMI, age, and sex. Outcomes variables are listed in the row headers.

Table 18

Physical activity predicting sleep controlling for BMI, age, and sex.

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Sleep duration								
(Intercept)	0.63 [0.37, 0.89]	0.13	4.72	< .001	0.63 [0.37, 0.88]	0.13	4.84	< .001
Physical activity	0.08 [0.04, 0.12]	0.02	3.73	< .001	0.29 [0.26, 0.32]	0.01	19.92	< .001
Wrist	-0.42 [-0.65, -0.19]	0.12	-3.62	< .001	-0.43 [-0.65, -0.21]	0.11	-3.85	< .001
Physical activity ²	0.06 [0.02, 0.09]	0.02	3.37	.001	-0.08 [-0.11, -0.05]	0.01	-5.86	< .001
Age	0.00 [-0.01, 0.00]	0.00	-2.41	.016	0.00 [-0.01, 0.00]	0.00	-2.40	.017
Physical activity × wrist	-0.04 [-0.09, 0.01]	0.03	-1.41	.159	-0.24 [-0.27, -0.20]	0.02	-13.13	< .001
Wrist × Physical activity ²	-0.05 [-0.09, -0.02]	0.02	-3.09	.002	0.09 [0.06, 0.12]	0.02	6.04	< .001
Sleep efficiency								
(Intercept)	-0.03 [-0.15, 0.09]	0.06	-0.46	.648	-0.22 [-0.35, -0.09]	0.06	-3.42	.001
Physical activity	0.18 [0.14, 0.23]	0.02	7.92	< .001	-0.39 [-0.41, -0.36]	0.01	-25.72	< .001
Wrist	0.56 [0.47, 0.66]	0.05	11.70	< .001	0.78 [0.68, 0.88]	0.05	15.29	< .001
Physical activity ²	-0.23 [-0.26, -0.19]	0.02	-13.09	< .001	0.17 [0.14, 0.20]	0.01	12.23	< .001
Age	0.00 [0.00, 0.00]	0.00	-0.54	.592	0.00 [0.00, 0.00]	0.00	-0.89	.376
Physical activity × wrist	-0.25 [-0.30, -0.20]	0.03	-9.21	< .001	0.31 [0.27, 0.35]	0.02	15.77	< .001
Wrist × Physical activity ²	0.23 [0.19, 0.26]	0.02	12.94	< .001	-0.19 [-0.22, -0.16]	0.02	-12.48	< .001
Sleep onset								
(Intercept)	-0.43 [-0.77, -0.10]	0.17	-2.52	.012	-0.59 [-0.91, -0.28]	0.16	-3.70	< .001
Physical activity	0.05 [0.01, 0.10]	0.02	2.21	.030	-0.73 [-0.75, -0.71]	0.01	-63.95	< .001
Wrist	0.93 [0.58, 1.28]	0.18	5.16	< .001	1.12 [0.80, 1.44]	0.16	6.81	< .001
Physical activity ²	-0.25 [-0.28, -0.22]	0.02	-16.50	< .001	0.27 [0.25, 0.30]	0.01	23.49	< .001
Age	0.00 [-0.01, 0.00]	0.00	-1.68	.094	0.00 [-0.01, 0.00]	0.00	-2.31	.021

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Physical activity \times wrist	-0.29 [-0.34, -0.24]	0.03	-10.84	< .001	0.49 [0.46, 0.52]	0.01	34.06	< .001
Wrist \times Physical activity ²	0.27 [0.24, 0.30]	0.02	17.19	< .001	-0.31 [-0.33, -0.28]	0.01	-23.56	< .001
Sleep regularity								
(Intercept)	0.15 [-0.14, 0.45]	0.15	1.00	.318	0.08 [-0.21, 0.38]	0.15	0.56	.579
Physical activity	0.20 [0.16, 0.24]	0.02	9.80	< .001	0.08 [0.05, 0.11]	0.01	5.54	< .001
Wrist	0.23 [-0.06, 0.51]	0.14	1.56	.119	0.42 [0.13, 0.70]	0.15	2.87	.004
Physical activity ²	-0.13 [-0.16, -0.10]	0.02	-8.00	< .001	-0.02 [-0.05, 0.00]	0.01	-1.70	.089
Age	0.00 [0.00, 0.00]	0.00	0.80	.426	0.00 [0.00, 0.00]	0.00	0.08	.936
Physical activity \times wrist	0.05 [0.00, 0.10]	0.03	1.89	.059	0.05 [0.01, 0.08]	0.02	2.47	.015
Wrist \times Physical activity ²	0.10 [0.07, 0.13]	0.02	5.93	< .001	0.02 [-0.01, 0.05]	0.02	1.44	.151

Note. Adjusted for BMI, age, and sex. Outcomes variables are listed in the column headers.

Table 19

Sleep predicting physical activity controlling for BMI, age, and sex

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Sleep duration								
(Intercept)	0.21 [-0.23, 0.64]	0.22	0.92	.357	0.63 [0.30, 0.96]	0.17	3.73	< .001
Sleep duration	-0.01 [-0.03, 0.01]	0.01	-0.77	.440	0.19 [0.16, 0.21]	0.01	13.84	< .001
Wrist	1.23 [0.77, 1.69]	0.24	5.21	< .001	0.41 [0.07, 0.75]	0.17	2.38	.018
Sleep duration ²	0.00 [-0.01, 0.01]	0.01	-0.81	.417	0.01 [0.00, 0.02]	0.01	1.80	.072
Age	-0.02 [-0.02, -0.01]	0.00	-8.90	< .001	-0.02 [-0.03, -0.02]	0.00	-8.76	< .001
Sleep duration × wrist	0.04 [0.01, 0.07]	0.02	2.52	.012	-0.11 [-0.14, -0.08]	0.02	-6.31	< .001
Wrist × Sleep duration ²	-0.02 [-0.03, 0.00]	0.01	-2.30	.021	-0.01 [-0.03, 0.00]	0.01	-1.79	.074
Sleep efficiency								
(Intercept)	0.21 [-0.23, 0.65]	0.22	0.96	.340	0.70 [0.36, 1.04]	0.17	3.99	< .001
Sleep efficiency	0.03 [0.00, 0.05]	0.01	2.25	.025	-0.13 [-0.16, -0.10]	0.02	-8.41	< .001
Wrist	1.26 [0.79, 1.72]	0.24	5.30	< .001	0.41 [0.06, 0.77]	0.18	2.27	.023
Sleep efficiency ²	0.00 [0.00, 0.01]	0.00	1.00	.317	-0.03 [-0.03, -0.02]	0.00	-7.00	< .001
Age	-0.02 [-0.02, -0.01]	0.00	-8.91	< .001	-0.02 [-0.03, -0.02]	0.00	-8.62	< .001
Sleep efficiency × wrist	-0.09 [-0.12, -0.05]	0.02	-5.36	< .001	0.05 [0.01, 0.09]	0.02	2.56	.012
Wrist × Sleep efficiency ²	-0.03 [-0.04, -0.02]	0.01	-4.59	< .001	0.00 [-0.01, 0.02]	0.01	0.37	.711
Sleep onset								
(Intercept)	0.19 [-0.24, 0.63]	0.22	0.87	.386	0.71 [0.37, 1.05]	0.17	4.05	< .001
Sleep onset	0.02 [0.00, 0.04]	0.01	1.88	.061	-0.20 [-0.23, -0.18]	0.01	-15.82	< .001
Wrist	1.29 [0.83, 1.74]	0.23	5.50	< .001	0.38 [0.03, 0.73]	0.18	2.15	.031
Sleep onset ²	0.01 [-0.03, 0.04]	0.02	0.38	.706	-0.13 [-0.18, -0.09]	0.02	-6.26	< .001
Age	-0.02 [-0.02, -0.01]	0.00	-9.00	< .001	-0.02 [-0.03, -0.02]	0.00	-8.72	< .001

Table 19 continued

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Sleep onset × wrist	-0.15 [-0.18, -0.12]	0.02	-9.44	< .001	0.06 [0.03, 0.10]	0.02	3.43	.001
Wrist × Sleep onset ²	-0.02 [-0.06, 0.02]	0.02	-0.87	.387	0.15 [0.11, 0.19]	0.02	6.69	< .001
Sleep regularity								
(Intercept)	0.21 [-0.22, 0.64]	0.22	0.94	.346	0.65 [0.31, 0.99]	0.17	3.76	< .001
Sleep regularity	0.09 [0.06, 0.11]	0.01	6.73	< .001	0.14 [0.10, 0.18]	0.02	7.63	< .001
Wrist	1.16 [0.70, 1.61]	0.23	4.95	< .001	0.34 [-0.01, 0.70]	0.18	1.91	.056
Sleep regularity ²	-0.02 [-0.04, -0.01]	0.01	-2.76	.006	0.03 [0.01, 0.04]	0.01	2.72	.007
Age	-0.02 [-0.02, -0.01]	0.00	-8.77	< .001	-0.02 [-0.03, -0.02]	0.00	-8.51	< .001
Sleep regularity × wrist	0.03 [0.00, 0.06]	0.02	1.71	.090	-0.06 [-0.11, -0.01]	0.02	-2.52	.017
Wrist × Sleep regularity ²	0.03 [0.00, 0.05]	0.01	2.39	.018	0.00 [-0.02, 0.03]	0.01	0.06	.950

Note. Adjusted for BMI, age, and sex. Outcomes variables are listed in the row headers.

Table 20

Physical activity predicting sleep controlling for BMI, age, and sex.

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Sleep duration								
(Intercept)	0.40 [0.15, 0.64]	0.13	3.16	.003	0.29 [0.04, 0.54]	0.13	2.29	.029
Physical activity	0.06 [0.01, 0.11]	0.03	2.38	.018	0.14 [0.10, 0.17]	0.02	7.27	< .001
Pa mostactivehr	-0.01 [-0.01, 0.00]	0.00	-4.77	< .001	0.00 [-0.01, 0.00]	0.00	-2.21	.027
Physical activity ²	0.00 [-0.02, 0.01]	0.01	-0.46	.647	0.01 [-0.01, 0.04]	0.01	1.02	.309
Age	0.00 [-0.01, 0.00]	0.00	-2.52	.012	0.00 [-0.01, 0.00]	0.00	-1.40	.160
Physical activity × pa mostactivehr	0.00 [0.00, 0.00]	0.00	-0.54	.588	0.00 [0.00, 0.00]	0.00	-0.30	.764
Pa mostactivehr × Physical activity ²	0.00 [0.00, 0.00]	0.00	1.06	.289	0.00 [0.00, 0.00]	0.00	-0.87	.385
Sleep efficiency								
(Intercept)	0.29 [0.08, 0.49]	0.11	2.71	.007	0.48 [0.26, 0.69]	0.11	4.37	< .001
Physical activity	-0.02 [-0.07, 0.03]	0.03	-0.84	.402	-0.09 [-0.13, -0.05]	0.02	-4.27	< .001
Pa mostactivehr	0.01 [0.00, 0.01]	0.00	4.05	< .001	0.00 [0.00, 0.01]	0.00	1.33	.184
Physical activity ²	0.00 [-0.02, 0.01]	0.01	-0.14	.892	-0.01 [-0.03, 0.02]	0.01	-0.41	.679
Age	0.00 [0.00, 0.00]	0.00	0.89	.373	0.00 [-0.01, 0.00]	0.00	-1.24	.214
Physical activity × pa mostactivehr	0.00 [0.00, 0.01]	0.00	2.45	.014	-0.01 [-0.01, 0.00]	0.00	-4.76	< .001
Pa mostactivehr × Physical activity ²	0.00 [0.00, 0.00]	0.00	-2.89	.004	0.00 [0.00, 0.00]	0.00	0.92	.359
Sleep onset								
(Intercept)	-0.09 [-0.37, 0.19]	0.14	-0.60	.547	0.20 [-0.09, 0.48]	0.15	1.34	.181
Physical activity	-0.16 [-0.20, -0.11]	0.02	-6.83	< .001	-0.24 [-0.27, -0.20]	0.02	-14.48	< .001
Pa mostactivehr	0.02 [0.02, 0.03]	0.00	16.62	< .001	0.02 [0.01, 0.02]	0.00	10.65	< .001
Physical activity ²	0.01 [0.00, 0.03]	0.01	2.23	.026	-0.02 [-0.04, 0.01]	0.01	-1.40	.161
Age	0.00 [0.00, 0.00]	0.00	-0.26	.798	-0.01 [-0.01, 0.00]	0.00	-3.63	< .001

Table 20 continued

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Physical activity × pa mostactivehr	0.00 [0.00, 0.01]	0.00	1.72	.085	-0.01 [-0.01, -0.01]	0.00	-10.40	< .001
Pa mostactivehr × Physical activity ²	0.00 [0.00, 0.00]	0.00	-4.04	< .001	0.00 [0.00, 0.00]	0.00	2.60	.009
Sleep regularity								
(Intercept)	0.39 [0.16, 0.61]	0.12	3.38	.001	0.50 [0.25, 0.74]	0.13	3.90	< .001
Physical activity	0.22 [0.17, 0.27]	0.03	8.45	< .001	0.07 [0.03, 0.11]	0.02	3.69	< .001
Pa mostactivehr	-0.01 [-0.01, 0.00]	0.00	-3.43	.001	0.00 [-0.01, 0.00]	0.00	-2.82	.005
Physical activity ²	-0.03 [-0.05, -0.02]	0.01	-4.81	< .001	-0.02 [-0.04, 0.01]	0.01	-1.35	.179
Age	0.00 [0.00, 0.00]	0.00	0.91	.364	0.00 [0.00, 0.00]	0.00	0.10	.923
Physical activity × pa mostactivehr	0.00 [0.00, 0.01]	0.00	1.38	.169	0.00 [0.00, 0.01]	0.00	2.21	.028
Pa mostactivehr × Physical activity ²	0.00 [0.00, 0.00]	0.00	0.44	.661	0.00 [0.00, 0.00]	0.00	0.85	.394

Note. Adjusted for BMI, age, and sex. Outcomes variables are listed in the column headers.

Table 21

Sleep predicting physical activity controlling for BMI, age, and sex

Term	Physical Activity Volume					Physical Activity Intensity				
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p		
Sleep duration										
(Intercept)	1.27 [0.92, 1.62]	0.18	7.10	< .001	1.14 [0.89, 1.40]	0.13	8.80	< .001		
Sleep duration	0.02 [-0.02, 0.06]	0.02	1.09	.275	0.12 [0.08, 0.16]	0.02	5.57	< .001		
Pa mostactivehr	-0.01 [-0.01, 0.00]	0.00	-4.85	< .001	-0.01 [-0.02, -0.01]	0.00	-10.60	< .001		
Sleep duration ²	-0.02 [-0.04, 0.00]	0.01	-2.14	.032	-0.01 [-0.03, 0.02]	0.01	-0.48	.635		
Age	-0.02 [-0.02, -0.01]	0.00	-8.21	< .001	-0.02 [-0.03, -0.02]	0.00	-8.66	< .001		
Sleep duration × pa mostactivehr	0.00 [0.00, 0.00]	0.00	-0.45	.656	0.00 [0.00, 0.00]	0.00	0.19	.850		
Pa mostactivehr × Sleep duration ²	0.00 [0.00, 0.00]	0.00	0.91	.365	0.00 [0.00, 0.00]	0.00	0.42	.678		
Sleep efficiency										
(Intercept)	1.26 [0.91, 1.61]	0.18	7.05	< .001	1.20 [0.95, 1.45]	0.13	9.36	< .001		
Sleep efficiency	0.01 [-0.03, 0.05]	0.02	0.69	.489	-0.02 [-0.06, 0.02]	0.02	-0.99	.323		
Pa mostactivehr	0.00 [-0.01, 0.00]	0.00	-3.52	< .001	-0.01 [-0.02, -0.01]	0.00	-8.97	< .001		
Sleep efficiency ²	0.00 [-0.02, 0.01]	0.01	-0.32	.751	-0.02 [-0.04, -0.01]	0.01	-3.09	.002		
Age	-0.02 [-0.02, -0.01]	0.00	-8.23	< .001	-0.02 [-0.03, -0.02]	0.00	-8.50	< .001		
Sleep efficiency × pa mostactivehr	0.00 [-0.01, 0.00]	0.00	-2.05	.041	-0.01 [-0.01, 0.00]	0.00	-3.75	< .001		
Pa mostactivehr × Sleep efficiency ²	0.00 [0.00, 0.00]	0.00	-1.10	.272	0.00 [0.00, 0.00]	0.00	-0.02	.984		
Sleep onset										
(Intercept)	1.30 [0.94, 1.66]	0.18	7.13	< .001	1.17 [0.90, 1.44]	0.14	8.56	< .001		
Sleep onset	-0.04 [-0.07, -0.01]	0.02	-2.42	.016	-0.10 [-0.14, -0.07]	0.02	-5.54	< .001		
Pa mostactivehr	-0.01 [-0.01, 0.00]	0.00	-4.18	< .001	-0.01 [-0.02, -0.01]	0.00	-8.41	< .001		
Sleep onset ²	-0.05 [-0.07, -0.02]	0.01	-3.69	< .001	-0.01 [-0.03, 0.02]	0.01	-0.36	.717		
Age	-0.02 [-0.02, -0.01]	0.00	-8.24	< .001	-0.02 [-0.03, -0.02]	0.00	-8.26	< .001		

Table 21 continued

Term	Physical Activity Volume				Physical Activity Intensity					
	β	[95% CI]	SE	t	p	β	[95% CI]	SE	t	p
Sleep onset × pa mostactivehr	0.00	[0.00, 0.00]	0.00	-0.39	.695	0.00	[-0.01, 0.00]	0.00	-2.39	.017
Pa mostactivehr × Sleep onset ²	0.00	[0.00, 0.00]	0.00	1.23	.218	0.00	[0.00, 0.00]	0.00	0.91	.362
Sleep regularity										
(Intercept)	1.22	[0.88, 1.56]	0.17	7.03	< .001	1.12	[0.88, 1.37]	0.12	9.01	< .001
Sleep regularity	0.13	[0.09, 0.16]	0.02	6.47	< .001	0.07	[0.03, 0.11]	0.02	3.36	.001
Pa mostactivehr	-0.01	[-0.01, 0.00]	0.00	-4.46	< .001	-0.02	[-0.02, -0.01]	0.00	-10.57	< .001
Sleep regularity ²	-0.02	[-0.04, 0.00]	0.01	-1.65	.100	-0.01	[-0.04, 0.01]	0.01	-0.80	.421
Age	-0.02	[-0.02, -0.01]	0.00	-8.14	< .001	-0.02	[-0.03, -0.02]	0.00	-8.55	< .001
Sleep regularity × pa mostactivehr	0.00	[0.00, 0.00]	0.00	-0.94	.353	0.00	[0.00, 0.01]	0.00	1.61	.109
Pa mostactivehr × Sleep regularity ²	0.00	[0.00, 0.00]	0.00	1.30	.196	0.00	[0.00, 0.00]	0.00	2.63	.009

Note. Adjusted for BMI, age, and sex. Outcomes variables are listed in the row headers.

