

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.

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## 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	0.09	-2.39	100.00%
Scale sleep efficiency by PA volume	-0.93	-3.79	100.00%
Scale sleep onset by PA volume	0.47	-4.84	100.00%
Scale sleep regularity by PA volume	-0.86	-3.20	100.00%
Scale sleep duration by PA intensity	0.09	-2.37	100.00%
Scale sleep efficiency by PA intensity	-0.93	-3.77	100.00%
Scale sleep onset by PA intensity	0.47	-4.75	100.00%
Scale sleep regularity by PA intensity	-0.85	-3.16	100.00%
Scale PA volume by sleep duration(lagged)	1.14	-12.71	100.00%
Scale PA intensity by sleep duration(lagged)	0.14	-2.74	100.00%
Scale PA volume by sleep efficiency(lagged)	1.14	-12.78	100.00%
Scale PA intensity by sleep efficiency(lagged)	0.14	-2.73	100.00%
Scale PA volume by sleep onset(lagged)	1.14	-12.71	100.00%
Scale PA intensity by sleep onset(lagged)	0.14	-2.73	100.00%
Scale PA volume by sleep regularity(lagged)	1.18	-13.08	100.00%
Scale PA intensity by sleep regularity(lagged)	0.18	-2.67	100.00%
Models moderated by bmi			
Scale sleep duration by PA volume	0.09	-2.40	100.00%
Scale sleep efficiency by PA volume	-0.93	-3.79	100.00%
Scale sleep onset by PA volume	0.47	-4.83	100.00%
Scale sleep regularity by PA volume	-0.86	-3.22	100.00%
Scale sleep duration by PA intensity	0.09	-2.37	100.00%
Scale sleep efficiency by PA intensity	-0.93	-3.77	100.00%
Scale sleep onset by PA intensity	0.47	-4.75	100.00%
Scale sleep regularity by PA intensity	-0.86	-3.13	100.00%
Scale PA volume by sleep duration(lagged)	1.14	-12.72	100.00%
Scale PA intensity by sleep duration(lagged)	0.14	-2.75	100.00%
Scale PA volume by sleep efficiency(lagged)	1.14	-12.78	100.00%
Scale PA intensity by sleep efficiency(lagged)	0.14	-2.73	100.00%
Scale PA volume by sleep onset(lagged)	1.14	-12.73	100.00%
Scale PA intensity by sleep onset(lagged)	0.14	-2.73	100.00%
Scale PA volume by sleep regularity(lagged)	1.18	-13.06	100.00%
Scale PA intensity by sleep regularity(lagged)	0.17	-2.67	100.00%

Table 1 continued

Model name	Skewness	Kurtosis	Converged (%)
Models moderated by ses			
Scale sleep duration by PA volume	0.09	-2.40	100.00%
Scale sleep efficiency by PA volume	-0.93	-3.78	100.00%
Scale sleep onset by PA volume	0.46	-4.84	100.00%
Scale sleep regularity by PA volume	-0.86	-3.19	100.00%
Scale sleep duration by PA intensity	0.09	-2.37	100.00%
Scale sleep efficiency by PA intensity	-0.93	-3.77	100.00%
Scale sleep onset by PA intensity	0.47	-4.76	100.00%
Scale sleep regularity by PA intensity	-0.86	-3.11	100.00%
Scale PA volume by sleep duration(lagged)	1.14	-12.71	100.00%
Scale PA intensity by sleep duration(lagged)	0.14	-2.75	100.00%
Scale PA volume by sleep efficiency(lagged)	1.14	-12.78	100.00%
Scale PA intensity by sleep efficiency(lagged)	0.14	-2.73	100.00%
Scale PA volume by sleep onset(lagged)	1.14	-12.72	100.00%
Scale PA intensity by sleep onset(lagged)	0.14	-2.73	100.00%
Scale PA volume by sleep regularity(lagged)	1.18	-13.06	100.00%
Scale PA intensity by sleep regularity(lagged)	0.17	-2.68	100.00%
Models moderated by sex			
Scale sleep duration by PA volume	0.09	-2.40	100.00%
Scale sleep efficiency by PA volume	-0.93	-3.77	100.00%
Scale sleep onset by PA volume	0.47	-4.82	100.00%
Scale sleep regularity by PA volume	-0.86	-3.19	100.00%
Scale sleep duration by PA intensity	0.09	-2.37	100.00%
Scale sleep efficiency by PA intensity	-0.93	-3.78	100.00%
Scale sleep onset by PA intensity	0.47	-4.75	100.00%
Scale sleep regularity by PA intensity	-0.86	-3.12	100.00%
Scale PA volume by sleep duration(lagged)	1.14	-12.73	100.00%
Scale PA intensity by sleep duration(lagged)	0.14	-2.75	100.00%
Scale PA volume by sleep efficiency(lagged)	1.14	-12.76	100.00%
Scale PA intensity by sleep efficiency(lagged)	0.14	-2.73	100.00%
Scale PA volume by sleep onset(lagged)	1.14	-12.71	100.00%
Scale PA intensity by sleep onset(lagged)	0.14	-2.73	100.00%
Scale PA volume by sleep regularity(lagged)	1.18	-13.08	100.00%
Scale PA intensity by sleep regularity(lagged)	0.17	-2.67	100.00%
Models moderated by weekday			

Table 1 continued

Model name	Skewness	Kurtosis	Converged (%)
Scale sleep duration by PA volume	0.07	-2.35	100.00%
Scale sleep efficiency by PA volume	-0.92	-3.79	100.00%
Scale sleep onset by PA volume	0.45	-4.92	100.00%
Scale sleep regularity by PA volume	-0.91	-3.59	100.00%
Scale sleep duration by PA intensity	0.07	-2.35	100.00%
Scale sleep efficiency by PA intensity	-0.91	-3.76	100.00%
Scale sleep onset by PA intensity	0.46	-4.80	100.00%
Scale sleep regularity by PA intensity	-0.92	-3.62	100.00%
Scale PA volume by sleep duration(lagged)	1.20	-13.14	100.00%
Scale PA intensity by sleep duration(lagged)	0.19	-2.84	100.00%
Scale PA volume by sleep efficiency(lagged)	1.19	-13.22	100.00%
Scale PA intensity by sleep efficiency(lagged)	0.19	-2.88	100.00%
Scale PA volume by sleep onset(lagged)	1.20	-13.19	100.00%
Scale PA intensity by sleep onset(lagged)	0.20	-2.89	100.00%
Scale PA volume by sleep regularity(lagged)	1.22	-13.34	100.00%
Scale PA intensity by sleep regularity(lagged)	0.21	-2.76	100.00%
Models moderated by season			
Scale sleep duration by PA volume	0.09	-2.38	100.00%
Scale sleep efficiency by PA volume	-0.92	-3.77	100.00%
Scale sleep onset by PA volume	0.47	-4.82	100.00%
Scale sleep regularity by PA volume	-0.86	-3.23	100.00%
Scale sleep duration by PA intensity	0.09	-2.36	100.00%
Scale sleep efficiency by PA intensity	-0.93	-3.77	100.00%
Scale sleep onset by PA intensity	0.47	-4.76	100.00%
Scale sleep regularity by PA intensity	-0.86	-3.11	100.00%
Scale PA volume by sleep duration(lagged)	1.14	-12.67	100.00%
Scale PA intensity by sleep duration(lagged)	0.14	-2.76	100.00%
Scale PA volume by sleep efficiency(lagged)	1.14	-12.79	100.00%
Scale PA intensity by sleep efficiency(lagged)	0.14	-2.73	100.00%
Scale PA volume by sleep onset(lagged)	1.14	-12.67	100.00%
Scale PA intensity by sleep onset(lagged)	0.14	-2.74	100.00%
Scale PA volume by sleep regularity(lagged)	1.18	-13.09	100.00%
Scale PA intensity by sleep regularity(lagged)	0.17	-2.68	100.00%
Models moderated by region			
Scale sleep duration by PA volume	0.09	-2.41	100.00%

Table 1 continued

Model name	Skewness	Kurtosis	Converged (%)
Scale sleep efficiency by PA volume	-0.92	-3.81	100.00%
Scale sleep onset by PA volume	0.46	-4.82	100.00%
Scale sleep regularity by PA volume	-0.86	-3.22	100.00%
Scale sleep duration by PA intensity	0.09	-2.36	100.00%
Scale sleep efficiency by PA intensity	-0.92	-3.76	100.00%
Scale sleep onset by PA intensity	0.46	-4.73	100.00%
Scale sleep regularity by PA intensity	-0.84	-3.07	100.00%
Scale PA volume by sleep duration(lagged)	1.15	-12.72	100.00%
Scale PA intensity by sleep duration(lagged)	0.14	-2.77	100.00%
Scale PA volume by sleep efficiency(lagged)	1.14	-12.73	100.00%
Scale PA intensity by sleep efficiency(lagged)	0.14	-2.74	100.00%
Scale PA volume by sleep onset(lagged)	1.14	-12.74	100.00%
Scale PA intensity by sleep onset(lagged)	0.13	-2.74	100.00%
Scale PA volume by sleep regularity(lagged)	1.19	-13.08	100.00%
Scale PA intensity by sleep regularity(lagged)	0.17	-2.67	100.00%
Models moderated by daylight			
Scale sleep duration by PA volume	0.09	-2.41	100.00%
Scale sleep efficiency by PA volume	-0.93	-3.79	100.00%
Scale sleep onset by PA volume	0.47	-4.83	100.00%
Scale sleep regularity by PA volume	-0.86	-3.21	100.00%
Scale sleep duration by PA intensity	0.09	-2.38	100.00%
Scale sleep efficiency by PA intensity	-0.93	-3.78	100.00%
Scale sleep onset by PA intensity	0.47	-4.75	100.00%
Scale sleep regularity by PA intensity	-0.86	-3.12	100.00%
Scale PA volume by sleep duration(lagged)	1.14	-12.72	100.00%
Scale PA intensity by sleep duration(lagged)	0.14	-2.76	100.00%
Scale PA volume by sleep efficiency(lagged)	1.14	-12.78	100.00%
Scale PA intensity by sleep efficiency(lagged)	0.14	-2.73	100.00%
Scale PA volume by sleep onset(lagged)	1.14	-12.73	100.00%
Scale PA intensity by sleep onset(lagged)	0.14	-2.74	100.00%
Scale PA volume by sleep regularity(lagged)	1.18	-13.07	100.00%
Scale PA intensity by sleep regularity(lagged)	0.18	-2.66	100.00%
Models moderated by wear location			
Scale sleep duration by PA volume	0.09	-2.40	100.00%
Scale sleep efficiency by PA volume	-0.92	-3.82	100.00%

Table 1 continued

Model name	Skewness	Kurtosis	Converged (%)
Scale sleep onset by PA volume	0.47	-4.85	100.00%
Scale sleep regularity by PA volume	-0.86	-3.21	100.00%
Scale sleep duration by PA intensity	0.09	-2.37	100.00%
Scale sleep efficiency by PA intensity	-0.92	-3.76	100.00%
Scale sleep onset by PA intensity	0.48	-4.73	100.00%
Scale sleep regularity by PA intensity	-0.85	-3.14	100.00%
Scale PA volume by sleep duration(lagged)	1.14	-12.71	100.00%
Scale PA intensity by sleep duration(lagged)	0.14	-2.75	100.00%
Scale PA volume by sleep efficiency(lagged)	1.14	-12.78	100.00%
Scale PA intensity by sleep efficiency(lagged)	0.14	-2.73	100.00%
Scale PA volume by sleep onset(lagged)	1.14	-12.75	100.00%
Scale PA intensity by sleep onset(lagged)	0.14	-2.73	100.00%
Scale PA volume by sleep regularity(lagged)	1.18	-13.07	100.00%
Scale PA intensity by sleep regularity(lagged)	0.19	-2.67	100.00%
Models moderated by PA mostactivehr			
Scale sleep duration by PA volume	0.09	-2.40	100.00%
Scale sleep efficiency by PA volume	-0.93	-3.79	100.00%
Scale sleep onset by PA volume	0.47	-4.83	100.00%
Scale sleep regularity by PA volume	-0.85	-3.16	100.00%
Scale sleep duration by PA intensity	0.09	-2.37	100.00%
Scale sleep efficiency by PA intensity	-0.93	-3.78	100.00%
Scale sleep onset by PA intensity	0.47	-4.74	100.00%
Scale sleep regularity by PA intensity	-0.85	-3.06	100.00%
Scale PA volume by sleep duration(lagged)	1.14	-12.61	100.00%
Scale PA intensity by sleep duration(lagged)	0.14	-2.75	100.00%
Scale PA volume by sleep efficiency(lagged)	1.13	-12.70	100.00%
Scale PA intensity by sleep efficiency(lagged)	0.14	-2.73	100.00%
Scale PA volume by sleep onset(lagged)	1.13	-12.63	100.00%
Scale PA intensity by sleep onset(lagged)	0.14	-2.73	100.00%
Scale PA volume by sleep regularity(lagged)	1.17	-12.93	100.00%
Scale PA intensity by sleep regularity(lagged)	0.17	-2.66	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			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
<b>Sleep duration</b>								
(Intercept)	0.78 [0.53, 1.03]	0.13	6.09	< .001	0.71 [0.46, 0.97]	0.13	5.53	< .001
Physical activity	0.09 [0.05, 0.13]	0.02	4.10	< .001	0.07 [0.02, 0.11]	0.02	2.73	.006
Age	0.00 [0.00, 0.01]	0.00	0.42	.678	0.00 [0.00, 0.01]	0.00	0.34	.734
Physical activity <sup>2</sup>	0.00 [-0.01, 0.01]	0.01	-0.26	.799	0.02 [-0.01, 0.05]	0.01	1.53	.126
Physical activity × age	0.00 [0.00, 0.00]	0.00	0.00	.999	0.00 [0.00, 0.00]	0.00	-0.35	.727
Age × Physical activity <sup>2</sup>	0.00 [0.00, 0.00]	0.00	-1.05	.294	0.00 [0.00, 0.00]	0.00	-1.34	.180
<b>Sleep efficiency</b>								
(Intercept)	-0.30 [-0.52, -0.08]	0.11	-2.68	.011	-0.32 [-0.54, -0.10]	0.11	-2.88	.006
Physical activity	0.07 [0.03, 0.12]	0.02	3.52	< .001	0.02 [-0.03, 0.07]	0.02	0.88	.380
Age	0.00 [0.00, 0.00]	0.00	0.06	.949	0.00 [0.00, 0.00]	0.00	0.01	.994
Physical activity <sup>2</sup>	-0.02 [-0.03, -0.01]	0.01	-3.29	.001	-0.02 [-0.05, 0.01]	0.01	-1.42	.156
Physical activity × age	0.00 [0.00, 0.00]	0.00	-2.82	.005	0.00 [0.00, 0.00]	0.00	-1.04	.297
Age × Physical activity <sup>2</sup>	0.00 [0.00, 0.00]	0.00	1.03	.302	0.00 [0.00, 0.00]	0.00	0.84	.404
<b>Sleep onset</b>								
(Intercept)	-0.95 [-1.15, -0.74]	0.10	-9.19	< .001	-0.91 [-1.11, -0.71]	0.10	-8.97	< .001
Physical activity	-0.01 [-0.04, 0.02]	0.02	-0.76	.446	-0.06 [-0.09, -0.03]	0.02	-3.50	< .001
Age	0.00 [-0.01, 0.00]	0.00	-1.03	.304	0.00 [-0.01, 0.00]	0.00	-0.76	.448
Physical activity <sup>2</sup>	-0.01 [-0.01, 0.00]	0.00	-1.77	.076	-0.02 [-0.04, 0.00]	0.01	-2.09	.036
Physical activity × age	0.00 [0.00, 0.00]	0.00	-5.06	< .001	0.00 [0.00, 0.00]	0.00	0.30	.762
Age × Physical activity <sup>2</sup>	0.00 [0.00, 0.00]	0.00	3.46	.001	0.00 [0.00, 0.00]	0.00	2.45	.015
<b>Sleep regularity</b>								

Table 2 continued

Term	Physical Activity Volume			Physical Activity Intensity				
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
(Intercept)	0.13 [-0.10, 0.36]	0.12	1.14	.262	0.06 [-0.17, 0.30]	0.12	0.55	.586
Physical activity	0.21 [0.17, 0.25]	0.02	10.64	< .001	0.24 [0.20, 0.29]	0.02	11.00	< .001
Age	0.00 [0.00, 0.01]	0.00	0.06	.950	0.00 [-0.01, 0.00]	0.00	-1.55	.123
Physical activity <sup>2</sup>	-0.02 [-0.03, -0.01]	0.00	-4.38	< .001	-0.08 [-0.11, -0.06]	0.01	-6.45	< .001
Physical activity × age	0.00 [0.00, 0.00]	0.00	-0.64	.522	0.00 [0.00, 0.00]	0.00	-8.97	< .001
Age × Physical activity <sup>2</sup>	0.00 [0.00, 0.00]	0.00	-5.08	< .001	0.00 [0.00, 0.00]	0.00	1.78	.076

*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				
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
<b>Sleep duration</b>								
(Intercept)	0.18 [0.02, 0.34]	0.08	2.14	.036	0.98 [0.78, 1.19]	0.10	9.37	< .001
Sleep duration	0.01 [-0.01, 0.04]	0.01	0.98	.328	0.01 [-0.01, 0.03]	0.01	0.76	.448
Age	-0.02 [-0.03, -0.02]	0.00	-8.89	< .001	-0.03 [-0.03, -0.02]	0.00	-8.06	< .001
Sleep duration <sup>2</sup>	-0.02 [-0.03, -0.01]	0.01	-3.78	< .001	-0.01 [-0.02, 0.00]	0.00	-2.00	.045
Sleep duration × age	0.00 [0.00, 0.00]	0.00	-1.73	.084	0.00 [0.00, 0.00]	0.00	0.97	.332
Age × Sleep duration <sup>2</sup>	0.00 [0.00, 0.00]	0.00	0.29	.774	0.00 [0.00, 0.00]	0.00	0.37	.714
<b>Sleep efficiency</b>								
(Intercept)	0.17 [0.01, 0.33]	0.08	2.07	.041	0.98 [0.78, 1.19]	0.11	9.28	< .001
Sleep efficiency	0.00 [-0.03, 0.03]	0.02	0.01	.991	0.00 [-0.03, 0.02]	0.01	-0.35	.729
Age	-0.02 [-0.03, -0.02]	0.00	-9.02	< .001	-0.03 [-0.03, -0.02]	0.00	-8.06	< .001
Sleep efficiency <sup>2</sup>	-0.01 [-0.01, 0.00]	0.00	-1.28	.203	0.00 [-0.01, 0.01]	0.00	-0.35	.726
Sleep efficiency × age	0.00 [0.00, 0.00]	0.00	0.12	.905	0.00 [0.00, 0.00]	0.00	0.02	.981
Age × Sleep efficiency <sup>2</sup>	0.00 [0.00, 0.00]	0.00	0.49	.628	0.00 [0.00, 0.00]	0.00	0.15	.882
<b>Sleep onset</b>								
(Intercept)	0.17 [0.01, 0.34]	0.08	2.11	.038	0.98 [0.77, 1.19]	0.11	9.18	< .001
Sleep onset	-0.04 [-0.07, -0.01]	0.01	-2.89	.004	-0.03 [-0.05, 0.00]	0.01	-1.82	.069
Age	-0.03 [-0.03, -0.02]	0.00	-9.00	< .001	-0.03 [-0.03, -0.02]	0.00	-8.07	< .001
Sleep onset <sup>2</sup>	-0.03 [-0.05, -0.01]	0.01	-2.78	.005	-0.01 [-0.03, 0.01]	0.01	-0.64	.523
Sleep onset × age	0.00 [0.00, 0.00]	0.00	2.28	.023	0.00 [0.00, 0.00]	0.00	1.45	.147
Age × Sleep onset <sup>2</sup>	0.00 [0.00, 0.00]	0.00	1.24	.214	0.00 [0.00, 0.00]	0.00	1.05	.296
Sleep regularity								

Table 3 continued

Term	Physical Activity Volume			Physical Activity Intensity				
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
(Intercept)	0.17 [0.01, 0.32]	0.08	2.06	.041	0.99 [0.79, 1.20]	0.10	9.50	< .001
Sleep regularity	0.14 [0.11, 0.16]	0.01	11.05	< .001	0.10 [0.07, 0.12]	0.01	8.11	< .001
Age	-0.02 [-0.03, -0.02]	0.00	-8.86	< .001	-0.03 [-0.03, -0.02]	0.00	-7.87	< .001
Sleep regularity <sup>2</sup>	0.00 [-0.01, 0.02]	0.01	0.66	.511	0.01 [-0.01, 0.02]	0.01	1.09	.274
Sleep regularity × age	0.00 [0.00, 0.00]	0.00	-3.74	< .001	0.00 [0.00, 0.00]	0.00	-5.32	< .001
Age × Sleep regularity <sup>2</sup>	0.00 [0.00, 0.00]	0.00	-0.63	.530	0.00 [0.00, 0.00]	0.00	-2.35	.019

*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			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
<b>Sleep duration</b>								
(Intercept)	0.17 [-0.17, 0.50]	0.17	0.99	.329	0.15 [-0.16, 0.46]	0.16	0.96	.344
Physical activity	0.11 [0.02, 0.19]	0.05	2.32	.021	0.08 [0.01, 0.15]	0.04	2.37	.019
Physical activity <sup>2</sup>	0.00 [-0.03, 0.03]	0.02	-0.15	.881	0.04 [-0.01, 0.08]	0.02	1.58	.118
Age	0.00 [-0.01, 0.00]	0.00	-0.66	.512	0.00 [-0.01, 0.00]	0.00	-0.87	.382
Physical activity × bmi	0.00 [-0.01, 0.00]	0.00	-0.42	.676	0.00 [0.00, 0.00]	0.00	-0.51	.614
<b>Sleep efficiency</b>								
(Intercept)	0.25 [-0.03, 0.54]	0.14	1.75	.084	0.27 [-0.03, 0.56]	0.15	1.78	.079
Physical activity	0.10 [0.01, 0.19]	0.05	2.15	.033	0.04 [-0.06, 0.13]	0.05	0.77	.446
Physical activity <sup>2</sup>	-0.03 [-0.06, 0.00]	0.02	-1.70	.090	-0.01 [-0.05, 0.03]	0.02	-0.39	.693
Age	0.00 [0.00, 0.01]	0.00	1.36	.173	0.00 [0.00, 0.01]	0.00	1.11	.267
Physical activity × bmi	0.00 [-0.01, 0.00]	0.00	-1.34	.181	0.00 [-0.01, 0.00]	0.00	-0.72	.477
<b>Sleep onset</b>								
(Intercept)	0.05 [-0.31, 0.40]	0.18	0.26	.795	0.04 [-0.31, 0.38]	0.18	0.21	.831
Physical activity	0.01 [-0.05, 0.07]	0.03	0.20	.843	-0.06 [-0.11, 0.00]	0.03	-2.12	.035
Physical activity <sup>2</sup>	-0.02 [-0.04, 0.00]	0.01	-1.86	.064	-0.02 [-0.05, 0.01]	0.02	-1.04	.299
Age	0.00 [0.00, 0.00]	0.00	-0.12	.906	0.00 [0.00, 0.00]	0.00	-0.18	.858
Physical activity × bmi	0.00 [-0.01, 0.00]	0.00	-2.44	.015	0.00 [0.00, 0.00]	0.00	-0.45	.654
<b>Sleep regularity</b>								
(Intercept)	0.34 [0.08, 0.59]	0.13	2.58	.013	0.56 [0.30, 0.82]	0.13	4.22	< .001
Physical activity	0.11 [-0.32, 0.54]	0.22	0.49	.639	0.19 [0.11, 0.26]	0.04	4.75	< .001
Physical activity <sup>2</sup>	0.03 [-0.09, 0.16]	0.06	0.52	.616	-0.04 [-0.11, 0.04]	0.04	-0.93	.367

Table 4 continued

Term	Physical Activity Volume				Physical Activity Intensity			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Age	0.00 [0.00, 0.00]	0.00	0.36	.721	0.00 [0.00, 0.00]	0.00	-0.19	.846
Physical activity $\times$ bmi	0.01 [-0.02, 0.03]	0.01	0.54	.606	0.00 [-0.01, 0.00]	0.00	-3.51	< .001

*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			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Sleep duration								
(Intercept)	1.51 [1.13, 1.90]	0.20	7.65	< .001	1.35 [1.09, 1.61]	0.13	10.25	< .001
Sleep duration	0.01 [-0.03, 0.05]	0.02	0.63	.528	-0.01 [-0.07, 0.06]	0.03	-0.17	.866
Sleep duration <sup>2</sup>	-0.02 [-0.04, 0.00]	0.01	-2.31	.022	-0.01 [-0.04, 0.01]	0.01	-0.98	.338
Age	-0.02 [-0.03, -0.02]	0.00	-9.32	< .001	-0.03 [-0.03, -0.02]	0.00	-10.08	< .001
Sleep duration × bmi	0.00 [0.00, 0.00]	0.00	-1.03	.303	0.00 [0.00, 0.00]	0.00	0.37	.717
Sleep efficiency								
(Intercept)	1.50 [1.11, 1.89]	0.20	7.54	< .001	1.34 [1.07, 1.61]	0.14	9.83	< .001
Sleep efficiency	0.01 [-0.04, 0.07]	0.03	0.52	.605	0.02 [-0.03, 0.06]	0.02	0.70	.485
Sleep efficiency <sup>2</sup>	-0.01 [-0.02, 0.01]	0.01	-0.97	.336	0.00 [-0.02, 0.01]	0.01	-0.43	.665
Age	-0.02 [-0.03, -0.02]	0.00	-9.27	< .001	-0.03 [-0.03, -0.02]	0.00	-10.11	< .001
Sleep efficiency × bmi	0.00 [0.00, 0.00]	0.00	-0.24	.810	0.00 [0.00, 0.00]	0.00	-0.37	.715
Sleep onset								
(Intercept)	1.51 [1.11, 1.90]	0.20	7.52	< .001	1.33 [1.06, 1.60]	0.14	9.72	< .001
Sleep onset	0.00 [-0.05, 0.04]	0.03	-0.19	.853	0.01 [-0.05, 0.07]	0.03	0.43	.670
Sleep onset <sup>2</sup>	-0.02 [-0.06, 0.02]	0.02	-0.87	.387	0.01 [-0.01, 0.04]	0.01	1.00	.316
Age	-0.02 [-0.03, -0.02]	0.00	-9.28	< .001	-0.03 [-0.03, -0.02]	0.00	-10.05	< .001
Sleep onset × bmi	0.00 [0.00, 0.00]	0.00	0.21	.832	0.00 [0.00, 0.00]	0.00	0.24	.809
Sleep regularity								
(Intercept)	1.45 [1.07, 1.83]	0.19	7.48	< .001	1.31 [1.06, 1.56]	0.13	10.30	< .001
Sleep regularity	0.14 [0.08, 0.20]	0.03	4.63	< .001	0.13 [0.07, 0.18]	0.03	4.30	< .001
Sleep regularity <sup>2</sup>	0.00 [-0.04, 0.03]	0.02	-0.19	.848	0.02 [-0.03, 0.06]	0.02	0.72	.479

Table 5 continued

Term	Physical Activity Volume				Physical Activity Intensity					
	$\beta$	[95% CI]	SE	t	p	$\beta$	[95% CI]	SE	t	p
Age	-0.02	[-0.03, -0.02]	0.00	-9.38	< .001	-0.03	[-0.03, -0.02]	0.00	-10.21	< .001
Sleep regularity $\times$ bmi	0.00	[0.00, 0.00]	0.00	-1.72	.087	0.00	[-0.01, 0.00]	0.00	-2.93	.004

*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			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
(Intercept)	0.45 [0.20, 0.70]	0.13	3.51	.001	0.55 [0.27, 0.82]	0.14	3.90	< .001
Physical activity	0.22 [0.18, 0.27]	0.02	9.84	< .001	0.07 [0.03, 0.11]	0.02	3.78	< .001
Physical activity <sup>2</sup>	-0.05 [-0.06, -0.03]	0.01	-6.76	< .001	-0.02 [-0.04, 0.00]	0.01	-1.74	.084
Age	0.00 [0.00, 0.00]	0.00	0.46	.645	0.00 [0.00, 0.00]	0.00	-0.21	.837
Physical activity × sesmedium	-0.02 [-0.09, 0.04]	0.03	-0.78	.436	0.00 [-0.05, 0.05]	0.02	-0.05	.959
Physical activity × seshigh	-0.02 [-0.08, 0.04]	0.03	-0.74	.462	0.01 [-0.04, 0.06]	0.02	0.49	.628