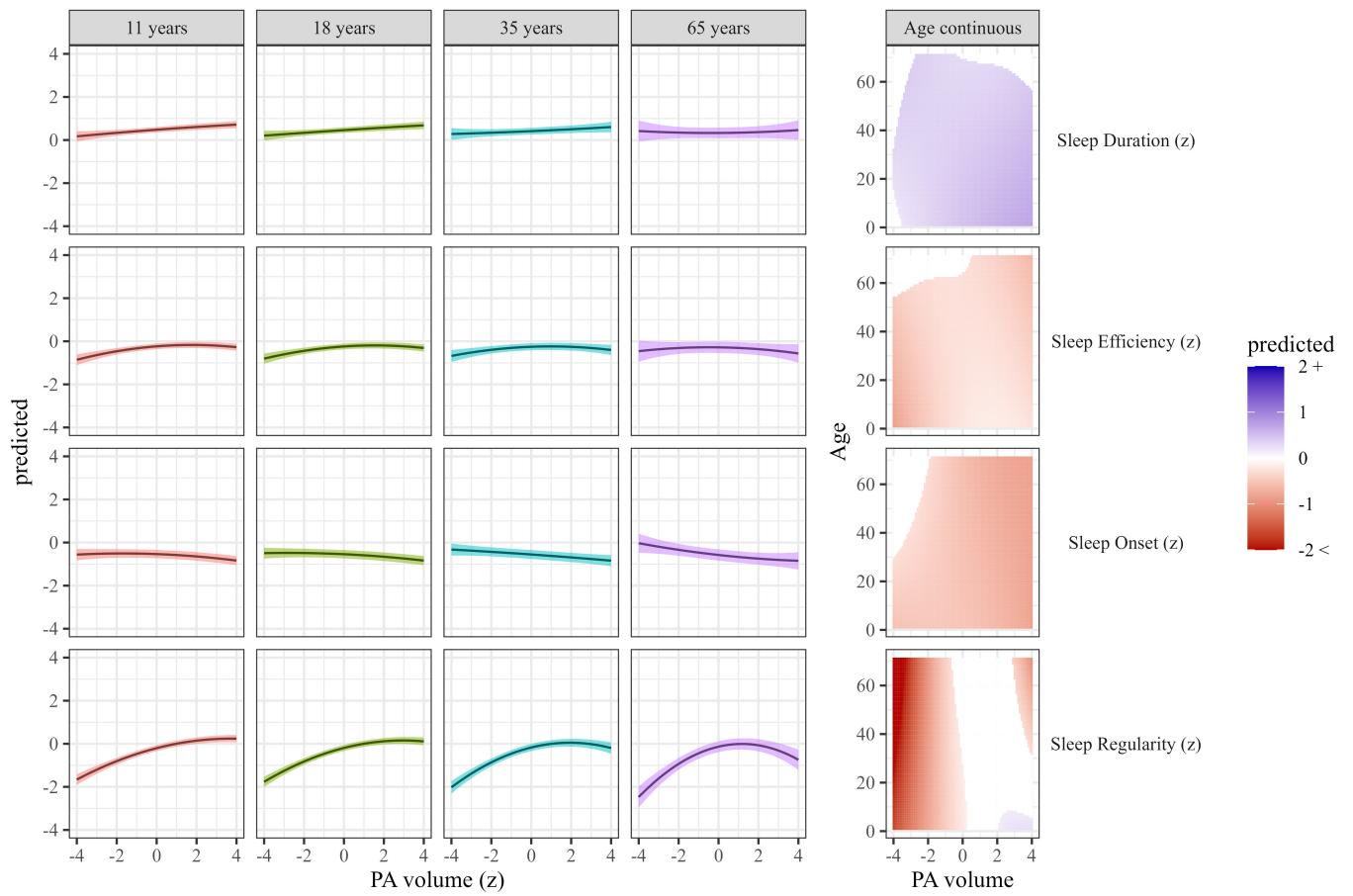


Figure 1. Sleep metrics on Physical activity volume

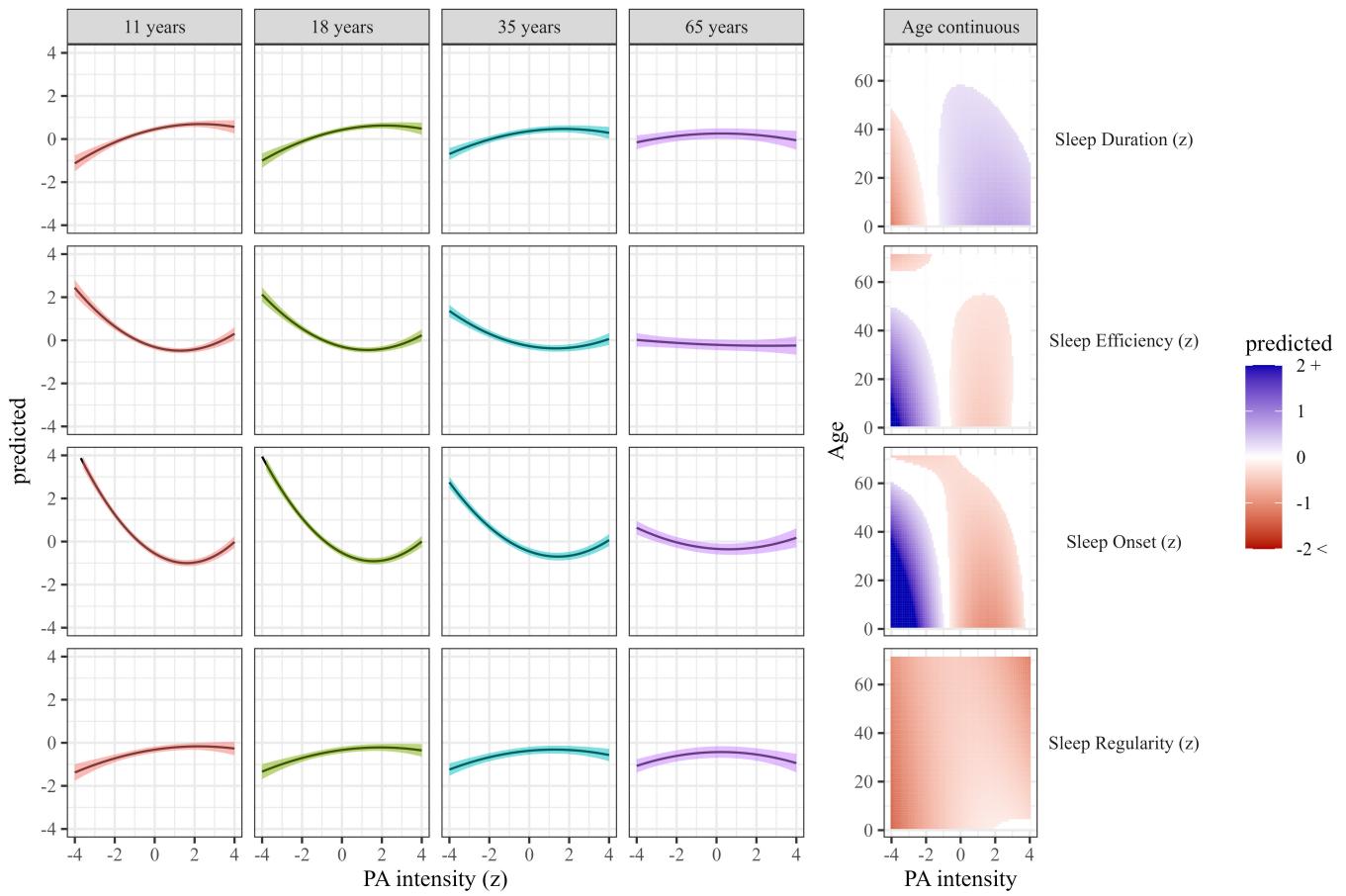


Figure 2. Sleep metrics on Physical activity intensity

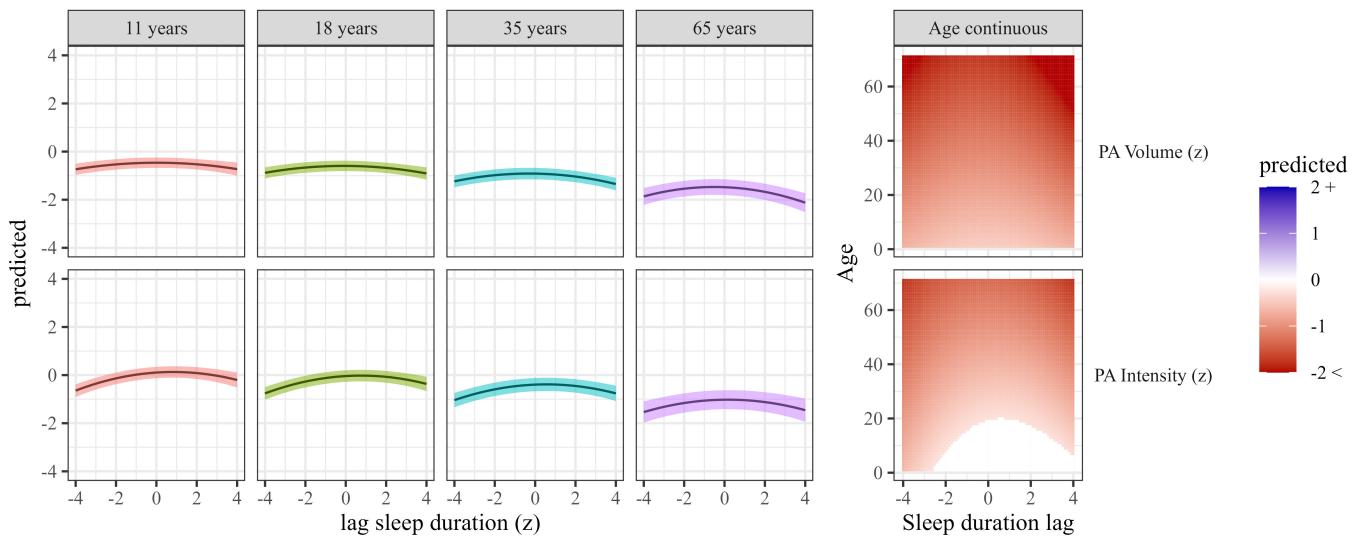


Figure 3. Physical activity by sleep duration

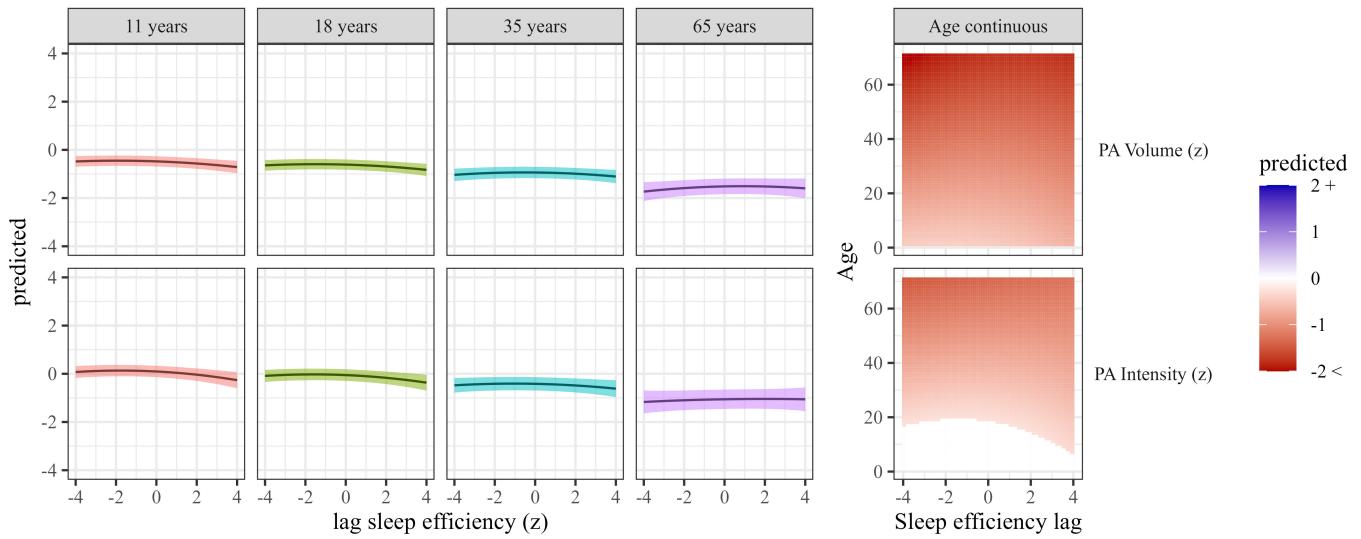


Figure 4. Physical activity by sleep efficiency

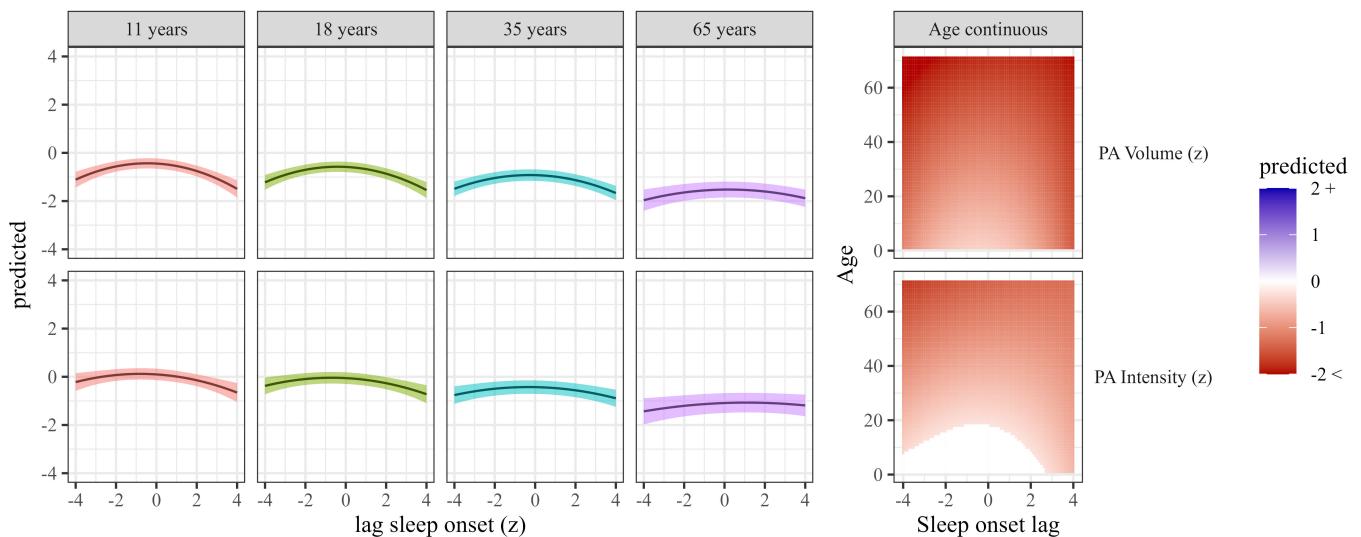


Figure 5. Physical activity by sleep onset

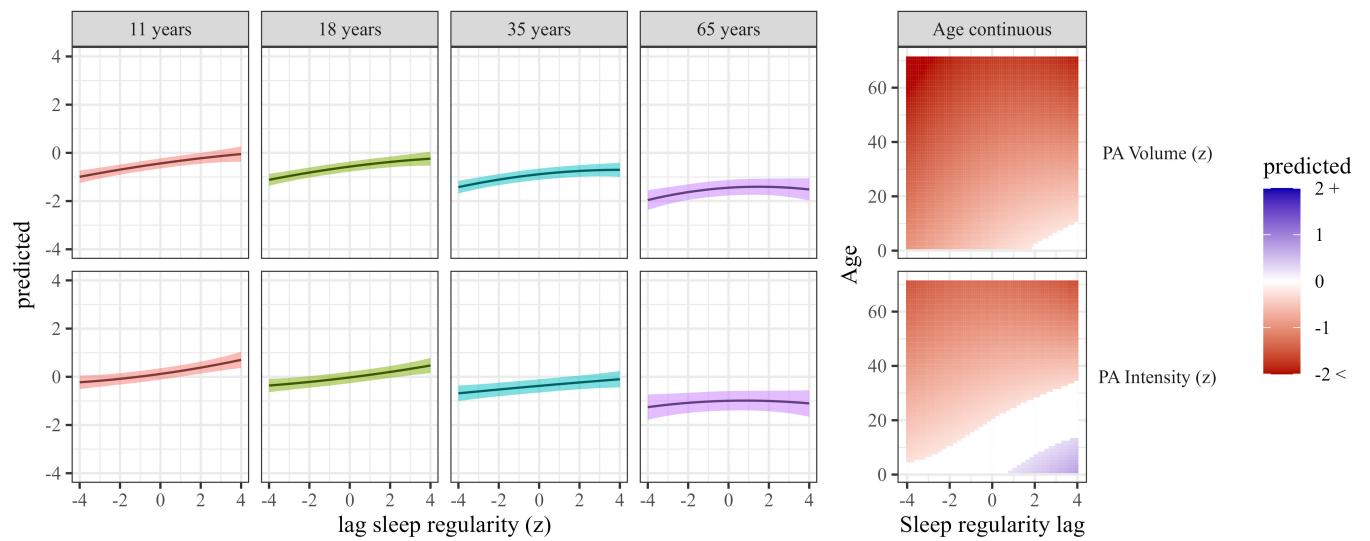


Figure 6. Physical activity by sleep regularity

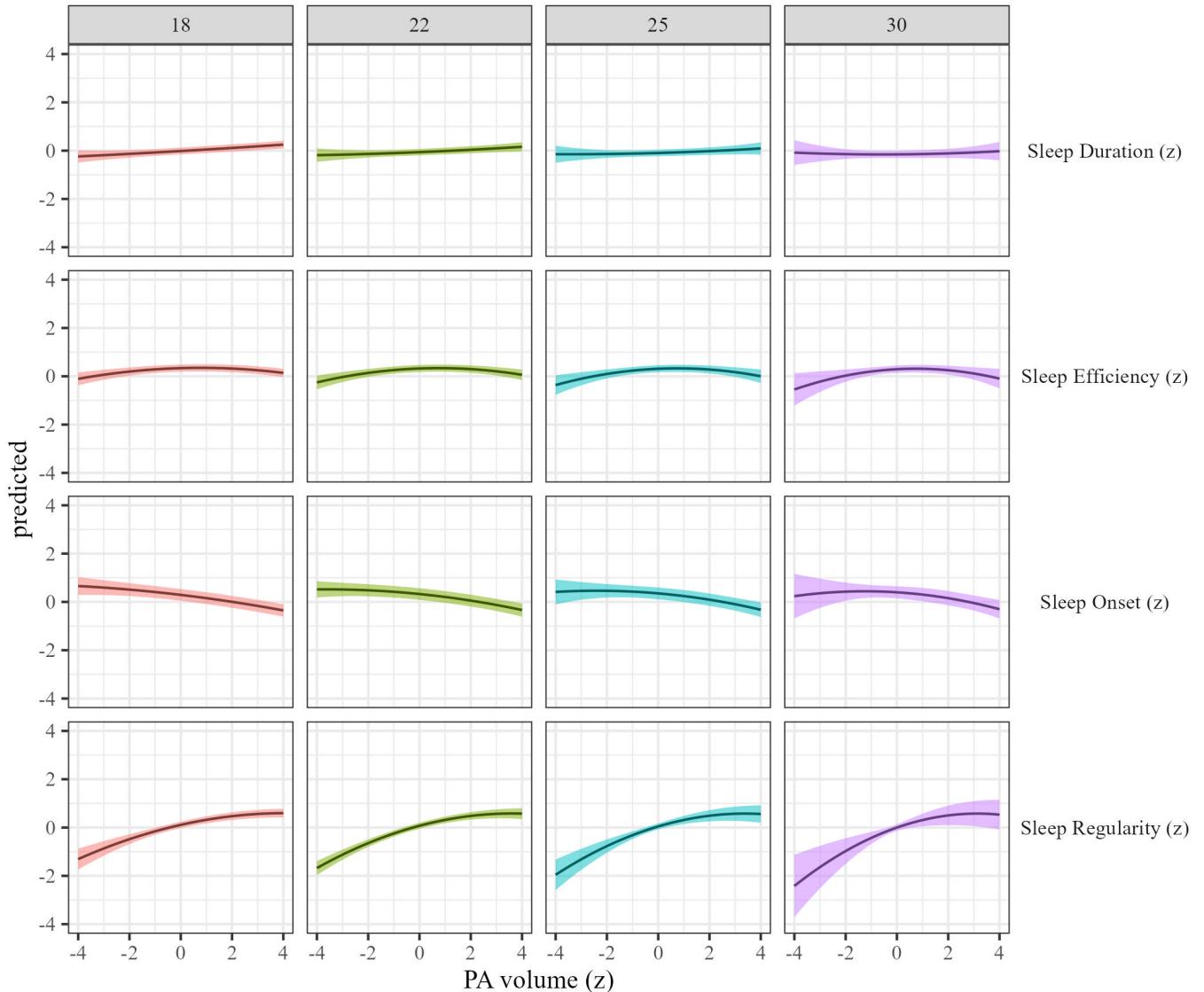


Figure 7. Sleep metrics on Physical activity volume by BMI

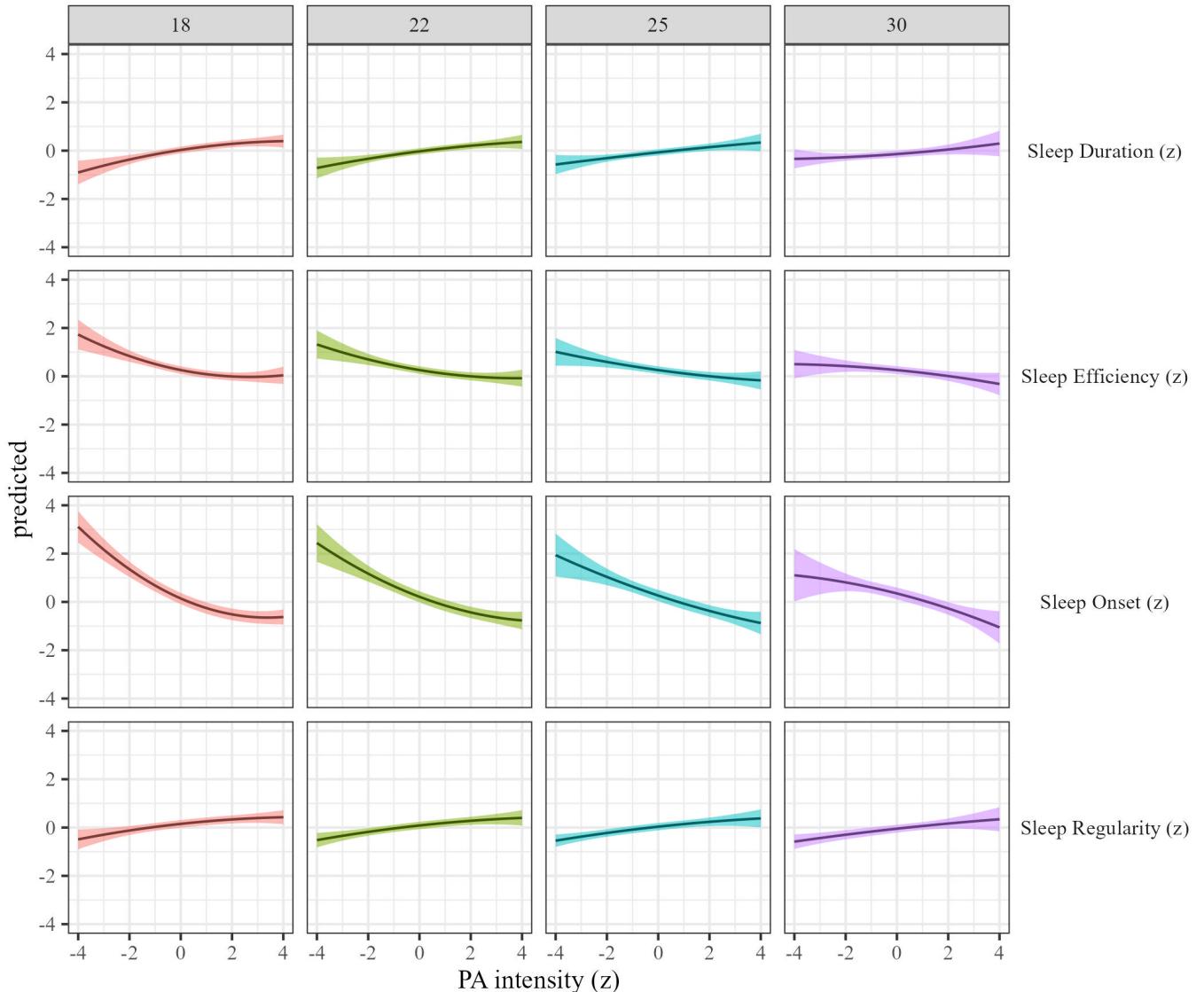


Figure 8. Sleep metrics on Physical activity intensity moderated by BMI

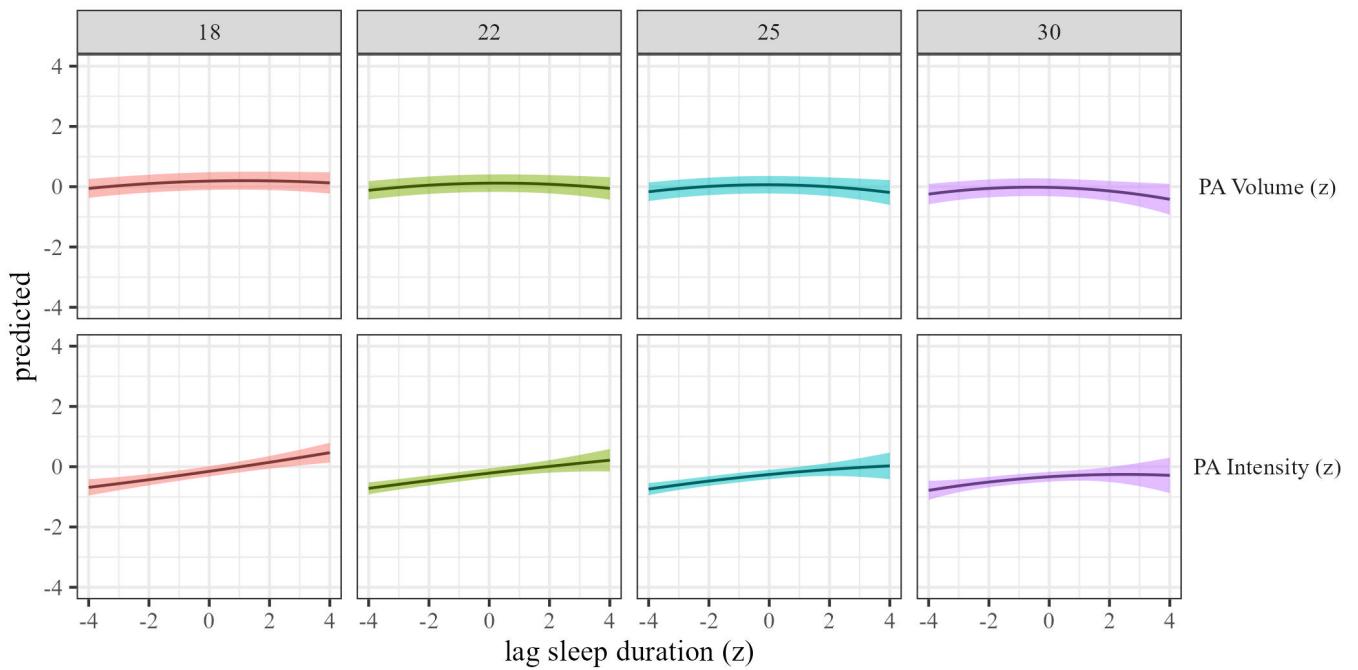


Figure 9. Physical activity by sleep duration moderated by BMI

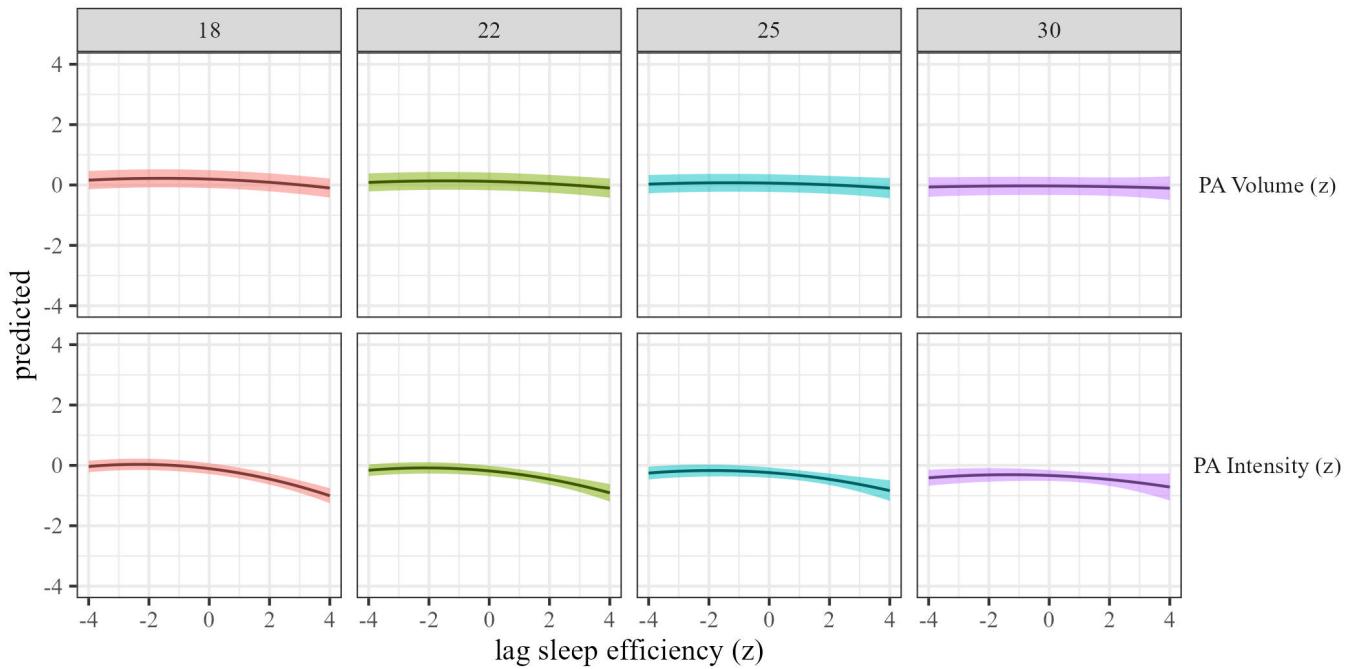