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				
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
<b>Sleep duration</b>								
(Intercept)	1.51 [1.12, 1.89]	0.20	7.63	< .001	1.35 [1.09, 1.61]	0.13	10.07	< .001
Sleep duration	-0.01 [-0.03, 0.02]	0.01	-0.57	.566	0.01 [-0.01, 0.03]	0.01	1.10	.272
Sleep duration <sup>2</sup>	-0.02 [-0.03, -0.01]	0.01	-3.04	.002	-0.01 [-0.02, 0.00]	0.01	-2.26	.024
Age	-0.02 [-0.03, -0.02]	0.00	-9.28	< .001	-0.03 [-0.03, -0.02]	0.00	-10.14	< .001
Sleep duration × sesmedium	0.00 [-0.04, 0.03]	0.02	-0.12	.901	0.01 [-0.03, 0.04]	0.02	0.40	.689
Sleep duration × seshigh	0.00 [-0.04, 0.03]	0.02	-0.18	.860	-0.02 [-0.05, 0.02]	0.02	-0.99	.322
<b>Sleep efficiency</b>								
(Intercept)	1.49 [1.10, 1.88]	0.20	7.51	< .001	1.34 [1.07, 1.60]	0.14	9.85	< .001
Sleep efficiency	0.00 [-0.02, 0.03]	0.01	0.34	.737	0.01 [-0.02, 0.03]	0.01	0.46	.644
Sleep efficiency <sup>2</sup>	0.00 [-0.01, 0.01]	0.01	0.12	.901	0.00 [-0.01, 0.01]	0.00	0.19	.846
Age	-0.02 [-0.03, -0.02]	0.00	-9.28	< .001	-0.03 [-0.03, -0.02]	0.00	-10.10	< .001
Sleep efficiency × sesmedium	0.01 [-0.03, 0.05]	0.02	0.44	.661	0.00 [-0.04, 0.04]	0.02	-0.02	.983
Sleep efficiency × seshigh	0.00 [-0.04, 0.04]	0.02	-0.08	.935	0.01 [-0.03, 0.04]	0.02	0.31	.755
<b>Sleep onset</b>								
(Intercept)	1.51 [1.12, 1.89]	0.20	7.61	< .001	1.34 [1.07, 1.60]	0.14	9.83	< .001
Sleep onset	0.00 [-0.03, 0.03]	0.01	-0.16	.871	0.02 [-0.01, 0.04]	0.01	1.20	.232
Sleep onset <sup>2</sup>	-0.02 [-0.04, 0.00]	0.01	-2.18	.031	0.00 [-0.01, 0.02]	0.01	0.38	.701
Age	-0.02 [-0.03, -0.02]	0.00	-9.26	< .001	-0.03 [-0.03, -0.02]	0.00	-10.12	< .001
Sleep onset × sesmedium	0.01 [-0.03, 0.05]	0.02	0.35	.730	0.00 [-0.03, 0.04]	0.02	0.19	.847
Sleep onset × seshigh	0.00 [-0.04, 0.04]	0.02	-0.02	.986	0.00 [-0.03, 0.03]	0.02	0.04	.969
Sleep regularity								

Table 7 continued

Term	Physical Activity Volume				Physical Activity Intensity			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
(Intercept)	1.45 [1.07, 1.83]	0.19	7.46	< .001	1.32 [1.06, 1.58]	0.13	9.94	< .001
Sleep regularity	0.09 [0.06, 0.12]	0.02	5.26	< .001	0.05 [0.02, 0.08]	0.02	2.93	.003
Sleep regularity <sup>2</sup>	-0.01 [-0.03, 0.01]	0.01	-1.06	.292	0.00 [-0.02, 0.01]	0.01	-0.42	.672
Age	-0.02 [-0.03, -0.02]	0.00	-9.41	< .001	-0.03 [-0.03, -0.02]	0.00	-10.25	< .001
Sleep regularity × sesmedium	0.00 [-0.04, 0.04]	0.02	-0.13	.899	-0.01 [-0.05, 0.03]	0.02	-0.31	.755
Sleep regularity × seshigh	0.00 [-0.04, 0.05]	0.02	0.19	.846	0.00 [-0.04, 0.04]	0.02	-0.04	.970

*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				
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
<b>Sleep duration</b>								
(Intercept)	0.17 [-0.15, 0.50]	0.17	1.03	.308	0.19 [-0.13, 0.50]	0.16	1.16	.253
Physical activity	0.11 [0.07, 0.14]	0.02	5.25	< .001	0.06 [0.03, 0.09]	0.01	4.14	< .001
Physical activity <sup>2</sup>	-0.01 [-0.02, 0.00]	0.01	-1.70	.090	0.01 [-0.01, 0.02]	0.01	0.71	.479
Age	0.00 [-0.01, 0.00]	0.00	-0.66	.509	0.00 [-0.01, 0.00]	0.00	-0.88	.381
Physical activity × sexmale	-0.03 [-0.08, 0.02]	0.03	-1.18	.237	0.02 [-0.02, 0.06]	0.02	1.14	.254
<b>Sleep efficiency</b>								
(Intercept)	0.25 [-0.03, 0.53]	0.14	1.72	.089	0.27 [-0.02, 0.56]	0.15	1.86	.067
Physical activity	0.03 [-0.01, 0.07]	0.02	1.65	.098	-0.02 [-0.05, 0.01]	0.01	-1.14	.253
Physical activity <sup>2</sup>	-0.02 [-0.03, -0.01]	0.01	-3.09	.002	-0.01 [-0.03, 0.00]	0.01	-1.41	.159
Age	0.00 [0.00, 0.01]	0.00	1.38	.167	0.00 [0.00, 0.01]	0.00	1.12	.265
Physical activity × sexmale	0.02 [-0.03, 0.07]	0.03	0.68	.499	0.03 [0.00, 0.07]	0.02	1.75	.080
<b>Sleep onset</b>								
(Intercept)	0.01 [-0.34, 0.37]	0.18	0.08	.938	0.02 [-0.32, 0.37]	0.18	0.14	.892
Physical activity	-0.09 [-0.12, -0.06]	0.01	-6.14	< .001	-0.08 [-0.10, -0.05]	0.01	-6.79	< .001
Physical activity <sup>2</sup>	0.01 [0.00, 0.02]	0.00	1.26	.206	0.00 [-0.02, 0.01]	0.01	-0.71	.479
Age	0.00 [0.00, 0.00]	0.00	-0.08	.938	0.00 [0.00, 0.00]	0.00	-0.18	.855
Physical activity × sexmale	0.05 [0.01, 0.08]	0.02	2.39	.017	0.01 [-0.02, 0.04]	0.01	0.57	.570
<b>Sleep regularity</b>								
(Intercept)	0.44 [0.19, 0.69]	0.13	3.47	.001	0.56 [0.29, 0.83]	0.14	4.05	< .001
Physical activity	0.22 [0.18, 0.25]	0.02	11.02	< .001	0.06 [0.04, 0.09]	0.01	4.46	< .001
Physical activity <sup>2</sup>	-0.04 [-0.06, -0.03]	0.01	-6.89	< .001	-0.04 [-0.05, -0.02]	0.01	-4.38	< .001

Term	Physical Activity Volume			Physical Activity Intensity				
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Age	0.00 [0.00, 0.00]	0.00	0.49	.627	0.00 [0.00, 0.00]	0.00	-0.20	.844
Physical activity $\times$ sexmale	-0.01 [-0.06, 0.03]	0.02	-0.57	.568	0.02 [-0.02, 0.05]	0.02	0.91	.361

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					
	$\beta$	[95% CI]	SE	t	p	$\beta$	[95% CI]	SE	t	p
Sleep duration										
(Intercept)	1.51	[1.12, 1.90]	0.20	7.65	< .001	1.35	[1.08, 1.61]	0.13	10.02	< .001
Sleep duration	-0.01	[-0.03, 0.00]	0.01	-1.51	.132	0.01	[-0.01, 0.03]	0.01	1.27	.205
Sleep duration <sup>2</sup>	-0.02	[-0.03, -0.01]	0.00	-5.21	< .001	-0.01	[-0.02, 0.00]	0.00	-2.68	.007
Age	-0.02	[-0.03, -0.02]	0.00	-9.30	< .001	-0.03	[-0.03, -0.02]	0.00	-10.15	< .001
Sleep duration × sexmale	0.01	[-0.01, 0.04]	0.01	0.95	.341	0.00	[-0.03, 0.02]	0.01	-0.31	.754
Sleep efficiency										
(Intercept)	1.49	[1.10, 1.88]	0.20	7.53	< .001	1.34	[1.07, 1.61]	0.14	9.84	< .001
Sleep efficiency	0.02	[0.00, 0.04]	0.01	1.92	.055	0.01	[-0.01, 0.03]	0.01	1.24	.216
Sleep efficiency <sup>2</sup>	0.00	[0.01, 0.00]	0.00	-1.05	.292	0.00	[-0.01, 0.00]	0.00	-0.85	.397
Age	-0.02	[-0.03, -0.02]	0.00	-9.31	< .001	-0.03	[-0.03, -0.02]	0.00	-10.13	< .001
Sleep efficiency × sexmale	-0.03	[-0.06, 0.00]	0.02	-1.77	.077	-0.01	[-0.04, 0.02]	0.01	-0.74	.460
Sleep onset										
(Intercept)	1.50	[1.11, 1.89]	0.20	7.58	< .001	1.34	[1.07, 1.61]	0.14	9.83	< .001
Sleep onset	0.02	[0.00, 0.04]	0.01	1.99	.047	0.01	[-0.01, 0.03]	0.01	1.12	.264
Sleep onset <sup>2</sup>	-0.02	[-0.03, 0.00]	0.01	-2.46	.014	0.00	[-0.01, 0.01]	0.01	0.15	.883
Age	-0.02	[-0.03, -0.02]	0.00	-9.31	< .001	-0.03	[-0.03, -0.02]	0.00	-10.12	< .001
Sleep onset × sexmale	-0.04	[-0.07, -0.01]	0.01	-2.94	.003	0.01	[-0.02, 0.04]	0.01	0.84	.402
Sleep regularity										
(Intercept)	1.45	[1.07, 1.83]	0.19	7.48	< .001	1.33	[1.07, 1.59]	0.13	10.00	< .001
Sleep regularity	0.07	[0.05, 0.09]	0.01	6.73	< .001	0.04	[0.02, 0.06]	0.01	3.83	< .001
Sleep regularity <sup>2</sup>	-0.01	[-0.02, 0.00]	0.01	-1.80	.071	-0.02	[-0.03, -0.01]	0.01	-3.61	< .001

Table 9 continued

Term	Physical Activity Volume				Physical Activity Intensity					
	$\beta$	[95% CI]	SE	t	p	$\beta$	[95% CI]	SE	t	p
Age	-0.02	[-0.03, -0.02]	0.00	-9.39	< .001	-0.03	[-0.03, -0.02]	0.00	-10.27	< .001
Sleep regularity $\times$ sexmale	0.04	[0.01, 0.07]	0.02	2.51	.012	0.01	[-0.02, 0.04]	0.02	0.54	.590

*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				
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
<b>Sleep duration</b>								
(Intercept)	0.22 [-0.09, 0.54]	0.16	1.38	.177	0.24 [-0.07, 0.54]	0.16	1.50	.142
Physical activity	0.08 [0.03, 0.14]	0.03	3.14	.002	0.08 [0.05, 0.12]	0.02	4.47	< .001
Weekday xmonday	-0.06 [-0.11, -0.01]	0.03	-2.46	.014	-0.07 [-0.13, -0.01]	0.03	-2.45	.014
Weekday xsaturday	0.02 [-0.02, 0.07]	0.02	1.00	.316	0.03 [-0.03, 0.09]	0.03	1.04	.299
Weekday xsunday	-0.01 [-0.06, 0.04]	0.03	-0.49	.623	-0.03 [-0.08, 0.03]	0.03	-0.90	.367
Weekday xthursday	-0.05 [-0.10, 0.00]	0.03	-1.97	.049	-0.06 [-0.12, 0.00]	0.03	-1.97	.049
Weekday xtuesday	-0.06 [-0.11, -0.01]	0.03	-2.41	.016	-0.06 [-0.12, 0.00]	0.03	-1.99	.046
Weekday xwednesday	-0.10 [-0.15, -0.05]	0.03	-3.95	< .001	-0.11 [-0.17, -0.05]	0.03	-3.68	< .001
Physical activity <sup>2</sup>	-0.01 [-0.03, 0.01]	0.01	-1.36	.175	0.00 [-0.03, 0.03]	0.01	-0.12	.908
Age	0.00 [-0.01, 0.00]	0.00	-0.74	.459	0.00 [-0.01, 0.00]	0.00	-0.88	.378
Physical activity × weekday xmonday	0.03 [-0.03, 0.10]	0.03	1.01	.312	0.01 [0.03, 0.06]	0.02	0.66	.512
Physical activity × weekday xsaturday	0.00 [-0.07, 0.06]	0.03	-0.13	.899	-0.03 [-0.08, 0.01]	0.02	-1.37	.171
Physical activity × weekday xsunday	0.02 [-0.05, 0.08]	0.03	0.49	.622	-0.07 [-0.11, -0.02]	0.02	-2.82	.005
Physical activity × weekday xtuesday	0.02 [-0.05, 0.09]	0.04	0.47	.635	0.02 [-0.02, 0.07]	0.02	1.02	.308
Physical activity × weekday xtuesday	-0.01 [-0.07, 0.06]	0.03	-0.18	.855	0.00 [-0.05, 0.04]	0.02	-0.06	.952
Physical activity × weekday xwednesday	-0.03 [-0.10, 0.03]	0.03	-0.99	.323	0.00 [-0.05, 0.04]	0.02	-0.11	.914
Weekday xmonday × Physical activity <sup>2</sup>	0.01 [-0.01, 0.03]	0.01	0.86	.388	0.01 [-0.02, 0.04]	0.02	0.53	.596
Weekday xsaturday × Physical activity <sup>2</sup>	0.01 [-0.01, 0.03]	0.01	0.89	.371	0.00 [-0.03, 0.04]	0.02	0.20	.845
Weekday xsunday × Physical activity <sup>2</sup>	0.00 [-0.02, 0.03]	0.01	0.33	.739	0.01 [-0.02, 0.04]	0.02	0.56	.579
Weekday xthursday × Physical activity <sup>2</sup>	0.00 [-0.02, 0.03]	0.01	0.22	.826	0.00 [-0.03, 0.04]	0.02	0.23	.814
Weekday xtuesday × Physical activity <sup>2</sup>	0.01 [-0.01, 0.03]	0.01	0.94	.348	0.01 [-0.03, 0.04]	0.02	0.44	.662

Table 10 continued

TITLE

Term	Physical Activity Volume				Physical Activity Intensity			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Weekday xwednesday $\times$ Physical activity <sup>2</sup>	0.02 [-0.01, 0.04]	0.01	1.34	.180	0.02 [-0.02, 0.06]	0.02	1.12	.262
Sleep efficency								
(Intercept)	0.28 [0.01, 0.55]	0.14	2.01	.047	0.31 [0.04, 0.59]	0.14	2.21	.029
Physical activity	0.04 [-0.01, 0.09]	0.03	1.46	.143	0.00 [-0.04, 0.04]	0.02	-0.07	.941
Weekday xmunday	-0.03 [-0.08, 0.02]	0.03	-1.20	.230	-0.03 [-0.09, 0.03]	0.03	-1.08	.280
Weekday xsaturday	-0.11 [-0.16, -0.06]	0.02	-4.38	< .001	-0.13 [-0.19, -0.07]	0.03	-4.50	< .001
Weekday xsunday	-0.09 [-0.14, -0.04]	0.03	-3.43	.001	-0.10 [-0.16, -0.04]	0.03	-3.53	< .001
Weekday xthursday	0.01 [-0.04, 0.06]	0.03	0.33	.740	0.00 [-0.06, 0.06]	0.03	-0.08	.938
Weekday xtuesday	0.00 [-0.05, 0.05]	0.03	0.07	.944	0.00 [-0.05, 0.06]	0.03	0.15	.882
Weekday xwednesday	0.00 [-0.05, 0.05]	0.03	-0.06	.951	0.00 [-0.06, 0.06]	0.03	0.00	.997
Physical activity <sup>2</sup>	-0.02 [-0.03, 0.00]	0.01	-1.81	.070	-0.01 [-0.04, 0.01]	0.01	-0.98	.326
Age	0.00 [0.00, 0.01]	0.00	1.36	.173	0.00 [0.00, 0.01]	0.00	1.06	.290
Physical activity $\times$ weekday xmonday	-0.01 [-0.07, 0.06]	0.03	-0.18	.860	-0.02 [-0.06, 0.03]	0.02	-0.78	.433
Physical activity $\times$ weekday xsaturday	0.00 [-0.06, 0.06]	0.03	0.02	.981	-0.03 [-0.08, 0.01]	0.02	-1.41	.160
Physical activity $\times$ weekday xsunday	0.04 [-0.02, 0.10]	0.03	1.24	.216	-0.02 [-0.06, 0.03]	0.02	-0.76	.449
Physical activity $\times$ weekday xthursday	-0.03 [-0.10, 0.04]	0.04	-0.90	.371	0.02 [-0.03, 0.07]	0.02	0.86	.388
Physical activity $\times$ weekday xtuesday	-0.05 [-0.11, 0.02]	0.03	-1.30	.193	-0.01 [-0.06, 0.03]	0.02	-0.62	.536
Physical activity $\times$ weekday xwednesday	-0.02 [-0.09, 0.05]	0.03	-0.62	.537	0.02 [-0.03, 0.07]	0.02	0.81	.419
Weekday xmunday $\times$ Physical activity <sup>2</sup>	0.00 [-0.02, 0.03]	0.01	0.39	.697	0.00 [-0.03, 0.03]	0.02	-0.05	.963
Weekday xsaturday $\times$ Physical activity <sup>2</sup>	0.01 [-0.01, 0.03]	0.01	1.05	.296	0.03 [-0.01, 0.07]	0.02	1.67	.095
Weekday xsunday $\times$ Physical activity <sup>2</sup>	0.00 [-0.02, 0.02]	0.01	-0.23	.817	0.00 [-0.03, 0.04]	0.02	0.05	.957
Weekday xthursday $\times$ Physical activity <sup>2</sup>	0.01 [-0.01, 0.04]	0.01	1.03	.305	0.02 [-0.02, 0.05]	0.02	1.00	.317
Weekday xtuesday $\times$ Physical activity <sup>2</sup>	0.00 [-0.02, 0.03]	0.01	0.31	.758	0.00 [-0.04, 0.04]	0.02	-0.01	.990

Table 10 continued

TITLE

Term	Physical Activity Volume				Physical Activity Intensity			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Weekday xwednesday $\times$ Physical activity <sup>2</sup>	0.01 [-0.01, 0.03]	0.01	0.71	.479	0.00 [-0.03, 0.04]	0.02	0.19	.847
Sleep onset								
(Intercept)	-0.01 [-0.36, 0.35]	0.18	-0.04	.967	0.00 [-0.35, 0.34]	0.18	-0.02	.986
Physical activity	-0.04 [-0.08, 0.00]	0.02	-1.99	.046	-0.04 [-0.06, -0.01]	0.01	-2.54	.011
Weekday xmunday	-0.08 [-0.11, -0.04]	0.02	-4.14	< .001	-0.06 [-0.10, -0.02]	0.02	-2.84	.005
Weekday xsaturday	0.09 [0.06, 0.13]	0.02	5.03	< .001	0.08 [0.04, 0.12]	0.02	3.79	< .001
Weekday xsunday	0.10 [0.06, 0.13]	0.02	5.28	< .001	0.08 [0.04, 0.12]	0.02	3.79	< .001
Weekday xthursday	-0.07 [-0.11, -0.03]	0.02	-3.70	< .001	-0.06 [-0.10, -0.01]	0.02	-2.63	.008
Weekday xtuesday	-0.05 [-0.09, -0.02]	0.02	-2.83	.005	-0.04 [-0.08, 0.01]	0.02	-1.64	.102
Weekday xwednesday	-0.04 [-0.07, 0.00]	0.02	-1.96	.050	-0.01 [-0.06, 0.03]	0.02	-0.58	.562
Physical activity <sup>2</sup>	0.01 [0.00, 0.02]	0.01	1.40	.162	0.01 [-0.01, 0.03]	0.01	0.89	.372
Age	0.00 [0.00, 0.00]	0.00	0.08	.935	0.00 [0.00, 0.00]	0.00	-0.09	.926
Physical activity $\times$ weekday xmonday	-0.06 [-0.11, -0.02]	0.02	-2.64	.008	-0.06 [-0.09, -0.02]	0.02	-3.36	.001
Physical activity $\times$ weekday xsaturday	0.07 [0.02, 0.11]	0.02	2.74	.006	0.00 [-0.04, 0.03]	0.02	-0.11	.915
Physical activity $\times$ weekday xsunday	0.03 [-0.01, 0.08]	0.02	1.44	.149	-0.03 [-0.07, 0.00]	0.02	-1.98	.047
Physical activity $\times$ weekday xtursday	-0.08 [-0.13, -0.03]	0.03	-2.95	.003	-0.04 [-0.08, -0.01]	0.02	-2.62	.009
Physical activity $\times$ weekday xtuesday	-0.09 [-0.14, -0.04]	0.03	-3.38	.001	-0.03 [-0.06, 0.01]	0.02	-1.67	.096
Physical activity $\times$ weekday xwednesday	-0.09 [-0.14, -0.04]	0.03	-3.49	< .001	-0.02 [-0.06, 0.01]	0.02	-1.33	.182
Weekday xmunday $\times$ Physical activity <sup>2</sup>	0.00 [-0.02, 0.01]	0.01	-0.23	.821	-0.01 [-0.04, 0.01]	0.01	-1.10	.272
Weekday xsaturday $\times$ Physical activity <sup>2</sup>	-0.01 [-0.03, 0.00]	0.01	-1.71	.087	0.00 [-0.03, 0.02]	0.01	-0.24	.812
Weekday xsunday $\times$ Physical activity <sup>2</sup>	-0.02 [-0.04, -0.01]	0.01	-2.71	.007	-0.01 [-0.04, 0.01]	0.01	-0.86	.388
Weekday xthursday $\times$ Physical activity <sup>2</sup>	0.01 [-0.01, 0.02]	0.01	0.87	.387	0.00 [-0.03, 0.02]	0.01	-0.20	.840
Weekday xtuesday $\times$ Physical activity <sup>2</sup>	0.01 [-0.01, 0.02]	0.01	0.66	.508	-0.01 [-0.04, 0.01]	0.01	-0.91	.365

Table 10 continued

TITLE

Term	Physical Activity Volume				Physical Activity Intensity			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Weekday xwednesday $\times$ Physical activity <sup>2</sup>	0.01 [-0.01, 0.03]	0.01	1.18	.239	-0.01 [-0.04, 0.01]	0.01	-1.07	.286
Sleep regularity								
(Intercept)	0.46 [0.22, 0.71]	0.12	3.75	< .001	0.59 [0.32, 0.86]	0.14	4.31	< .001
Physical activity	0.15 [0.10, 0.20]	0.02	6.10	< .001	-0.02 [-0.05, 0.02]	0.02	-0.89	.371
Weekday xmunday	0.05 [0.00, 0.10]	0.02	2.11	.035	0.02 [-0.03, 0.08]	0.03	0.94	.347
Weekday xsaturday	-0.13 [-0.17, -0.08]	0.02	-5.62	< .001	-0.12 [-0.18, -0.07]	0.03	-4.53	< .001
Weekday xsunday	-0.16 [-0.21, -0.12]	0.02	-6.94	< .001	-0.19 [-0.24, -0.14]	0.03	-7.07	< .001
Weekday xthursday	0.18 [0.13, 0.23]	0.02	7.55	< .001	0.21 [0.16, 0.27]	0.03	7.67	< .001
Weekday xtuesday	0.19 [0.14, 0.24]	0.02	8.06	< .001	0.21 [0.16, 0.26]	0.03	7.77	< .001
Weekday xwednesday	0.17 [0.12, 0.21]	0.02	7.09	< .001	0.24 [0.18, 0.29]	0.03	8.69	< .001
Physical activity <sup>2</sup>	-0.03 [-0.04, -0.01]	0.01	-3.47	.001	-0.01 [-0.04, 0.01]	0.01	-0.80	.422
Age	0.00 [0.00, 0.00]	0.00	0.18	.859	0.00 [-0.01, 0.00]	0.00	-0.60	.550
Physical activity $\times$ weekday xmonday	0.09 [0.03, 0.16]	0.03	3.05	.002	0.13 [0.09, 0.17]	0.02	5.98	< .001
Physical activity $\times$ weekday xsaturday	0.02 [-0.04, 0.08]	0.03	0.57	.570	-0.04 [-0.08, 0.01]	0.02	-1.71	.087
Physical activity $\times$ weekday xsunday	0.09 [0.03, 0.15]	0.03	2.96	.003	0.00 [-0.04, 0.04]	0.02	0.05	.959
Physical activity $\times$ weekday xtuesday	0.01 [-0.05, 0.08]	0.03	0.47	.640	0.10 [0.06, 0.14]	0.02	4.67	< .001
Physical activity $\times$ weekday xwednesday	-0.01 [-0.08, 0.05]	0.03	-0.44	.662	0.14 [0.10, 0.18]	0.02	6.53	< .001
Physical activity $\times$ weekday xthursday	-0.03 [-0.09, 0.04]	0.03	-0.80	.425	0.08 [0.04, 0.12]	0.02	3.87	< .001
Weekday xmunday $\times$ Physical activity <sup>2</sup>	-0.04 [-0.06, -0.02]	0.01	-3.59	< .001	-0.03 [-0.07, 0.00]	0.02	-2.18	.029
Weekday xsaturday $\times$ Physical activity <sup>2</sup>	0.00 [-0.02, 0.02]	0.01	-0.10	.921	-0.02 [-0.05, 0.01]	0.02	-1.23	.219
Weekday xsunday $\times$ Physical activity <sup>2</sup>	-0.01 [-0.03, 0.01]	0.01	-1.10	.269	-0.02 [-0.05, 0.01]	0.02	-1.28	.202
Weekday xthursday $\times$ Physical activity <sup>2</sup>	0.00 [-0.02, 0.02]	0.01	0.05	.959	-0.04 [-0.07, -0.01]	0.02	-2.31	.021
Weekday xtuesday $\times$ Physical activity <sup>2</sup>	0.01 [-0.01, 0.03]	0.01	1.14	.256	-0.02 [-0.05, 0.02]	0.02	-1.04	.301

Term	Physical Activity Volume			Physical Activity Intensity				
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Weekday x wednesday $\times$ Physical activity <sup>2</sup>	0.01 [-0.01, 0.03]	0.01	0.65	.516	-0.07 [-0.10, -0.04]	0.02	-4.07	< .001

*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				
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Sleep duration								
(Intercept)	1.54 [1.15, 1.93]	0.20	7.77	< .001	1.43 [1.18, 1.69]	0.13	11.14	< .001
Sleep duration	0.02 [-0.01, 0.06]	0.02	1.42	.157	0.04 [0.01, 0.07]	0.02	2.36	.018
Weekday xmonday	-0.16 [-0.20, -0.12]	0.02	-8.28	< .001	-0.08 [-0.12, -0.05]	0.02	-4.46	< .001
Weekday xsaturday	-0.08 [-0.12, -0.04]	0.02	-4.04	< .001	-0.07 [-0.11, -0.03]	0.02	-3.71	< .001
Weekday xsunday	-0.17 [-0.21, -0.13]	0.02	-9.03	< .001	-0.18 [-0.22, -0.14]	0.02	-9.80	< .001
Weekday xthursday	-0.03 [-0.07, 0.01]	0.02	-1.59	.111	0.03 [-0.01, 0.06]	0.02	1.34	.181
Weekday xtuesday	-0.04 [-0.08, 0.00]	0.02	-1.97	.049	-0.03 [-0.07, 0.01]	0.02	-1.67	.095
Weekday xwednesday	-0.04 [-0.08, -0.01]	0.02	-2.24	.025	-0.01 [-0.05, 0.03]	0.02	-0.41	.685
Sleep duration <sup>2</sup>	-0.01 [-0.03, 0.00]	0.01	-1.57	.115	-0.01 [-0.02, 0.01]	0.01	-0.73	.468
Age	-0.02 [-0.03, -0.02]	0.00	-9.27	< .001	-0.03 [-0.03, -0.02]	0.00	-10.26	< .001
Sleep duration × weekday xmonday	-0.03 [-0.07, 0.01]	0.02	-1.63	.103	-0.03 [-0.07, 0.01]	0.02	-1.71	.088
Sleep duration × weekday xsaturday	-0.03 [-0.07, 0.01]	0.02	-1.45	.146	-0.04 [-0.08, 0.00]	0.02	-1.92	.054
Sleep duration × weekday xsunday	-0.05 [-0.09, -0.01]	0.02	-2.50	.013	-0.06 [-0.10, -0.03]	0.02	-3.23	.001
Sleep duration × weekday xtuesday	-0.01 [-0.06, 0.03]	0.02	-0.48	.632	0.02 [-0.02, 0.07]	0.02	1.09	.276
Sleep duration × weekday xtuesday	-0.01 [-0.05, 0.03]	0.02	-0.49	.623	0.00 [-0.04, 0.04]	0.02	0.07	.941
Sleep duration × weekday xwednesday	-0.02 [-0.06, 0.03]	0.02	-0.79	.429	0.00 [-0.04, 0.05]	0.02	0.13	.900
Weekday xmonday × Sleep duration <sup>2</sup>	-0.01 [-0.03, 0.01]	0.01	-0.94	.346	0.00 [-0.02, 0.02]	0.01	-0.03	.977
Weekday xsaturday × Sleep duration <sup>2</sup>	-0.01 [-0.03, 0.01]	0.01	-0.78	.434	-0.02 [-0.04, 0.01]	0.01	-1.46	.144
Weekday xsunday × Sleep duration <sup>2</sup>	-0.01 [-0.03, 0.01]	0.01	-0.68	.498	-0.01 [-0.02, 0.01]	0.01	-0.54	.588
Weekday xtuesday × Sleep duration <sup>2</sup>	0.00 [-0.02, 0.03]	0.01	0.29	.774	0.01 [-0.02, 0.03]	0.01	0.60	.550
Weekday xtuesday × Sleep duration <sup>2</sup>	0.00 [-0.02, 0.02]	0.01	-0.07	.941	0.01 [-0.01, 0.03]	0.01	0.79	.432

Table 11 continued

TITLE

Term	Physical Activity Volume				Physical Activity Intensity			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Weekday xwednesday $\times$ Sleep duration <sup>2</sup>	0.01 [-0.02, 0.03]	0.01	0.47	.641	0.00 [-0.02, 0.02]	0.01	-0.10	.922
Sleep efficiency (Intercept)	1.55 [1.16, 1.94]	0.20	7.75	< .001	1.44 [1.18, 1.70]	0.13	10.92	< .001
Sleep efficiency	-0.03 [-0.07, 0.00]	0.02	-1.71	.090	-0.04 [-0.07, 0.00]	0.02	-1.95	.053
Weekday xmunday	-0.19 [-0.22, -0.15]	0.02	-9.80	< .001	-0.09 [-0.13, -0.06]	0.02	-5.04	< .001
Weekday xsaturday	-0.09 [-0.13, -0.05]	0.02	-4.71	< .001	-0.09 [-0.12, -0.05]	0.02	-4.69	< .001
Weekday xsunday	-0.19 [-0.22, -0.15]	0.02	-9.36	< .001	-0.19 [-0.23, -0.16]	0.02	-10.00	< .001
Weekday xthursday	-0.04 [-0.08, -0.01]	0.02	-2.23	.026	0.01 [-0.03, 0.05]	0.02	0.65	.515
Weekday xtuesday	-0.05 [-0.09, -0.01]	0.02	-2.63	.009	-0.04 [-0.08, 0.00]	0.02	-2.16	.031
Weekday xwednesday	-0.04 [-0.08, -0.01]	0.02	-2.25	.024	-0.02 [-0.05, 0.02]	0.02	-0.86	.388
Sleep efficiency <sup>2</sup>	-0.01 [-0.02, 0.00]	0.01	-1.95	.052	-0.01 [-0.02, 0.00]	0.01	-1.25	.213
Age	-0.02 [-0.03, -0.02]	0.00	-9.24	< .001	-0.03 [-0.03, -0.02]	0.00	-10.18	< .001
Sleep efficiency $\times$ weekday xmonday	0.04 [0.00, 0.09]	0.02	1.78	.076	0.05 [0.00, 0.09]	0.02	1.98	.048
Sleep efficiency $\times$ weekday xsaturday	0.03 [-0.02, 0.07]	0.02	1.10	.274	0.04 [-0.01, 0.08]	0.02	1.74	.083
Sleep efficiency $\times$ weekday xsunday	0.07 [0.02, 0.11]	0.02	2.77	.006	0.08 [0.03, 0.13]	0.02	3.20	.002
Sleep efficiency $\times$ weekday xthursday	0.03 [-0.02, 0.08]	0.03	1.25	.214	0.03 [-0.02, 0.08]	0.03	1.31	.192
Sleep efficiency $\times$ weekday xtuesday	0.02 [-0.02, 0.07]	0.02	0.99	.321	0.04 [-0.01, 0.09]	0.02	1.57	.117
Sleep efficiency $\times$ weekday xwednesday	0.03 [-0.02, 0.08]	0.03	1.06	.290	0.02 [-0.03, 0.07]	0.02	0.74	.461
Weekday xmunday $\times$ Sleep efficiency <sup>2</sup>	0.02 [0.00, 0.03]	0.01	1.93	.054	0.01 [-0.01, 0.02]	0.01	0.96	.337
Weekday xsaturday $\times$ Sleep efficiency <sup>2</sup>	0.00 [-0.02, 0.02]	0.01	0.27	.787	0.00 [-0.02, 0.02]	0.01	0.08	.937
Weekday xsunday $\times$ Sleep efficiency <sup>2</sup>	0.00 [-0.02, 0.02]	0.01	0.27	.788	0.00 [-0.02, 0.02]	0.01	0.29	.770
Weekday xthursday $\times$ Sleep efficiency <sup>2</sup>	0.01 [0.00, 0.03]	0.01	1.62	.106	0.01 [0.00, 0.03]	0.01	1.37	.171
Weekday xtuesday $\times$ Sleep efficiency <sup>2</sup>	0.01 [-0.01, 0.02]	0.01	1.11	.265	0.01 [0.00, 0.02]	0.01	1.34	.179

Table 11 continued

TITLE

Term	Physical Activity Volume				Physical Activity Intensity			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Weekday xwednesday $\times$ Sleep efficiency <sup>2</sup>	0.00 [-0.01, 0.02]	0.01	0.30	.767	0.01 [-0.01, 0.02]	0.01	0.75	.454
Sleep onset								
(Intercept)	1.54 [1.15, 1.93]	0.20	7.76	< .001	1.44 [1.18, 1.70]	0.13	10.96	< .001
Sleep onset	-0.02 [-0.05, 0.01]	0.01	-1.54	.124	-0.03 [-0.05, 0.00]	0.01	-1.78	.075
Weekday xmunday	-0.18 [-0.22, -0.14]	0.02	-8.36	< .001	-0.10 [-0.14, -0.06]	0.02	-4.76	< .001
Weekday xsaturday	-0.09 [-0.14, -0.05]	0.02	-4.37	< .001	-0.10 [-0.14, -0.06]	0.02	-4.83	< .001
Weekday xsunday	-0.18 [-0.22, -0.14]	0.02	-8.39	< .001	-0.20 [-0.24, -0.16]	0.02	-9.49	< .001
Weekday xthursday	-0.04 [-0.08, 0.01]	0.02	-1.71	.088	0.02 [-0.03, 0.06]	0.02	0.79	.430
Weekday xtuesday	-0.05 [-0.09, 0.00]	0.02	-2.03	.042	-0.04 [-0.08, 0.00]	0.02	-1.74	.081
Weekday xwednesday	-0.05 [-0.10, -0.01]	0.02	-2.43	.015	-0.03 [-0.07, 0.02]	0.02	-1.20	.230
Sleep onset <sup>2</sup>	-0.02 [-0.04, 0.01]	0.01	-1.48	.138	-0.01 [-0.03, 0.02]	0.01	-0.57	.569
Age	-0.02 [-0.03, -0.02]	0.00	-9.26	< .001	-0.03 [-0.03, -0.02]	0.00	-10.22	< .001
Sleep onset $\times$ weekday xmonday	0.04 [0.00, 0.07]	0.02	1.87	.061	0.07 [0.03, 0.10]	0.02	3.67	< .001
Sleep onset $\times$ weekday xsaturday	0.03 [-0.01, 0.07]	0.02	1.62	.106	0.07 [0.03, 0.11]	0.02	3.85	< .001
Sleep onset $\times$ weekday xsunday	0.06 [0.02, 0.09]	0.02	3.10	.002	0.11 [0.07, 0.14]	0.02	5.84	< .001
Sleep onset $\times$ weekday xthursday	0.02 [-0.02, 0.06]	0.02	0.99	.322	0.01 [-0.02, 0.05]	0.02	0.77	.443
Sleep onset $\times$ weekday xtuesday	0.01 [-0.03, 0.05]	0.02	0.44	.662	0.02 [-0.02, 0.06]	0.02	1.16	.245
Sleep onset $\times$ weekday xwednesday	0.02 [-0.02, 0.06]	0.02	1.08	.280	0.02 [-0.02, 0.06]	0.02	0.95	.340
Weekday xmunday $\times$ Sleep onset <sup>2</sup>	0.01 [-0.02, 0.04]	0.01	0.74	.460	0.01 [-0.02, 0.04]	0.01	0.66	.511
Weekday xsaturday $\times$ Sleep onset <sup>2</sup>	0.01 [-0.02, 0.04]	0.02	0.56	.578	0.01 [-0.02, 0.04]	0.01	0.84	.402
Weekday xsunday $\times$ Sleep onset <sup>2</sup>	0.00 [-0.03, 0.03]	0.01	-0.18	.859	0.00 [-0.03, 0.03]	0.01	-0.03	.978
Weekday xthursday $\times$ Sleep onset <sup>2</sup>	0.01 [-0.02, 0.04]	0.02	0.63	.527	0.01 [-0.02, 0.04]	0.02	0.57	.571
Weekday xtuesday $\times$ Sleep onset <sup>2</sup>	0.01 [-0.03, 0.04]	0.02	0.31	.759	0.01 [-0.02, 0.04]	0.02	0.66	.512

Table 11 continued

TITLE

Term	Physical Activity Volume				Physical Activity Intensity			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Weekday xwednesday $\times$ Sleep onset <sup>2</sup>	0.02 [-0.02, 0.05]	0.02	0.98	.328	0.02 [-0.01, 0.05]	0.02	1.17	.244
Sleep regularity								
(Intercept)	1.48 [1.10, 1.86]	0.20	7.57	< .001	1.42 [1.17, 1.67]	0.13	10.97	< .001
Sleep regularity	0.10 [0.06, 0.13]	0.02	5.72	< .001	0.04 [0.01, 0.07]	0.02	2.30	.022
Weekday xmunday	-0.16 [-0.19, -0.12]	0.02	-7.92	< .001	-0.07 [-0.11, -0.03]	0.02	-3.71	< .001
Weekday xsaturday	-0.06 [-0.10, -0.02]	0.02	-2.95	.003	-0.08 [-0.12, -0.05]	0.02	-4.39	< .001
Weekday xsunday	-0.14 [-0.18, -0.10]	0.02	-7.21	< .001	-0.17 [-0.21, -0.13]	0.02	-9.06	< .001
Weekday xthursday	-0.01 [-0.05, 0.03]	0.02	-0.33	.743	0.02 [-0.02, 0.06]	0.02	1.17	.242
Weekday xtuesday	-0.03 [-0.07, 0.01]	0.02	-1.66	.098	-0.02 [-0.06, 0.02]	0.02	-1.04	.299
Weekday xwednesday	-0.04 [-0.08, 0.00]	0.02	-2.08	.037	0.00 [-0.04, 0.03]	0.02	-0.24	.812
Sleep regularity <sup>2</sup>	0.00 [-0.03, 0.02]	0.01	-0.22	.829	-0.02 [-0.04, 0.01]	0.01	-1.33	.184
Age	-0.02 [-0.03, -0.02]	0.00	-9.36	< .001	-0.03 [-0.03, -0.02]	0.00	-10.30	< .001
Sleep regularity $\times$ weekday xmonday	-0.03 [-0.08, 0.02]	0.02	-1.20	.231	-0.04 [-0.09, 0.01]	0.02	-1.60	.109
Sleep regularity $\times$ weekday xsaturday	-0.02 [-0.06, 0.03]	0.02	-0.67	.501	0.00 [-0.05, 0.04]	0.02	-0.10	.918
Sleep regularity $\times$ weekday xsunday	0.00 [-0.05, 0.05]	0.02	0.04	.969	0.02 [-0.03, 0.07]	0.02	0.86	.391
Sleep regularity $\times$ weekday xthursday	-0.05 [-0.10, -0.01]	0.02	-2.22	.027	-0.02 [-0.06, 0.03]	0.02	-0.82	.414
Sleep regularity $\times$ weekday xtuesday	-0.03 [-0.08, 0.01]	0.02	-1.48	.140	-0.03 [-0.08, 0.01]	0.02	-1.39	.166
Sleep regularity $\times$ weekday xwednesday	-0.02 [-0.06, 0.03]	0.02	-0.66	.508	0.00 [-0.05, 0.04]	0.02	-0.12	.902
Weekday xmunday $\times$ Sleep regularity <sup>2</sup>	0.01 [-0.02, 0.04]	0.02	0.83	.404	-0.01 [-0.04, 0.02]	0.01	-0.57	.568
Weekday xsaturday $\times$ Sleep regularity <sup>2</sup>	-0.02 [-0.05, 0.01]	0.02	-1.41	.159	0.01 [-0.02, 0.04]	0.02	0.76	.450
Weekday xsunday $\times$ Sleep regularity <sup>2</sup>	-0.02 [-0.05, 0.02]	0.02	-0.96	.336	0.00 [-0.03, 0.03]	0.02	0.24	.810
Weekday xthursday $\times$ Sleep regularity <sup>2</sup>	-0.03 [-0.06, 0.00]	0.02	-1.77	.077	0.01 [-0.02, 0.04]	0.02	0.55	.580
Weekday xtuesday $\times$ Sleep regularity <sup>2</sup>	0.01 [-0.03, 0.04]	0.02	0.36	.716	0.00 [-0.03, 0.03]	0.02	-0.21	.831

Table 11 continued

TITLE

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Term	Physical Activity Volume			Physical Activity Intensity						
	$\beta$	[95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p	
Weekday x wednesday $\times$ Sleep regularity <sup>2</sup>	0.00	[ -0.03, 0.04]	0.02	0.23	.815	-0.01	[ -0.04, 0.02]	0.02	-0.45	.653

*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			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Sleep duration								
(Intercept)	0.19 [-0.12, 0.49]	0.16	1.21	.233	0.18 [-0.12, 0.47]	0.15	1.18	.246
Physical activity	0.09 [0.05, 0.14]	0.02	3.98	< .001	0.07 [0.03, 0.11]	0.02	3.70	< .001
Seasonspring	-0.04 [-0.11, 0.03]	0.04	-1.13	.257	0.00 [-0.07, 0.08]	0.04	0.07	.948
Seasonsummer	-0.13 [-0.20, -0.05]	0.04	-3.31	.001	-0.10 [-0.18, -0.02]	0.04	-2.55	.011
Seasonwinter	0.09 [0.02, 0.16]	0.03	2.61	.009	0.10 [0.03, 0.17]	0.04	2.71	.007
Physical activity <sup>2</sup>	0.00 [-0.01, 0.01]	0.01	0.09	.932	0.03 [0.01, 0.06]	0.01	2.52	.012
Age	0.00 [-0.01, 0.00]	0.00	-0.51	.613	0.00 [-0.01, 0.00]	0.00	-0.77	.444
Physical activity × seasonspring	0.00 [-0.06, 0.06]	0.03	0.00	> .999	0.01 [-0.04, 0.06]	0.02	0.34	.733
Physical activity × seasonsummer	0.01 [-0.07, 0.08]	0.04	0.20	.840	-0.02 [-0.08, 0.03]	0.03	-0.84	.400
Physical activity × seasonwinter	-0.03 [-0.09, 0.04]	0.03	-0.86	.391	-0.01 [-0.06, 0.04]	0.03	-0.29	.771
Seasonspring × Physical activity <sup>2</sup>	0.00 [-0.02, 0.02]	0.01	0.03	.976	-0.04 [-0.07, -0.01]	0.02	-2.34	.019
Seasonsummer × Physical activity <sup>2</sup>	-0.02 [-0.05, 0.00]	0.01	-1.62	.105	-0.05 [-0.08, -0.01]	0.02	-2.40	.016
Seasonwinter × Physical activity <sup>2</sup>	-0.01 [-0.02, 0.01]	0.01	-0.89	.375	-0.02 [-0.05, 0.01]	0.02	-1.11	.265
Sleep efficiency								
(Intercept)	0.19 [-0.08, 0.45]	0.14	1.39	.167	0.18 [-0.09, 0.46]	0.14	1.31	.192
Physical activity	0.08 [0.03, 0.13]	0.02	3.40	.001	0.04 [0.00, 0.08]	0.02	2.01	.044
Seasonspring	0.06 [-0.01, 0.13]	0.04	1.68	.094	0.10 [0.03, 0.18]	0.04	2.64	.008
Seasonsummer	0.03 [-0.05, 0.11]	0.04	0.79	.429	0.06 [-0.02, 0.14]	0.04	1.42	.156
Seasonwinter	0.09 [0.02, 0.16]	0.04	2.52	.012	0.12 [0.05, 0.20]	0.04	3.12	.002
Physical activity <sup>2</sup>	-0.01 [-0.02, 0.00]	0.01	-2.04	.042	0.02 [0.00, 0.05]	0.01	1.68	.094
Age	0.00 [0.00, 0.01]	0.00	1.45	.147	0.00 [0.00, 0.01]	0.00	1.11	.266

Table 12 continued

TITLE

Term	Physical Activity Volume				Physical Activity Intensity			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Physical activity $\times$ seasonspring	-0.08 [-0.15, -0.01]	0.03	-2.37	.018	-0.07 [-0.12, -0.02]	0.03	-2.79	.005
Physical activity $\times$ seasonsummer	-0.02 [-0.10, 0.05]	0.04	-0.60	.547	-0.07 [-0.13, -0.01]	0.03	-2.38	.017
Physical activity $\times$ seasonwinter	-0.04 [-0.11, 0.02]	0.03	-1.31	.189	-0.03 [-0.08, 0.02]	0.03	-1.21	.226
Seasonspring $\times$ Physical activity <sup>2</sup>	0.01 [-0.01, 0.03]	0.01	0.68	.495	-0.03 [-0.07, 0.00]	0.02	-1.93	.054
Seasonsummer $\times$ Physical activity <sup>2</sup>	-0.02 [-0.05, 0.01]	0.01	-1.61	.108	-0.05 [-0.09, -0.01]	0.02	-2.68	.007
Seasonwinter $\times$ Physical activity <sup>2</sup>	0.00 [-0.02, 0.02]	0.01	0.11	.909	-0.03 [-0.06, 0.01]	0.02	-1.60	.109
Sleep onset								
(Intercept)	-0.01 [-0.36, 0.34]	0.18	-0.06	.952	0.00 [-0.34, 0.35]	0.17	0.02	.986
Physical activity	-0.04 [-0.08, -0.01]	0.02	-2.44	.015	-0.05 [-0.08, -0.02]	0.01	-3.58	< .001
Seasonspring	0.02 [-0.04, 0.07]	0.03	0.61	.544	0.02 [-0.03, 0.08]	0.03	0.76	.448
Seasonsummer	0.06 [0.00, 0.11]	0.03	1.95	.052	0.06 [0.00, 0.12]	0.03	1.95	.051
Seasonwinter	0.01 [-0.05, 0.06]	0.03	0.20	.843	0.02 [-0.04, 0.07]	0.03	0.65	.516
Physical activity <sup>2</sup>	0.00 [-0.01, 0.01]	0.00	0.38	.706	0.00 [-0.02, 0.01]	0.01	-0.46	.643
Age	0.00 [0.00, 0.00]	0.00	-0.08	.939	0.00 [0.00, 0.00]	0.00	-0.27	.786
Physical activity $\times$ seasonspring	-0.07 [-0.12, -0.02]	0.02	-2.93	.003	-0.03 [-0.06, 0.01]	0.02	-1.49	.137
Physical activity $\times$ seasonsummer	0.00 [-0.06, 0.05]	0.03	-0.16	.876	-0.01 [-0.05, 0.04]	0.02	-0.30	.763
Physical activity $\times$ seasonwinter	-0.02 [-0.07, 0.03]	0.02	-0.79	.429	-0.03 [-0.07, 0.01]	0.02	-1.66	.098
Seasonspring $\times$ Physical activity <sup>2</sup>	0.02 [0.01, 0.04]	0.01	2.70	.007	0.01 [-0.01, 0.04]	0.01	1.09	.278
Seasonsummer $\times$ Physical activity <sup>2</sup>	0.01 [-0.01, 0.03]	0.01	1.04	.297	0.00 [-0.02, 0.03]	0.01	0.32	.749
Seasonwinter $\times$ Physical activity <sup>2</sup>	0.00 [-0.01, 0.01]	0.01	-0.03	.974	-0.01 [-0.03, 0.02]	0.01	-0.70	.486
Sleep regularity								
(Intercept)	0.46 [0.22, 0.70]	0.12	3.82	< .001	0.57 [0.31, 0.84]	0.13	4.30	< .001
Physical activity	0.19 [0.14, 0.23]	0.02	7.83	< .001	0.11 [0.07, 0.15]	0.02	5.92	< .001

Table 12 continued

Term	Physical Activity Volume				Physical Activity Intensity			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Seasonspring	-0.01 [-0.08, 0.06]	0.03	-0.22	.825	-0.04 [-0.11, 0.04]	0.04	-0.96	.340
Seasonsummer	0.04 [-0.04, 0.11]	0.04	0.93	.355	0.04 [-0.04, 0.12]	0.04	0.92	.359
Seasonwinter	-0.02 [-0.08, 0.05]	0.03	-0.45	.650	0.03 [-0.05, 0.10]	0.04	0.70	.484
Physical activity <sup>2</sup>	-0.03 [-0.04, -0.02]	0.01	-5.37	< .001	-0.01 [-0.04, 0.01]	0.01	-1.09	.276
Age	0.00 [0.00, 0.00]	0.00	0.44	.661	0.00 [0.00, 0.00]	0.00	-0.25	.801
Physical activity × seasonspring	0.07 [0.01, 0.14]	0.03	2.15	.032	-0.06 [-0.11, -0.02]	0.02	-2.60	.009
Physical activity × seasonsummer	0.03 [-0.05, 0.10]	0.04	0.77	.443	-0.04 [-0.09, 0.02]	0.03	-1.39	.166
Physical activity × seasonwinter	0.01 [-0.06, 0.07]	0.03	0.21	.831	-0.04 [-0.09, 0.00]	0.02	-1.80	.072
Seasonspring × Physical activity <sup>2</sup>	-0.04 [-0.06, -0.02]	0.01	-3.89	< .001	-0.01 [-0.04, 0.03]	0.02	-0.43	.666
Seasonsummer × Physical activity <sup>2</sup>	-0.02 [-0.05, 0.01]	0.01	-1.31	.192	-0.02 [-0.05, 0.02]	0.02	-0.79	.427
Seasonwinter × Physical activity <sup>2</sup>	0.00 [-0.01, 0.02]	0.01	0.31	.758	-0.04 [-0.07, -0.01]	0.02	-2.37	.018

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			
	$\beta$	[95% CI]	SE	t	p	$\beta$	[95% CI]	SE	t	p
Sleep duration										
(Intercept)	1.49	[1.10, 1.87]	0.20	7.52	< .001	1.40	[1.16, 1.64]	0.12	11.24	< .001
Sleep duration	0.00	[-0.03, 0.03]	0.01	0.03	.978	0.02	[-0.01, 0.04]	0.01	1.35	.177
Seasonspring	0.00	[-0.06, 0.07]	0.03	0.12	.907	0.00	[-0.06, 0.06]	0.03	0.01	.994
Seasonsummer	-0.08	[-0.14, -0.01]	0.03	-2.24	.025	-0.11	[-0.17, -0.05]	0.03	-3.58	< .001
Seasonwinter	-0.01	[-0.07, 0.05]	0.03	-0.35	.728	0.00	[-0.06, 0.06]	0.03	-0.01	.991
Sleep duration <sup>2</sup>	-0.02	[-0.03, -0.01]	0.01	-2.90	.004	0.00	[-0.01, 0.01]	0.01	-0.72	.474
Age	-0.02	[-0.03, -0.02]	0.00	-9.38	< .001	-0.03	[-0.03, -0.02]	0.00	-10.29	< .001
Sleep duration × seasonspring	-0.05	[-0.08, -0.01]	0.02	-2.61	.009	-0.03	[-0.07, 0.00]	0.02	-1.85	.065
Sleep duration × seasonsummer	-0.01	[-0.05, 0.04]	0.02	-0.31	.756	0.00	[-0.04, 0.04]	0.02	-0.09	.927
Sleep duration × seasonwinter	0.02	[-0.02, 0.06]	0.02	1.14	.255	0.01	[-0.03, 0.04]	0.02	0.34	.737
Seasonspring × Sleep duration <sup>2</sup>	-0.01	[-0.03, 0.00]	0.01	-1.69	.091	-0.01	[-0.03, 0.00]	0.01	-1.77	.077
Seasonsummer × Sleep duration <sup>2</sup>	0.01	[-0.01, 0.03]	0.01	0.95	.340	-0.01	[-0.03, 0.01]	0.01	-0.89	.372
Seasonwinter × Sleep duration <sup>2</sup>	-0.01	[-0.02, 0.01]	0.01	-0.95	.341	-0.01	[-0.03, 0.00]	0.01	-1.40	.162
Sleep efficiency										
(Intercept)	1.47	[1.08, 1.85]	0.20	7.45	< .001	1.39	[1.15, 1.64]	0.13	11.06	< .001
Sleep efficiency	0.03	[0.00, 0.06]	0.01	1.92	.055	0.02	[0.00, 0.05]	0.01	1.72	.085
Seasonspring	0.01	[-0.06, 0.07]	0.03	0.17	.863	0.00	[-0.06, 0.06]	0.03	0.05	.963
Seasonsummer	-0.08	[-0.14, -0.01]	0.03	-2.22	.027	-0.13	[-0.19, -0.06]	0.03	-3.99	< .001
Seasonwinter	-0.01	[-0.07, 0.05]	0.03	-0.29	.769	0.00	[-0.06, 0.05]	0.03	-0.13	.895
Sleep efficiency <sup>2</sup>	0.00	[-0.01, 0.01]	0.00	-0.27	.787	0.00	[-0.01, 0.01]	0.00	0.69	.491
Age	-0.02	[-0.03, -0.02]	0.00	-9.25	< .001	-0.03	[-0.03, -0.02]	0.00	-10.22	< .001

Table 13 continued

Term	Physical Activity Volume				Physical Activity Intensity			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Sleep efficiency × seasonspring	-0.04 [-0.08, 0.00]	0.02	-1.88	.061	-0.04 [-0.08, 0.00]	0.02	-1.91	.056
Sleep efficiency × seasonsummer	0.00 [-0.05, 0.04]	0.02	-0.05	.957	0.00 [-0.05, 0.04]	0.02	-0.12	.907
Sleep efficiency × seasonwinter	-0.04 [-0.08, 0.00]	0.02	-1.75	.082	-0.02 [-0.06, 0.02]	0.02	-1.06	.288
Seasonspring × Sleep efficiency <sup>2</sup>	-0.01 [-0.02, 0.01]	0.01	-1.00	.315	-0.01 [-0.02, 0.00]	0.01	-1.19	.236
Seasonsummer × Sleep efficiency <sup>2</sup>	0.01 [-0.01, 0.02]	0.01	0.99	.323	0.00 [-0.01, 0.02]	0.01	0.38	.701
Seasonwinter × Sleep efficiency <sup>2</sup>	-0.01 [-0.02, 0.01]	0.01	-0.96	.337	0.00 [-0.02, 0.01]	0.01	-0.55	.585
Sleep onset								
(Intercept)	1.49 [1.10, 1.88]	0.20	7.56	< .001	1.41 [1.16, 1.65]	0.13	11.16	< .001
Sleep onset	0.02 [0.00, 0.05]	0.01	1.83	.067	0.02 [0.00, 0.05]	0.01	1.71	.087
Seasonspring	-0.03 [-0.10, 0.03]	0.03	-0.99	.321	-0.03 [-0.09, 0.03]	0.03	-1.09	.274
Seasonsummer	-0.09 [-0.15, -0.02]	0.04	-2.41	.016	-0.13 [-0.19, -0.07]	0.03	-3.96	< .001
Seasonwinter	-0.01 [-0.08, 0.05]	0.03	-0.33	.740	0.00 [-0.06, 0.06]	0.03	0.06	.955
Sleep onset <sup>2</sup>	-0.03 [-0.05, -0.01]	0.01	-3.34	.001	-0.01 [-0.02, 0.01]	0.01	-0.96	.339
Age	-0.02 [-0.03, -0.02]	0.00	-9.35	< .001	-0.03 [-0.03, -0.02]	0.00	-10.28	< .001
Sleep onset × seasonspring	-0.01 [-0.05, 0.02]	0.02	-0.77	.440	0.01 [-0.03, 0.04]	0.02	0.33	.745
Sleep onset × seasonsummer	-0.03 [-0.07, 0.02]	0.02	-1.22	.221	-0.01 [-0.05, 0.03]	0.02	-0.31	.760
Sleep onset × seasonwinter	-0.07 [-0.10, -0.03]	0.02	-3.55	< .001	-0.02 [-0.06, 0.01]	0.02	-1.39	.166
Seasonspring × Sleep onset <sup>2</sup>	0.03 [0.01, 0.05]	0.01	2.42	.016	0.02 [0.00, 0.05]	0.01	1.96	.050
Seasonsummer × Sleep onset <sup>2</sup>	0.02 [-0.01, 0.05]	0.01	1.37	.171	0.01 [-0.02, 0.03]	0.01	0.56	.572
Seasonwinter × Sleep onset <sup>2</sup>	0.00 [-0.03, 0.03]	0.01	-0.06	.949	-0.01 [-0.03, 0.02]	0.01	-0.57	.568
Sleep regularity								
(Intercept)	1.42 [1.04, 1.80]	0.19	7.36	< .001	1.38 [1.14, 1.62]	0.12	11.19	< .001
Sleep regularity	0.08 [0.05, 0.11]	0.02	5.26	< .001	0.07 [0.04, 0.10]	0.02	4.88	< .001