Figure 10. Physical activity by sleep efficiency moderated by BMI

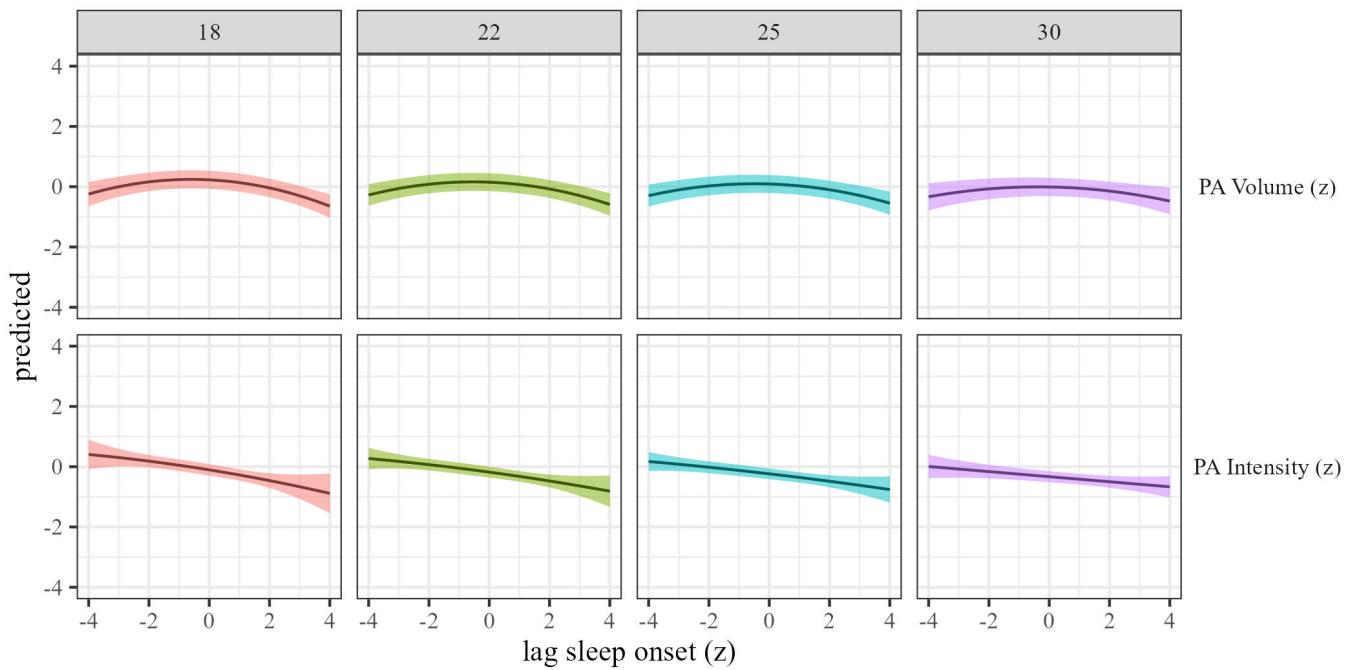


Figure 11. Physical activity by sleep onset moderated by BMI

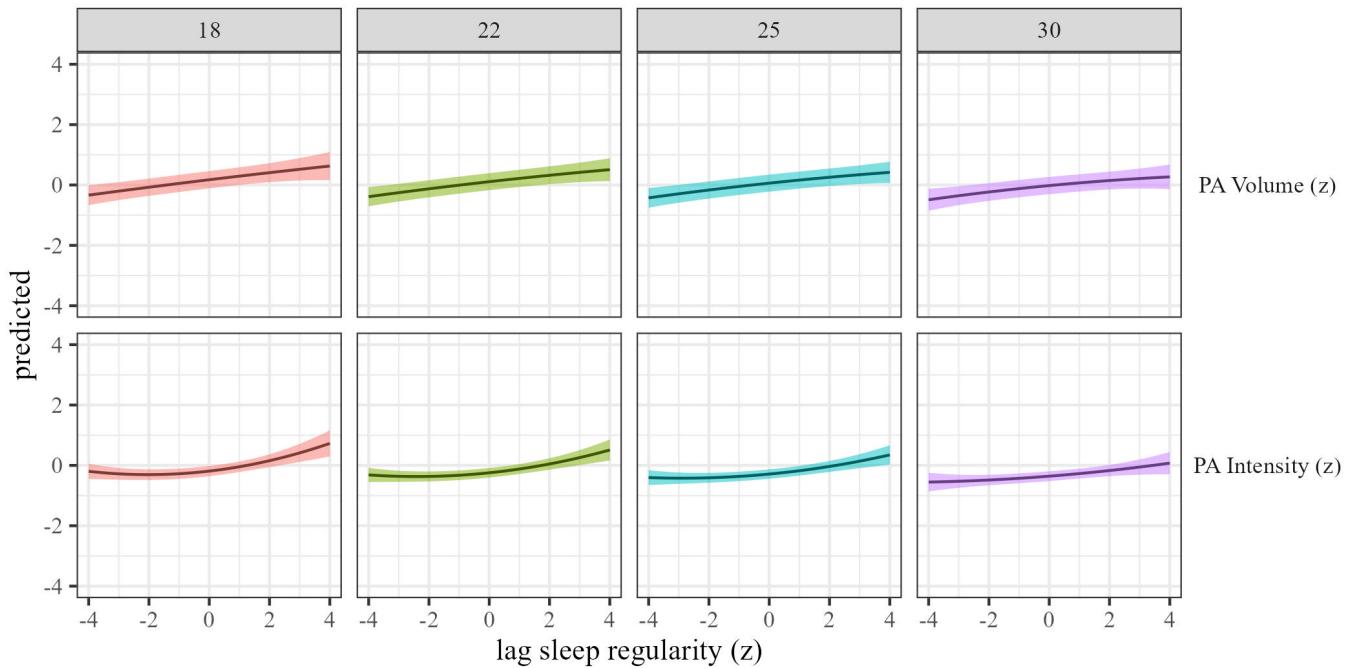


Figure 12. Physical activity by sleep regularity moderated by BMI

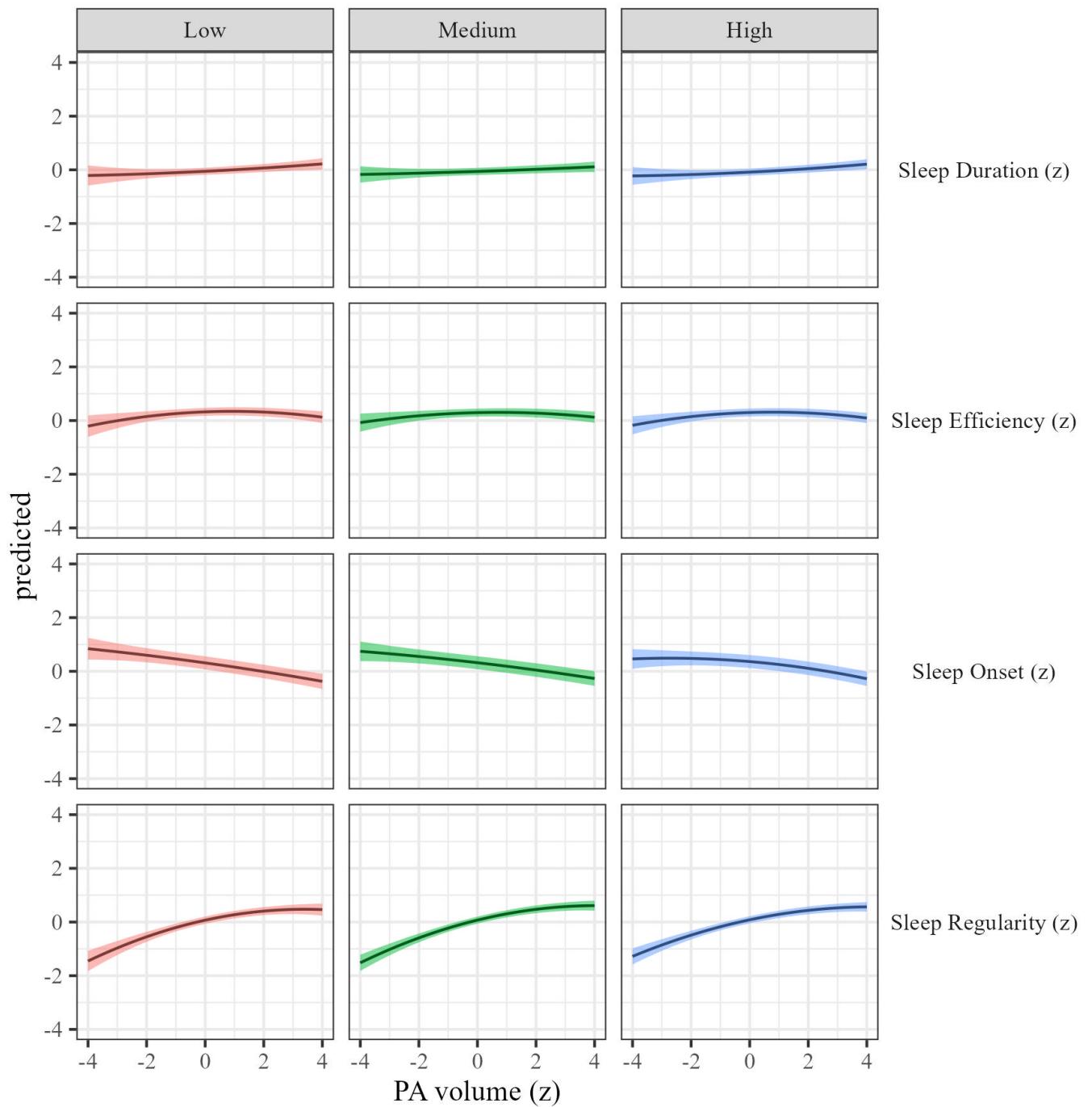


Figure 13. Sleep metrics on Physical activity volume by SES

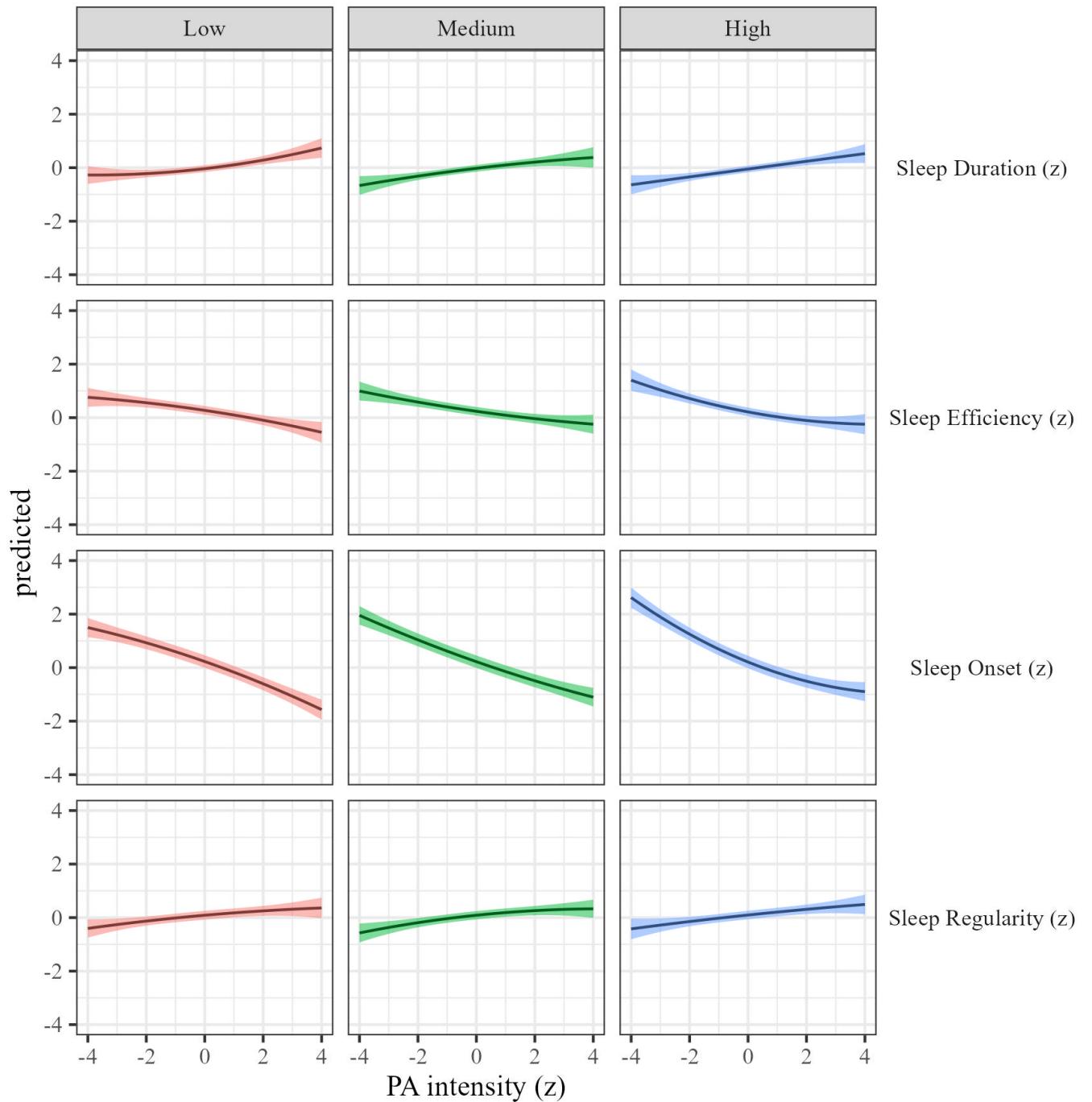


Figure 14. Sleep metrics on Physical activity intensity moderated by SES

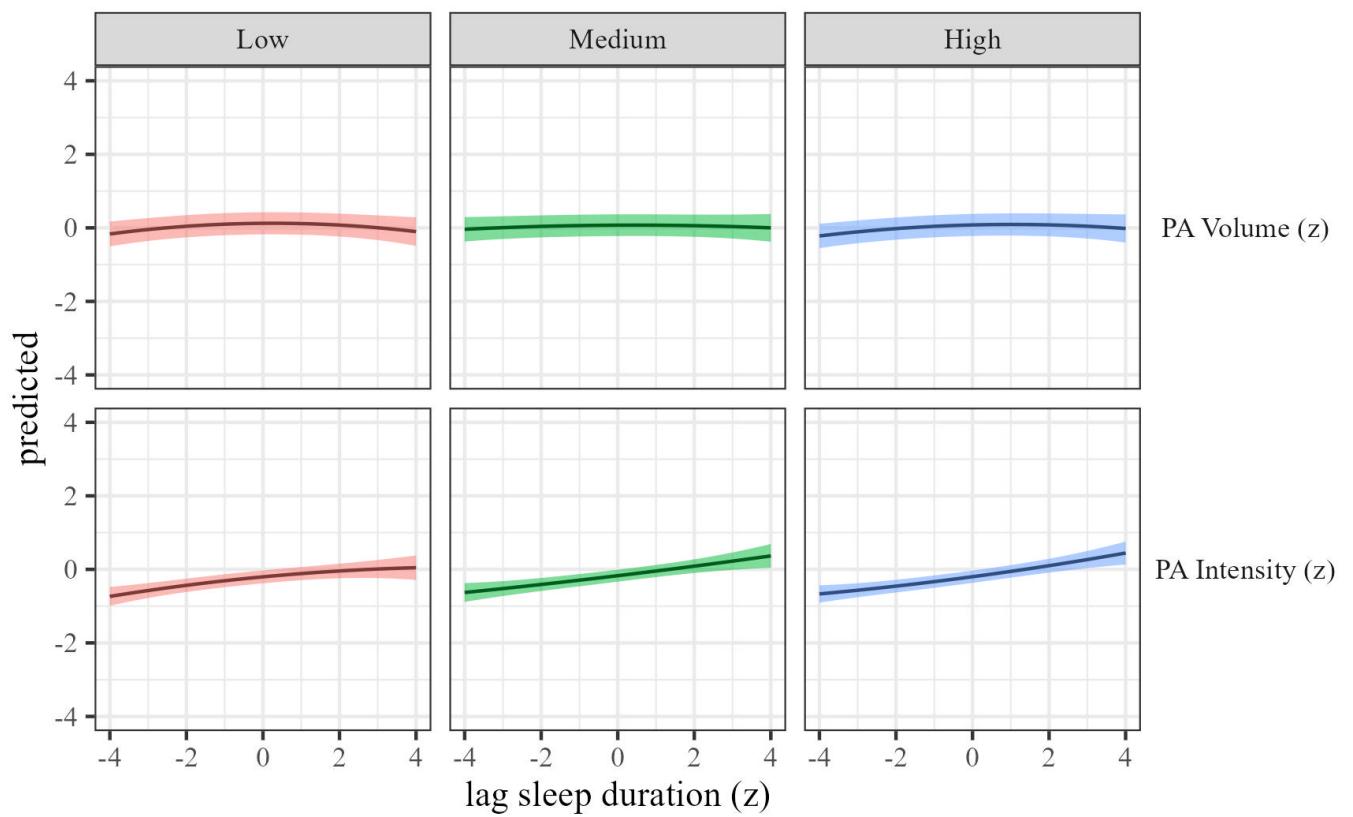


Figure 15. Physical activity by sleep duration moderated by SES

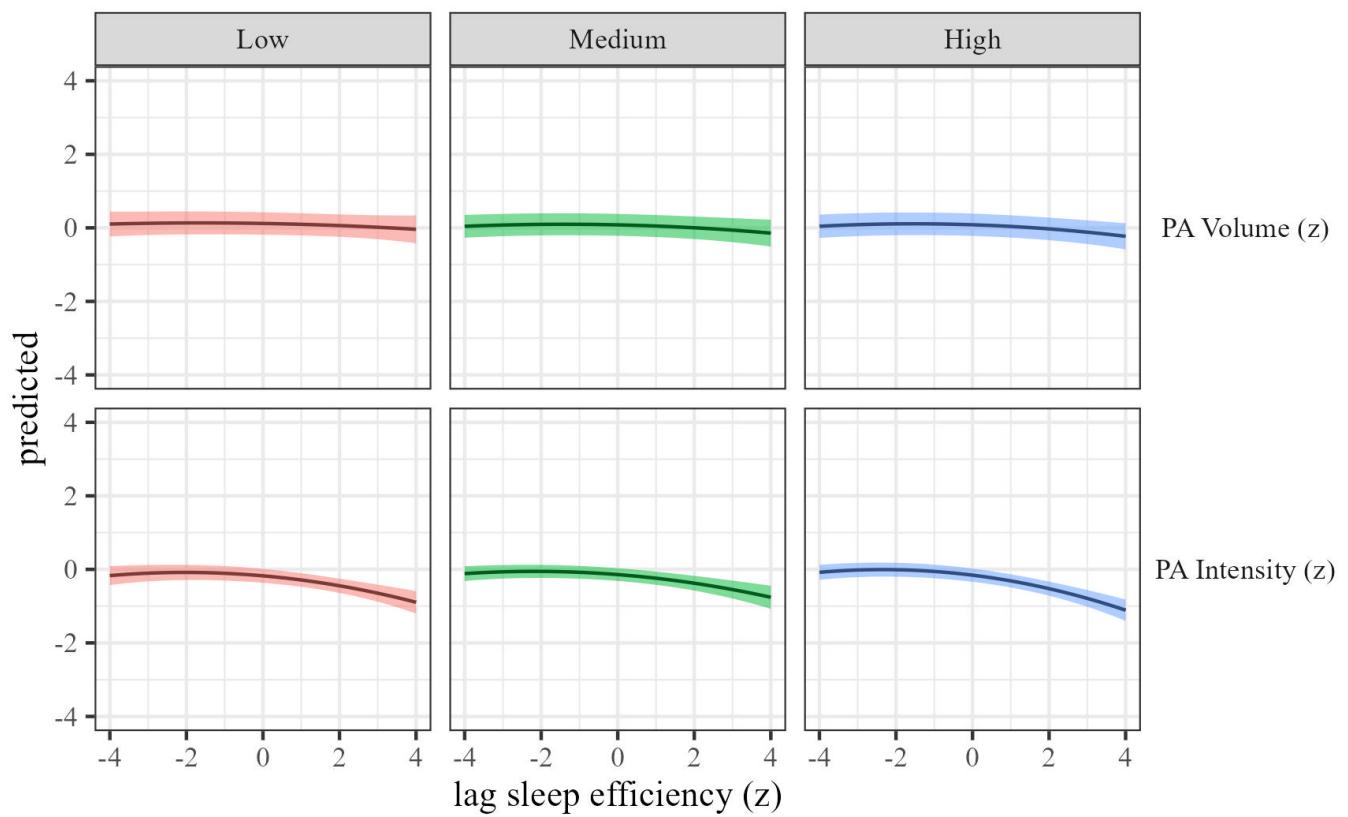


Figure 16. Physical activity by sleep efficiency moderated by SES

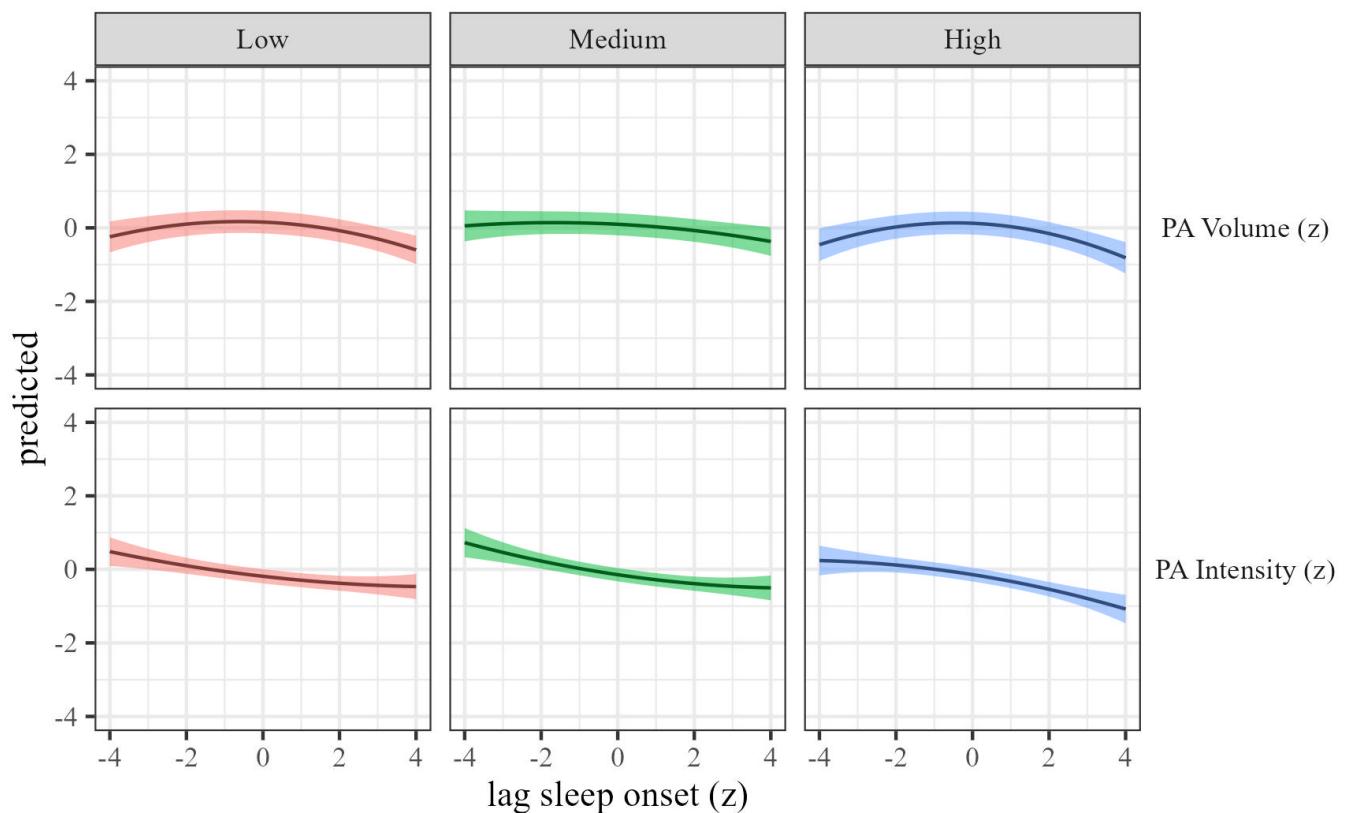


Figure 17. Physical activity by sleep onset moderated by SES

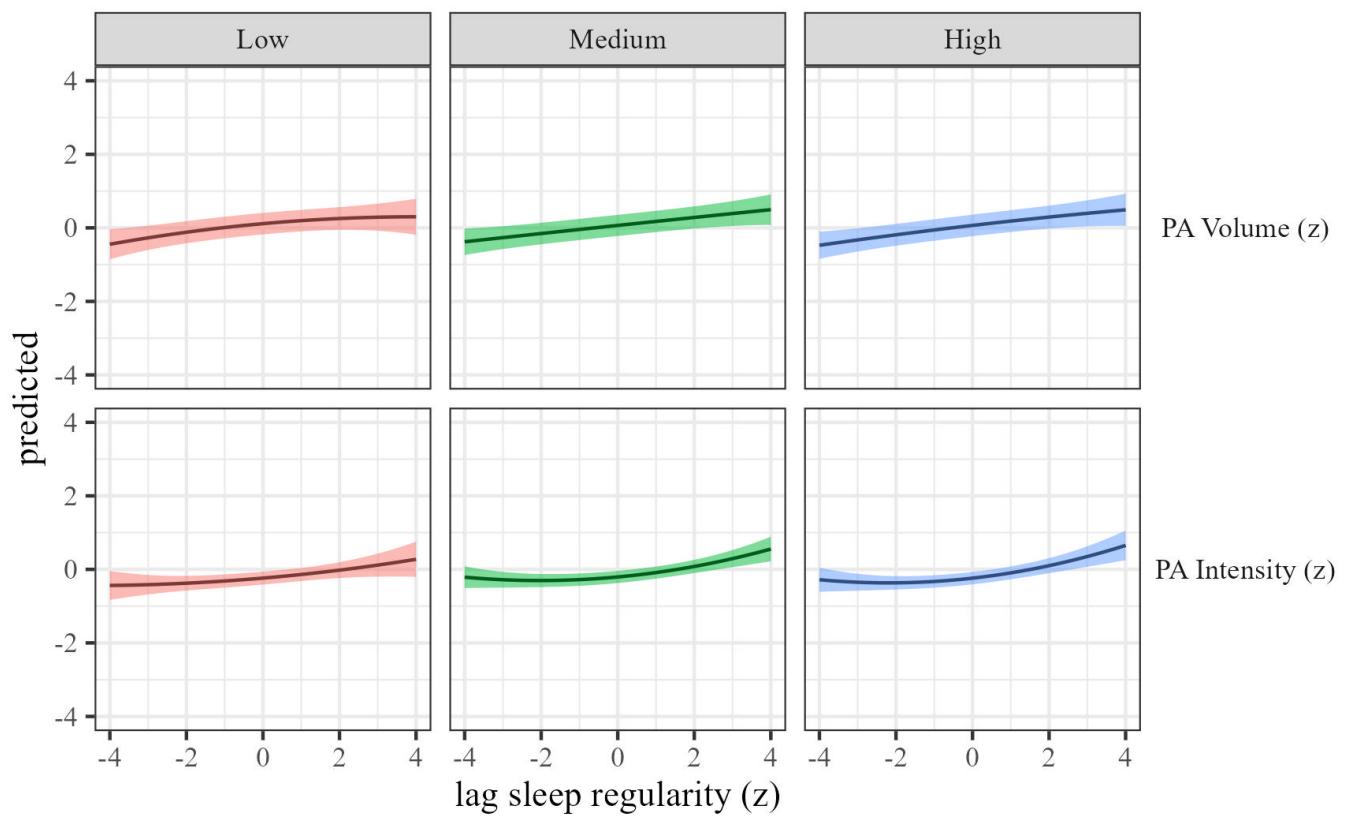


Figure 18. Physical activity by sleep regularity moderated by SES

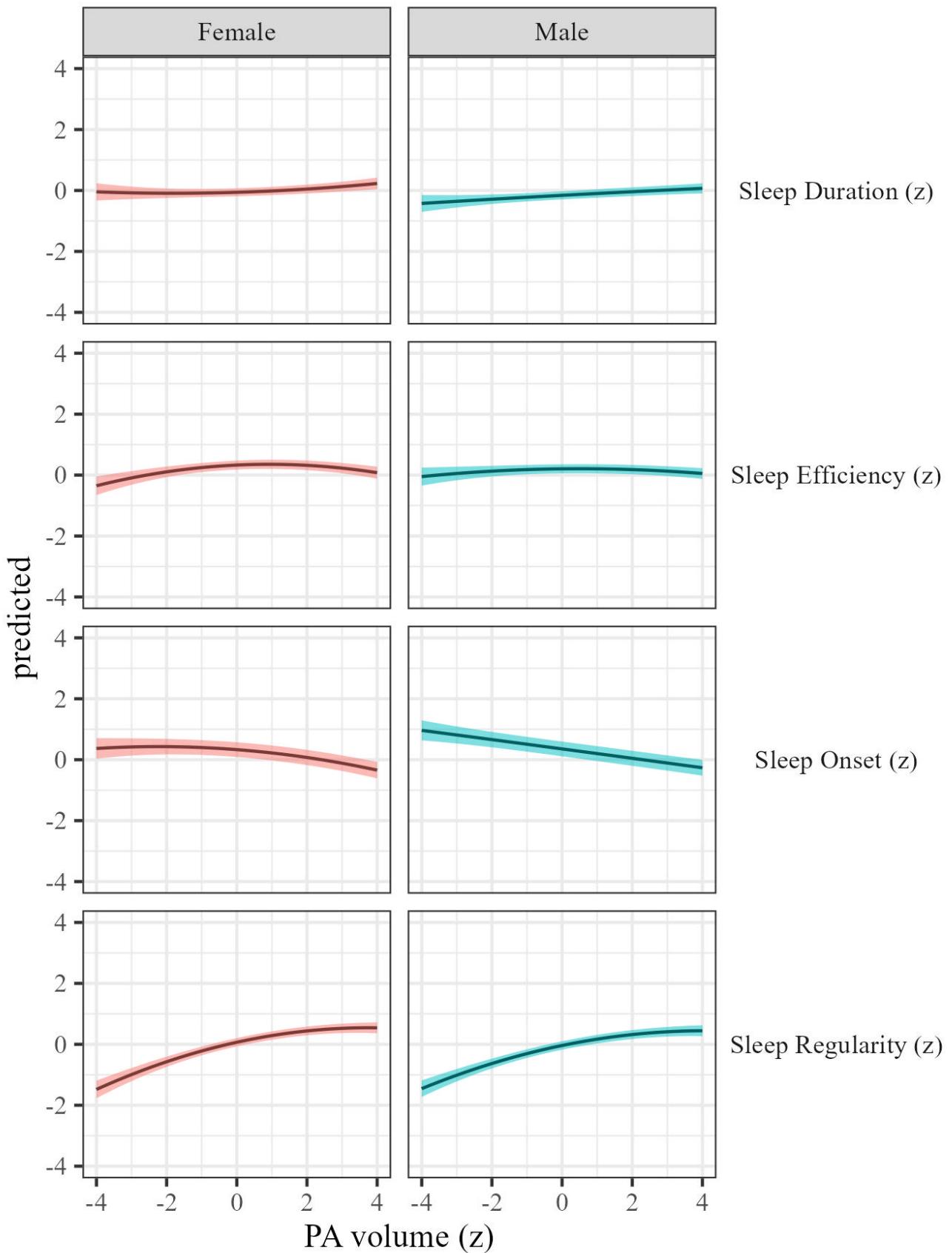


Figure 19. Sleep metrics on Physical activity volume by sex

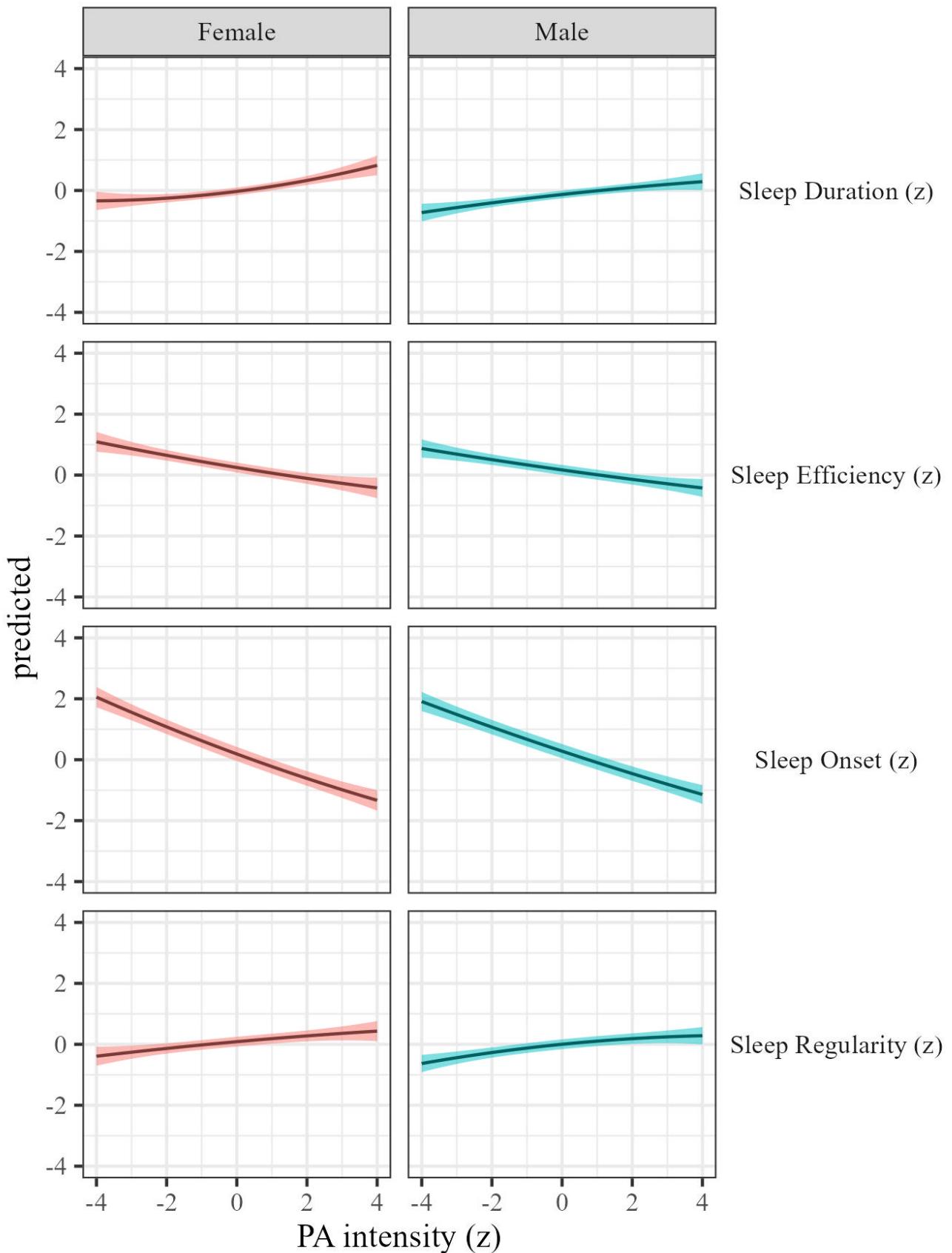


Figure 20. Sleep metrics on Physical activity intensity moderated by sex

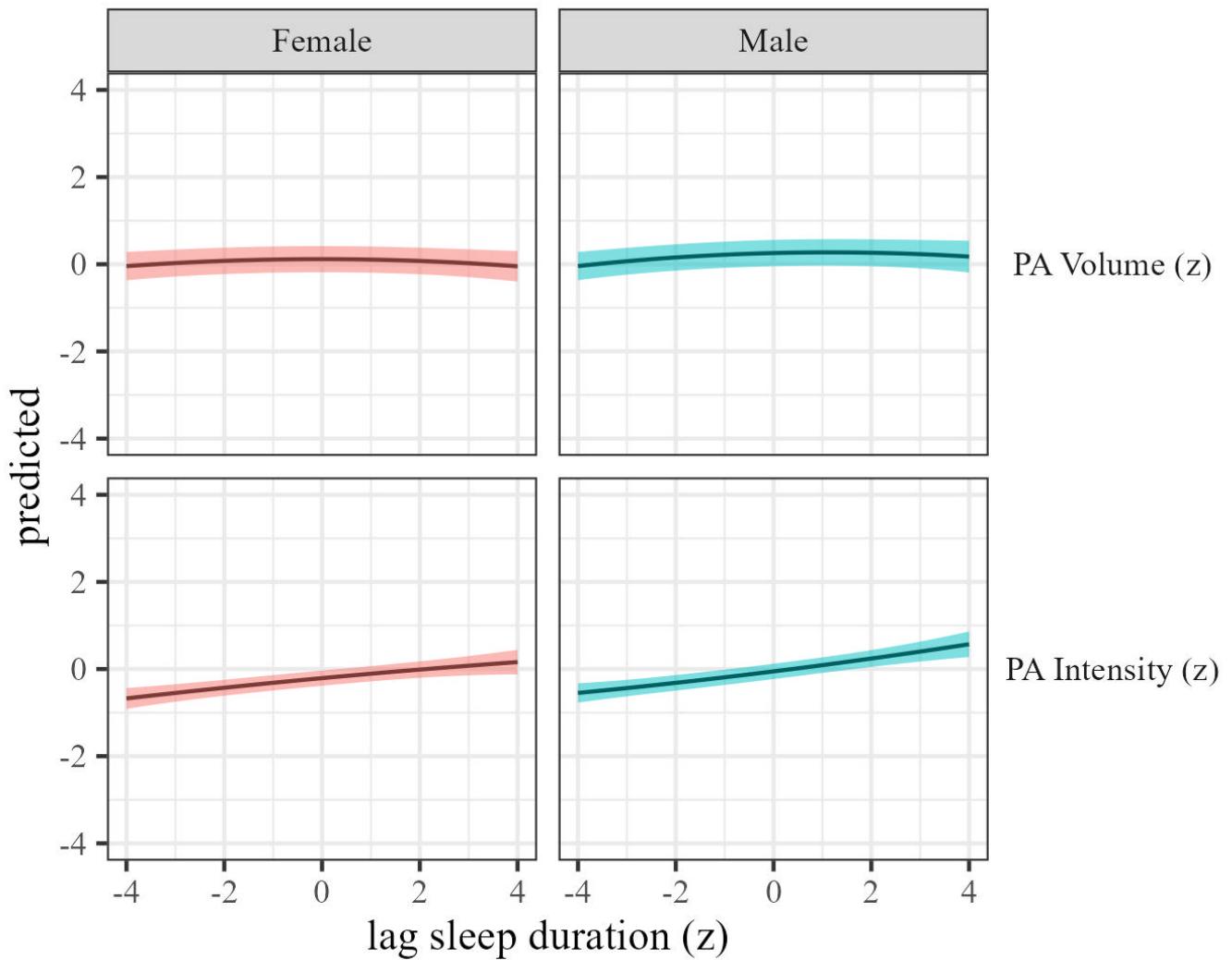


Figure 21. Physical activity by sleep duration moderated by sex

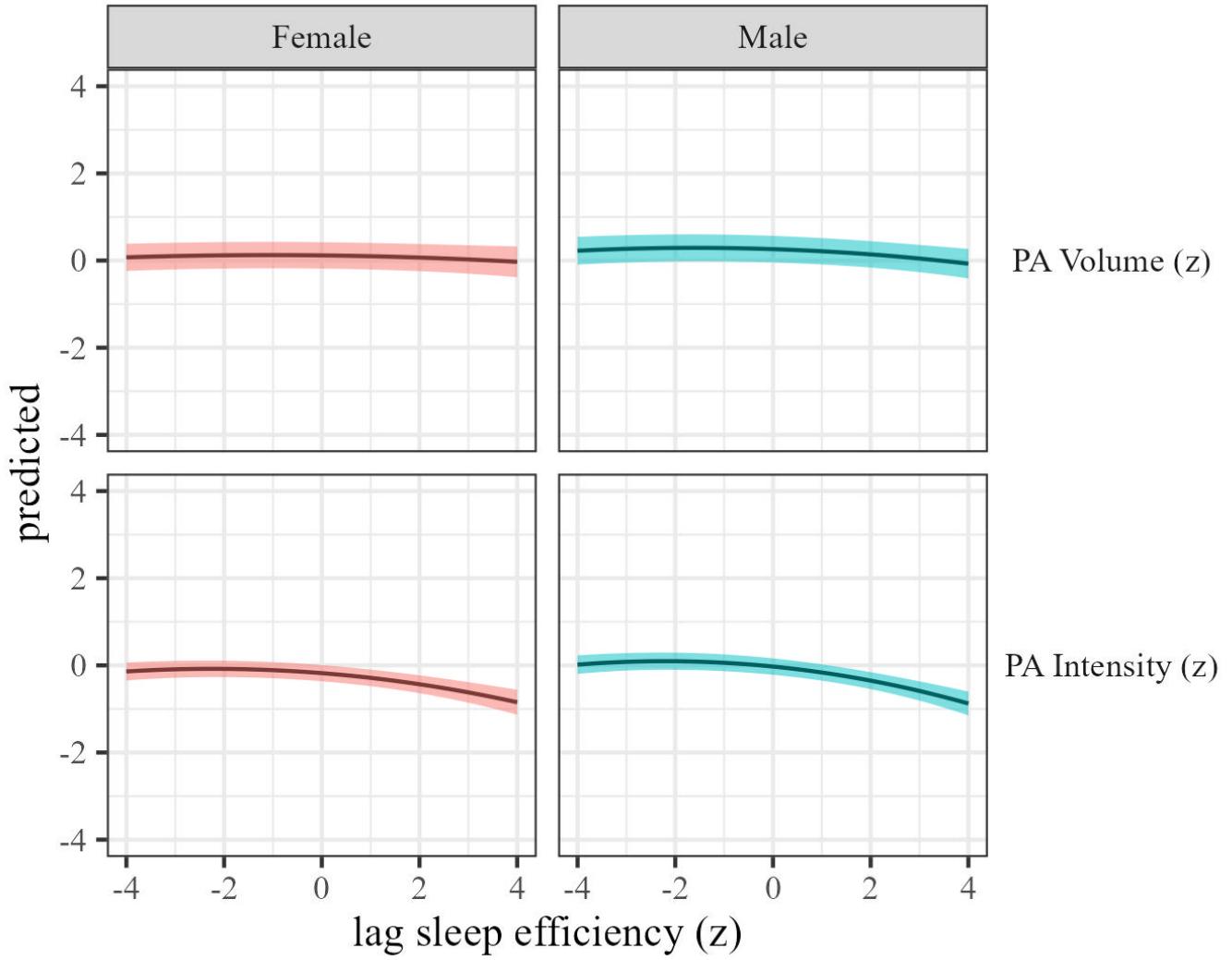


Figure 22. Physical activity by sleep efficiency moderated by sex

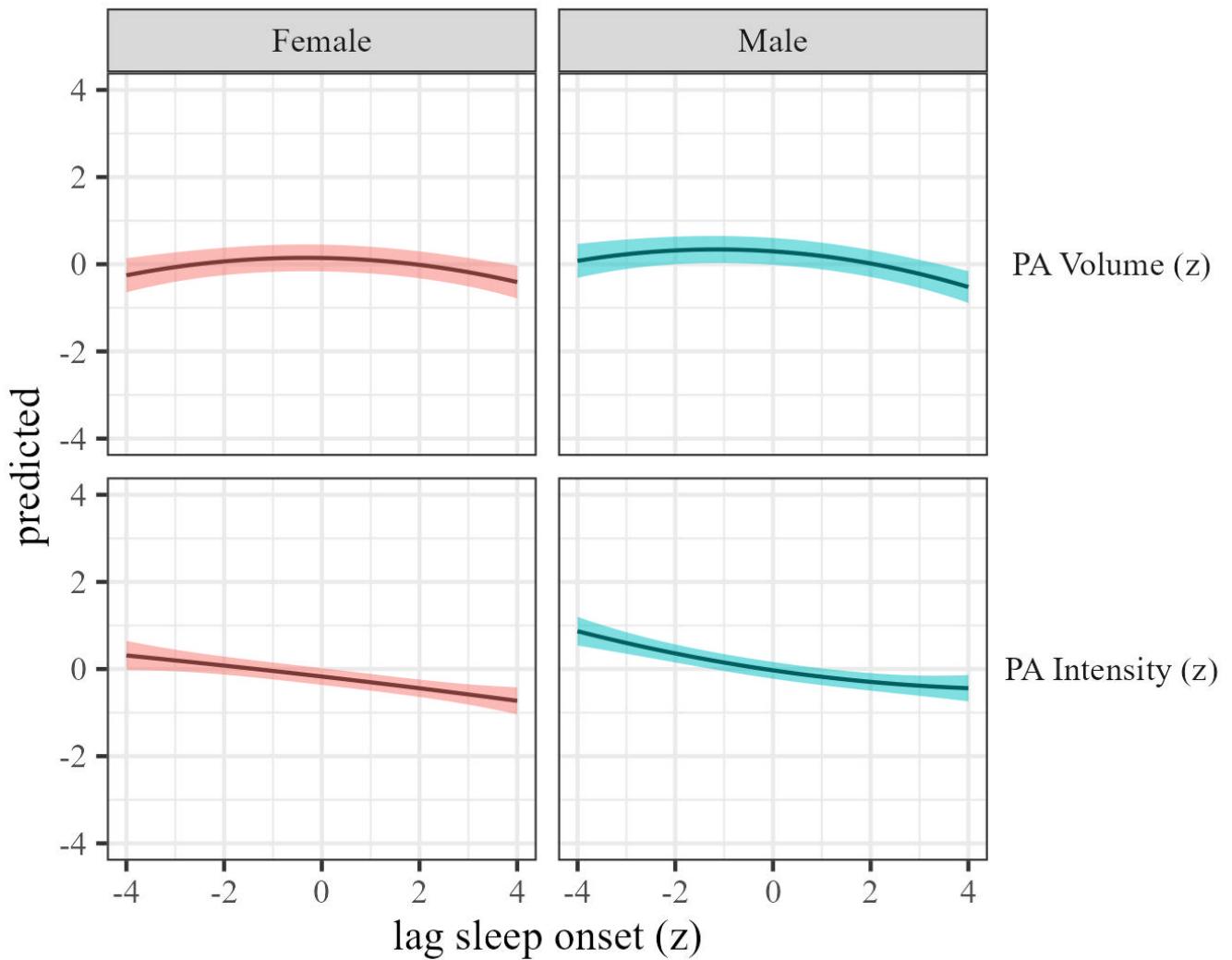


Figure 23. Physical activity by sleep onset moderated by sex

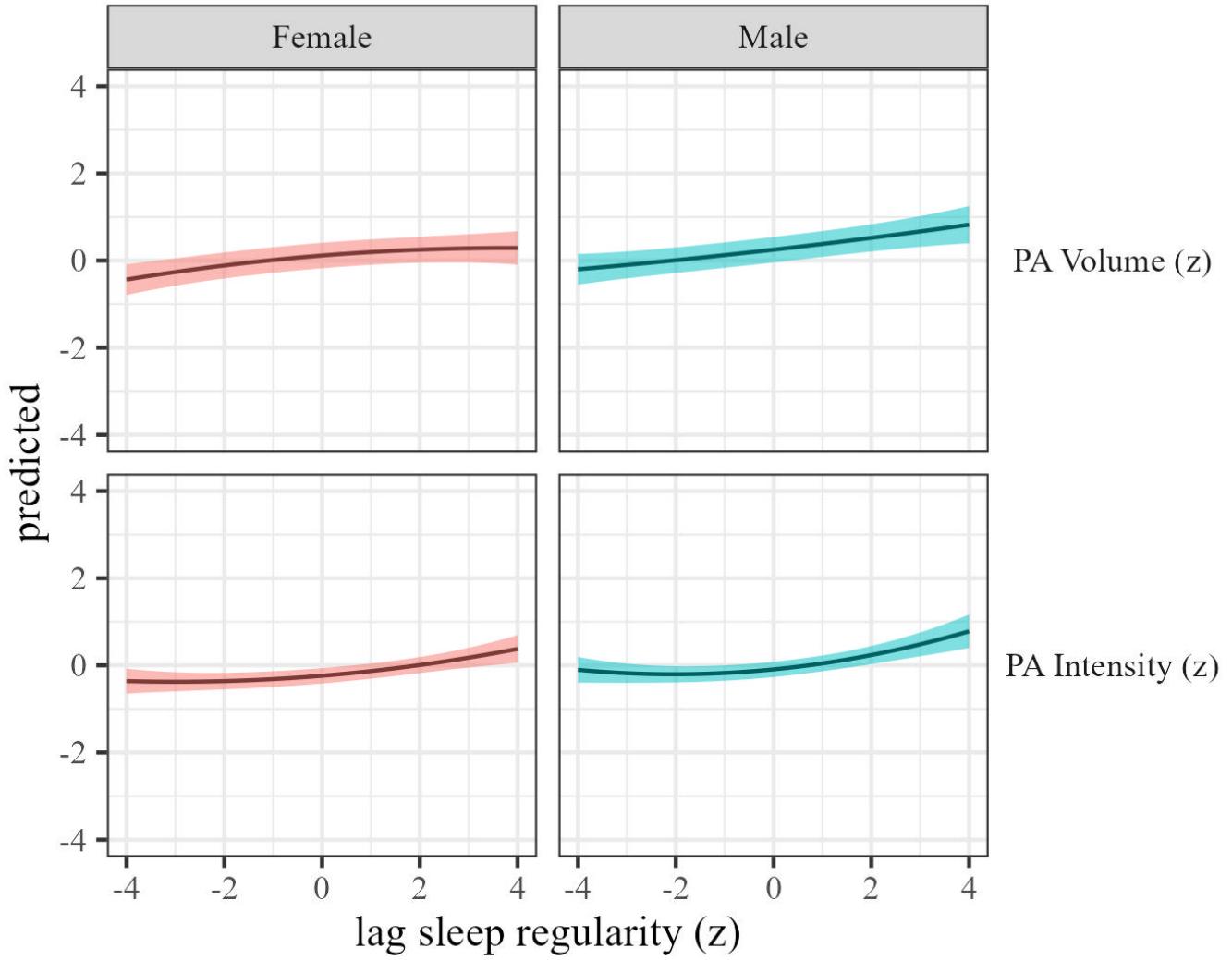


Figure 24. Physical activity by sleep regularity moderated by sex

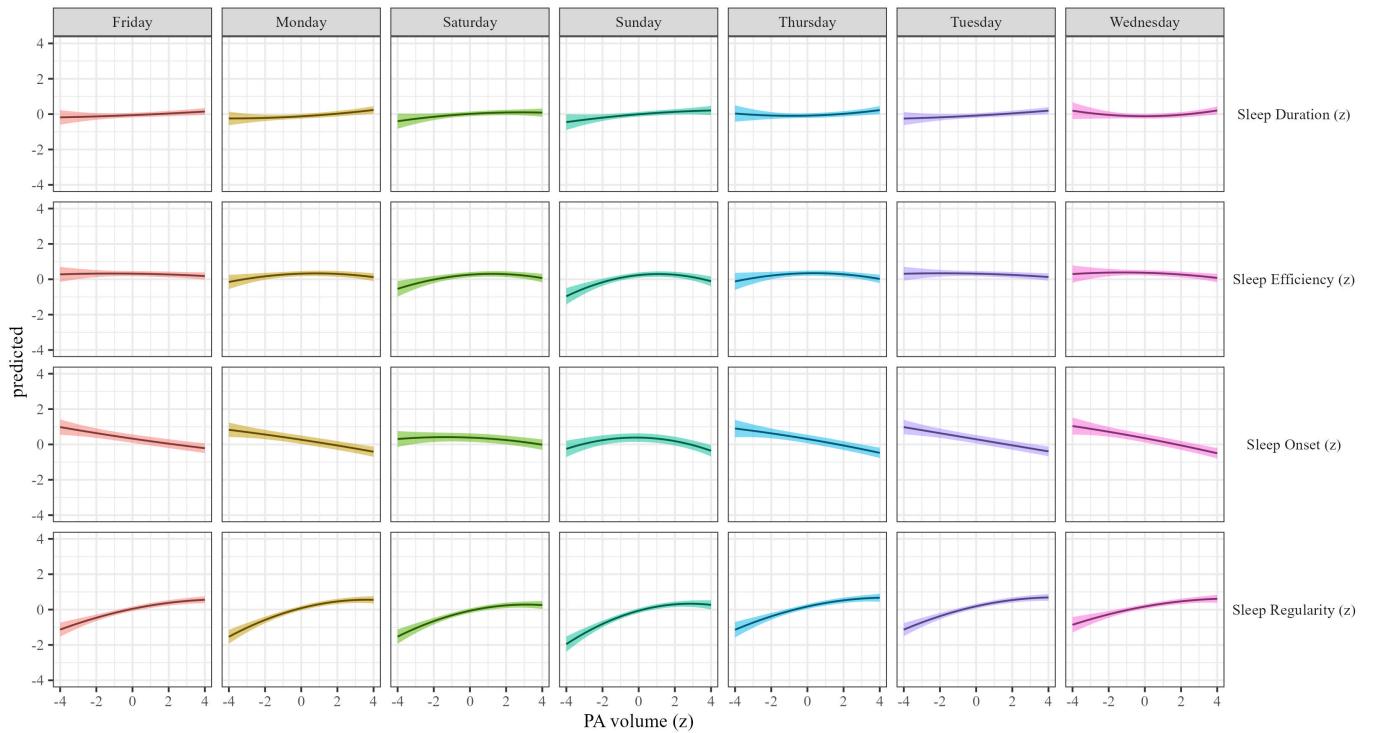


Figure 25. Sleep metrics on Physical activity volume by weekday

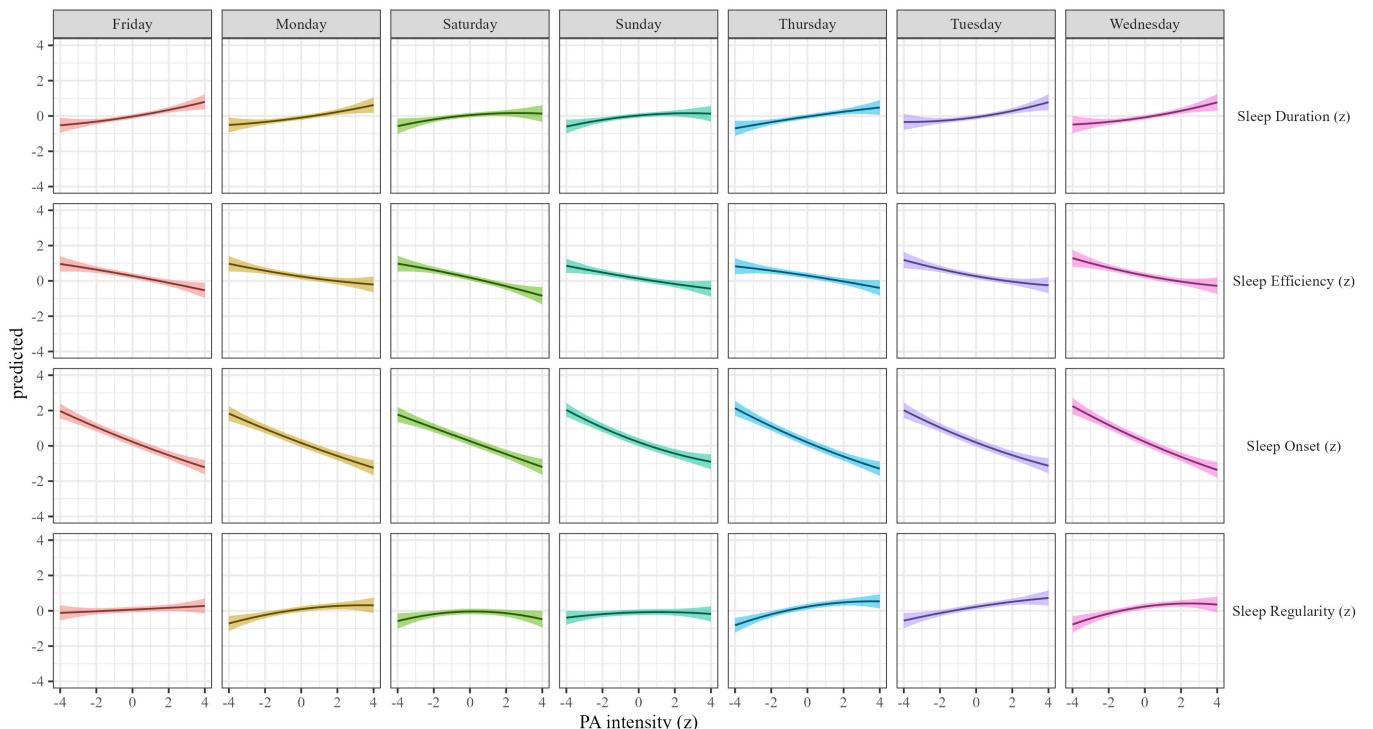


Figure 26. Sleep metrics on Physical activity intensity moderated by weekday

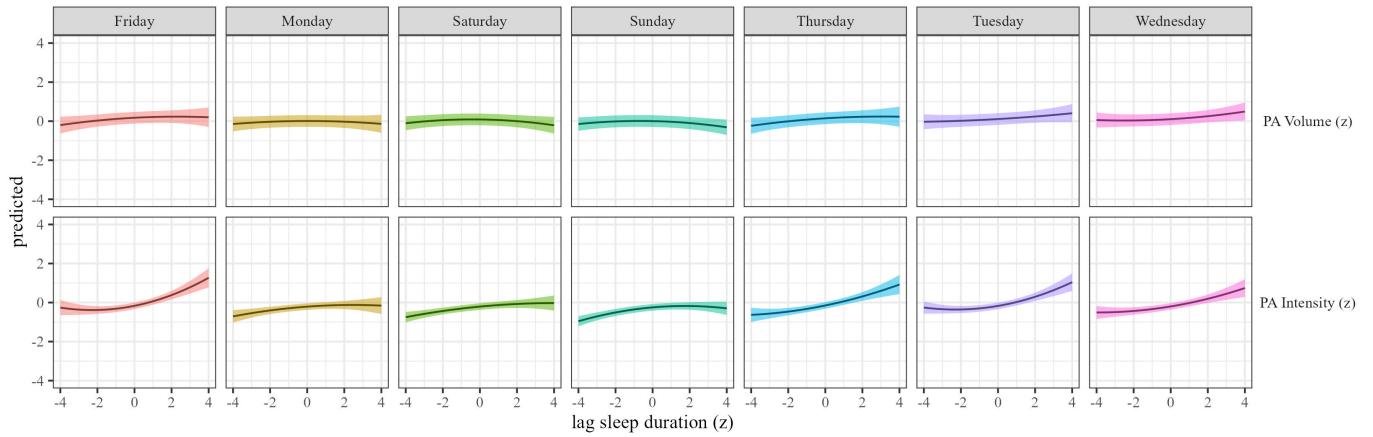


Figure 27. Physical activity by sleep duration moderated by weekday