Table 13 continued

Term	Physical Activity Volume				Physical Activity Intensity			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Seasonspring	0.02 [-0.05, 0.08]	0.03	0.52	.600	0.00 [-0.06, 0.06]	0.03	0.03	.976
Seasonsummer	-0.08 [-0.14, -0.01]	0.03	-2.26	.024	-0.12 [-0.18, -0.06]	0.03	-3.81	< .001
Seasonwinter	-0.01 [-0.07, 0.05]	0.03	-0.20	.839	-0.01 [-0.06, 0.05]	0.03	-0.26	.796
Sleep regularity <sup>2</sup>	-0.01 [-0.02, 0.01]	0.01	-0.61	.544	-0.01 [-0.03, 0.01]	0.01	-0.92	.358
Age	-0.02 [-0.03, -0.02]	0.00	-9.43	< .001	-0.03 [-0.03, -0.02]	0.00	-10.42	< .001
Sleep regularity × seasonspring	0.02 [-0.02, 0.06]	0.02	0.82	.414	-0.04 [-0.08, 0.00]	0.02	-2.04	.042
Sleep regularity × seasonsummer	0.01 [-0.04, 0.06]	0.02	0.48	.633	-0.05 [-0.10, 0.00]	0.02	-2.02	.043
Sleep regularity × seasonwinter	0.01 [-0.03, 0.05]	0.02	0.43	.670	-0.04 [-0.08, 0.01]	0.02	-1.70	.089
Seasonspring × Sleep regularity <sup>2</sup>	-0.01 [-0.04, 0.01]	0.01	-1.04	.301	-0.01 [-0.04, 0.01]	0.01	-1.07	.285
Seasonsummer × Sleep regularity <sup>2</sup>	0.01 [-0.01, 0.04]	0.01	0.97	.331	-0.01 [-0.03, 0.02]	0.01	-0.58	.560
Seasonwinter × Sleep regularity <sup>2</sup>	0.00 [-0.03, 0.02]	0.01	-0.19	.852	0.00 [-0.02, 0.02]	0.01	-0.01	.994

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.*

Term	Physical Activity Volume				Physical Activity Intensity			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Sleep duration								
(Intercept)	0.19 [-0.08, 0.45]	0.14	1.38	.166	0.21 [-0.05, 0.47]	0.13	1.61	.107
Physical activity	0.04 [-0.03, 0.11]	0.03	1.21	.225	0.03 [-0.06, 0.12]	0.05	0.73	.465
Regioneurope	-0.19 [-0.37, -0.02]	0.09	-2.15	.032	-0.21 [-0.39, -0.02]	0.09	-2.22	.027
Regionafrica	-0.21 [-0.42, 0.00]	0.11	-2.00	.046	-0.24 [-0.45, -0.02]	0.11	-2.14	.032
Regionasia	-0.38 [-0.63, -0.12]	0.13	-2.91	.004	-0.47 [-0.70, -0.24]	0.12	-4.00	< .001
Regionnorth america	-0.01 [-0.22, 0.20]	0.11	-0.09	.931	-0.07 [-0.27, 0.14]	0.10	-0.65	.517
Regionsouth america	-0.37 [-0.56, -0.18]	0.10	-3.83	< .001	-0.40 [-0.59, -0.21]	0.10	-4.11	< .001
Physical activity <sup>2</sup>								
Age	0.01 [-0.01, 0.02]	0.01	0.90	.368	0.03 [-0.01, 0.07]	0.02	1.55	.121
0.00 [-0.01, 0.00]	0.00	-0.71	.478	0.00 [-0.01, 0.00]	0.00	-0.91	.364	
Physical activity × regioneurope	0.05 [-0.03, 0.13]	0.04	1.27	.205	0.04 [-0.06, 0.13]	0.05	0.77	.442
Physical activity × regionafrica	0.00 [-0.14, 0.14]	0.07	0.01	.991	0.06 [-0.15, 0.27]	0.11	0.56	.577
Physical activity × regionasia	0.10 [-0.12, 0.32]	0.11	0.85	.393	0.15 [-0.05, 0.36]	0.10	1.47	.142
Physical activity × regionnorth america	0.08 [-0.06, 0.22]	0.07	1.11	.269	0.03 [-0.13, 0.18]	0.08	0.37	.712
Physical activity × regionsouth america	0.07 [-0.03, 0.17]	0.05	1.32	.188	0.03 [-0.09, 0.15]	0.06	0.47	.638
Regioneurope × Physical activity <sup>2</sup>	-0.02 [-0.03, 0.00]	0.01	-1.89	.058	-0.03 [-0.07, 0.01]	0.02	-1.32	.187
Regionafrica × Physical activity <sup>2</sup>	-0.05 [-0.15, 0.06]	0.05	-0.85	.398	-0.02 [-0.15, 0.10]	0.07	-0.37	.709
Regionasia × Physical activity <sup>2</sup>	-0.08 [-0.28, 0.11]	0.10	-0.85	.394	-0.08 [-0.24, 0.09]	0.08	-0.90	.368
Regionnorth america × Physical activity <sup>2</sup>	-0.01 [-0.05, 0.03]	0.02	-0.41	.681	0.03 [-0.07, 0.13]	0.05	0.50	.614
Regionsouth america × Physical activity <sup>2</sup>	-0.09 [-0.17, -0.02]	0.04	-2.61	.009	-0.07 [-0.15, 0.01]	0.04	-1.61	.107
Sleep efficiency								
(Intercept)	0.19 [-0.05, 0.43]	0.12	1.52	.127	0.25 [0.00, 0.49]	0.12	1.97	.048

Table 14 continued

TITLE

Term	Physical Activity Volume				Physical Activity Intensity			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Physical activity	-0.06 [-0.13, 0.01]	0.04	-1.76	.078	-0.08 [-0.17, 0.01]	0.05	-1.71	.087
Regioneurope	-0.05 [-0.23, 0.13]	0.09	-0.57	.572	-0.11 [-0.29, 0.08]	0.10	-1.11	.268
Regionafrica	-0.06 [-0.27, 0.16]	0.11	-0.51	.609	-0.04 [-0.26, 0.18]	0.11	-0.37	.713
Regionasia	-0.39 [-0.65, -0.13]	0.13	-2.92	.004	-0.48 [-0.72, -0.24]	0.12	-3.96	< .001
Regionnorth america	0.19 [-0.03, 0.40]	0.11	1.72	.085	-0.02 [-0.24, 0.19]	0.11	-0.23	.821
Regionsouth america	0.02 [-0.18, 0.21]	0.10	0.19	.852	-0.13 [-0.33, 0.06]	0.10	-1.32	.186
Physical activity <sup>2</sup>	0.01 [0.00, 0.02]	0.01	1.19	.236	0.02 [-0.03, 0.06]	0.02	0.79	.432
Age	0.00 [0.00, 0.01]	0.00	1.25	.211	0.00 [0.00, 0.01]	0.00	1.05	.293
Physical activity × regioneurope	0.10 [0.02, 0.18]	0.04	2.48	.013	0.09 [-0.01, 0.18]	0.05	1.81	.071
Physical activity × regionafrica	0.01 [-0.13, 0.15]	0.07	0.14	.889	0.00 [-0.21, 0.21]	0.11	-0.02	.981
Physical activity × regionasia	0.02 [-0.20, 0.24]	0.11	0.17	.867	0.13 [-0.08, 0.33]	0.11	1.20	.231
Physical activity × regionnorth america	0.26 [0.12, 0.40]	0.07	3.58	< .001	0.23 [0.08, 0.39]	0.08	2.94	.003
Physical activity × regionsouth america	0.22 [0.11, 0.32]	0.05	4.16	< .001	0.03 [-0.09, 0.15]	0.06	0.47	.637
Regioneurope × Physical activity <sup>2</sup>	-0.02 [-0.04, 0.00]	0.01	-2.14	.032	-0.02 [-0.06, 0.03]	0.02	-0.83	.407
Regionafrica × Physical activity <sup>2</sup>	0.00 [-0.11, 0.11]	0.06	0.01	.989	0.01 [-0.12, 0.14]	0.07	0.16	.874
Regionasia × Physical activity <sup>2</sup>	-0.09 [-0.29, 0.10]	0.10	-0.95	.344	0.04 [-0.13, 0.21]	0.09	0.45	.652
Regionnorth america × Physical activity <sup>2</sup>	-0.08 [-0.12, -0.04]	0.02	-3.74	< .001	-0.06 [-0.16, 0.04]	0.05	-1.13	.260
Regionsouth america × Physical activity <sup>2</sup>	-0.18 [-0.25, -0.11]	0.04	-4.87	< .001	-0.03 [-0.12, 0.05]	0.04	-0.80	.423
Sleep onset								
(Intercept)	0.00 [-0.33, 0.33]	0.17	-0.01	.992	0.05 [-0.28, 0.37]	0.16	0.28	.779
Physical activity	-0.08 [-0.13, -0.03]	0.03	-3.12	.002	-0.10 [-0.17, -0.04]	0.03	-3.00	.003
Regioneurope	0.16 [0.02, 0.31]	0.07	2.22	.026	0.14 [-0.01, 0.29]	0.08	1.80	.072
Regionafrica	0.08 [-0.08, 0.25]	0.08	0.99	.321	0.04 [-0.14, 0.21]	0.09	0.41	.681

Table 14 continued

TITLE

Term	Physical Activity Volume			Physical Activity Intensity				
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Regionasia	0.12 [-0.08, 0.32]	0.10	1.18	.238	0.10 [-0.08, 0.29]	0.09	1.11	.265
Regionnorth america	0.11 [-0.06, 0.27]	0.08	1.27	.205	0.00 [-0.16, 0.17]	0.08	0.03	.975
Regionsouth america	0.21 [0.05, 0.36]	0.08	2.64	.008	0.14 [-0.02, 0.29]	0.08	1.77	.077
Physical activity <sup>2</sup>	0.00 [-0.01, 0.01]	0.00	0.57	.570	-0.02 [-0.05, 0.01]	0.02	-1.29	.197
Age	0.00 [0.00, 0.00]	0.00	-0.06	.953	0.00 [0.00, 0.00]	0.00	-0.15	.885
Physical activity × regioneurope	-0.01 [-0.06, 0.05]	0.03	-0.18	.858	0.04 [-0.03, 0.11]	0.04	1.09	.277
Physical activity × regionafrica	0.07 [-0.03, 0.18]	0.05	1.32	.185	0.00 [-0.16, 0.15]	0.08	-0.04	.970
Physical activity × regionasia	-0.07 [-0.24, 0.09]	0.08	-0.89	.375	-0.02 [-0.17, 0.13]	0.08	-0.30	.767
Physical activity × regionnorth america	0.12 [0.02, 0.23]	0.05	2.31	.021	0.14 [0.03, 0.25]	0.06	2.40	.016
Physical activity × regionsouth america	0.04 [-0.04, 0.11]	0.04	0.93	.352	-0.04 [-0.13, 0.05]	0.05	-0.80	.421
Regioneurope × Physical activity <sup>2</sup>	0.01 [0.00, 0.03]	0.01	2.24	.025	0.02 [-0.01, 0.05]	0.02	1.28	.201
Regionafrica × Physical activity <sup>2</sup>	-0.01 [-0.08, 0.07]	0.04	-0.13	.900	0.04 [-0.06, 0.13]	0.05	0.73	.467
Regionasia × Physical activity <sup>2</sup>	-0.03 [-0.17, 0.11]	0.07	-0.42	.676	0.07 [-0.05, 0.19]	0.06	1.13	.260
Regionnorth america × Physical activity <sup>2</sup>	0.01 [-0.02, 0.04]	0.02	0.48	.634	-0.03 [-0.10, 0.05]	0.04	-0.77	.440
Regionsouth america × Physical activity <sup>2</sup>	0.02 [-0.03, 0.07]	0.03	0.69	.487	0.11 [0.05, 0.17]	0.03	3.72	< .001
Sleep regularity								
(Intercept)	0.01 [-0.20, 0.23]	0.11	0.11	.910	0.25 [0.01, 0.48]	0.12	2.06	.039
Physical activity	0.18 [0.11, 0.24]	0.03	5.35	< .001	0.02 [-0.06, 0.11]	0.04	0.55	.585
Regioneurope	0.26 [0.10, 0.43]	0.08	3.15	.002	0.11 [-0.07, 0.28]	0.09	1.19	.236
Regionafrica	0.48 [0.28, 0.68]	0.10	4.77	< .001	0.24 [0.03, 0.46]	0.11	2.22	.027
Regionasia	0.32 [0.08, 0.56]	0.12	2.60	.009	0.17 [-0.06, 0.39]	0.12	1.43	.154
Regionnorth america	0.20 [0.00, 0.40]	0.10	1.97	.049	-0.12 [-0.33, 0.08]	0.10	-1.17	.242
Regionsouth america	0.13 [-0.05, 0.31]	0.09	1.41	.159	-0.10 [-0.29, 0.09]	0.10	-1.03	.302

Table 14 continued

## TITLE

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Term	Physical Activity Volume			Physical Activity Intensity				
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Physical activity <sup>2</sup>	-0.02 [-0.03, -0.01]	0.01	-3.98	< .001	-0.06 [-0.10, -0.02]	0.02	-3.16	.002
Age	0.00 [0.00, 0.00]	0.00	-0.48	.630	0.00 [-0.01, 0.00]	0.00	-1.53	.126
Physical activity × regioneurope	0.04 [-0.03, 0.11]	0.04	1.07	.283	0.04 [-0.05, 0.12]	0.04	0.84	.402
Physical activity × regionafrica	-0.06 [-0.19, 0.07]	0.07	-0.88	.379	0.41 [0.21, 0.60]	0.10	4.05	< .001
Physical activity × regionasia	-0.19 [-0.40, 0.01]	0.11	-1.83	.067	0.29 [0.10, 0.48]	0.10	2.99	.003
Physical activity × regionnorth america	0.19 [0.05, 0.32]	0.07	2.74	.006	0.29 [0.15, 0.44]	0.07	3.90	< .001
Physical activity × regionsouth america	0.06 [-0.04, 0.15]	0.05	1.15	.251	0.21 [0.10, 0.32]	0.06	3.65	< .001
Regioneurope × Physical activity <sup>2</sup>	-0.03 [-0.04, -0.01]	0.01	-3.22	.001	0.05 [0.00, 0.09]	0.02	2.14	.032
Regionafrica × Physical activity <sup>2</sup>	-0.14 [-0.24, -0.04]	0.05	-2.82	.005	-0.14 [-0.26, -0.02]	0.06	-2.34	.019
Regionasia × Physical activity <sup>2</sup>	-0.18 [-0.36, 0.00]	0.09	-1.97	.049	-0.13 [-0.28, 0.03]	0.08	-1.60	.109
Regionnorth america × Physical activity <sup>2</sup>	-0.08 [-0.12, -0.04]	0.02	-4.21	< .001	-0.08 [-0.17, 0.02]	0.05	-1.61	.109
Regionsouth america × Physical activity <sup>2</sup>	-0.13 [-0.19, -0.06]	0.03	-3.79	< .001	-0.07 [-0.14, 0.01]	0.04	-1.74	.081

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				
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Sleep duration								
(Intercept)	1.46 [1.08, 1.84]	0.19	7.59	< .001	1.19 [0.99, 1.39]	0.10	11.43	< .001
Sleep duration	0.02 [-0.02, 0.06]	0.02	0.86	.389	0.01 [-0.03, 0.05]	0.02	0.41	.682
Regioneurope	-0.37 [-0.55, -0.20]	0.09	-4.11	< .001	-0.23 [-0.37, -0.08]	0.07	-3.05	.002
Regionafrica	-0.26 [-0.46, -0.06]	0.10	-2.52	.012	-0.11 [-0.28, 0.06]	0.09	-1.32	.187
Regionasia	-0.58 [-0.80, -0.36]	0.11	-5.23	< .001	-0.51 [-0.70, -0.32]	0.10	-5.34	< .001
Regionnorth america	-0.54 [-0.74, -0.35]	0.10	-5.38	< .001	-0.32 [-0.49, -0.16]	0.09	-3.80	< .001
Regionsouth america	-0.44 [-0.63, -0.26]	0.09	-4.71	< .001	-0.40 [-0.55, -0.24]	0.08	-5.04	< .001
Sleep duration <sup>2</sup>	-0.02 [-0.04, -0.01]	0.01	-2.91	.004	-0.01 [-0.02, 0.01]	0.01	-0.67	.500
Age	-0.03 [-0.03, -0.02]	0.00	-9.93	< .001	-0.03 [-0.03, -0.02]	0.00	-11.49	< .001
Sleep duration × regioneurope	-0.04 [-0.08, 0.01]	0.02	-1.55	.121	0.01 [-0.03, 0.05]	0.02	0.44	.661
Sleep duration × regionafrica	-0.01 [-0.09, 0.06]	0.04	-0.28	.779	-0.04 [-0.11, 0.04]	0.04	-0.96	.339
Sleep duration × regionasia	-0.02 [-0.13, 0.09]	0.06	-0.37	.711	0.00 [-0.11, 0.11]	0.06	0.07	.943
Sleep duration × regiornnorth america	0.04 [-0.03, 0.11]	0.04	1.01	.313	0.00 [-0.07, 0.07]	0.03	0.01	.988
Sleep duration × regionsouth america	-0.04 [-0.10, 0.02]	0.03	-1.44	.151	-0.03 [-0.08, 0.03]	0.03	-1.04	.297
Regioneurope × Sleep duration <sup>2</sup>	0.00 [-0.02, 0.01]	0.01	-0.23	.819	-0.01 [-0.02, 0.01]	0.01	-0.94	.347
Regionafrica × Sleep duration <sup>2</sup>	0.01 [-0.02, 0.05]	0.02	0.66	.509	-0.02 [-0.06, 0.01]	0.02	-1.18	.237
Regionasia × Sleep duration <sup>2</sup>	0.01 [-0.04, 0.05]	0.02	0.24	.809	0.02 [-0.03, 0.06]	0.02	0.71	.480
Regionnorth america × Sleep duration <sup>2</sup>	0.02 [-0.01, 0.05]	0.02	1.43	.152	0.00 [-0.03, 0.03]	0.02	0.06	.952
Regionsouth america × Sleep duration <sup>2</sup>	0.01 [-0.01, 0.04]	0.01	1.22	.222	-0.01 [-0.03, 0.01]	0.01	-1.09	.276
Sleep efficiency								
(Intercept)	1.46 [1.08, 1.83]	0.19	7.58	< .001	1.19 [0.98, 1.39]	0.10	11.47	< .001

Table 15 continued

TITLE

Term	Physical Activity Volume				Physical Activity Intensity			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Sleep efficiency	-0.03 [-0.11, 0.05]	0.04	-0.77	.448	0.01 [-0.05, 0.06]	0.03	0.31	.760
Regioneurope	-0.40 [-0.57, -0.22]	0.09	-4.40	< .001	-0.23 [-0.38, -0.09]	0.07	-3.15	.002
Regionafrica	-0.26 [-0.45, -0.06]	0.10	-2.57	.010	-0.16 [-0.33, 0.00]	0.08	-1.94	.052
Regionasia	-0.57 [-0.79, -0.36]	0.11	-5.23	< .001	-0.49 [-0.67, -0.30]	0.09	-5.20	< .001
Regionnorth america	-0.51 [-0.71, -0.32]	0.10	-5.23	< .001	-0.33 [-0.49, -0.16]	0.08	-3.95	< .001
Regionsouth america	-0.45 [-0.64, -0.27]	0.09	-4.86	< .001	-0.42 [-0.57, -0.27]	0.08	-5.47	< .001
Sleep efficiency <sup>2</sup>	-0.03 [-0.05, -0.01]	0.01	-2.42	.017	-0.01 [-0.02, 0.01]	0.01	-0.57	.569
Age	-0.03 [-0.03, -0.02]	0.00	-9.70	< .001	-0.03 [-0.03, -0.02]	0.00	-11.49	< .001
Sleep efficiency × regioneurope	0.04 [-0.04, 0.12]	0.04	1.08	.289	0.00 [-0.06, 0.06]	0.03	-0.01	.993
Sleep efficiency × regionafrica	0.03 [-0.07, 0.14]	0.05	0.62	.539	-0.04 [-0.13, 0.05]	0.05	-0.87	.384
Sleep efficiency × regionasia	0.06 [-0.06, 0.18]	0.06	0.96	.342	0.08 [-0.02, 0.18]	0.05	1.58	.114
Sleep efficiency × regionnorth america	0.03 [-0.08, 0.14]	0.05	0.59	.561	0.03 [-0.05, 0.12]	0.05	0.76	.448
Sleep efficiency × regionsouth america	0.04 [-0.05, 0.12]	0.04	0.83	.414	-0.02 [-0.09, 0.05]	0.03	-0.63	.530
Regioneurope × Sleep efficiency <sup>2</sup>	0.03 [0.00, 0.05]	0.01	2.12	.035	0.00 [-0.02, 0.02]	0.01	0.32	.751
Regionafrica × Sleep efficiency <sup>2</sup>	0.02 [-0.01, 0.05]	0.01	1.60	.112	0.01 [-0.02, 0.03]	0.01	0.51	.608
Regionasia × Sleep efficiency <sup>2</sup>	0.03 [-0.01, 0.06]	0.02	1.54	.125	0.02 [-0.01, 0.05]	0.01	1.55	.122
Regionnorth america × Sleep efficiency <sup>2</sup>	0.02 [0.00, 0.05]	0.01	1.74	.083	0.01 [-0.01, 0.04]	0.01	0.84	.400
Regionsouth america × Sleep efficiency <sup>2</sup>	0.03 [0.00, 0.05]	0.01	2.16	.032	0.00 [-0.02, 0.02]	0.01	0.31	.756
Sleep onset								
(Intercept)	1.43 [1.05, 1.81]	0.19	7.44	< .001	1.18 [0.97, 1.38]	0.10	11.30	< .001
Sleep onset	-0.03 [-0.08, 0.01]	0.02	-1.49	.137	0.02 [-0.02, 0.07]	0.02	1.04	.299
Regioneurope	-0.34 [-0.53, -0.16]	0.09	-3.68	< .001	-0.23 [-0.38, -0.08]	0.08	-2.95	.003
Regionafrica	-0.26 [-0.48, -0.04]	0.11	-2.30	.022	-0.18 [-0.37, 0.02]	0.10	-1.80	.072

Table 15 continued

TITLE

Term	Physical Activity Volume				Physical Activity Intensity			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Regionasia	-0.53 [-0.77, -0.28]	0.12	-4.27	< .001	-0.44 [-0.66, -0.23]	0.11	-4.09	< .001
Regionnorth america	-0.50 [-0.72, -0.28]	0.11	-4.52	< .001	-0.34 [-0.52, -0.15]	0.10	-3.54	< .001
Regionsouth america	-0.44 [-0.63, -0.24]	0.10	-4.45	< .001	-0.43 [-0.59, -0.27]	0.08	-5.19	< .001
Sleep onset <sup>2</sup>	-0.01 [-0.04, 0.02]	0.02	-0.42	.676	0.01 [-0.02, 0.04]	0.02	0.49	.626
Age	-0.03 [-0.03, -0.02]	0.00	-9.87	< .001	-0.03 [-0.03, -0.02]	0.00	-11.50	< .001
Sleep onset × regioneurope	0.04 [0.01, 0.10]	0.03	1.72	.087	-0.01 [-0.06, 0.04]	0.02	-0.37	.708
Sleep onset × regionafrica	0.12 [0.01, 0.22]	0.05	2.22	.027	0.00 [-0.10, 0.11]	0.05	0.09	.928
Sleep onset × regionasia	0.06 [-0.06, 0.18]	0.06	0.95	.344	-0.01 [-0.13, 0.11]	0.06	-0.12	.904
Sleep onset × regionnorth america	0.03 [-0.06, 0.13]	0.05	0.70	.482	0.04 [-0.05, 0.13]	0.05	0.94	.346
Sleep onset × regionsouth america	0.03 [-0.03, 0.09]	0.03	0.94	.345	-0.01 [-0.07, 0.05]	0.03	-0.34	.734
Regioneurope × Sleep onset <sup>2</sup>	-0.01 [-0.05, 0.02]	0.02	-0.85	.394	-0.01 [-0.04, 0.02]	0.02	-0.56	.573
Regionafrica × Sleep onset <sup>2</sup>	0.08 [-0.05, 0.21]	0.07	1.21	.227	0.03 [-0.09, 0.16]	0.06	0.49	.628
Regionasia × Sleep onset <sup>2</sup>	-0.02 [-0.16, 0.13]	0.08	-0.22	.829	-0.06 [-0.20, 0.08]	0.07	-0.86	.391
Regionnorth america × Sleep onset <sup>2</sup>	0.02 [-0.09, 0.13]	0.06	0.30	.765	0.04 [-0.07, 0.14]	0.05	0.66	.507
Regionsouth america × Sleep onset <sup>2</sup>	0.01 [-0.03, 0.06]	0.02	0.47	.638	0.01 [-0.04, 0.05]	0.02	0.29	.775
Sleep regularity								
(Intercept)	1.45 [1.08, 1.82]	0.19	7.63	< .001	1.17 [0.97, 1.38]	0.10	11.31	< .001
Sleep regularity	0.09 [0.05, 0.13]	0.02	4.62	< .001	-0.03 [-0.07, 0.00]	0.02	-1.75	.081
Regioneurope	-0.41 [-0.59, -0.24]	0.09	-4.64	< .001	-0.21 [-0.36, -0.07]	0.07	-2.86	.004
Regionafrica	-0.27 [-0.46, -0.08]	0.10	-2.72	.006	-0.14 [-0.31, 0.02]	0.08	-1.71	.088
Regionasia	-0.62 [-0.83, -0.40]	0.11	-5.65	< .001	-0.47 [-0.66, -0.29]	0.09	-5.00	< .001
Regionnorth america	-0.51 [-0.70, -0.32]	0.10	-5.21	< .001	-0.27 [-0.43, -0.11]	0.08	-3.24	.001
Regionsouth america	-0.46 [-0.64, -0.28]	0.09	-4.95	< .001	-0.40 [-0.55, -0.25]	0.08	-5.16	< .001

Table 15 continued

TITLE

Term	Physical Activity Volume				Physical Activity Intensity			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Sleep regularity <sup>2</sup>	-0.02 [-0.04, 0.01]	0.01	-1.43	.152	-0.01 [-0.04, 0.01]	0.01	-1.39	.163
Age	-0.02 [-0.03, -0.02]	0.00	-9.98	< .001	-0.03 [-0.03, -0.02]	0.00	-11.45	< .001
Sleep regularity × regioneurope	0.01 [-0.04, 0.05]	0.02	0.32	.749	0.08 [0.04, 0.12]	0.02	3.92	< .001
Sleep regularity × regionafrica	-0.10 [-0.19, -0.02]	0.04	-2.49	.013	0.07 [-0.01, 0.15]	0.04	1.84	.066
Sleep regularity × regionasia	-0.01 [-0.11, 0.09]	0.05	-0.18	.856	0.14 [0.04, 0.24]	0.05	2.72	.007
Sleep regularity × regionnorth america	0.03 [-0.06, 0.11]	0.04	0.62	.535	0.12 [0.04, 0.20]	0.04	2.99	.003
Sleep regularity × regionsouth america	0.04 [-0.02, 0.09]	0.03	1.30	.192	0.12 [0.07, 0.18]	0.03	4.46	< .001
Regioneurope × Sleep regularity <sup>2</sup>	0.01 [-0.02, 0.03]	0.01	0.61	.539	0.00 [-0.03, 0.02]	0.01	-0.38	.705
Regionafrica × Sleep regularity <sup>2</sup>	-0.03 [-0.07, 0.01]	0.02	-1.52	.129	0.01 [-0.03, 0.05]	0.02	0.43	.665
Regionasia × Sleep regularity <sup>2</sup>	0.02 [-0.05, 0.08]	0.03	0.50	.617	0.00 [-0.06, 0.06]	0.03	0.04	.972
Regionnorth america × Sleep regularity <sup>2</sup>	0.01 [-0.03, 0.06]	0.02	0.60	.551	-0.01 [-0.06, 0.03]	0.02	-0.53	.593
Regionsouth america × Sleep regularity <sup>2</sup>	0.03 [0.00, 0.06]	0.02	1.89	.059	0.03 [0.00, 0.06]	0.02	2.19	.029