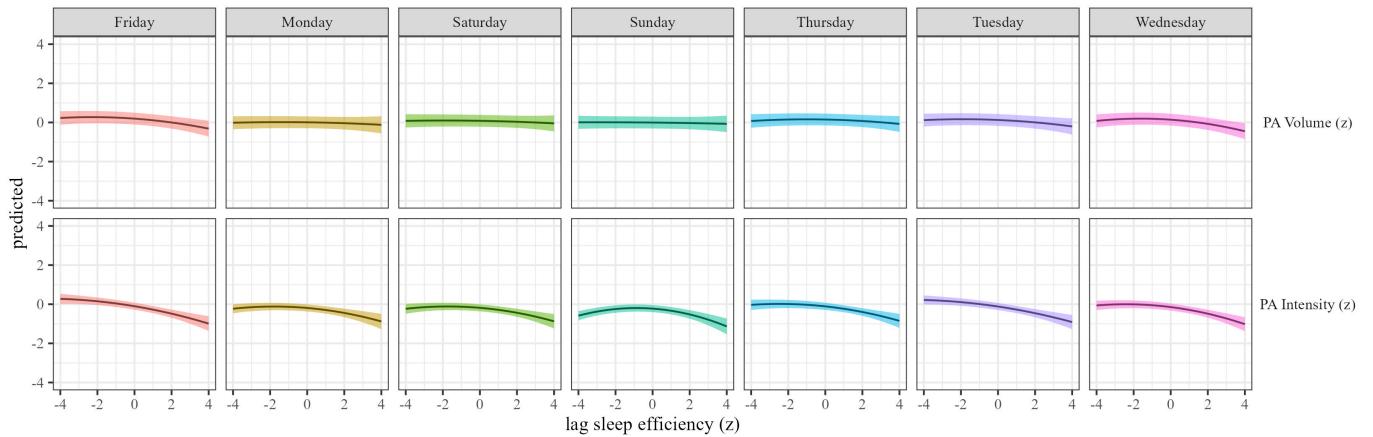


Figure 28. Physical activity by sleep efficiency moderated by weekday

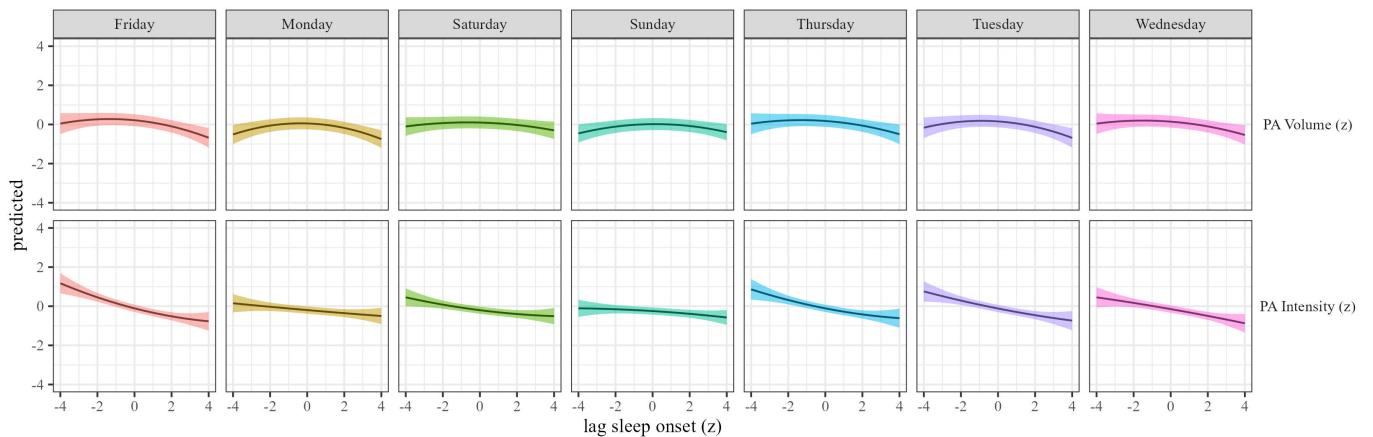


Figure 29. Physical activity by sleep onset moderated by weekday

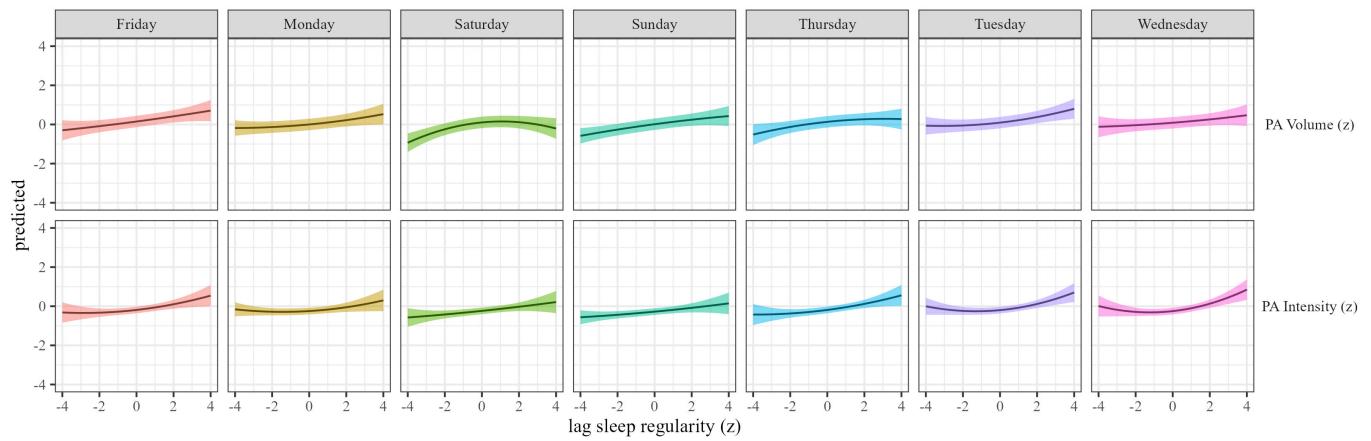


Figure 30. Physical activity by sleep regularity moderated by weekday

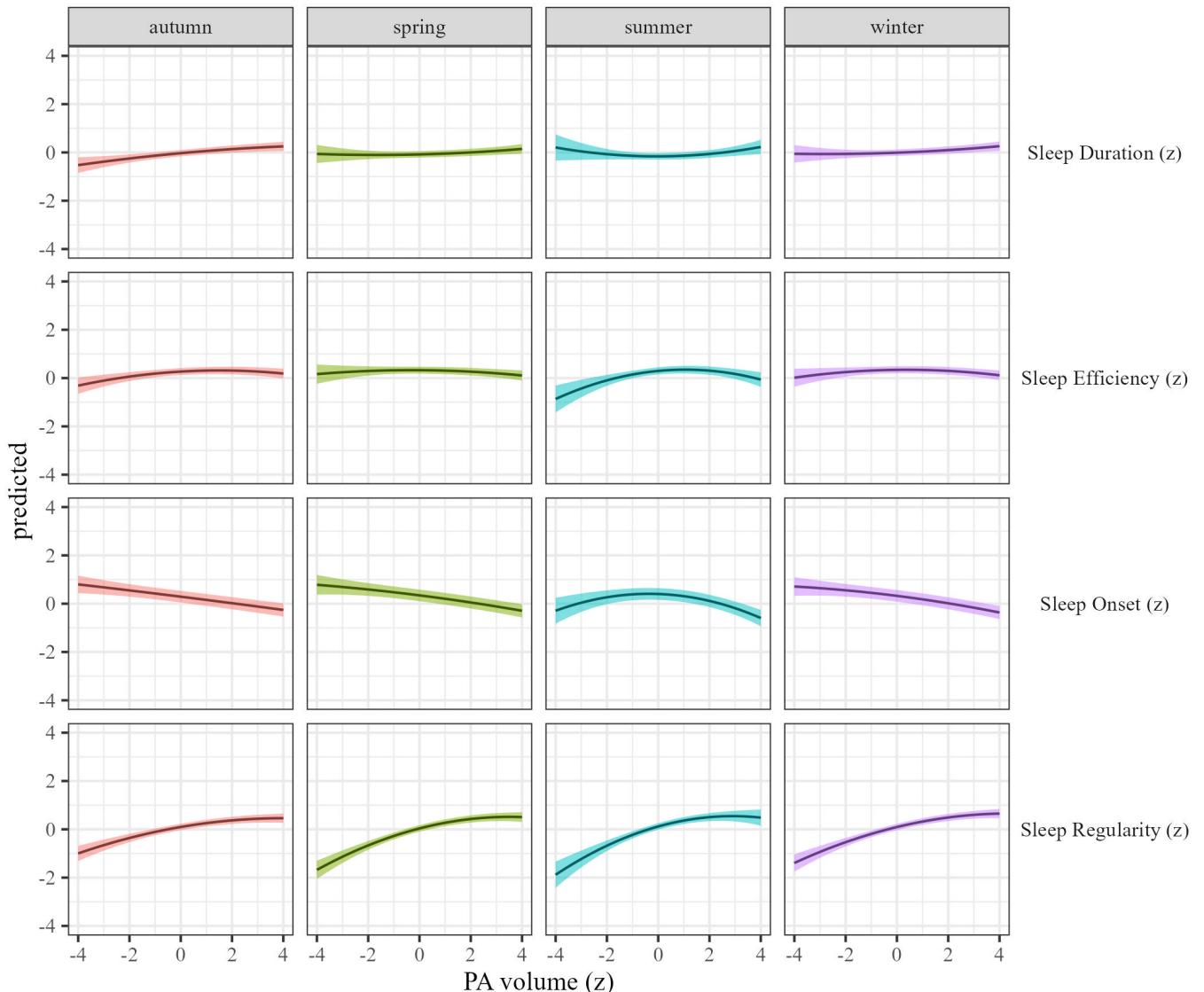


Figure 31. Sleep metrics on Physical activity volume by season

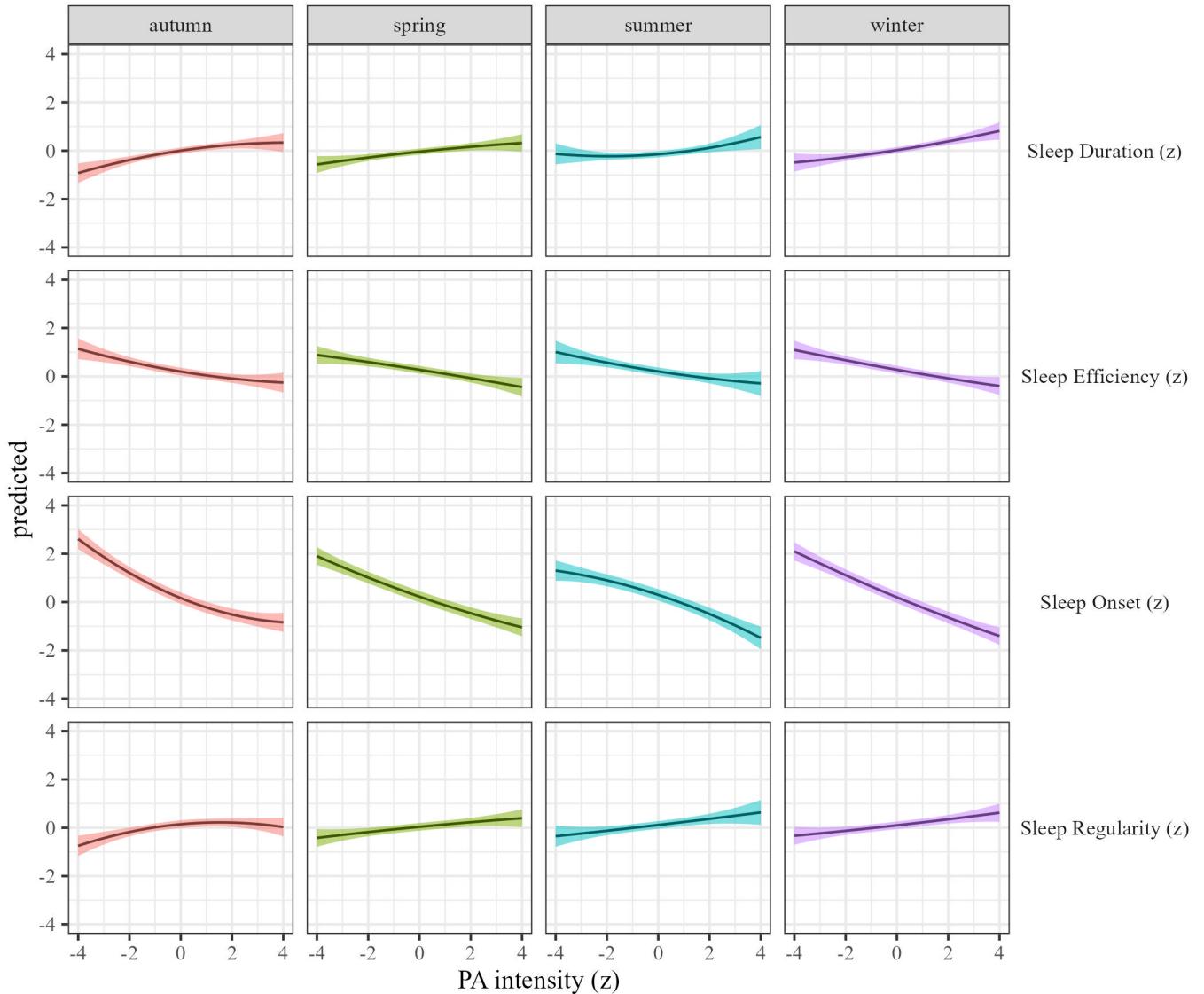


Figure 32. Sleep metrics on Physical activity intensity moderated by season

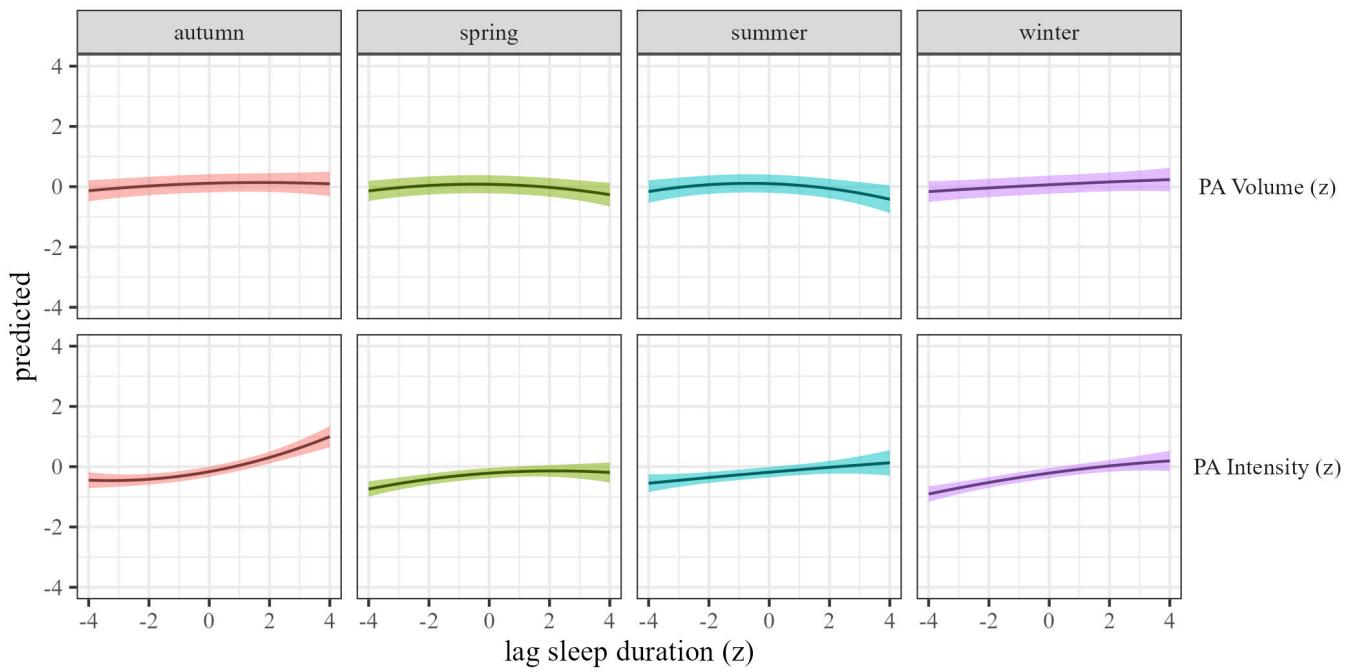


Figure 33. Physical activity by sleep duration moderated by season

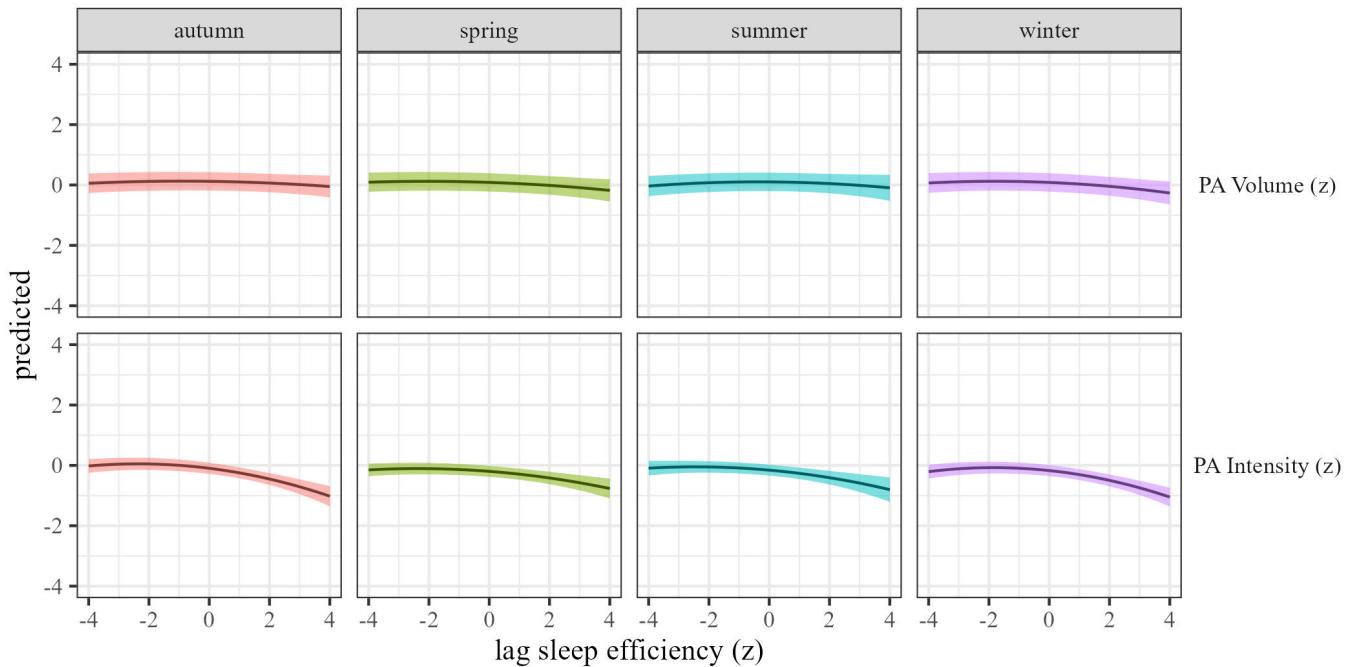


Figure 34. Physical activity by sleep efficiency moderated by season

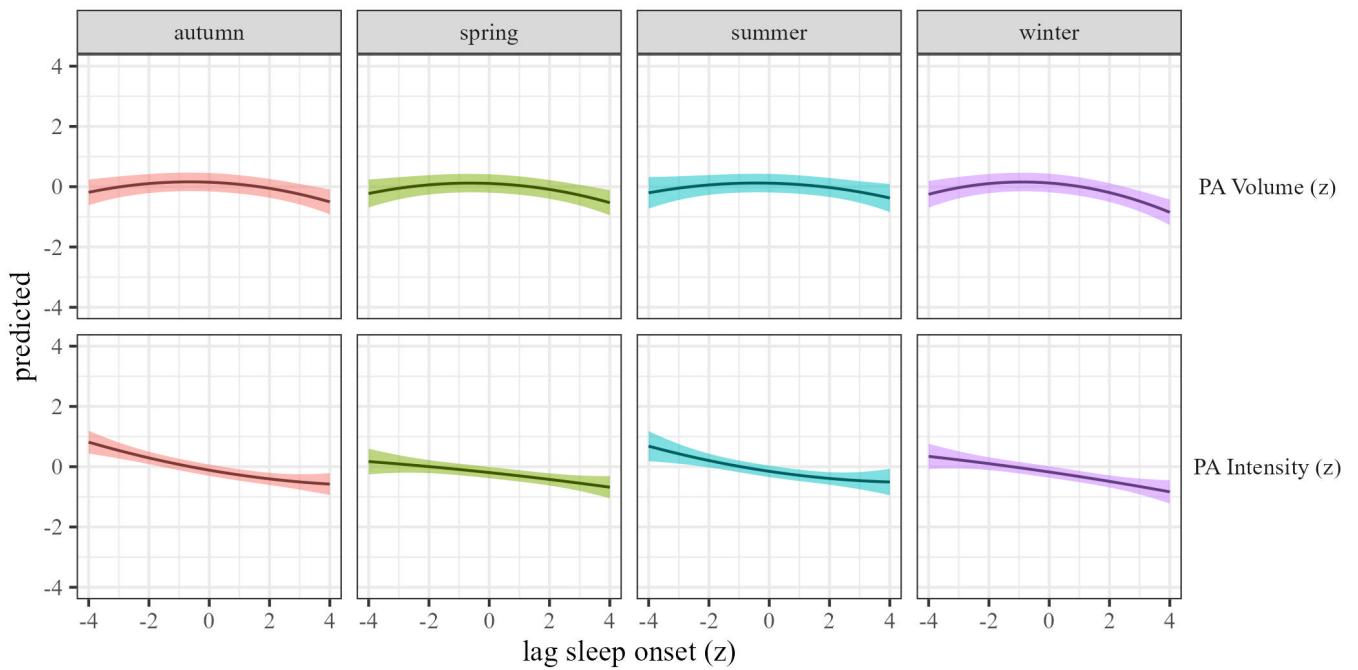


Figure 35. Physical activity by sleep onset moderated by season

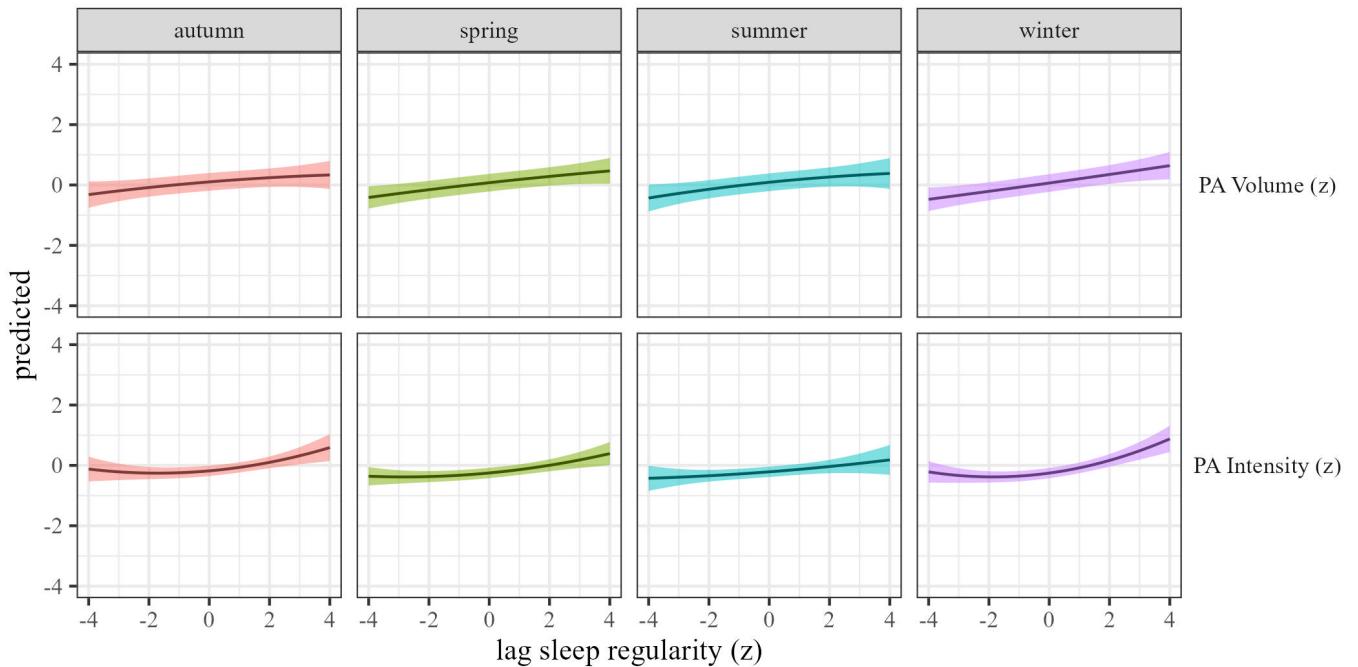


Figure 36. Physical activity by sleep regularity moderated by season

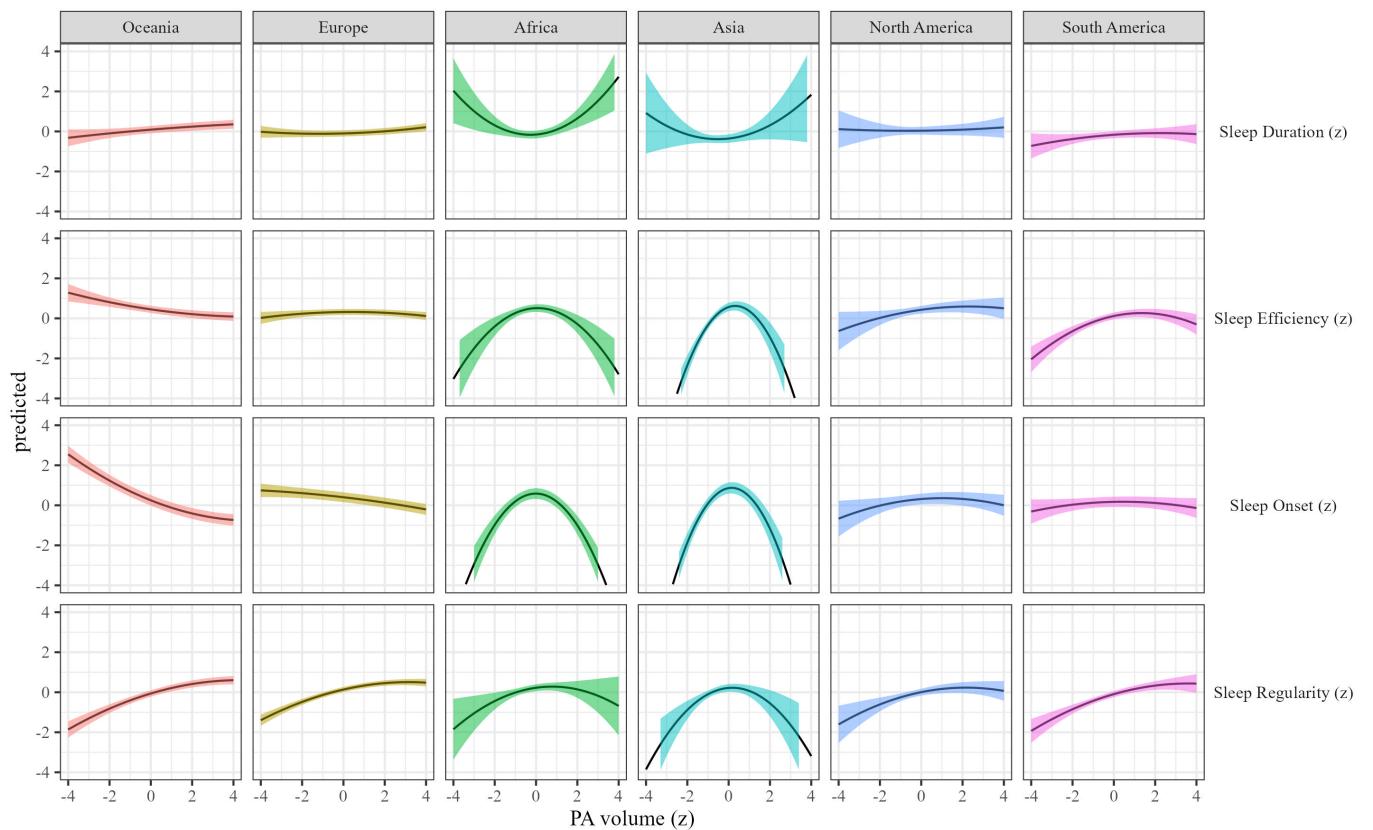


Figure 37. Sleep metrics on Physical activity volume by region

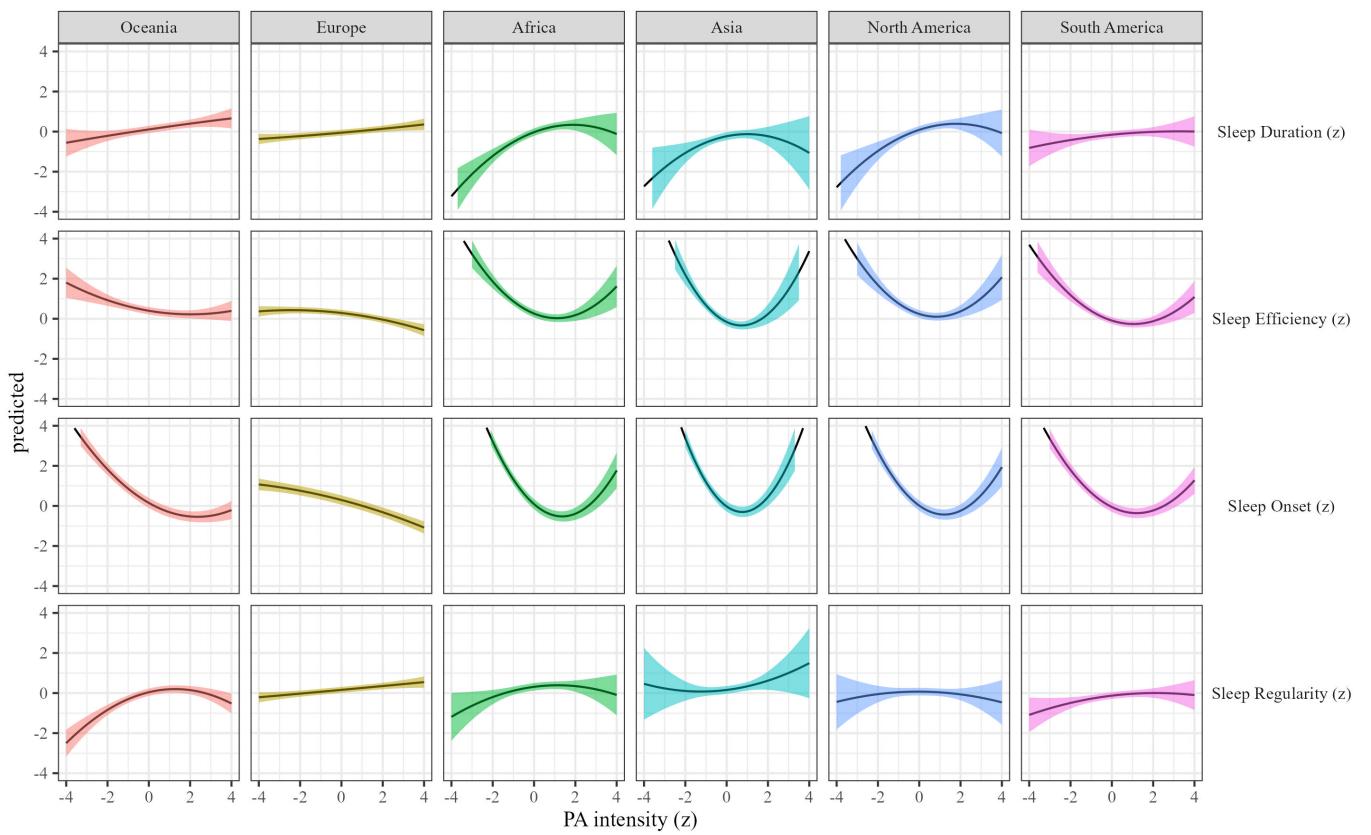


Figure 38. Sleep metrics on Physical activity intensity moderated by region

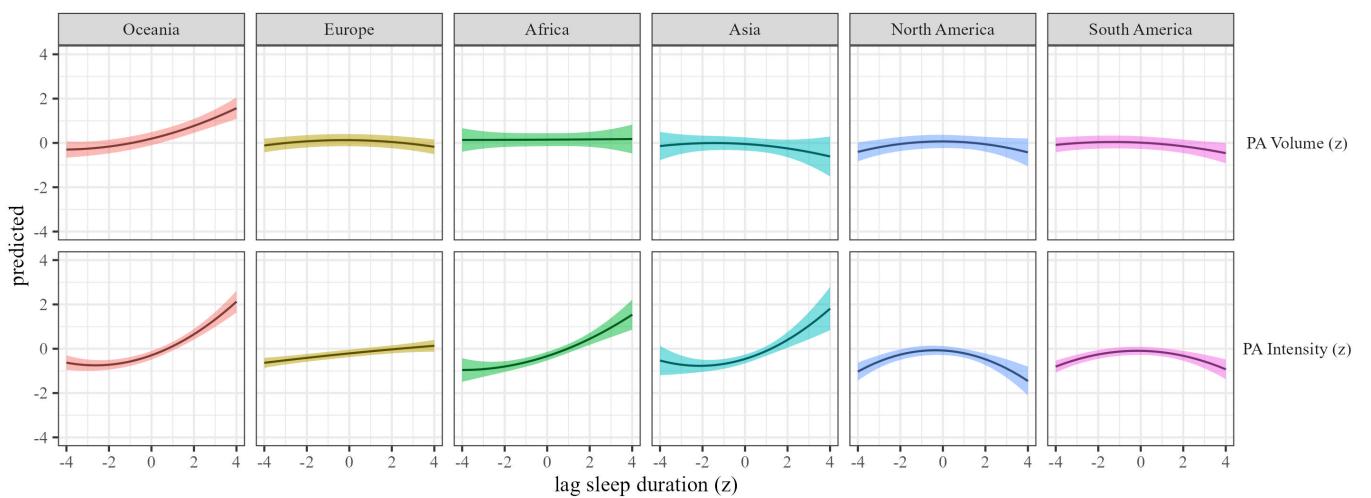


Figure 39. Physical activity by sleep duration moderated by region

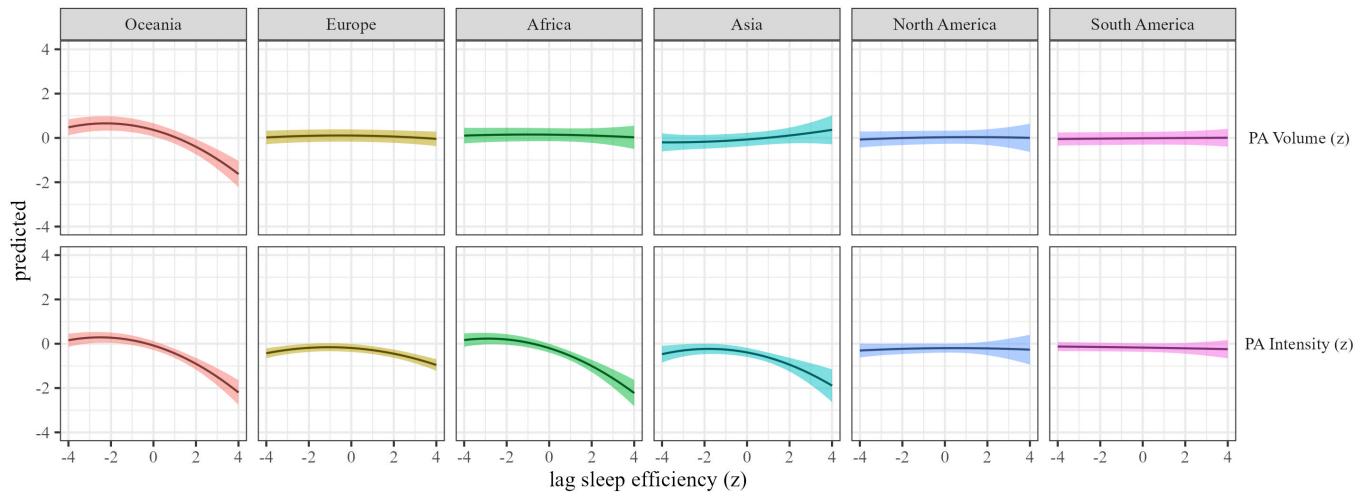


Figure 40. Physical activity by sleep efficiency moderated by region

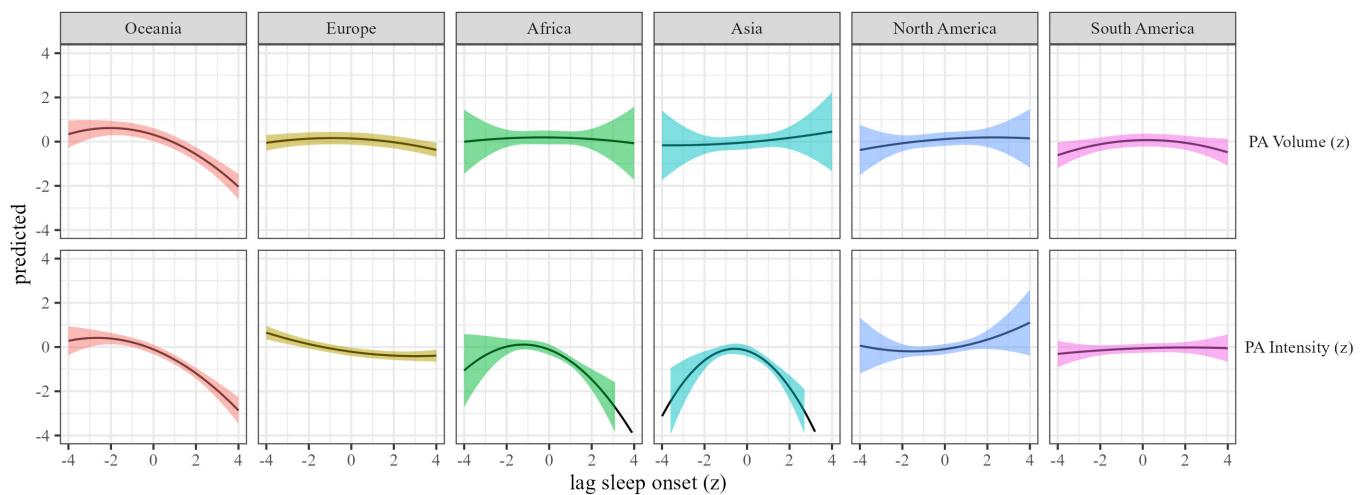


Figure 41. Physical activity by sleep onset moderated by region

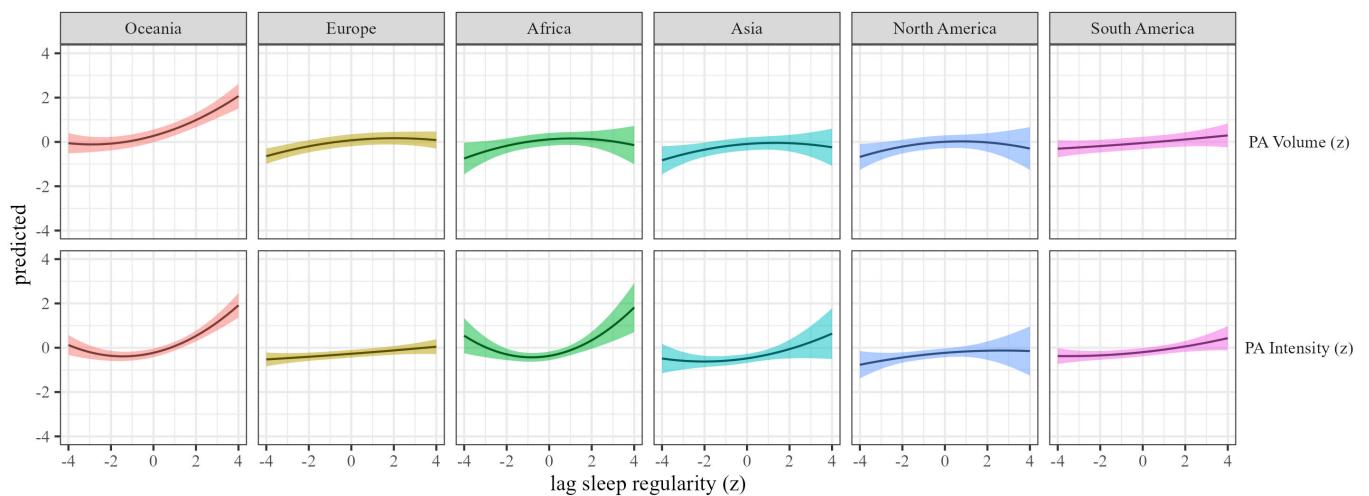


Figure 42. Physical activity by sleep regularity moderated by region

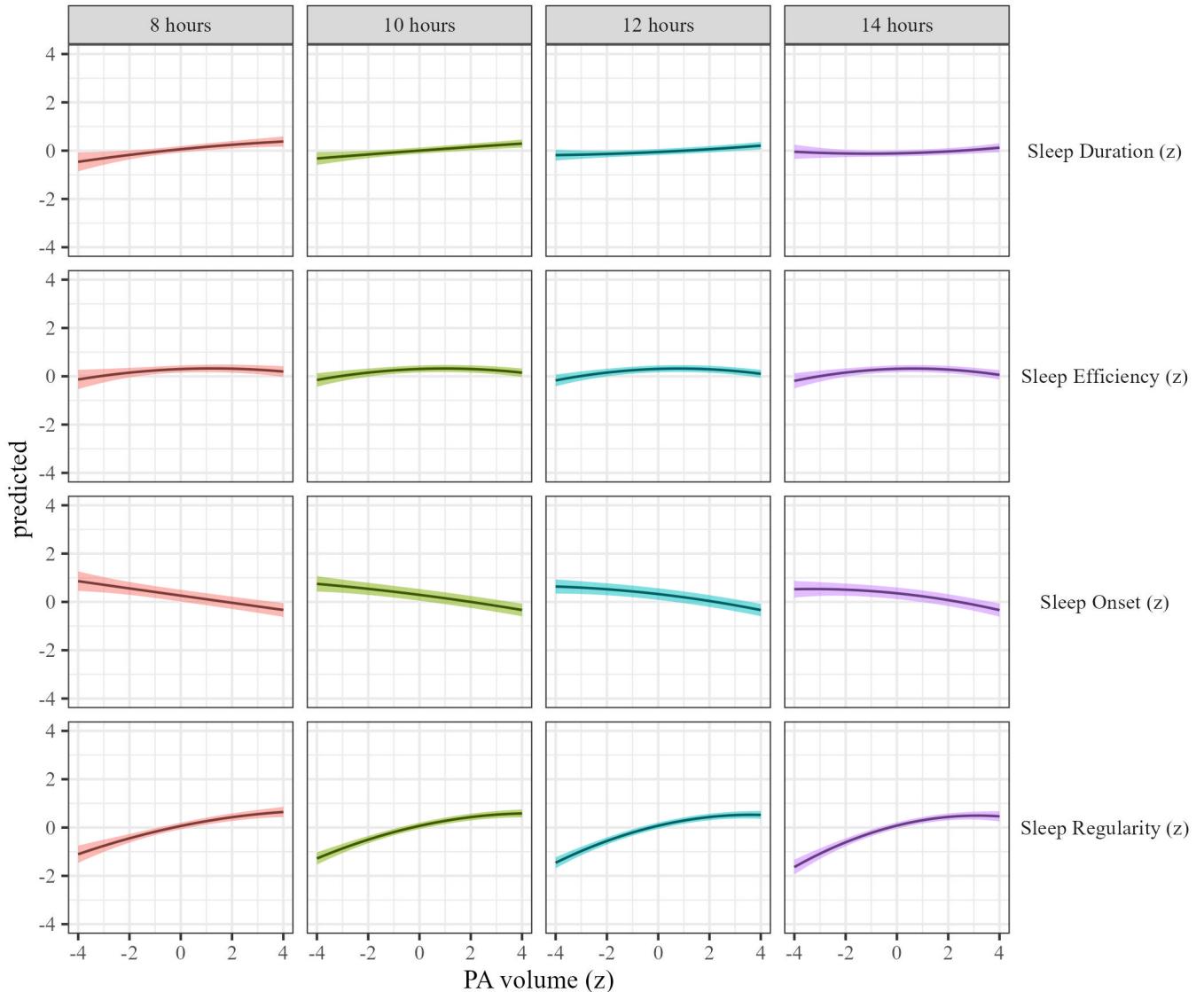


Figure 43. Sleep metrics on Physical activity volume by daylight hours

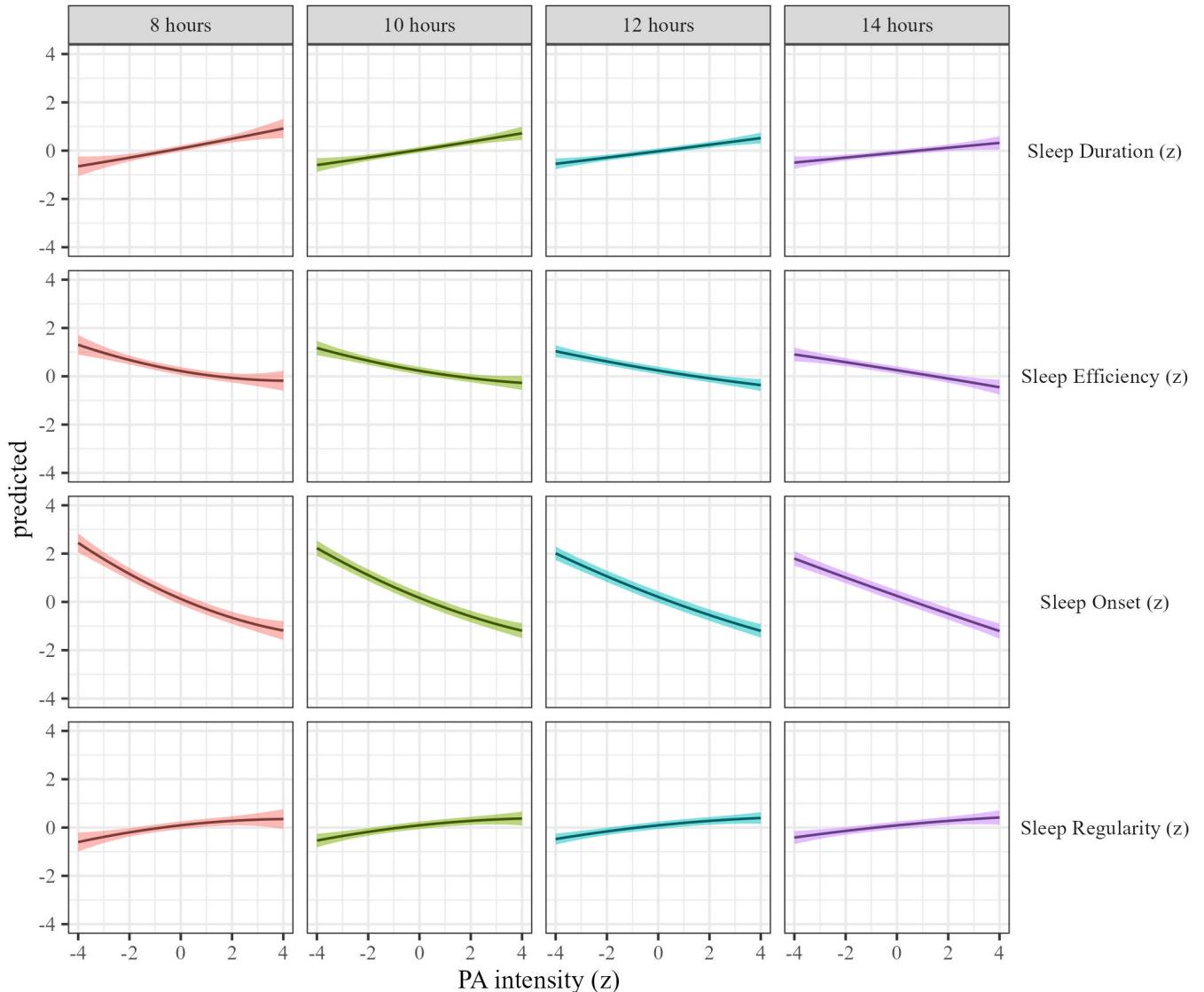


Figure 44. Sleep metrics on Physical activity intensity moderated by daylight hours