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			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
<b>Sleep duration</b>								
(Intercept)	0.60 [0.27, 0.93]	0.17	3.56	.001	0.56 [0.24, 0.88]	0.16	3.40	.001
Physical activity	0.04 [-0.10, 0.17]	0.07	0.53	.596	0.06 [-0.04, 0.16]	0.05	1.16	.245
Daylight hours	-0.04 [-0.05, -0.02]	0.01	-5.92	< .001	-0.03 [-0.04, -0.02]	0.01	-4.90	< .001
Physical activity <sup>2</sup>	-0.01 [-0.05, 0.04]	0.02	-0.26	.794	0.04 [-0.02, 0.10]	0.03	1.30	.195
Age	0.00 [-0.01, 0.00]	0.00	-0.53	.596	0.00 [-0.01, 0.00]	0.00	-0.76	.450
Physical activity × daylight hours	0.00 [-0.01, 0.02]	0.01	0.74	.461	0.00 [-0.01, 0.01]	0.00	0.25	.799
Daylight hours × Physical activity <sup>2</sup>	0.00 [0.00, 0.00]	0.00	0.06	.955	0.00 [-0.01, 0.00]	0.00	-1.08	.282
<b>Sleep efficiency</b>								
(Intercept)	0.32 [0.02, 0.62]	0.15	2.09	.038	0.30 [-0.01, 0.62]	0.16	1.89	.060
Physical activity	0.11 [-0.03, 0.25]	0.07	1.56	.118	0.08 [-0.02, 0.18]	0.05	1.59	.111
Daylight hours	-0.01 [-0.02, 0.00]	0.01	-1.25	.211	0.00 [-0.02, 0.01]	0.01	-0.67	.504
Physical activity <sup>2</sup>	-0.02 [-0.06, 0.03]	0.02	-0.79	.430	0.03 [-0.03, 0.10]	0.03	1.05	.294
Age	0.00 [0.00, 0.01]	0.00	1.50	.135	0.00 [0.00, 0.01]	0.00	1.22	.224
Physical activity × daylight hours	-0.01 [-0.02, 0.01]	0.01	-1.00	.315	-0.01 [-0.01, 0.00]	0.00	-1.64	.100
Daylight hours × Physical activity <sup>2</sup>	0.00 [0.00, 0.00]	0.00	0.25	.803	0.00 [-0.01, 0.00]	0.00	-1.22	.224
<b>Sleep onset</b>								
(Intercept)	-0.06 [-0.43, 0.30]	0.19	-0.35	.728	-0.03 [-0.39, 0.32]	0.18	-0.19	.850
Physical activity	-0.06 [-0.16, 0.04]	0.05	-1.11	.265	-0.05 [-0.13, 0.02]	0.04	-1.44	.151
Daylight hours	0.01 [0.00, 0.01]	0.00	1.30	.194	0.00 [-0.01, 0.01]	0.00	0.91	.362
Physical activity <sup>2</sup>	-0.03 [-0.06, 0.00]	0.02	-1.73	.084	-0.03 [-0.07, 0.02]	0.02	-1.12	.264
Age	0.00 [0.00, 0.00]	0.00	-0.10	.917	0.00 [0.00, 0.00]	0.00	-0.21	.835

Table 16 continued

Term	Physical Activity Volume				Physical Activity Intensity			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Physical activity $\times$ daylight hours	0.00 [-0.01, 0.01]	0.00	-0.26	.798	0.00 [-0.01, 0.00]	0.00	-0.45	.653
Daylight hours $\times$ Physical activity <sup>2</sup>	0.00 [0.00, 0.01]	0.00	2.14	.033	0.00 [0.00, 0.01]	0.00	1.02	.307
Sleep regularity								
(Intercept)	0.41 [0.15, 0.67]	0.13	3.14	.002	0.59 [0.31, 0.88]	0.14	4.10	< .001
Physical activity	0.21 [0.07, 0.34]	0.07	3.04	.002	0.15 [0.06, 0.25]	0.05	3.11	.002
Daylight hours	0.00 [-0.01, 0.02]	0.01	0.62	.535	0.00 [-0.01, 0.01]	0.01	-0.28	.779
Physical activity <sup>2</sup>	0.03 [-0.01, 0.07]	0.02	1.48	.139	-0.06 [-0.12, 0.00]	0.03	-1.82	.069
Age	0.00 [0.00, 0.00]	0.00	0.45	.651	0.00 [0.00, 0.00]	0.00	-0.22	.829
Physical activity $\times$ daylight hours	0.00 [-0.01, 0.01]	0.01	0.08	.934	-0.01 [-0.01, 0.00]	0.00	-1.66	.096
Daylight hours $\times$ Physical activity <sup>2</sup>	-0.01 [-0.01, 0.00]	0.00	-3.31	.001	0.00 [0.00, 0.01]	0.00	0.82	.411

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			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Sleep duration								
(Intercept)	1.41 [1.01, 1.81]	0.21	6.87	< .001	1.52 [1.26, 1.78]	0.13	11.43	< .001
Sleep duration	0.05 [-0.02, 0.12]	0.04	1.38	.167	0.03 [-0.04, 0.11]	0.04	0.95	.343
Daylight hours	0.01 [-0.01, 0.02]	0.01	0.97	.334	-0.01 [-0.02, 0.00]	0.01	-2.29	.022
Sleep duration <sup>2</sup>	-0.02 [-0.05, 0.02]	0.02	-0.98	.327	-0.01 [-0.04, 0.03]	0.02	-0.33	.744
Age	-0.02 [-0.03, -0.02]	0.00	-9.41	< .001	-0.03 [-0.03, -0.02]	0.00	-10.38	< .001
Sleep duration × daylight hours	-0.01 [-0.01, 0.00]	0.00	-1.59	.111	0.00 [-0.01, 0.00]	0.00	-0.71	.475
Daylight hours × Sleep duration <sup>2</sup>	0.00 [0.00, 0.00]	0.00	-0.17	.861	0.00 [0.00, 0.00]	0.00	-0.35	.724
Sleep efficiency								
(Intercept)	1.40 [1.00, 1.80]	0.21	6.83	< .001	1.52 [1.25, 1.78]	0.13	11.27	< .001
Sleep efficiency	-0.01 [-0.10, 0.07]	0.04	-0.28	.777	0.05 [-0.04, 0.13]	0.04	1.10	.271
Daylight hours	0.00 [-0.01, 0.02]	0.01	0.84	.401	-0.01 [-0.02, 0.00]	0.01	-2.30	.022
Sleep efficiency <sup>2</sup>	-0.02 [-0.05, 0.01]	0.02	-1.45	.148	-0.01 [-0.04, 0.02]	0.02	-0.45	.655
Age	-0.02 [-0.03, -0.02]	0.00	-9.36	< .001	-0.03 [-0.03, -0.02]	0.00	-10.33	< .001
Sleep efficiency × daylight hours	0.00 [-0.01, 0.01]	0.00	0.45	.654	0.00 [-0.01, 0.00]	0.00	-0.92	.357
Daylight hours × Sleep efficiency <sup>2</sup>	0.00 [0.00, 0.00]	0.00	1.25	.211	0.00 [0.00, 0.00]	0.00	0.49	.624
Sleep onset								
(Intercept)	1.46 [1.06, 1.86]	0.21	7.09	< .001	1.56 [1.30, 1.83]	0.13	11.62	< .001
Sleep onset	-0.04 [-0.12, 0.03]	0.04	-1.10	.272	0.01 [-0.06, 0.09]	0.04	0.33	.745
Daylight hours	0.00 [-0.01, 0.01]	0.01	0.11	.909	-0.02 [-0.03, -0.01]	0.01	-2.96	.003
Sleep onset <sup>2</sup>	-0.08 [-0.13, -0.03]	0.03	-2.98	.003	-0.05 [-0.10, 0.00]	0.03	-1.87	.061
Age	-0.02 [-0.03, -0.02]	0.00	-9.39	< .001	-0.03 [-0.03, -0.02]	0.00	-10.35	< .001

Table 17 continued

Term	Physical Activity Volume				Physical Activity Intensity			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Sleep onset × daylight hours	0.00 [0.00, 0.01]	0.00	1.06	.290	0.00 [-0.01, 0.01]	0.00	0.08	.933
Daylight hours × Sleep onset <sup>2</sup>	0.01 [0.00, 0.01]	0.00	2.41	.016	0.00 [0.00, 0.01]	0.00	1.90	.057
Sleep regularity								
(Intercept)	1.33 [0.94, 1.73]	0.20	6.62	< .001	1.51 [1.25, 1.77]	0.13	11.39	< .001
Sleep regularity	0.11 [0.02, 0.19]	0.04	2.46	.014	0.16 [0.08, 0.24]	0.04	3.91	< .001
Daylight hours	0.01 [0.00, 0.02]	0.01	1.17	.242	-0.01 [-0.02, 0.00]	0.01	-2.44	.015
Sleep regularity <sup>2</sup>	0.00 [-0.05, 0.05]	0.03	-0.01	.989	-0.02 [-0.07, 0.03]	0.02	-0.68	.496
Age	-0.02 [-0.03, -0.02]	0.00	-9.52	< .001	-0.03 [-0.03, -0.02]	0.00	-10.48	< .001
Sleep regularity × daylight hours	0.00 [-0.01, 0.01]	0.00	-0.32	.747	-0.01 [-0.02, 0.00]	0.00	-2.92	.004
Daylight hours × Sleep regularity <sup>2</sup>	0.00 [0.00, 0.00]	0.00	-0.30	.767	0.00 [0.00, 0.00]	0.00	0.14	.887

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			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
<b>Sleep duration</b>								
(Intercept)	0.76 [0.42, 1.10]	0.17	4.39	< .001	0.66 [0.32, 1.00]	0.17	3.79	< .001
Physical activity	0.12 [0.07, 0.16]	0.02	5.17	< .001	0.09 [0.04, 0.13]	0.02	3.86	< .001
Wrist	-0.69 [-1.01, -0.37]	0.16	-4.23	< .001	-0.57 [-0.89, -0.25]	0.16	-3.51	< .001
Physical activity <sup>2</sup>	-0.04 [-0.08, 0.00]	0.02	-1.95	.051	0.01 [-0.02, 0.04]	0.02	0.63	.528
Age	0.00 [-0.01, 0.00]	0.00	-0.93	.352	0.00 [-0.01, 0.00]	0.00	-0.91	.361
Physical activity × wrist	-0.05 [-0.10, 0.01]	0.03	-1.71	.087	-0.02 [-0.07, 0.03]	0.03	-0.82	.410
Wrist × Physical activity <sup>2</sup>	0.04 [0.00, 0.08]	0.02	1.91	.056	0.00 [-0.04, 0.03]	0.02	-0.22	.823
<b>Sleep efficiency</b>								
(Intercept)	-0.34 [-0.46, -0.22]	0.06	-5.61	< .001	-0.45 [-0.58, -0.33]	0.06	-7.15	< .001
Physical activity	0.14 [0.10, 0.19]	0.02	6.37	< .001	0.07 [0.03, 0.12]	0.02	3.18	.001
Wrist	0.83 [0.73, 0.93]	0.05	16.13	< .001	0.94 [0.83, 1.05]	0.05	17.19	< .001
Physical activity <sup>2</sup>	-0.08 [-0.12, -0.04]	0.02	-3.90	< .001	-0.02 [-0.05, 0.01]	0.02	-1.22	.224
Age	0.00 [0.00, 0.00]	0.00	-0.42	.674	0.00 [0.00, 0.00]	0.00	-0.31	.754
Physical activity × wrist	-0.19 [-0.25, -0.13]	0.03	-6.59	< .001	-0.10 [-0.16, -0.05]	0.03	-3.95	< .001
Wrist × Physical activity <sup>2</sup>	0.08 [0.04, 0.12]	0.02	4.01	< .001	0.01 [-0.03, 0.04]	0.02	0.51	.608
<b>Sleep onset</b>								
(Intercept)	-1.00 [-1.45, -0.55]	0.23	-4.38	< .001	-0.98 [-1.42, -0.54]	0.23	-4.36	< .001
Physical activity	0.00 [-0.04, 0.03]	0.02	-0.23	.818	-0.04 [-0.07, 0.00]	0.02	-2.10	.036
Wrist	1.27 [0.80, 1.75]	0.24	5.25	< .001	1.24 [0.77, 1.71]	0.24	5.20	< .001
Physical activity <sup>2</sup>	0.00 [-0.03, 0.03]	0.01	0.13	.894	-0.01 [-0.03, 0.02]	0.01	-0.46	.646
Age	0.00 [0.00, 0.00]	0.00	-0.54	.586	0.00 [0.00, 0.00]	0.00	-0.49	.626

Table 18 continued

Term	Physical Activity Volume				Physical Activity Intensity			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Physical activity $\times$ wrist	-0.11 [-0.15, -0.06]	0.02	-4.95	< .001	-0.05 [-0.09, -0.02]	0.02	-2.73	.006
Wrist $\times$ Physical activity <sup>2</sup>	0.01 [-0.02, 0.04]	0.02	0.68	.496	0.00 [-0.03, 0.02]	0.01	-0.13	.895
Sleep regularity								
(Intercept)	0.30 [-0.01, 0.62]	0.16	1.88	.061	0.15 [-0.19, 0.49]	0.17	0.87	.384
Physical activity	0.22 [0.18, 0.26]	0.02	10.42	< .001	0.27 [0.23, 0.31]	0.02	12.40	< .001
Wrist	0.27 [-0.04, 0.58]	0.16	1.70	.089	0.64 [0.30, 0.97]	0.17	3.75	< .001
Physical activity <sup>2</sup>	-0.17 [-0.21, -0.14]	0.02	-9.15	< .001	-0.10 [-0.13, -0.07]	0.02	-6.77	< .001
Age	0.00 [0.00, 0.00]	0.00	-0.26	.795	0.00 [-0.01, 0.00]	0.00	-1.64	.101
Physical activity $\times$ wrist	-0.05 [-0.11, 0.00]	0.03	-1.93	.054	-0.26 [-0.31, -0.22]	0.03	-10.54	< .001
Wrist $\times$ Physical activity <sup>2</sup>	0.14 [0.11, 0.18]	0.02	7.52	< .001	0.07 [0.04, 0.10]	0.02	4.05	< .001

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			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
<b>Sleep duration</b>								
(Intercept)	0.24 [-0.25, 0.73]	0.25	0.95	.340	1.06 [0.70, 1.41]	0.18	5.84	< .001
Sleep duration	0.01 [-0.01, 0.04]	0.01	1.02	.307	0.00 [-0.02, 0.03]	0.01	0.31	.760
Wrist	1.53 [1.01, 2.06]	0.27	5.71	< .001	0.43 [0.08, 0.78]	0.18	2.42	.015
Sleep duration <sup>2</sup>	0.00 [-0.01, 0.01]	0.01	-0.51	.611	-0.01 [-0.02, 0.00]	0.01	-1.80	.073
Age	-0.02 [-0.03, -0.02]	0.00	-10.35	< .001	-0.03 [-0.03, -0.02]	0.00	-10.91	< .001
Sleep duration × wrist	-0.03 [-0.06, 0.00]	0.01	-2.24	.025	0.01 [-0.02, 0.04]	0.01	0.62	.535
Wrist × Sleep duration <sup>2</sup>	-0.02 [-0.04, -0.01]	0.01	-3.62	< .001	0.00 [-0.01, 0.01]	0.01	-0.24	.813
<b>Sleep efficiency</b>								
(Intercept)	0.25 [-0.24, 0.74]	0.25	0.99	.321	1.05 [0.69, 1.41]	0.18	5.75	< .001
Sleep efficiency	0.03 [0.01, 0.06]	0.01	2.63	.009	0.03 [0.01, 0.05]	0.01	2.53	.011
Wrist	1.51 [0.98, 2.03]	0.27	5.64	< .001	0.43 [0.08, 0.78]	0.18	2.40	.016
Sleep efficiency <sup>2</sup>	0.00 [0.00, 0.01]	0.00	0.37	.712	0.00 [0.00, 0.01]	0.00	1.47	.141
Age	-0.02 [-0.03, -0.02]	0.00	-10.30	< .001	-0.03 [-0.03, -0.02]	0.00	-10.80	< .001
Sleep efficiency × wrist	-0.04 [-0.08, -0.01]	0.02	-2.44	.016	-0.04 [-0.07, -0.01]	0.02	-2.45	.014
Wrist × Sleep efficiency <sup>2</sup>	-0.01 [-0.02, 0.00]	0.01	-1.15	.251	-0.01 [-0.02, 0.00]	0.01	-1.13	.260
<b>Sleep onset</b>								
(Intercept)	0.23 [-0.26, 0.72]	0.25	0.91	.360	1.04 [0.68, 1.40]	0.18	5.70	< .001
Sleep onset	0.04 [0.01, 0.07]	0.02	2.39	.017	0.04 [0.01, 0.07]	0.01	2.87	.004
Wrist	1.53 [1.01, 2.06]	0.27	5.73	< .001	0.43 [0.08, 0.79]	0.18	2.41	.016
Sleep onset <sup>2</sup>	0.03 [-0.01, 0.06]	0.02	1.37	.172	0.03 [-0.01, 0.07]	0.02	1.67	.096
Age	-0.02 [-0.03, -0.02]	0.00	-10.35	< .001	-0.03 [-0.03, -0.02]	0.00	-10.81	< .001

Table 19 continued

Term	Physical Activity Volume				Physical Activity Intensity			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Sleep onset × wrist	-0.05 [-0.09, -0.01]	0.02	-2.68	.007	-0.04 [-0.07, 0.00]	0.02	-1.90	.057
Wrist × Sleep onset <sup>2</sup>	-0.04 [-0.08, 0.00]	0.02	-1.93	.054	-0.03 [-0.06, 0.01]	0.02	-1.48	.139
Sleep regularity								
(Intercept)	0.22 [-0.26, 0.70]	0.24	0.90	.366	1.05 [0.70, 1.40]	0.18	5.81	< .001
Sleep regularity	0.11 [0.08, 0.13]	0.01	7.78	< .001	0.11 [0.08, 0.14]	0.01	8.29	< .001
Wrist	1.48 [0.96, 2.00]	0.26	5.61	< .001	0.42 [0.07, 0.77]	0.18	2.37	.018
Sleep regularity <sup>2</sup>	0.00 [-0.02, 0.01]	0.01	-0.55	.585	0.00 [-0.01, 0.02]	0.01	0.15	.878
Age	-0.02 [-0.03, -0.02]	0.00	-10.49	< .001	-0.03 [-0.03, -0.02]	0.00	-10.88	< .001
Sleep regularity × wrist	-0.02 [-0.05, 0.01]	0.02	-1.24	.215	-0.10 [-0.14, -0.07]	0.02	-6.35	< .001
Wrist × Sleep regularity <sup>2</sup>	0.00 [-0.02, 0.01]	0.01	-0.46	.646	-0.02 [-0.03, 0.00]	0.01	-1.68	.092

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				
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p		
<b>Sleep duration</b>										
(Intercept)	0.23 [-0.09, 0.55]	0.16	1.39	.173	0.23 [-0.08, 0.54]	0.16	1.47	.149		
Physical activity	0.09 [0.04, 0.14]	0.03	3.52	< .001	0.09 [0.05, 0.13]	0.02	4.25	< .001		
Pa mostactivehr	0.00 [-0.01, 0.00]	0.00	-2.06	.039	0.00 [-0.01, 0.00]	0.00	-1.61	.108		
Physical activity <sup>2</sup>	0.00 [-0.02, 0.01]	0.01	-0.72	.473	0.00 [-0.02, 0.03]	0.01	0.31	.756		
Age	0.00 [-0.01, 0.00]	0.00	-0.73	.466	0.00 [-0.01, 0.00]	0.00	-0.89	.375		
Physical activity × pa mostactivehr	0.00 [0.00, 0.00]	0.00	-0.01	.995	0.00 [0.00, 0.00]	0.00	-0.77	.441		
Pa mostactivehr × Physical activity <sup>2</sup>	0.00 [0.00, 0.00]	0.00	0.07	.940	0.00 [0.00, 0.00]	0.00	0.32	.748		
<b>Sleep efficiency</b>										
(Intercept)	0.24 [-0.03, 0.51]	0.14	1.76	.081	0.27 [0.00, 0.55]	0.14	1.94	.055		
Physical activity	-0.03 [-0.08, 0.02]	0.03	-1.05	.292	-0.01 [-0.05, 0.03]	0.02	-0.35	.729		
Pa mostactivehr	0.00 [0.00, 0.00]	0.00	-0.19	.853	0.00 [0.00, 0.00]	0.00	-0.56	.573		
Physical activity <sup>2</sup>	0.00 [-0.01, 0.02]	0.01	0.68	.494	0.00 [-0.03, 0.03]	0.01	0.04	.969		
Age	0.00 [0.00, 0.01]	0.00	1.35	.177	0.00 [0.00, 0.01]	0.00	1.14	.254		
Physical activity × pa mostactivehr	0.01 [0.00, 0.01]	0.00	3.17	.002	0.00 [0.00, 0.00]	0.00	0.46	.647		
Pa mostactivehr × Physical activity <sup>2</sup>	0.00 [0.00, 0.00]	0.00	-2.66	.008	0.00 [0.00, 0.00]	0.00	-0.36	.721		
<b>Sleep onset</b>										
(Intercept)	-0.07 [-0.42, 0.29]	0.18	-0.36	.718	-0.05 [-0.39, 0.30]	0.18	-0.28	.782		
Physical activity	-0.09 [-0.13, -0.06]	0.02	-5.11	< .001	-0.05 [-0.08, -0.02]	0.01	-3.56	< .001		
Pa mostactivehr	0.01 [0.00, 0.01]	0.00	5.08	< .001	0.01 [0.00, 0.01]	0.00	4.09	< .001		
Physical activity <sup>2</sup>	0.01 [0.00, 0.02]	0.01	1.98	.048	-0.01 [-0.03, 0.01]	0.01	-0.58	.559		
Age	0.00 [0.00, 0.00]	0.00	-0.08	.939	0.00 [0.00, 0.00]	0.00	-0.15	.878		

Table 20 continued

Term	Physical Activity Volume				Physical Activity Intensity			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Physical activity × pa mostactivehr	0.00 [0.00, 0.00]	0.00	1.66	.096	0.00 [0.00, 0.00]	0.00	-1.46	.143
Pa mostactivehr × Physical activity <sup>2</sup>	0.00 [0.00, 0.00]	0.00	-1.00	.317	0.00 [0.00, 0.00]	0.00	0.41	.681
Sleep regularity								
(Intercept)	0.49 [0.25, 0.73]	0.12	4.04	< .001	0.63 [0.37, 0.89]	0.13	4.76	< .001
Physical activity	0.12 [0.08, 0.17]	0.02	5.10	< .001	0.01 [-0.02, 0.05]	0.02	0.76	.445
Pa mostactivehr	0.00 [0.00, 0.00]	0.00	-1.20	.230	0.00 [-0.01, 0.00]	0.00	-2.57	.010
Physical activity <sup>2</sup>	-0.02 [-0.04, -0.01]	0.01	-3.46	.001	-0.05 [-0.07, -0.02]	0.01	-3.74	< .001
Age	0.00 [0.00, 0.00]	0.00	0.28	.781	0.00 [0.00, 0.00]	0.00	-0.35	.723
Physical activity × pa mostactivehr	0.01 [0.00, 0.01]	0.00	4.09	< .001	0.00 [0.00, 0.01]	0.00	3.58	< .001
Pa mostactivehr × Physical activity <sup>2</sup>	0.00 [0.00, 0.00]	0.00	-2.35	.019	0.00 [0.00, 0.00]	0.00	1.54	.125

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			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
<b>Sleep duration</b>								
(Intercept)	1.41 [1.02, 1.80]	0.20	7.06	< .001	1.37 [1.11, 1.62]	0.13	10.56	< .001
Sleep duration	0.01 [-0.02, 0.04]	0.02	0.71	.480	0.03 [0.00, 0.06]	0.01	1.95	.051
Pa mostactivehr	0.01 [0.00, 0.01]	0.00	4.63	< .001	0.00 [0.00, 0.00]	0.00	1.26	.206
Sleep duration <sup>2</sup>	-0.02 [-0.03, -0.01]	0.01	-3.04	.002	-0.01 [-0.02, 0.01]	0.01	-0.85	.397
Age	-0.02 [-0.03, -0.02]	0.00	-9.37	< .001	-0.03 [-0.03, -0.02]	0.00	-10.34	< .001
Sleep duration × pa mostactivehr	0.00 [0.00, 0.00]	0.00	-1.48	.140	0.00 [0.00, 0.00]	0.00	-1.47	.141
Pa mostactivehr × Sleep duration <sup>2</sup>	0.00 [0.00, 0.00]	0.00	0.20	.839	0.00 [0.00, 0.00]	0.00	-0.92	.358
<b>Sleep efficiency</b>								
(Intercept)	1.40 [1.01, 1.79]	0.20	7.00	< .001	1.37 [1.11, 1.63]	0.13	10.46	< .001
Sleep efficiency	-0.02 [-0.05, 0.02]	0.02	-0.90	.367	-0.02 [-0.06, 0.01]	0.02	-1.43	.151
Pa mostactivehr	0.00 [0.00, 0.01]	0.00	4.17	< .001	0.00 [0.00, 0.00]	0.00	0.43	.664
Sleep efficiency <sup>2</sup>	-0.01 [-0.02, 0.00]	0.01	-2.05	.041	-0.01 [-0.02, 0.00]	0.01	-1.16	.245
Age	-0.02 [-0.03, -0.02]	0.00	-9.35	< .001	-0.03 [-0.03, -0.02]	0.00	-10.30	< .001
Sleep efficiency × pa mostactivehr	0.00 [0.00, 0.00]	0.00	1.48	.139	0.00 [0.00, 0.01]	0.00	2.12	.034
Pa mostactivehr × Sleep efficiency <sup>2</sup>	0.00 [0.00, 0.00]	0.00	1.64	.102	0.00 [0.00, 0.00]	0.00	1.42	.157
<b>Sleep onset</b>								
(Intercept)	1.41 [1.01, 1.80]	0.20	7.04	< .001	1.35 [1.09, 1.61]	0.13	10.29	< .001
Sleep onset	-0.02 [-0.05, 0.01]	0.02	-1.49	.135	-0.01 [-0.04, 0.02]	0.01	-0.74	.461
Pa mostactivehr	0.00 [0.00, 0.01]	0.00	3.63	< .001	0.00 [0.00, 0.00]	0.00	1.57	.117
Sleep onset <sup>2</sup>	-0.03 [-0.05, -0.01]	0.01	-2.68	.007	0.01 [-0.01, 0.03]	0.01	1.12	.261
Age	-0.02 [-0.03, -0.02]	0.00	-9.36	< .001	-0.03 [-0.03, -0.02]	0.00	-10.32	< .001

Table 21 continued

Term	Physical Activity Volume				Physical Activity Intensity			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Sleep onset × pa mostactivehr	0.00 [0.00, 0.00]	0.00	1.71	.088	0.00 [0.00, 0.00]	0.00	2.19	.028
Pa mostactivehr × Sleep onset <sup>2</sup>	0.00 [0.00, 0.00]	0.00	1.35	.177	0.00 [0.00, 0.00]	0.00	-1.22	.224
Sleep regularity								
(Intercept)	1.33 [0.94, 1.71]	0.20	6.77	< .001	1.34 [1.09, 1.59]	0.13	10.41	< .001
Sleep regularity	0.05 [0.02, 0.08]	0.02	2.99	.003	0.01 [-0.02, 0.04]	0.02	0.51	.610
Pa mostactivehr	0.01 [0.00, 0.01]	0.00	5.95	< .001	0.00 [0.00, 0.00]	0.00	1.67	.095
Sleep regularity <sup>2</sup>	0.01 [-0.01, 0.03]	0.01	0.83	.408	-0.01 [-0.03, 0.01]	0.01	-0.69	.493
Age	-0.02 [-0.03, -0.02]	0.00	-9.49	< .001	-0.03 [-0.03, -0.02]	0.00	-10.43	< .001
Sleep regularity × pa mostactivehr	0.00 [0.00, 0.01]	0.00	2.94	.003	0.00 [0.00, 0.01]	0.00	2.45	.014
Pa mostactivehr × Sleep regularity <sup>2</sup>	0.00 [0.00, 0.00]	0.00	-1.65	.099	0.00 [0.00, 0.00]	0.00	-0.71	.475