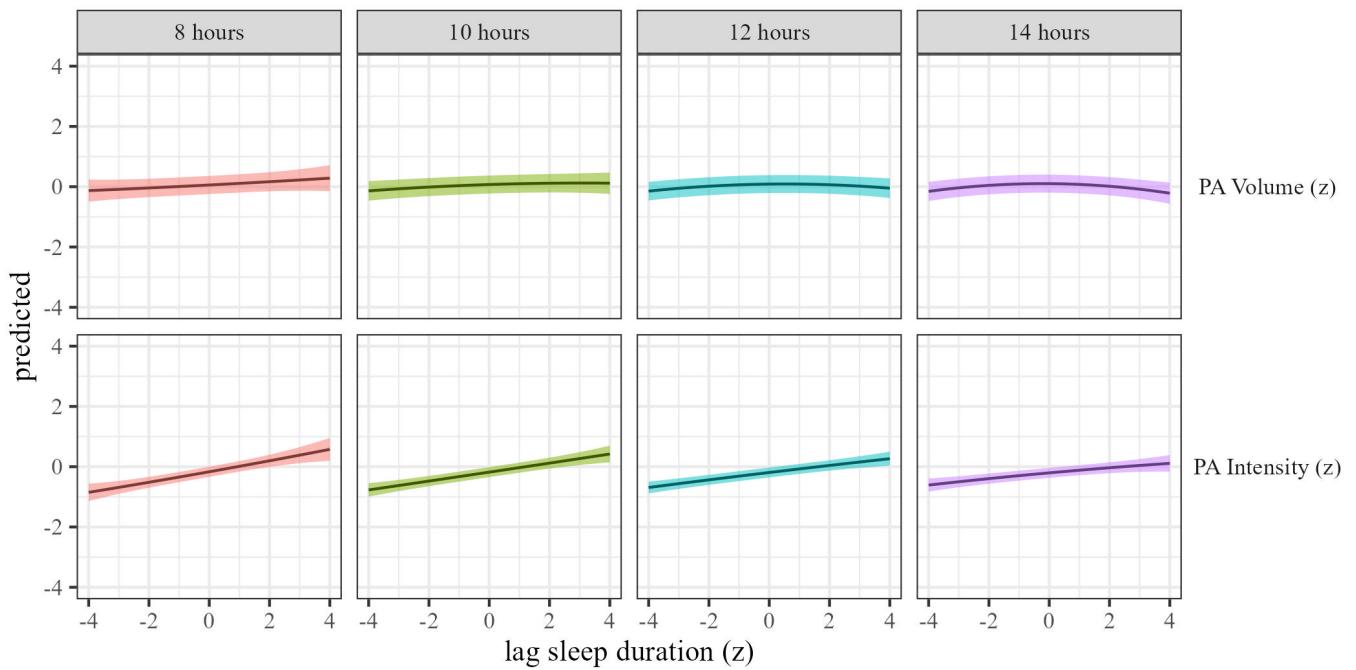


Figure 45. Physical activity by sleep duration moderated by daylight hours

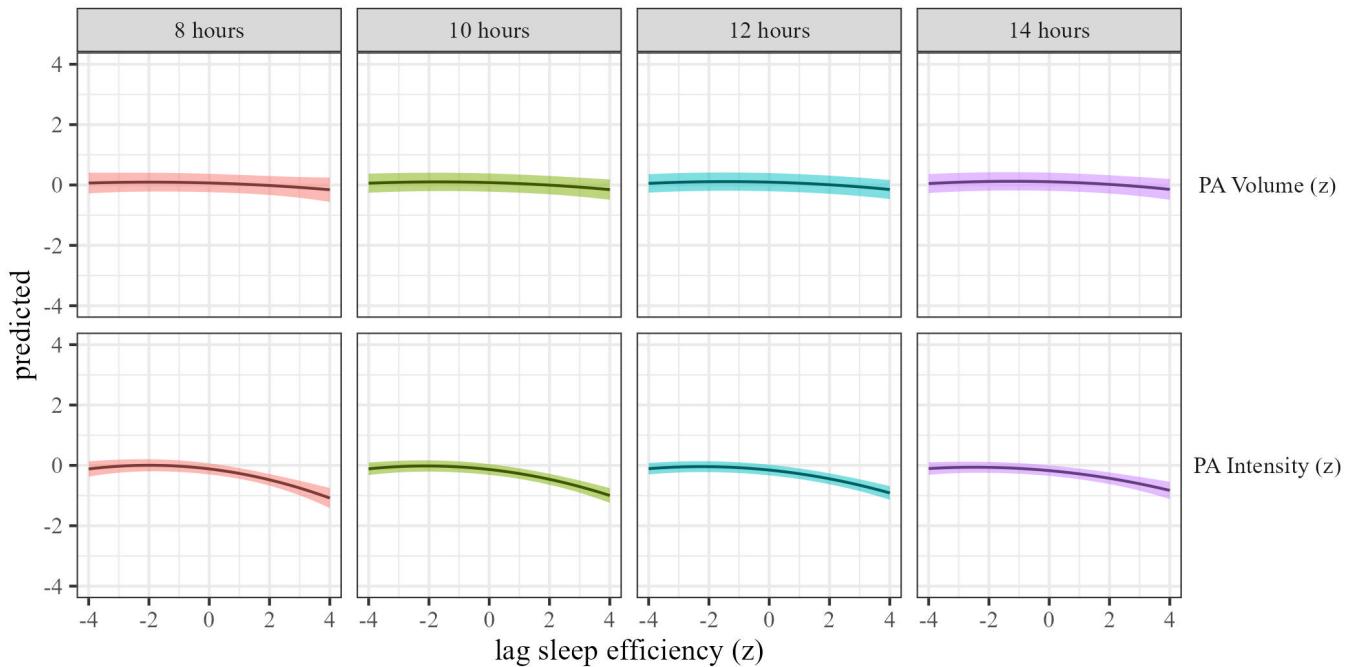


Figure 46. Physical activity by sleep efficiency moderated by daylight hours

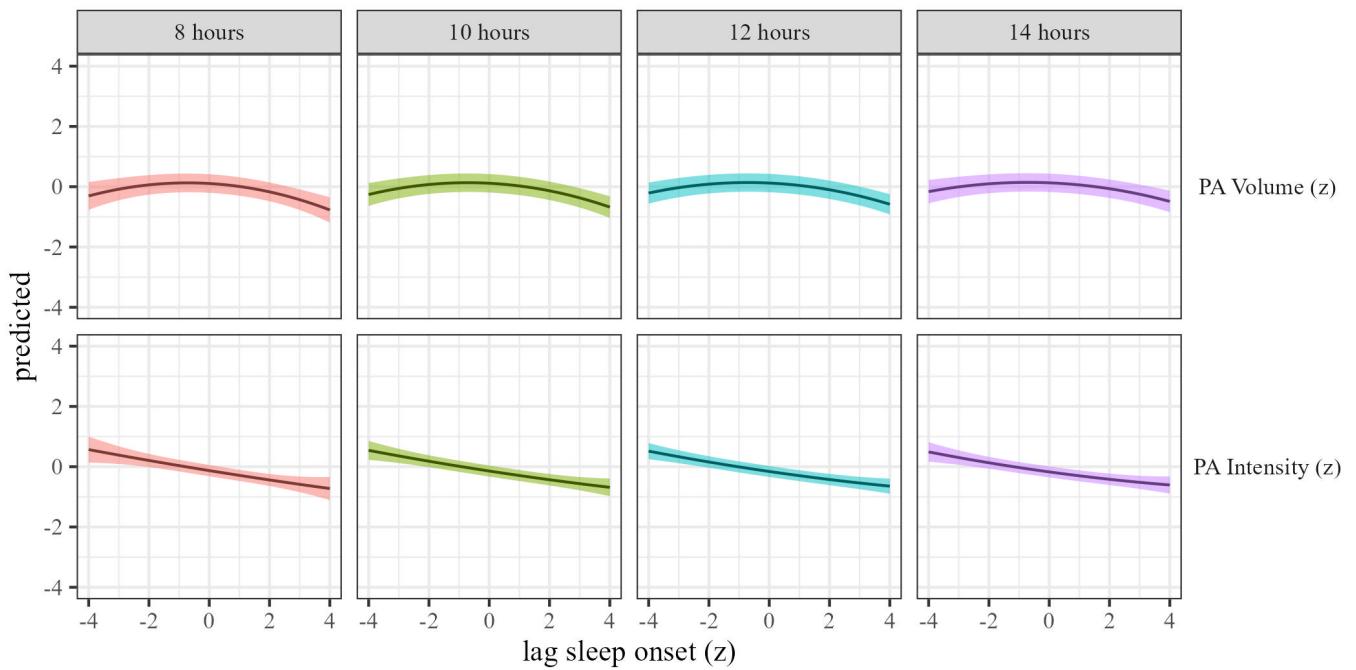


Figure 47. Physical activity by sleep onset moderated by daylight hours

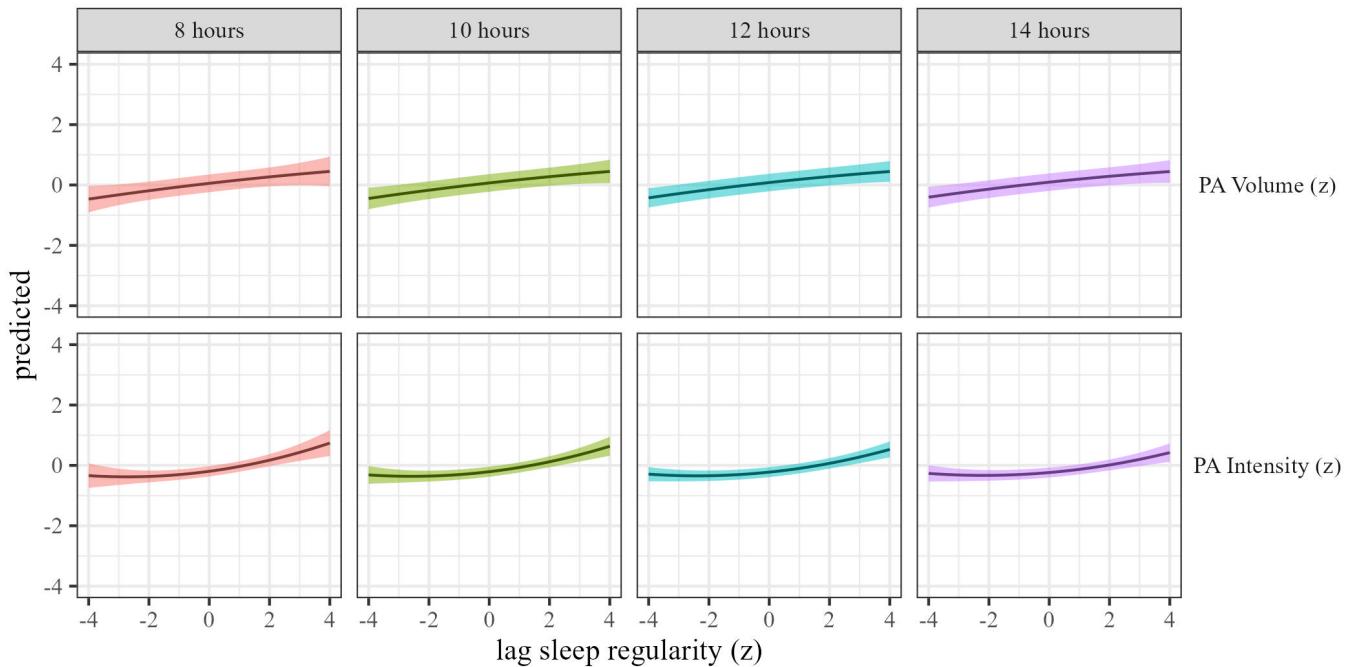


Figure 48. Physical activity by sleep regularity moderated by daylight hours

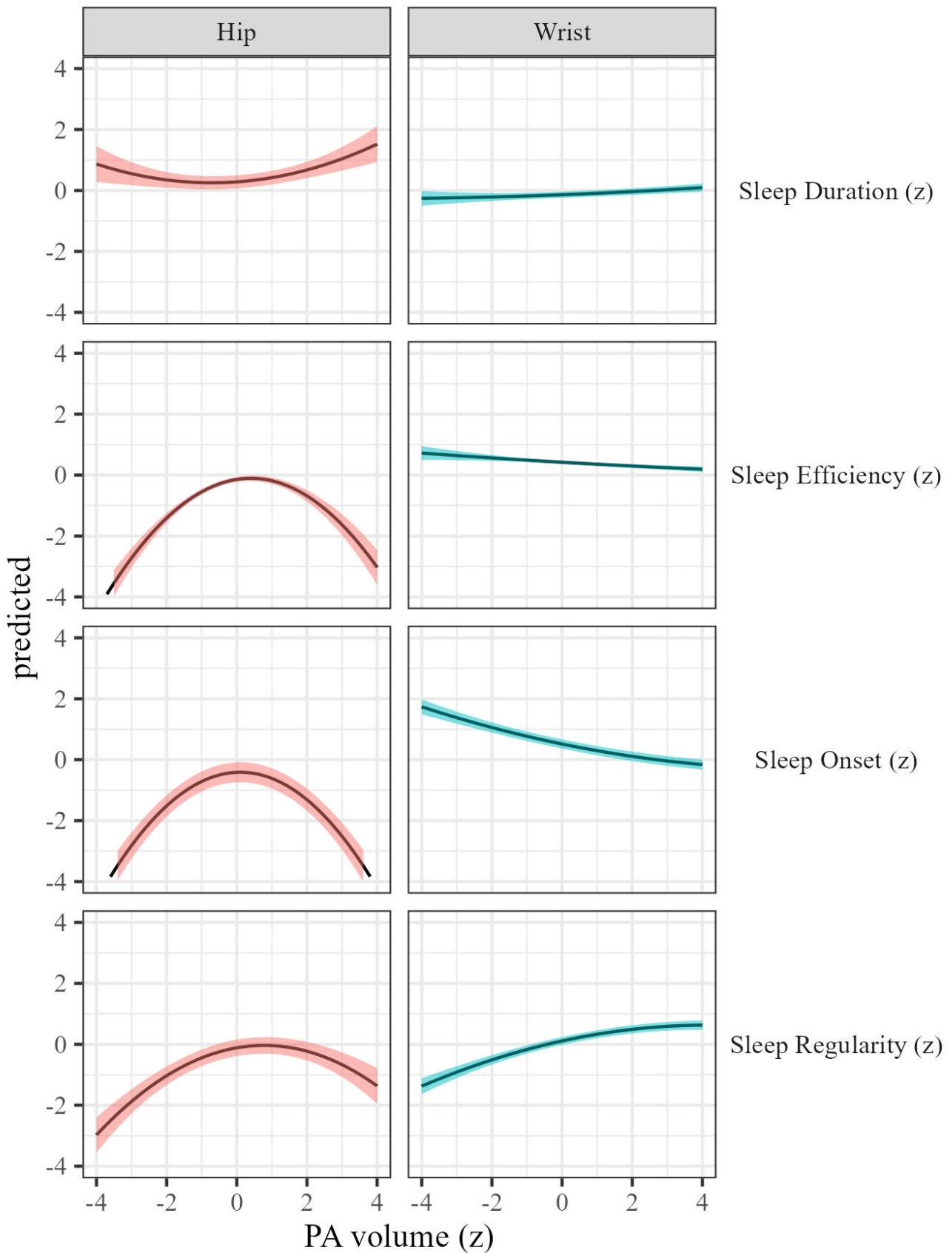


Figure 49. Sleep metrics on Physical activity volume by wear location

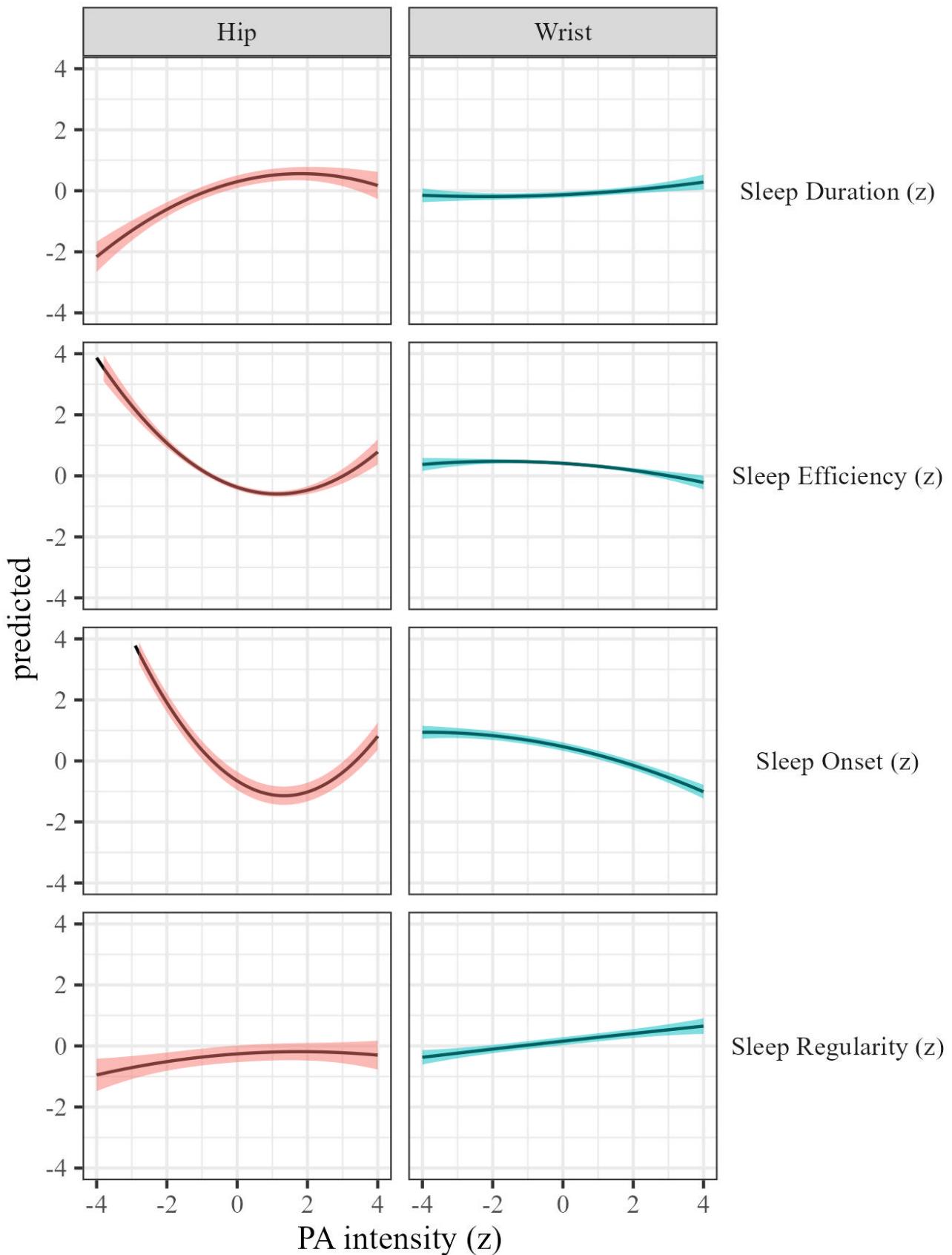


Figure 50. Sleep metrics on Physical activity intensity moderated by wear location

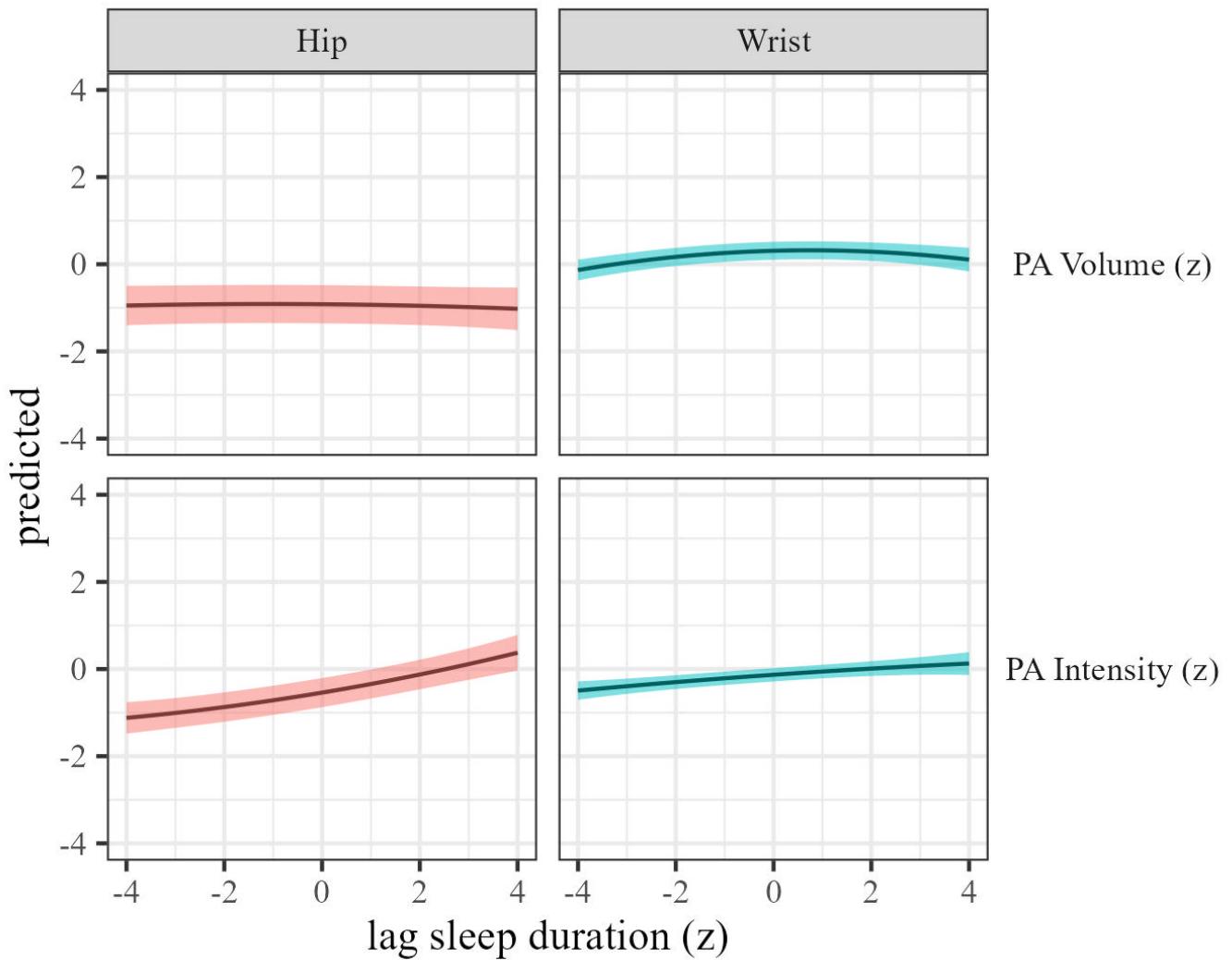


Figure 51. Physical activity by sleep duration moderated by wear location

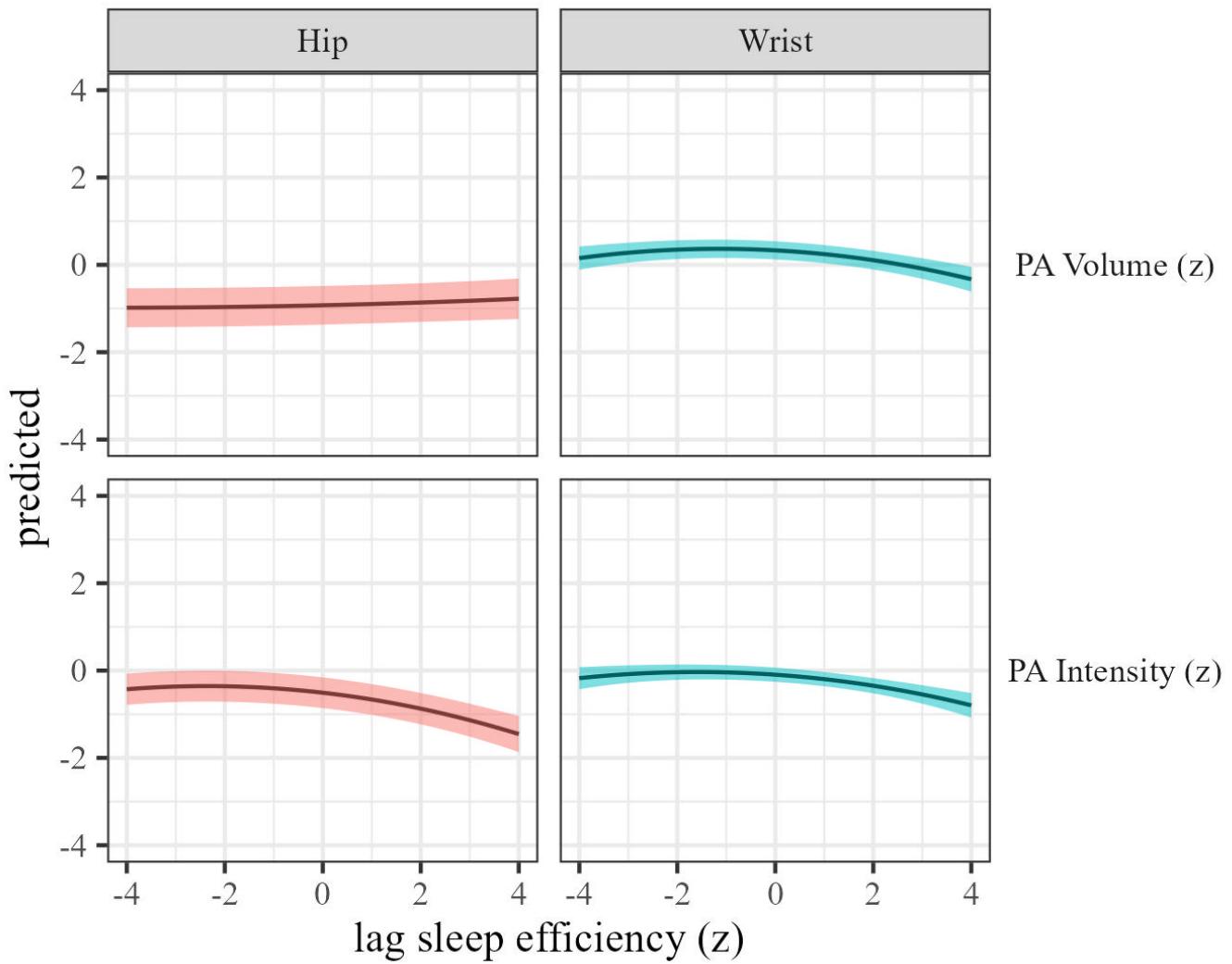


Figure 52. Physical activity by sleep efficiency moderated by wear location

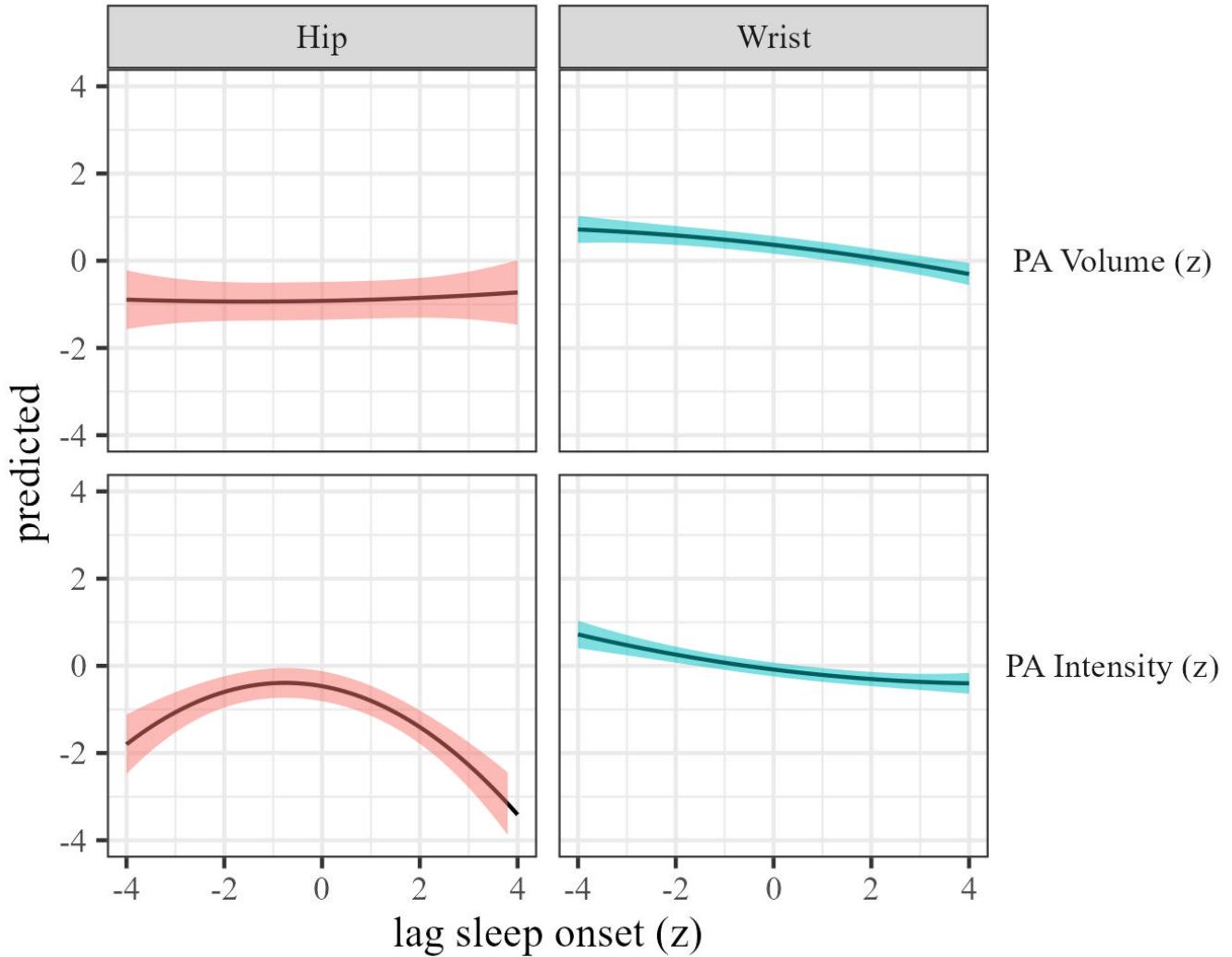


Figure 53. Physical activity by sleep onset moderated by wear location

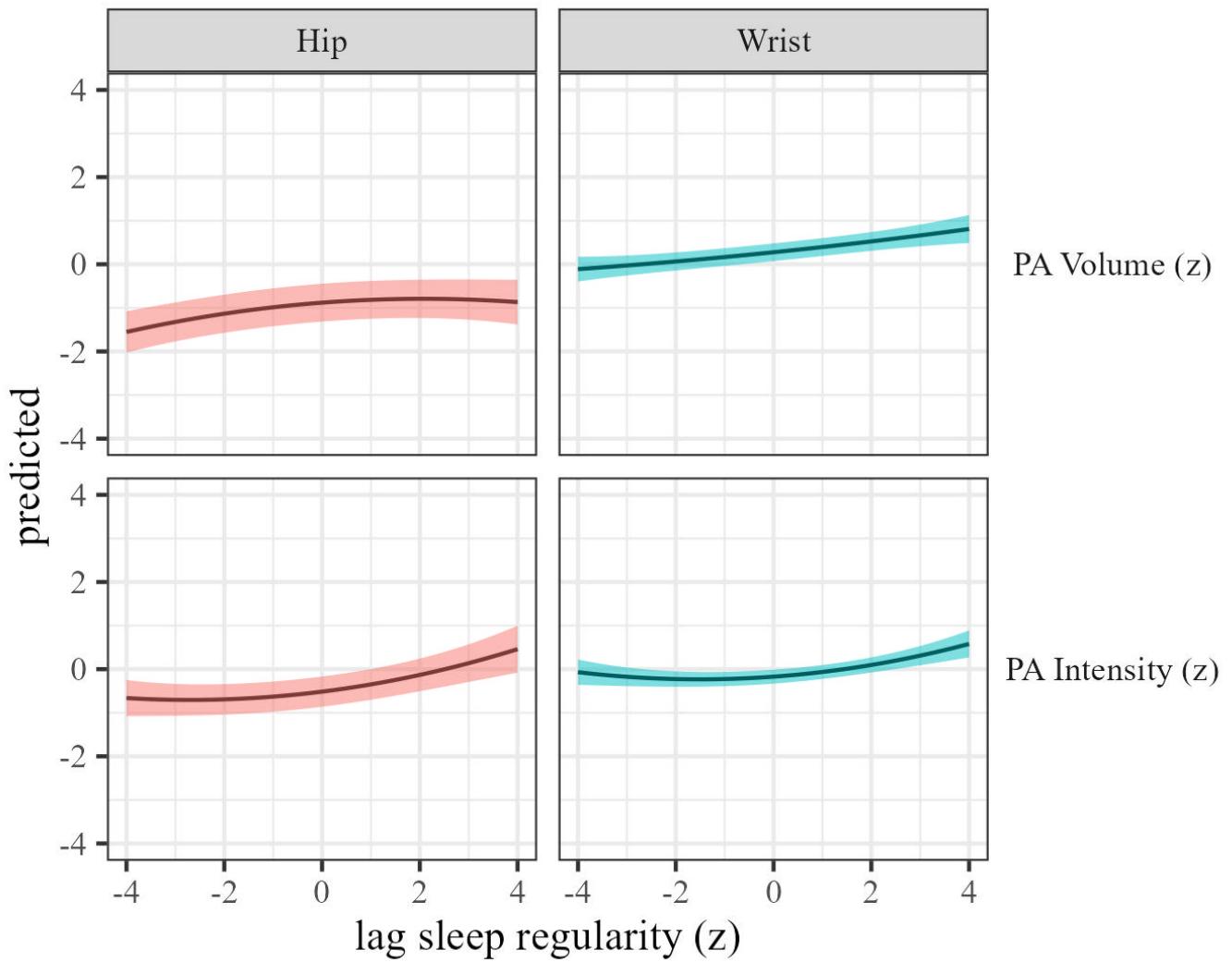


Figure 54. Physical activity by sleep regularity moderated by wear location

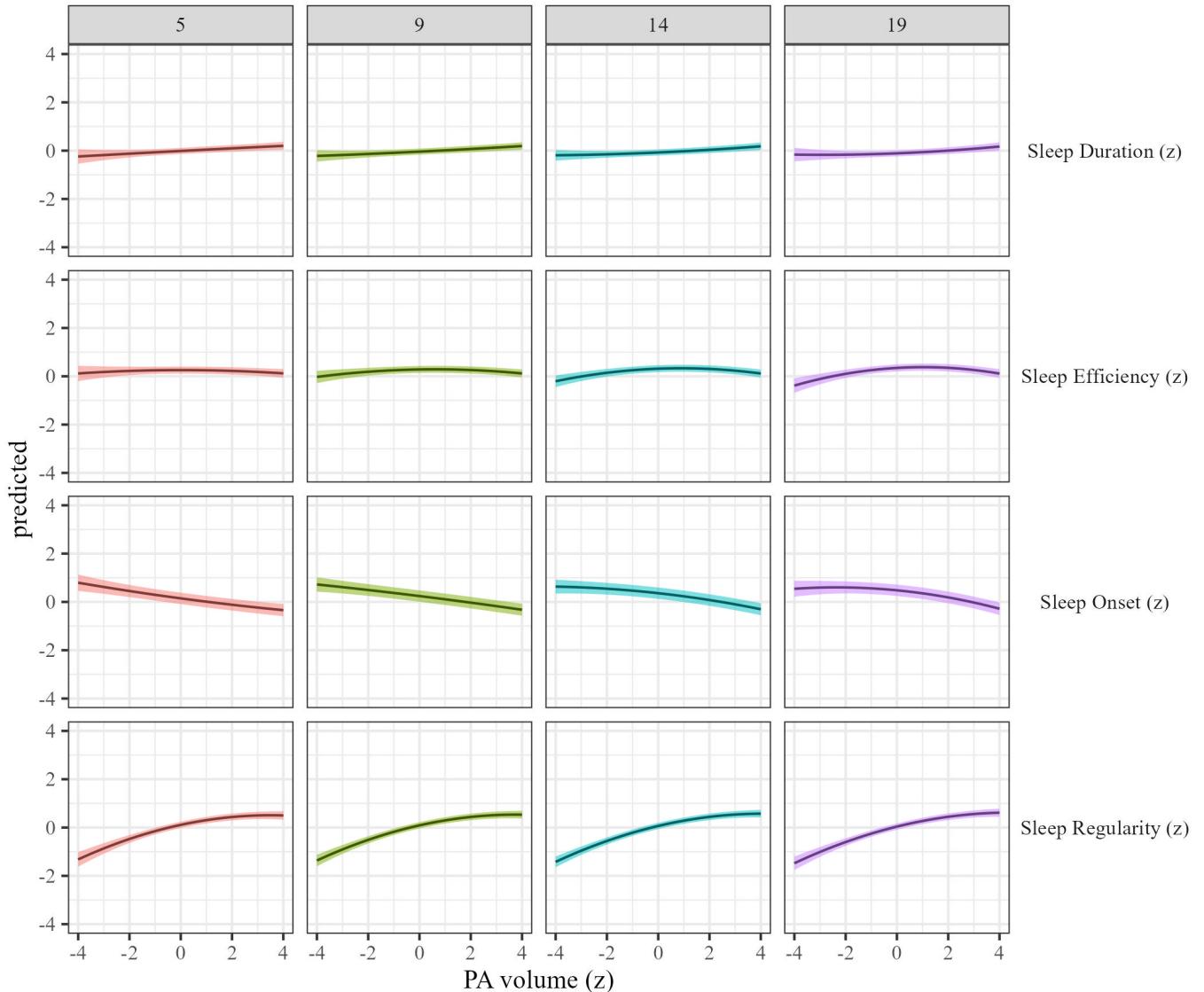


Figure 55. Sleep metrics on Physical activity volume by most active hour

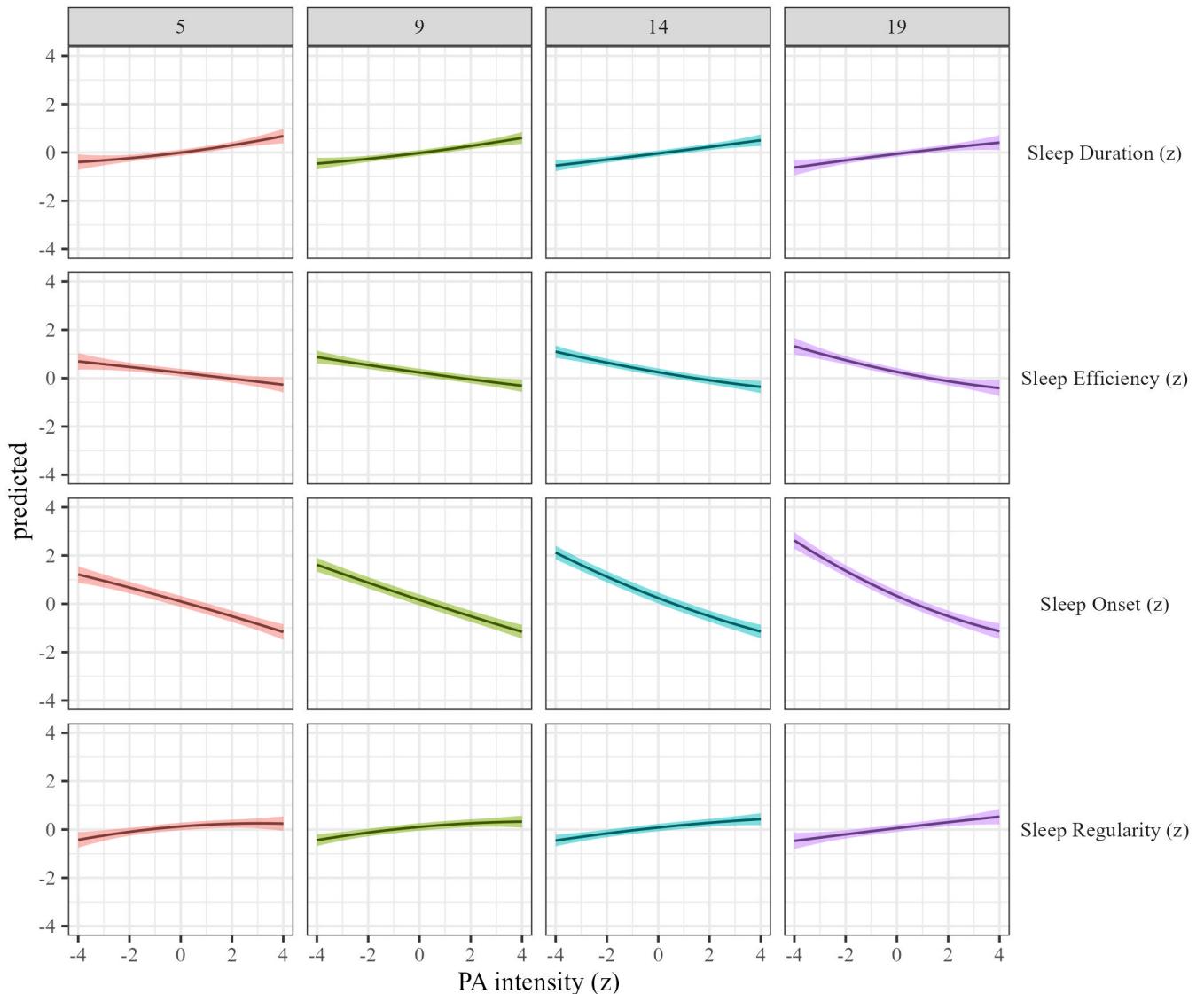


Figure 56. Sleep metrics on Physical activity intensity moderated by most active hour

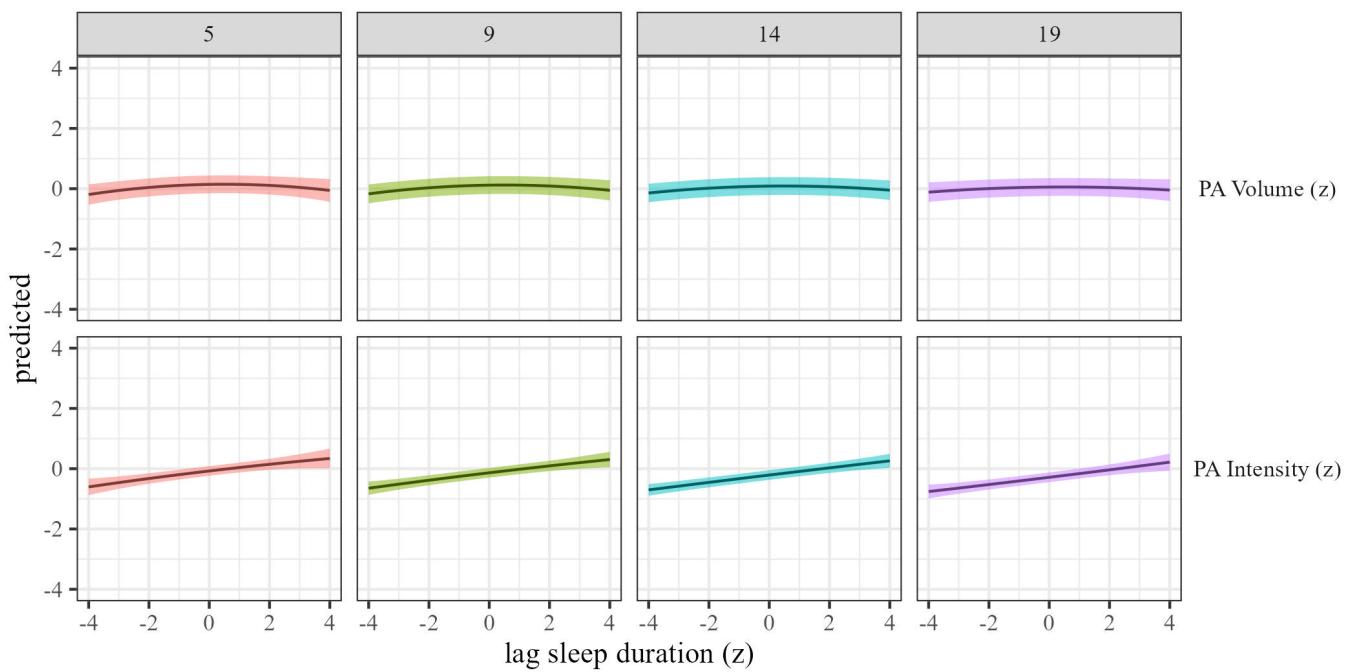


Figure 57. Physical activity by sleep duration moderated by most active hour

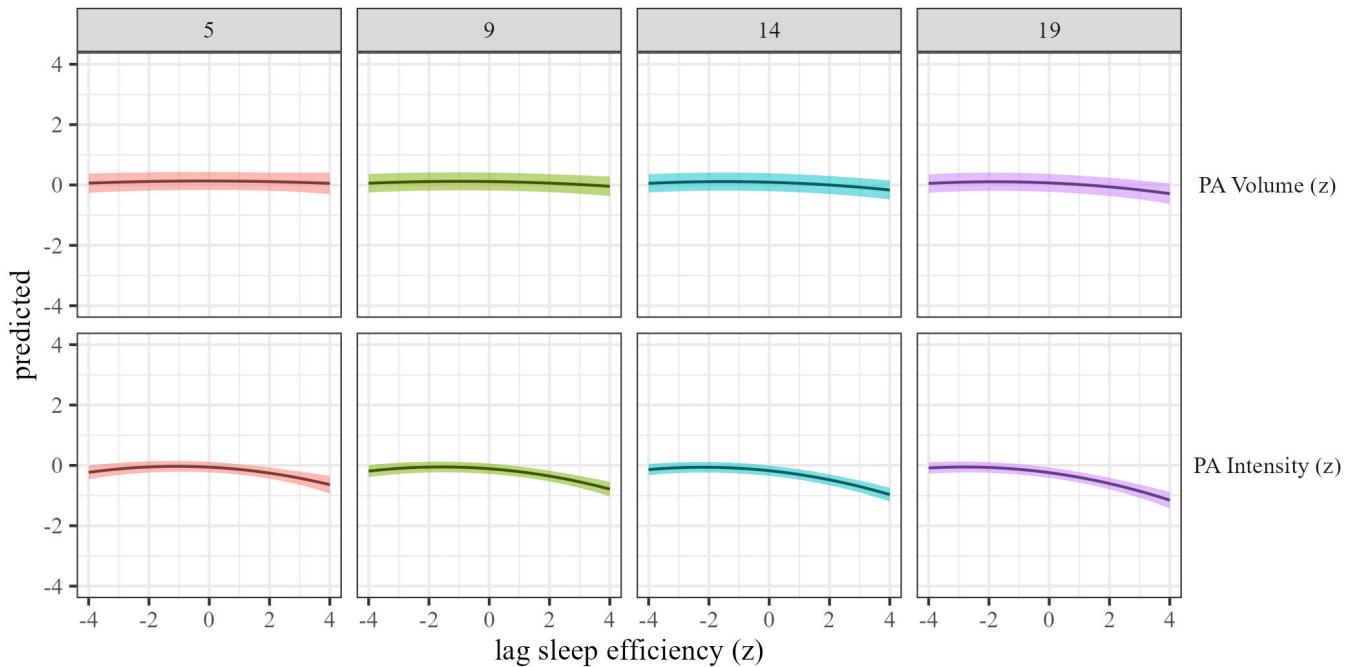


Figure 58. Physical activity by sleep efficiency moderated by most active hour

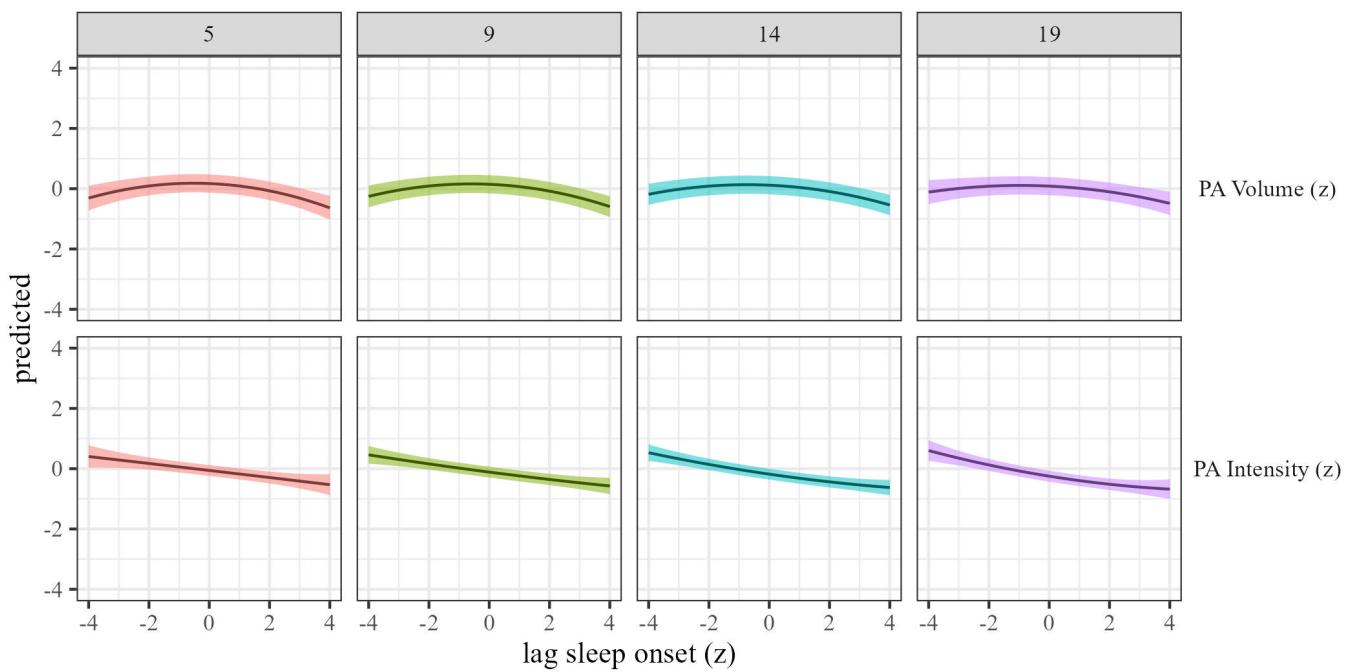


Figure 59. Physical activity by sleep onset moderated by most active hour

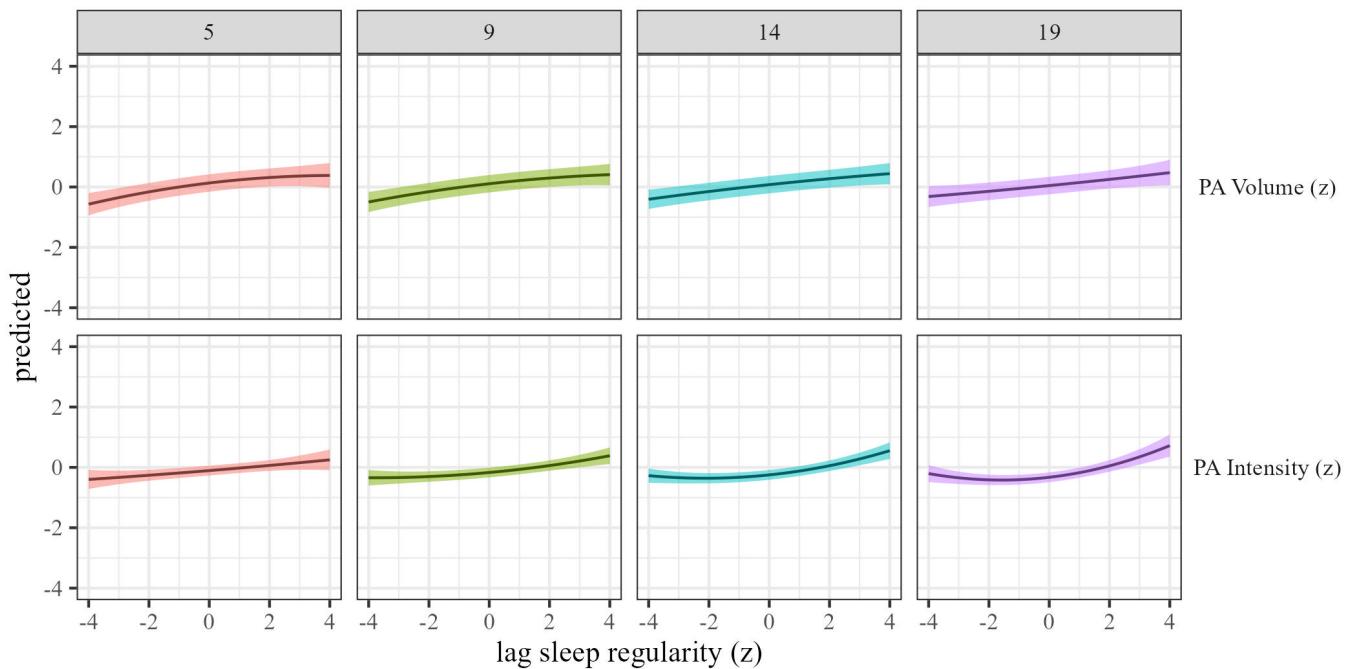


Figure 60. Physical activity by sleep regularity moderated by most active hour