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

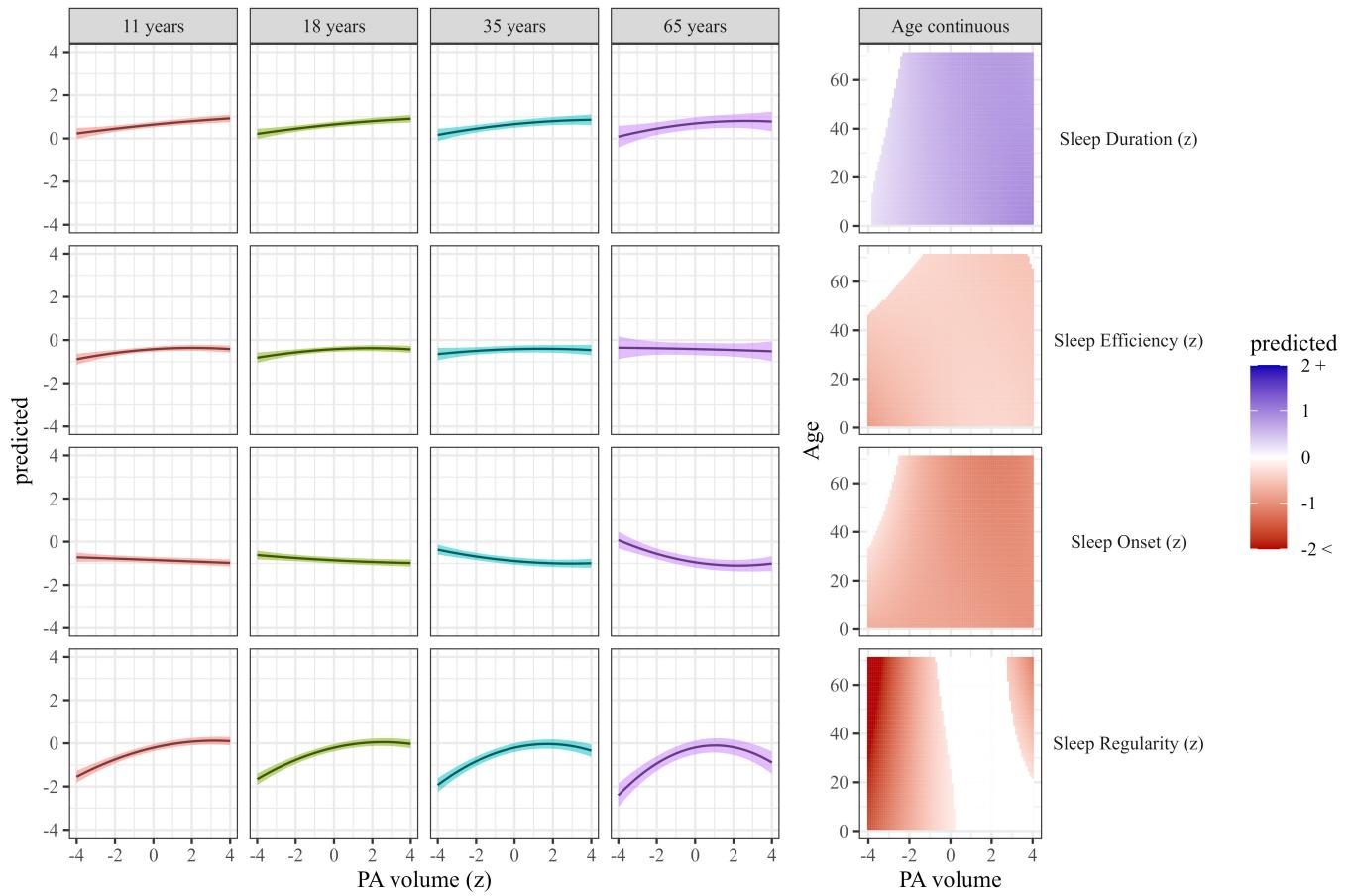


Figure 1. Sleep metrics on Physical activity volume

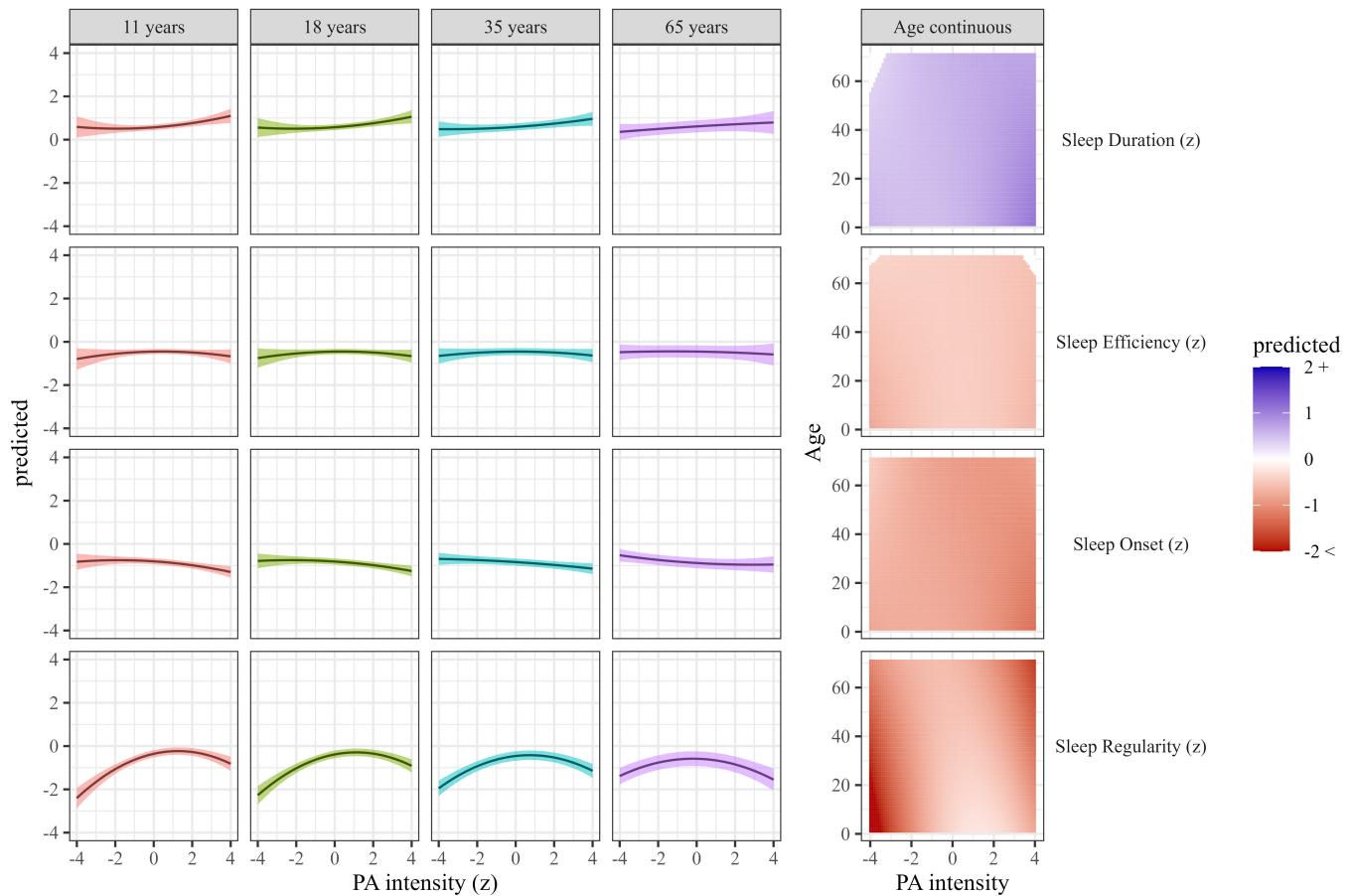


Figure 2. Sleep metrics on Physical activity intensity

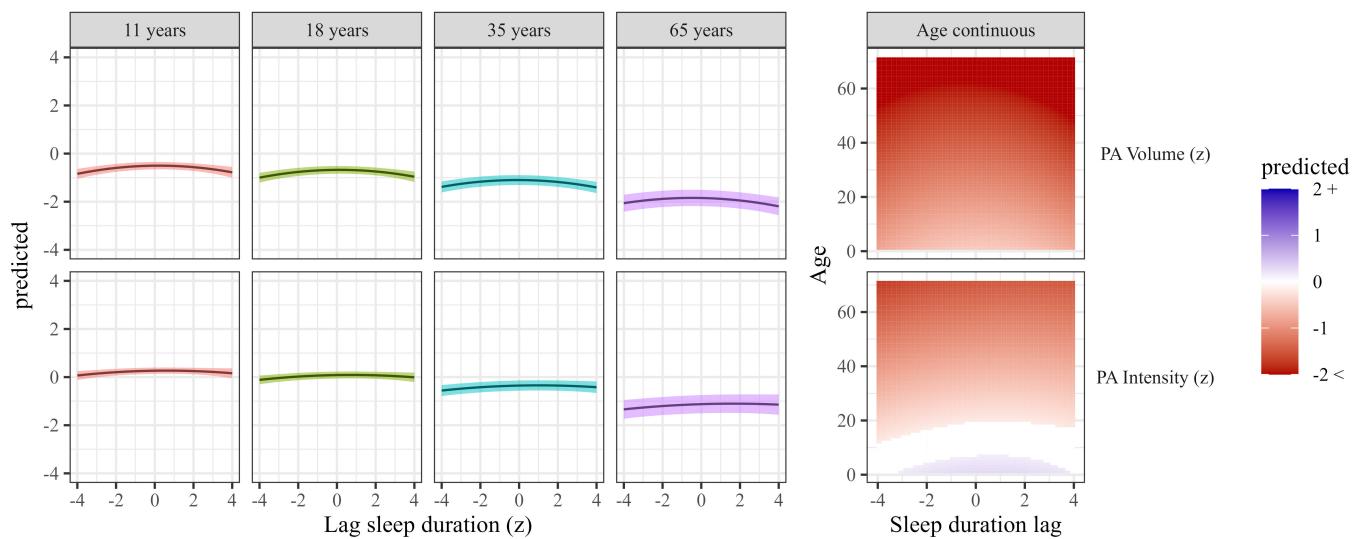


Figure 3. Physical activity by sleep duration

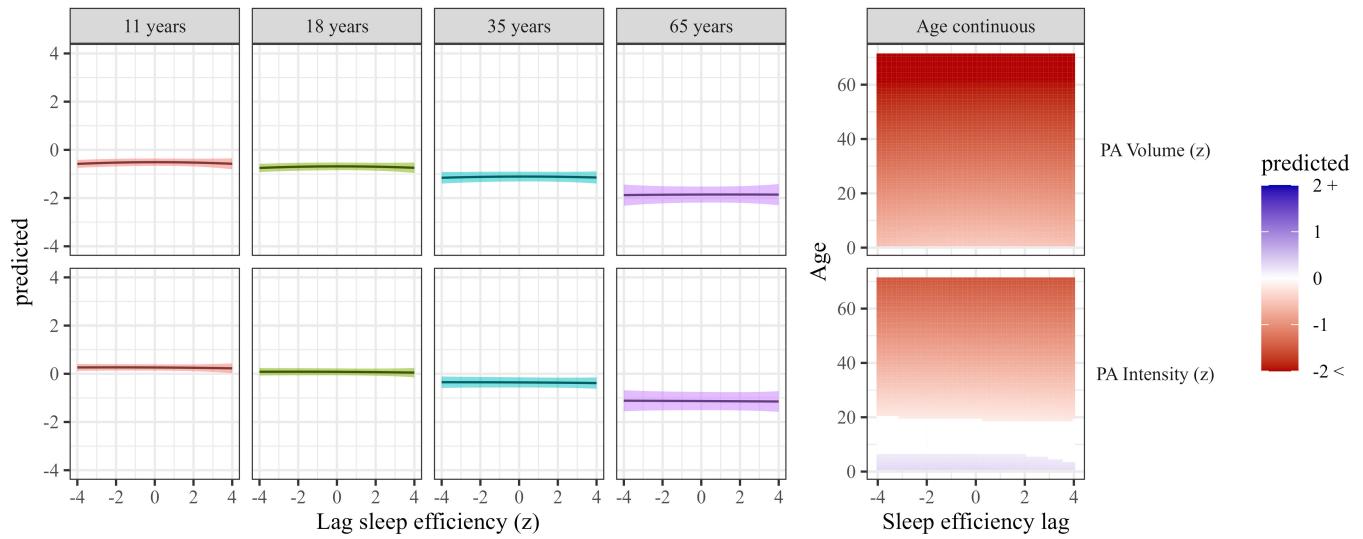


Figure 4. Physical activity by sleep efficiency

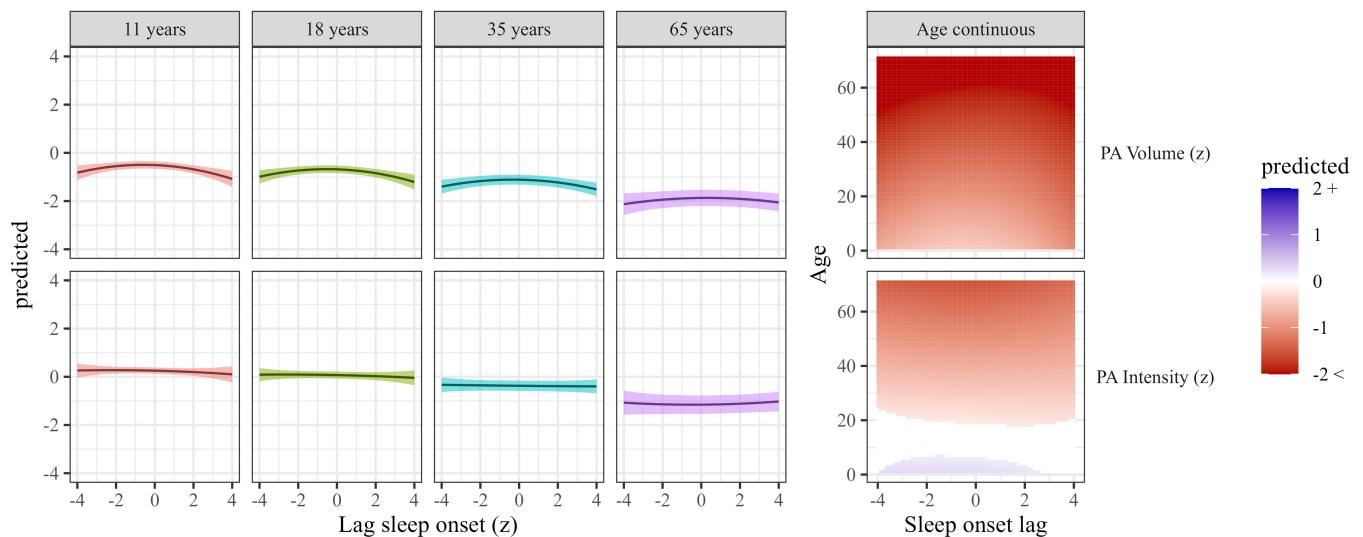


Figure 5. Physical activity by sleep onset

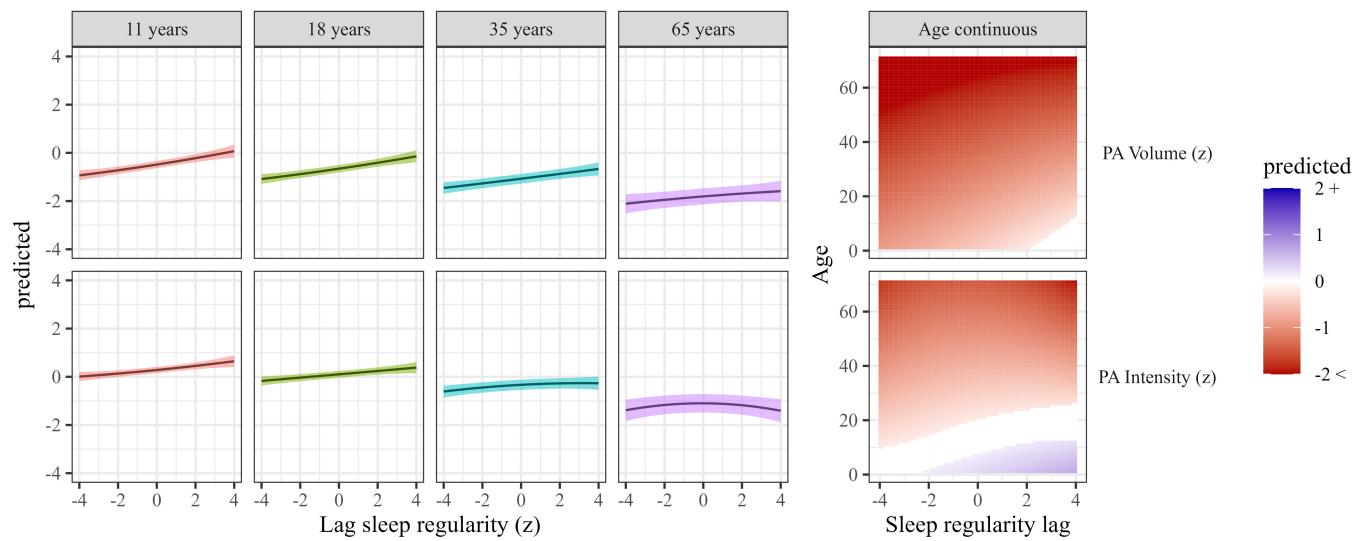


Figure 6. Physical activity by sleep regularity

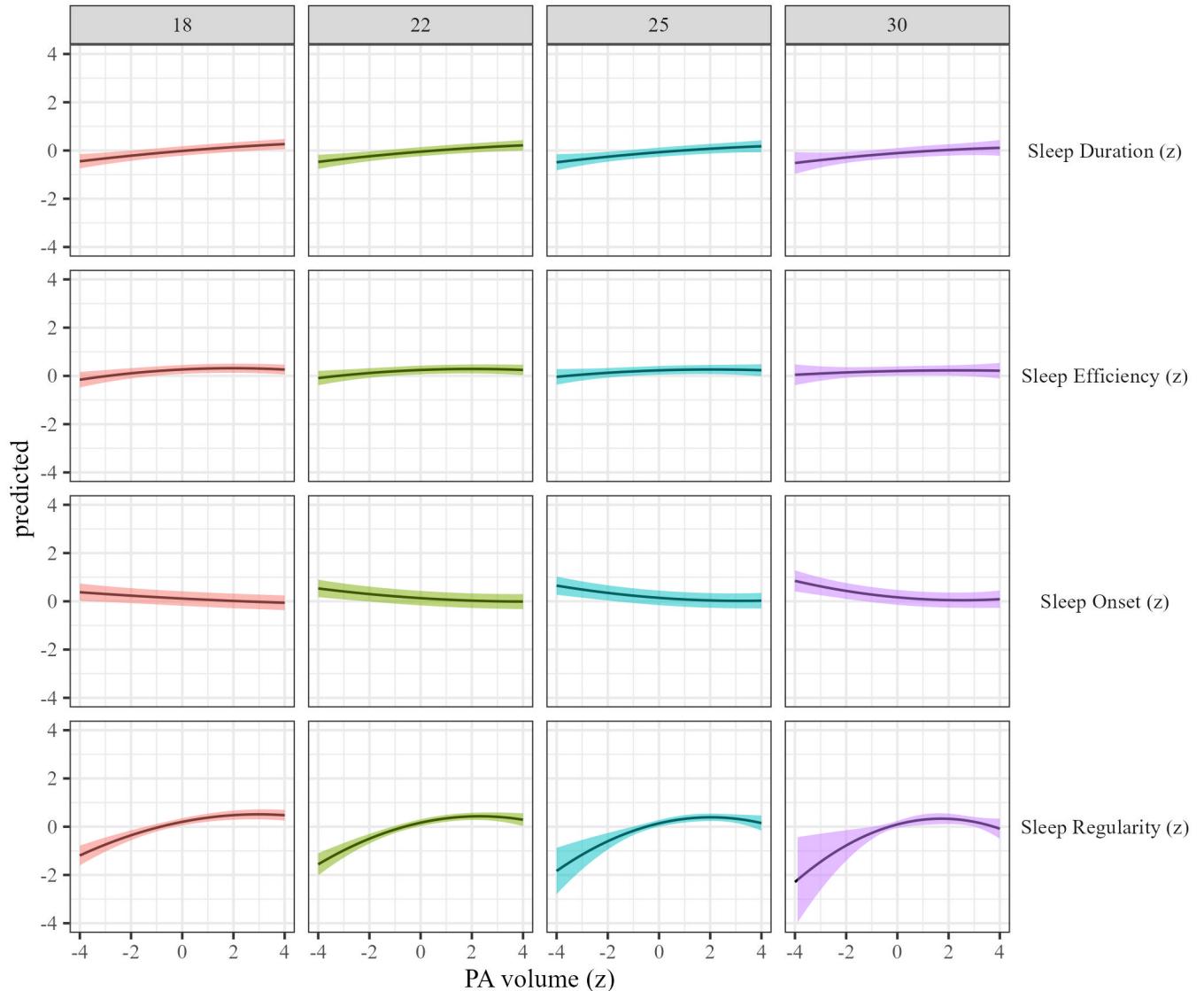


Figure 7. Sleep metrics on Physical activity volume by BMI

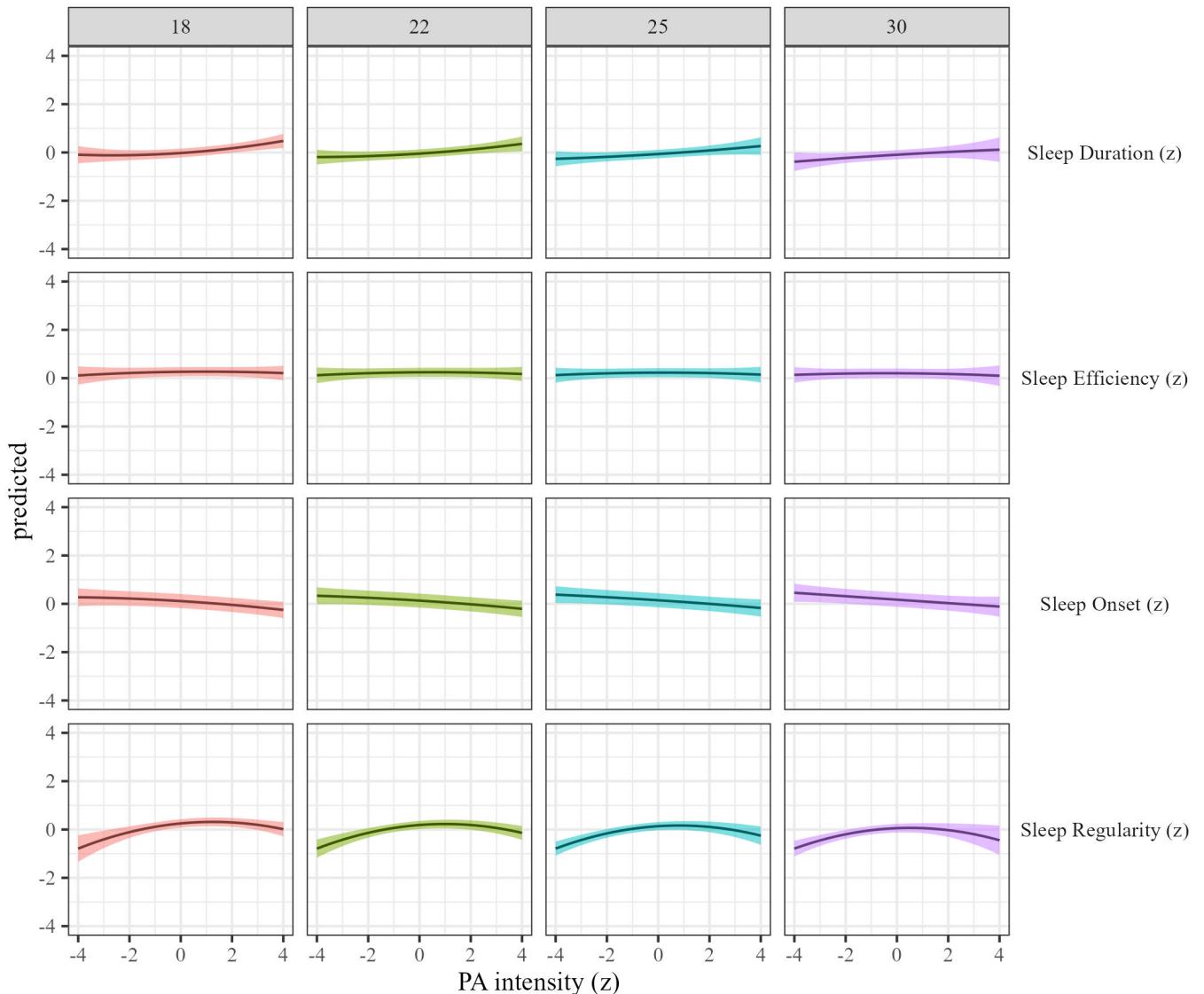


Figure 8. Sleep metrics on Physical activity intensity moderated by BMI

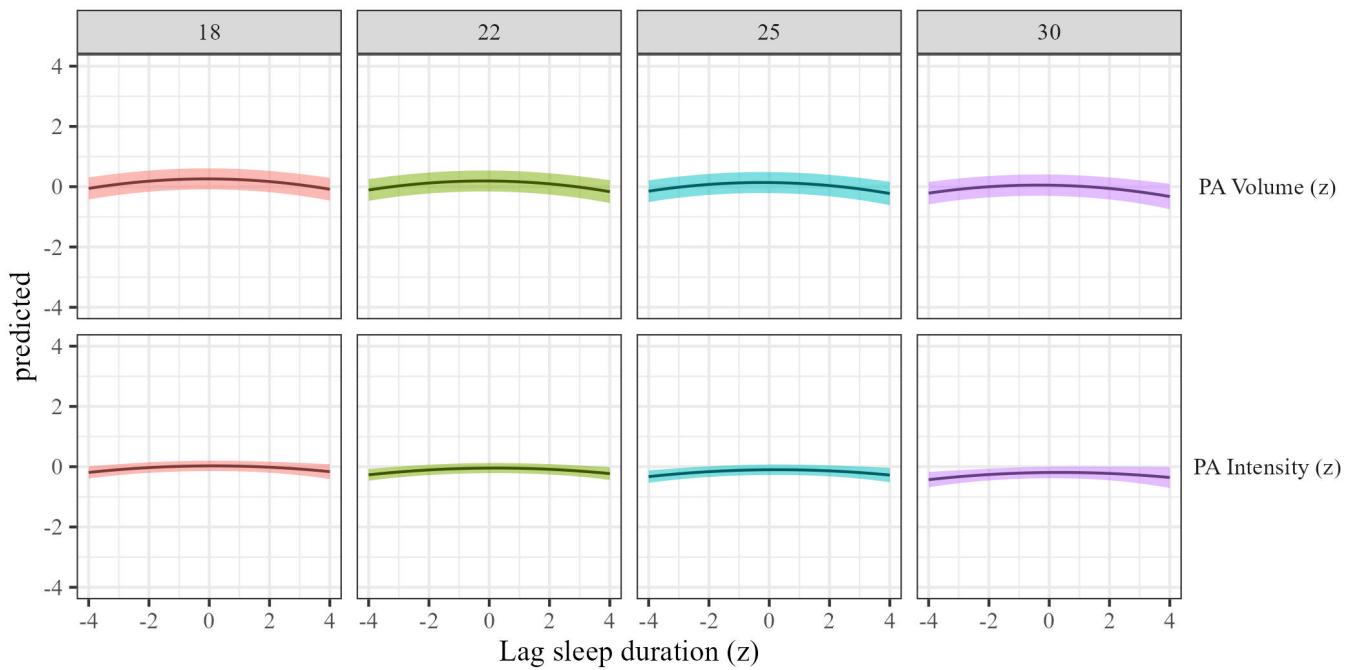


Figure 9. Physical activity by sleep duration moderated by BMI

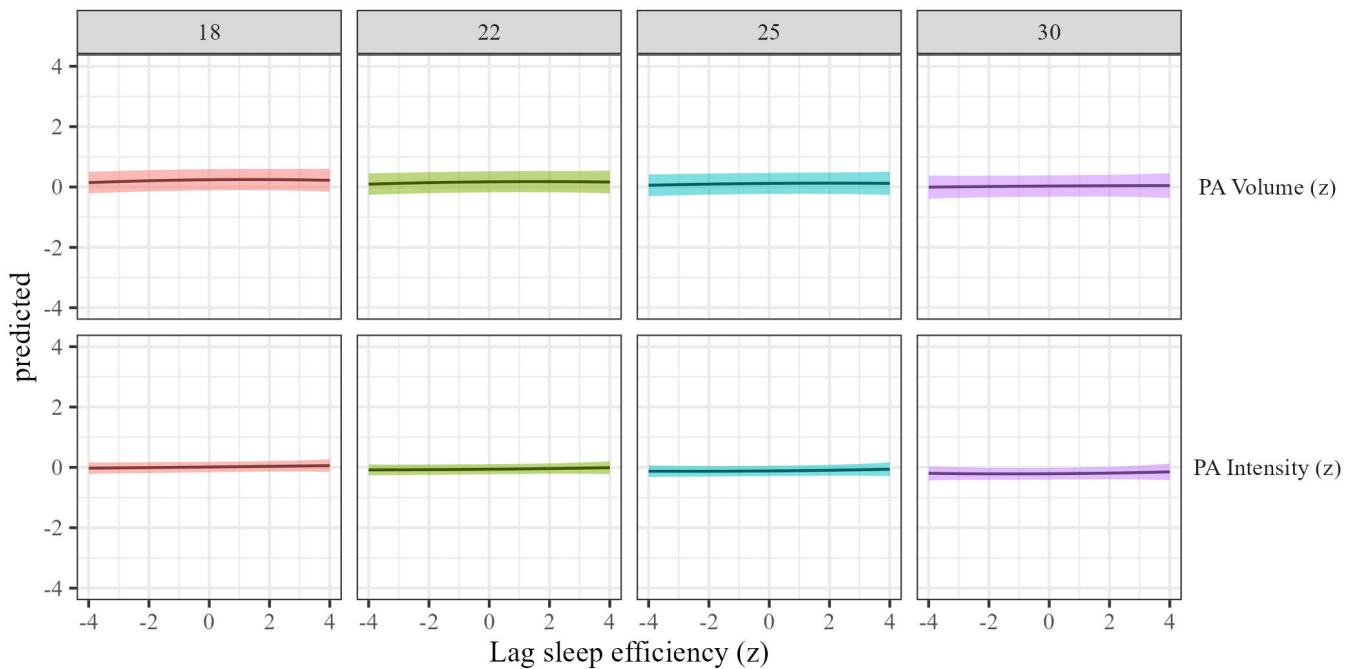


Figure 10. Physical activity by sleep efficiency moderated by BMI

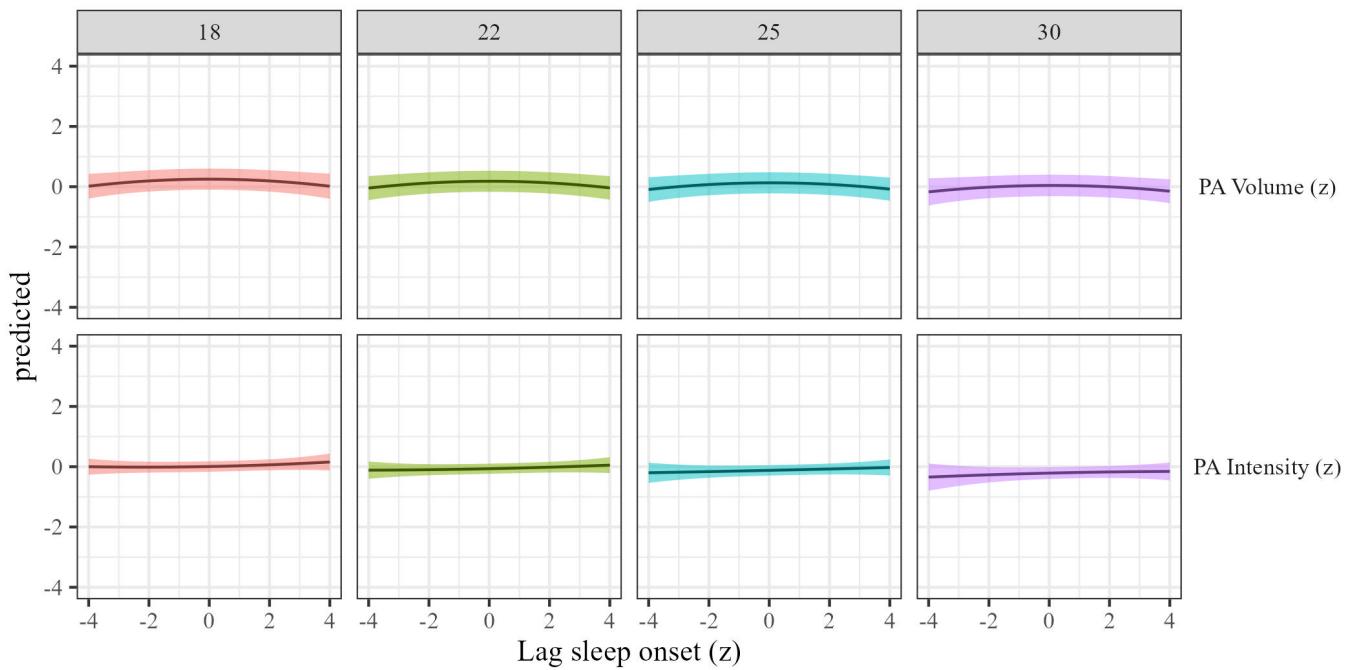


Figure 11. Physical activity by sleep onset moderated by BMI

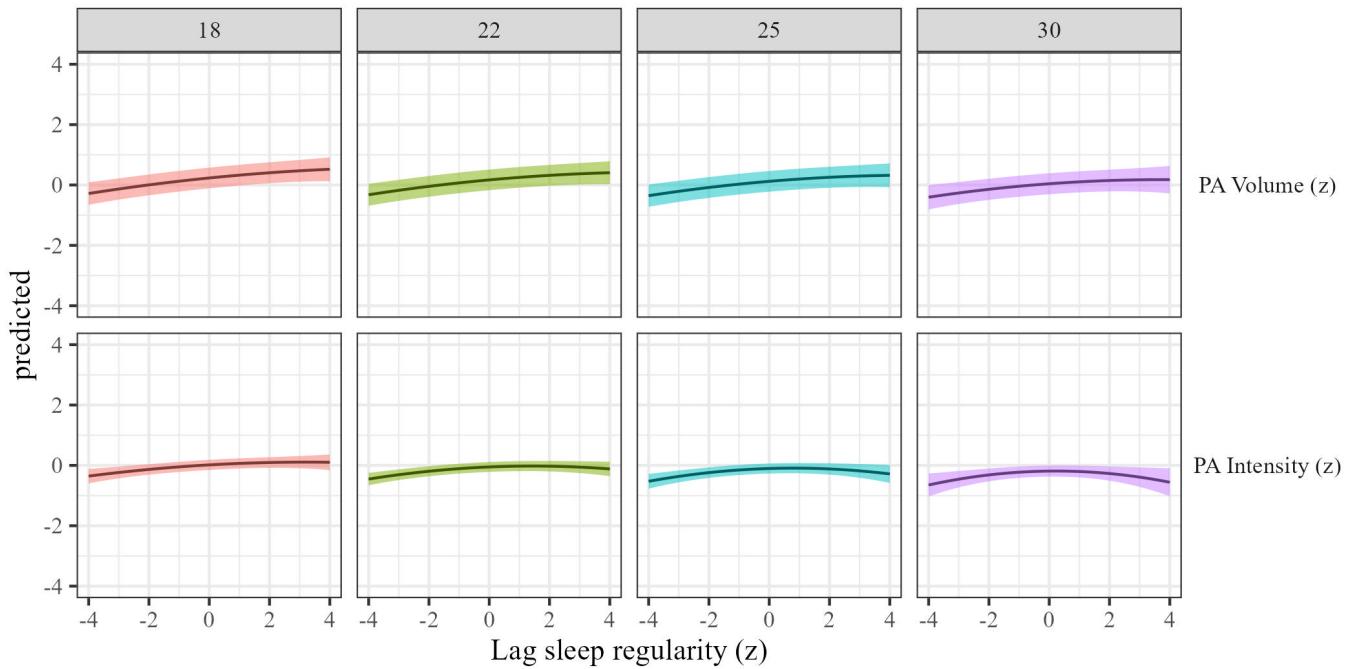


Figure 12. Physical activity by sleep regularity moderated by BMI

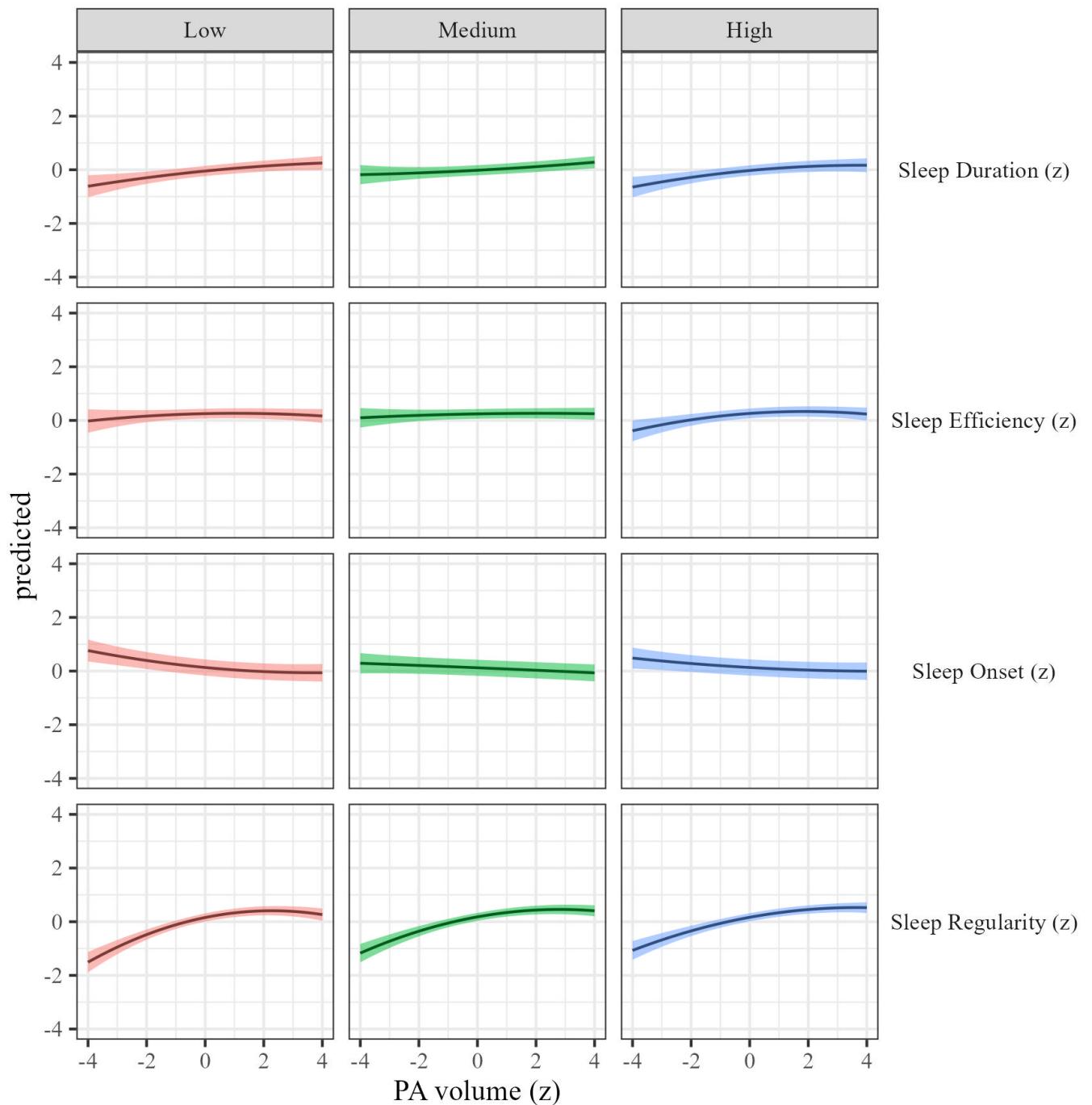


Figure 13. Sleep metrics on Physical activity volume by SES

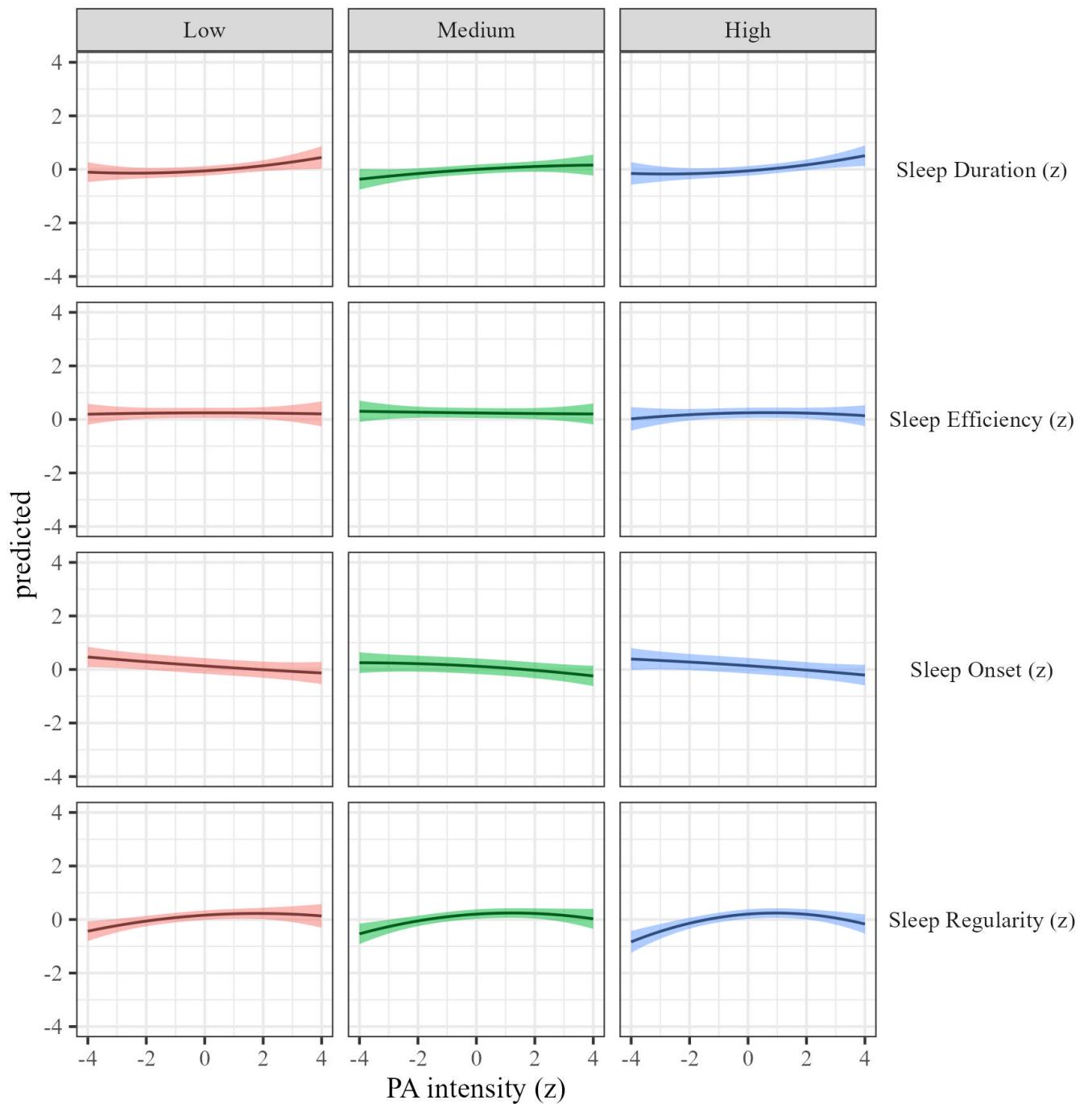


Figure 14. Sleep metrics on Physical activity intensity moderated by SES

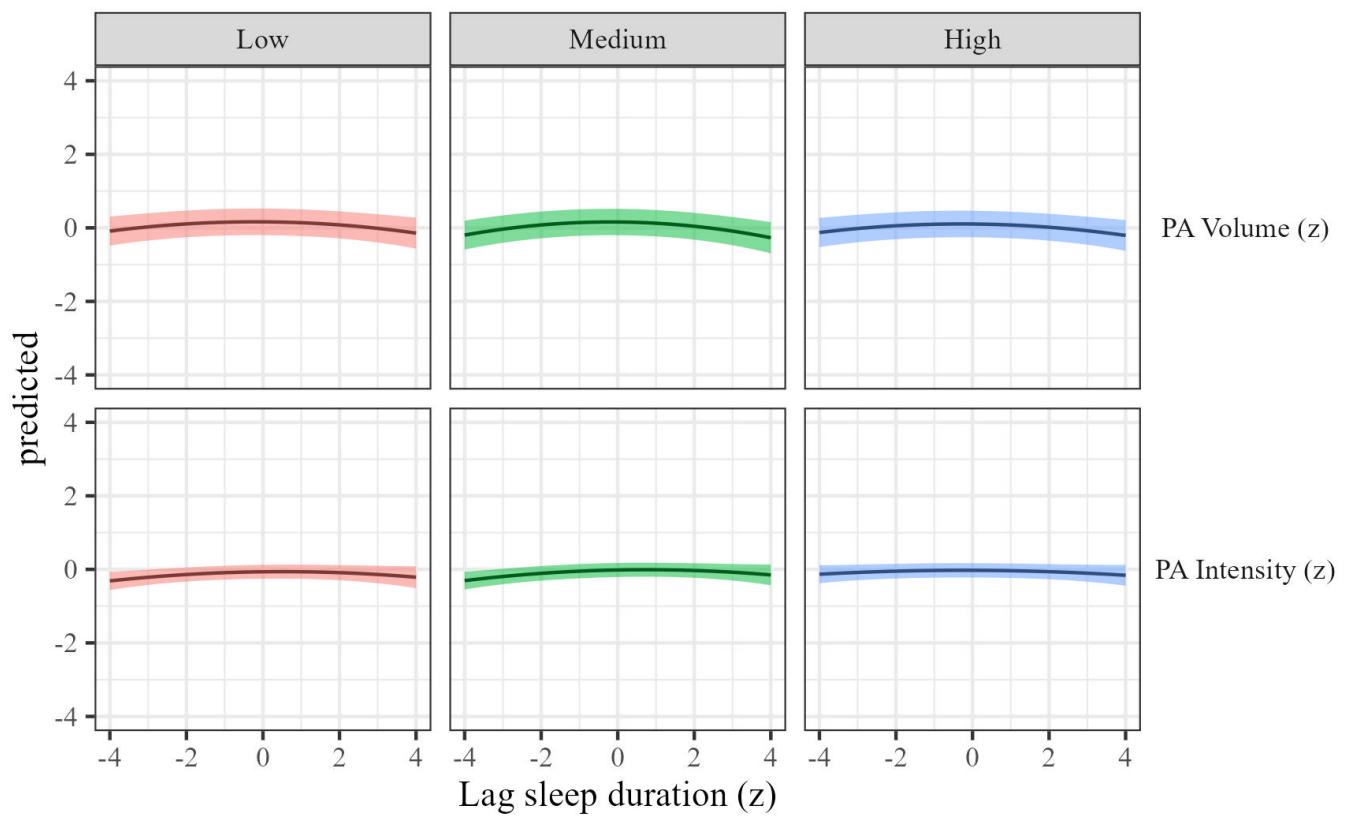


Figure 15. Physical activity by sleep duration moderated by SES

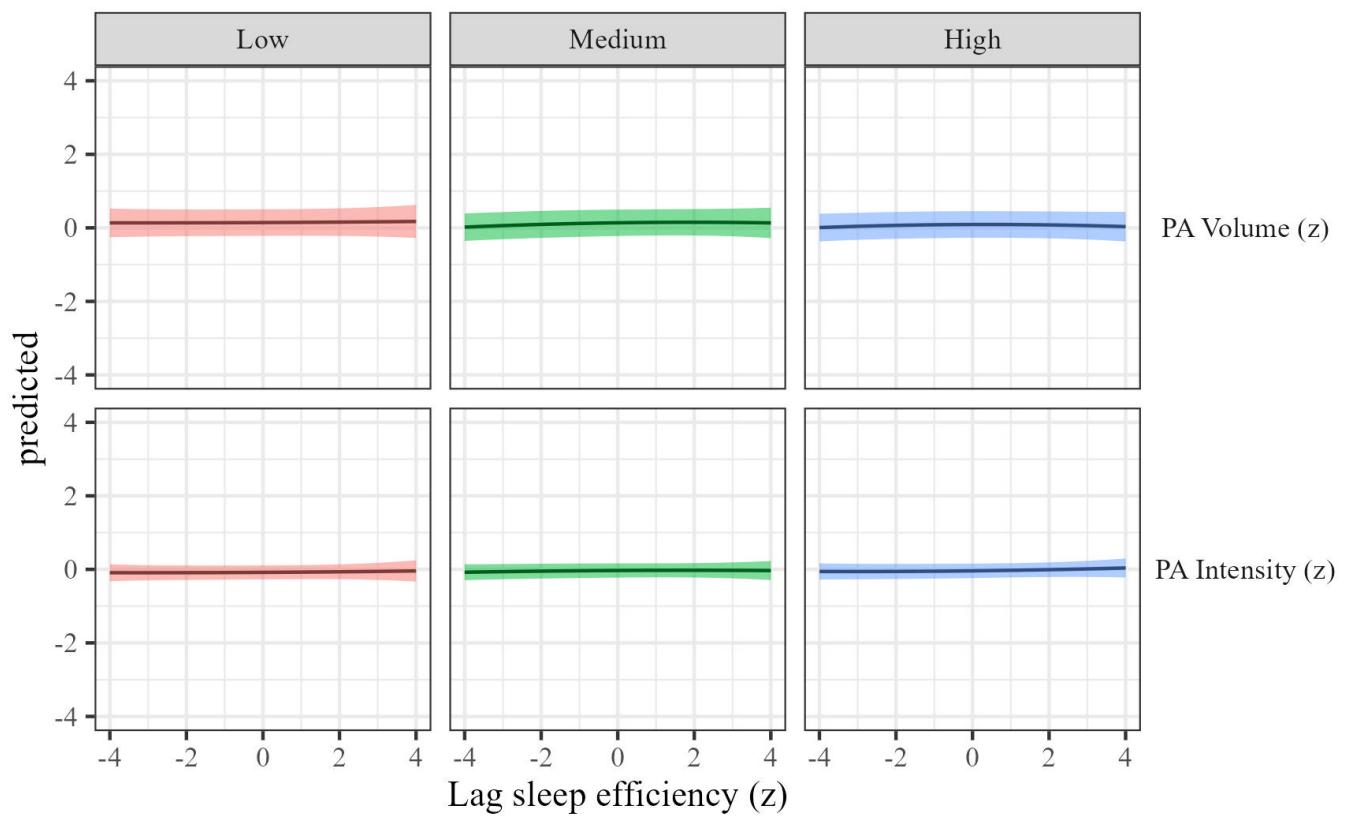


Figure 16. Physical activity by sleep efficiency moderated by SES

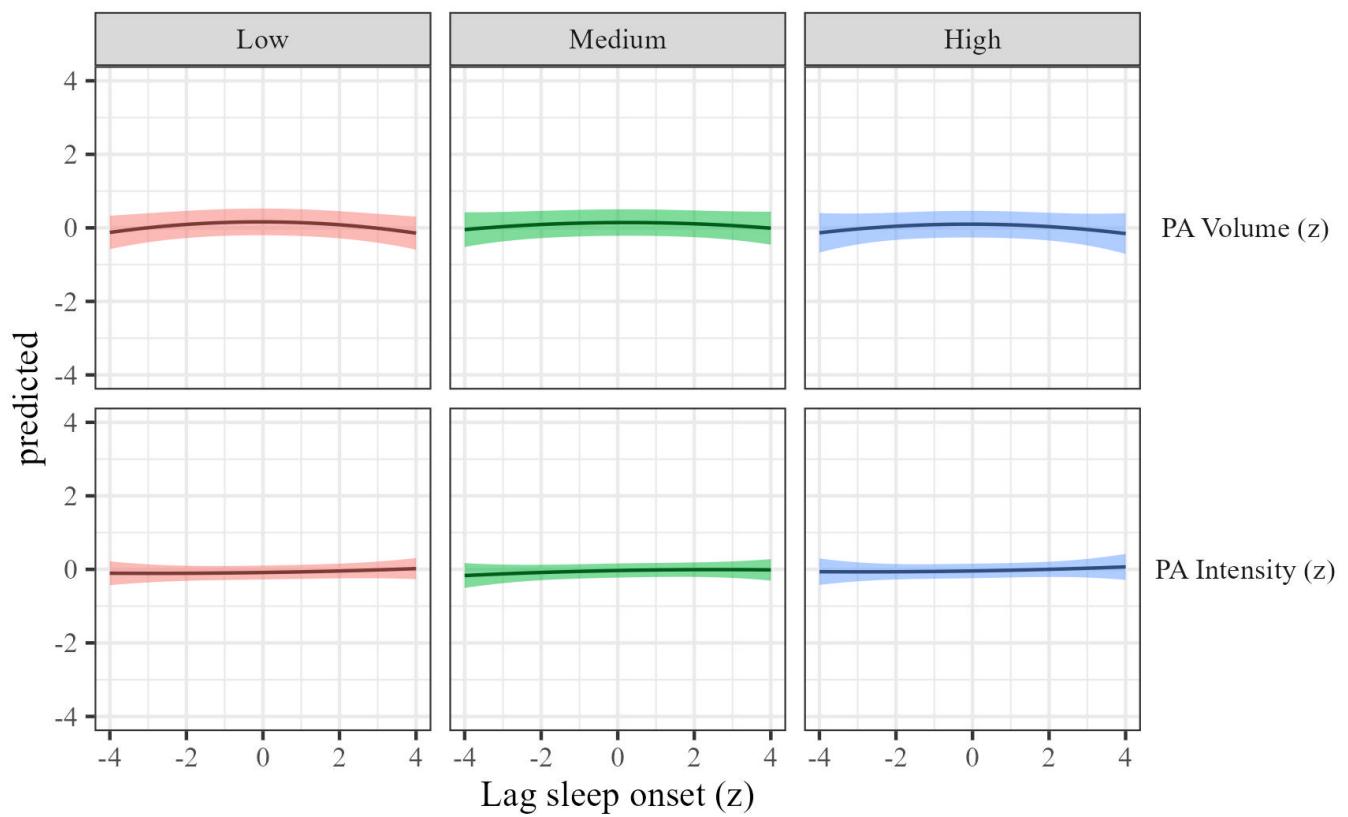


Figure 17. Physical activity by sleep onset moderated by SES

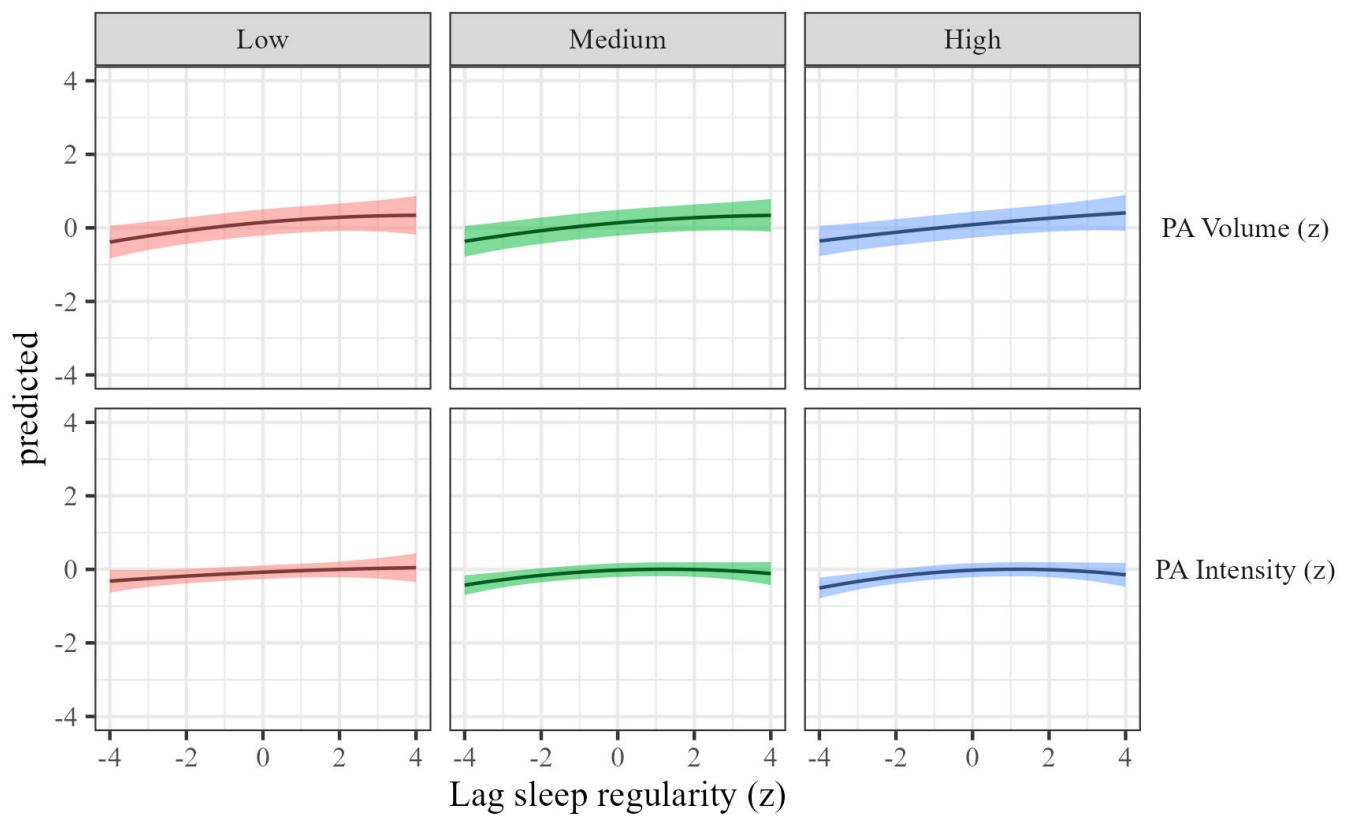


Figure 18. Physical activity by sleep regularity moderated by SES

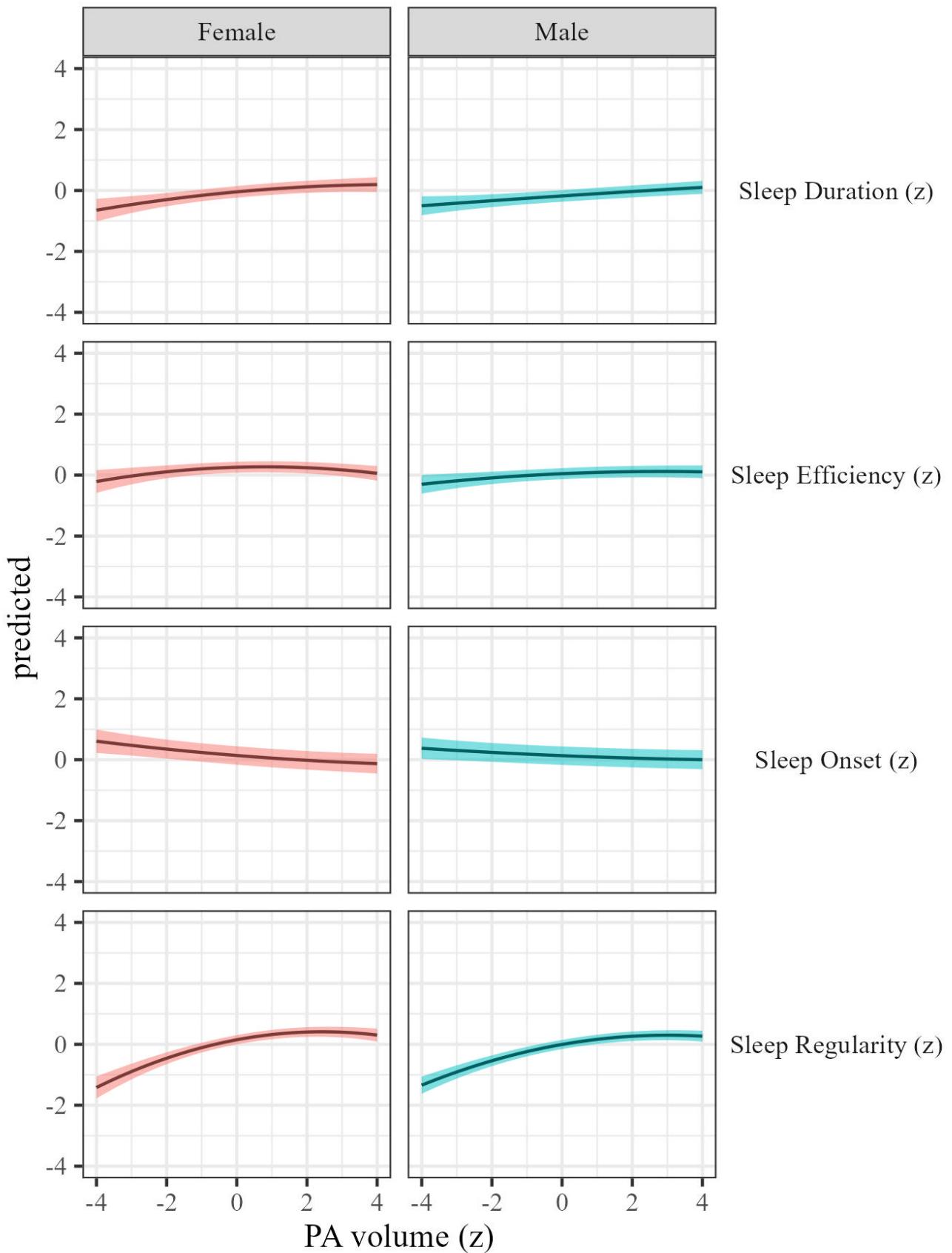


Figure 19. Sleep metrics on Physical activity volume by sex

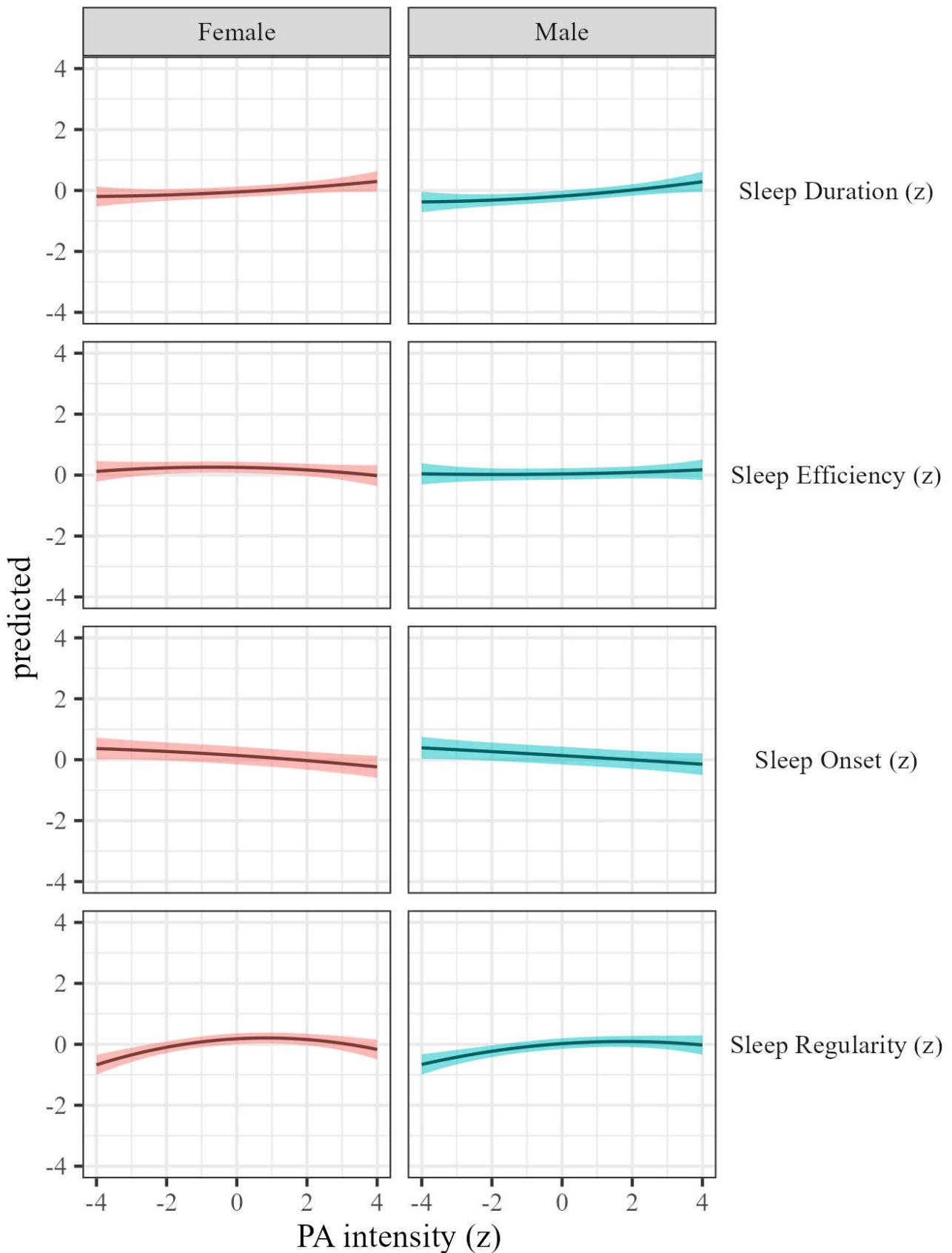


Figure 20. Sleep metrics on Physical activity intensity moderated by sex

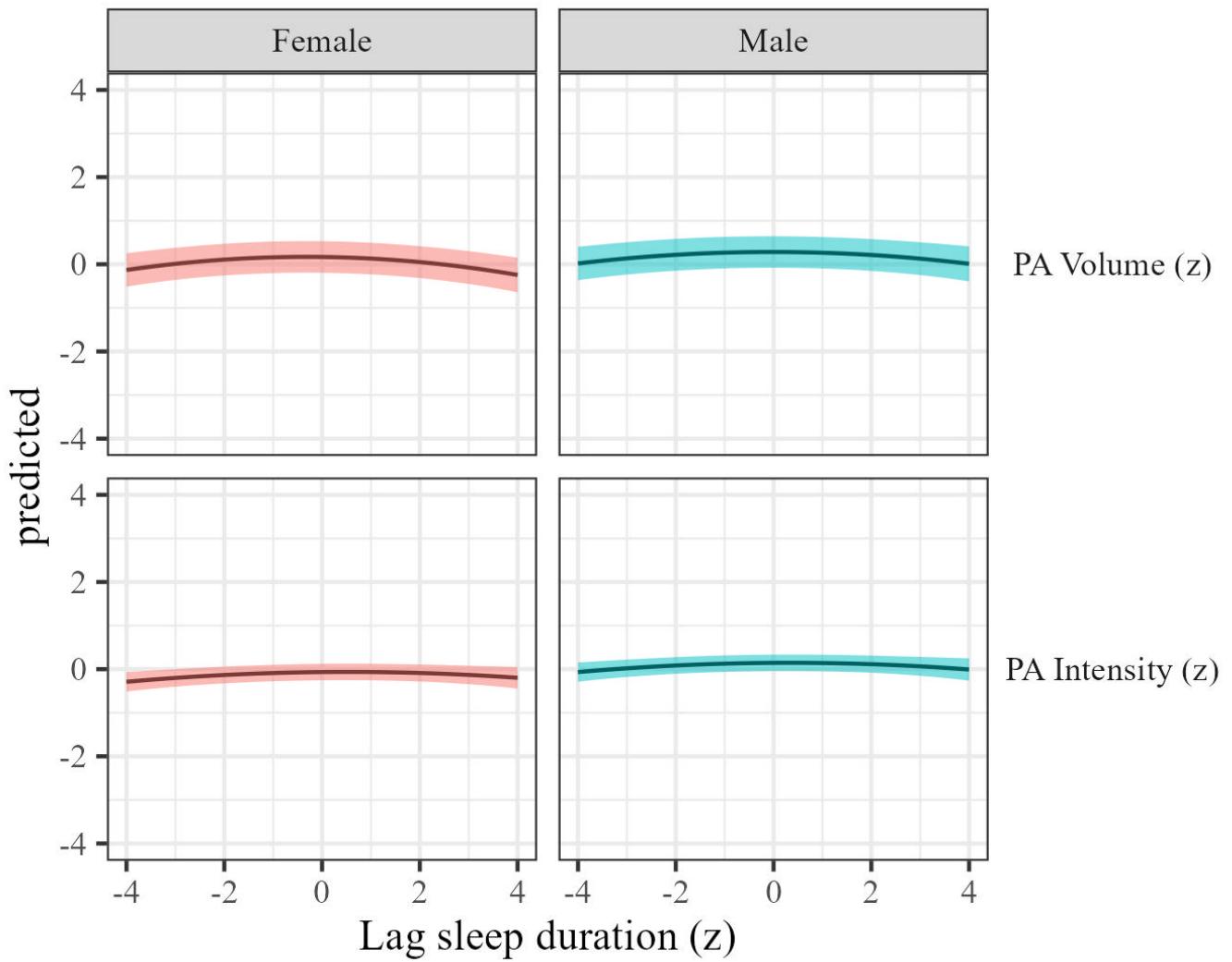


Figure 21. Physical activity by sleep duration moderated by sex

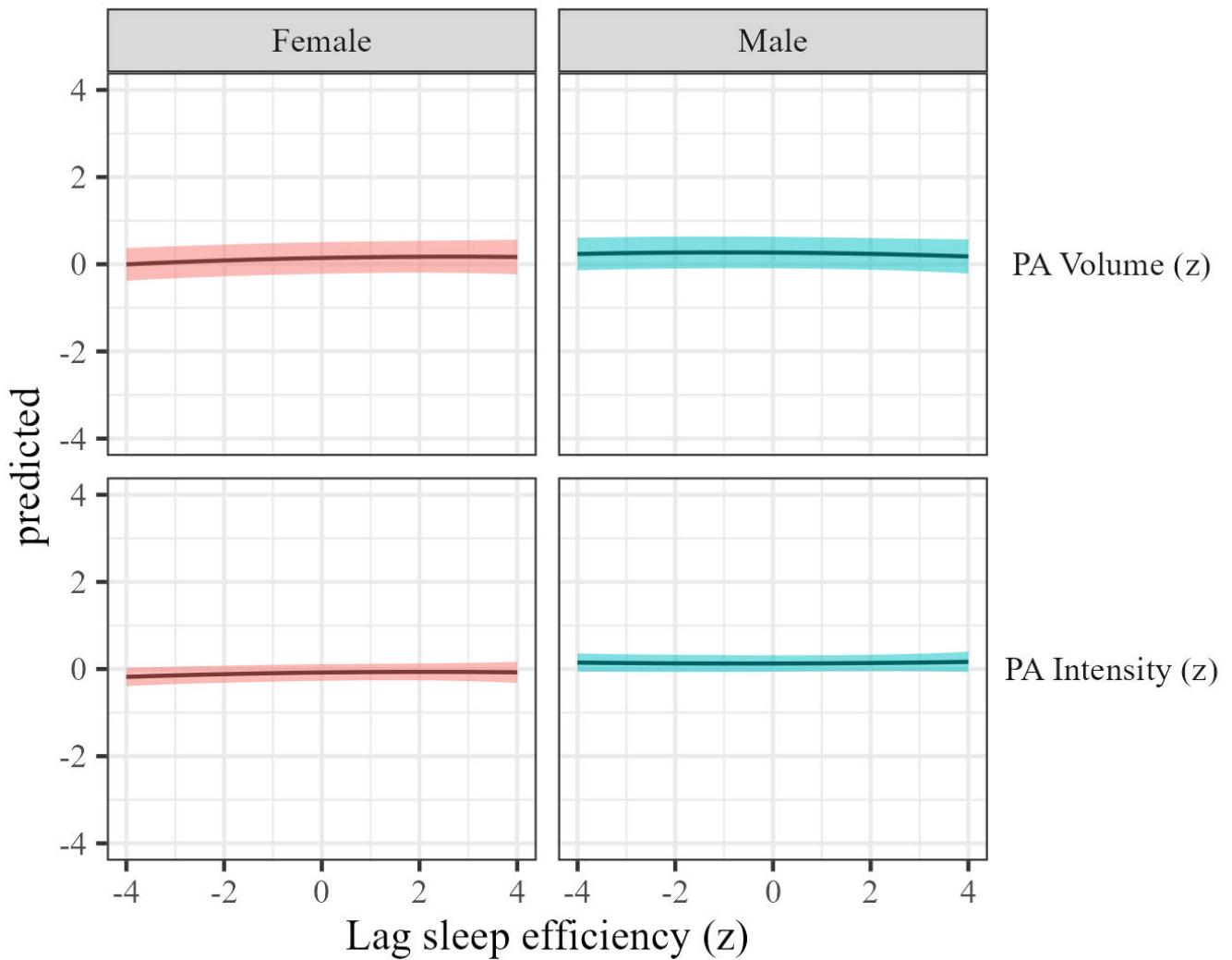


Figure 22. Physical activity by sleep efficiency moderated by sex

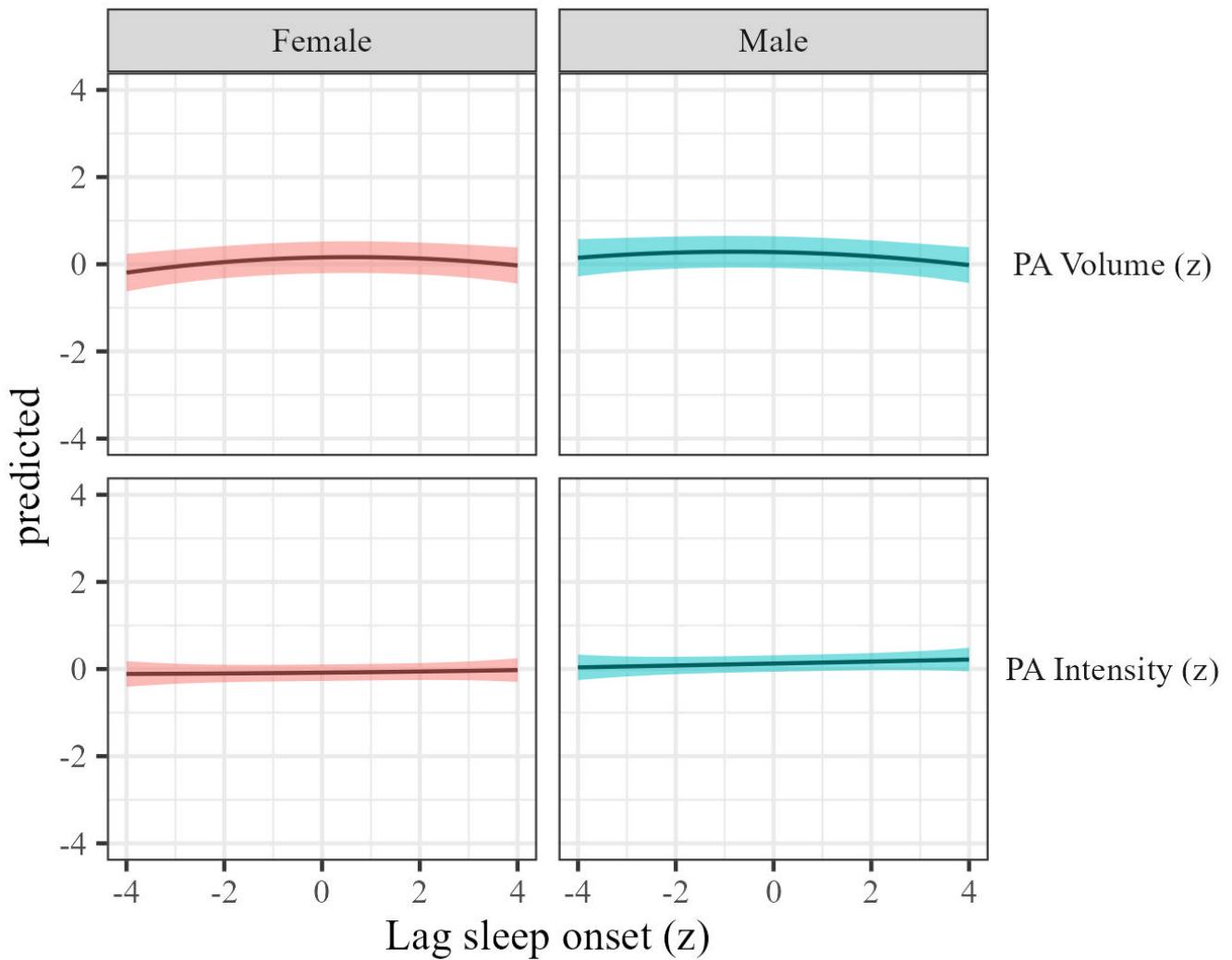


Figure 23. Physical activity by sleep onset moderated by sex

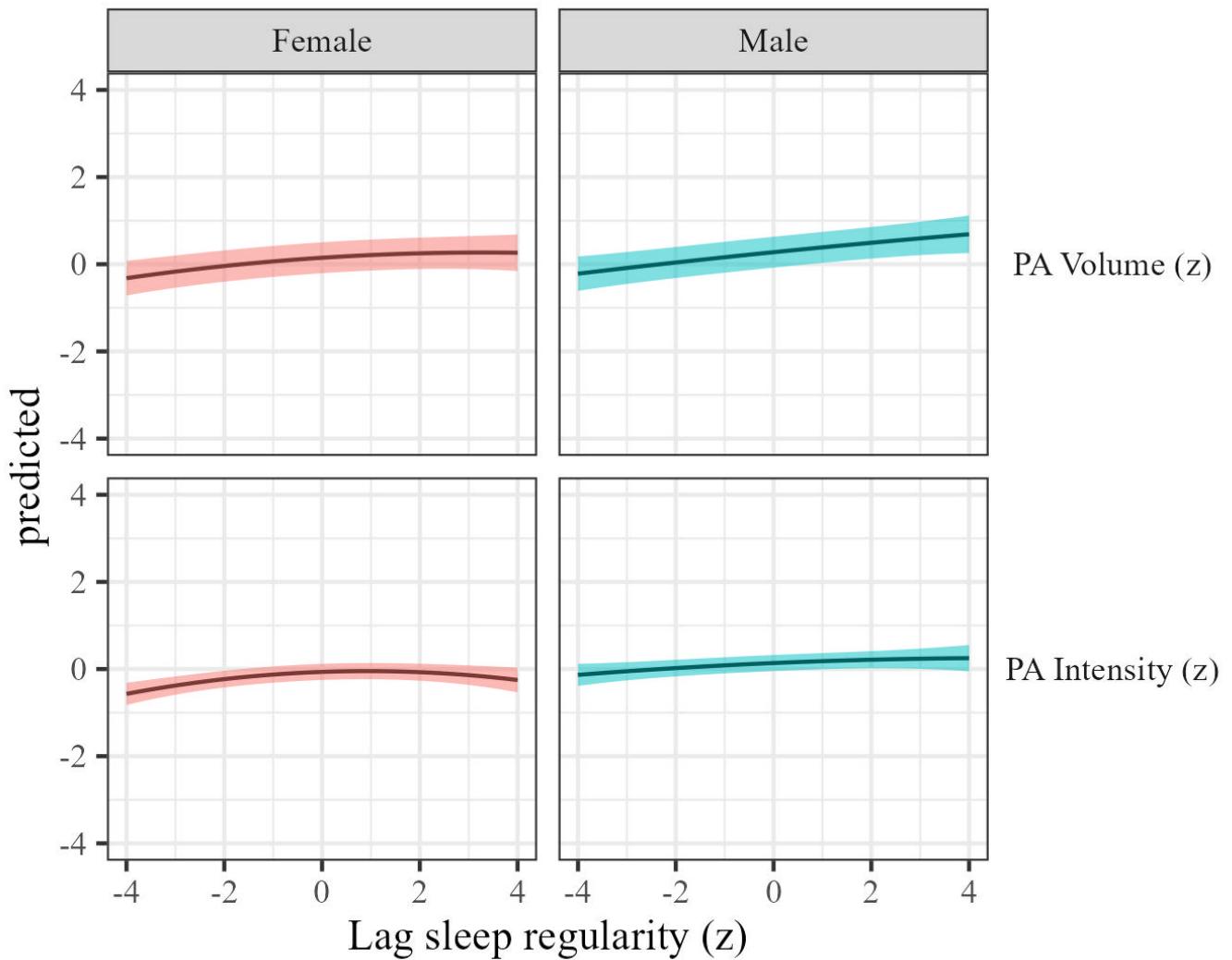


Figure 24. Physical activity by sleep regularity moderated by sex

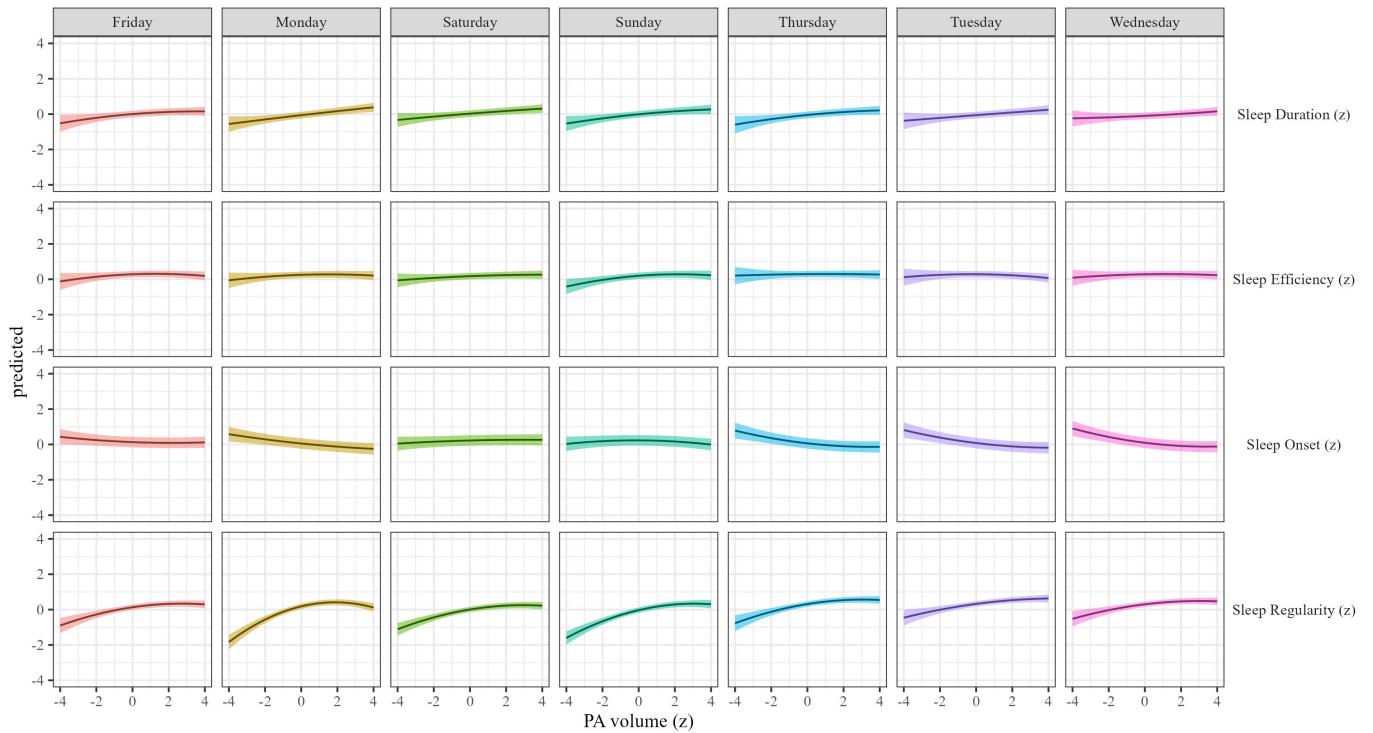


Figure 25. Sleep metrics on Physical activity volume by weekday

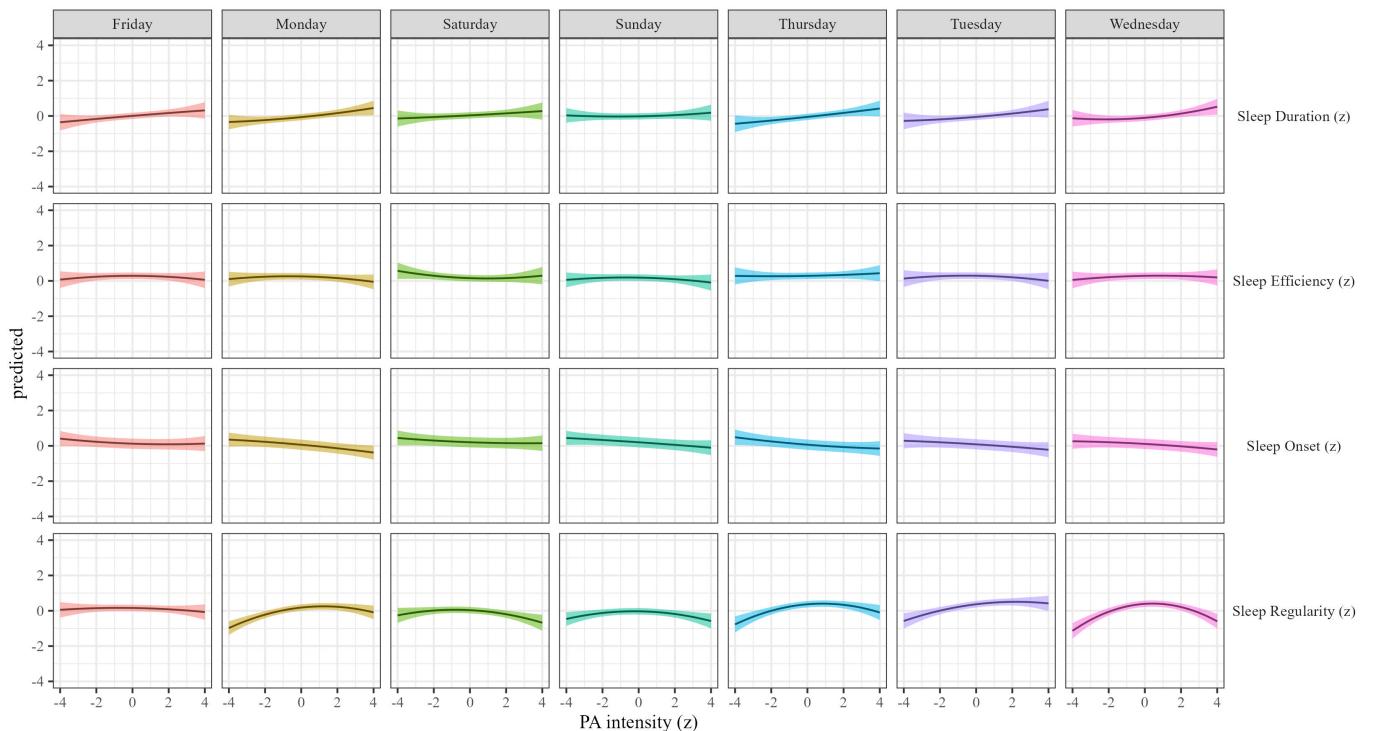


Figure 26. Sleep metrics on Physical activity intensity moderated by weekday

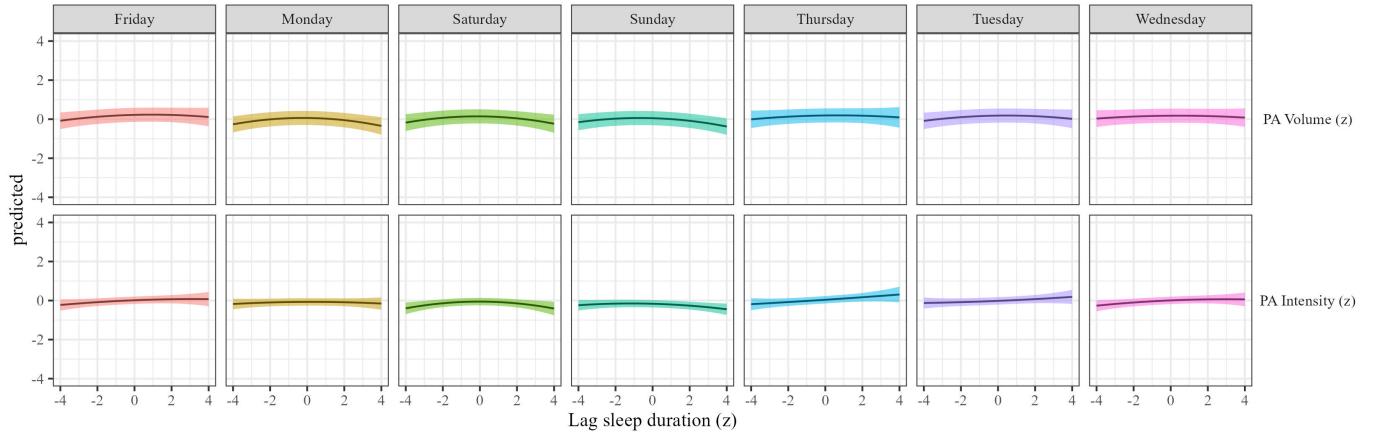


Figure 27. Physical activity by sleep duration moderated by weekday

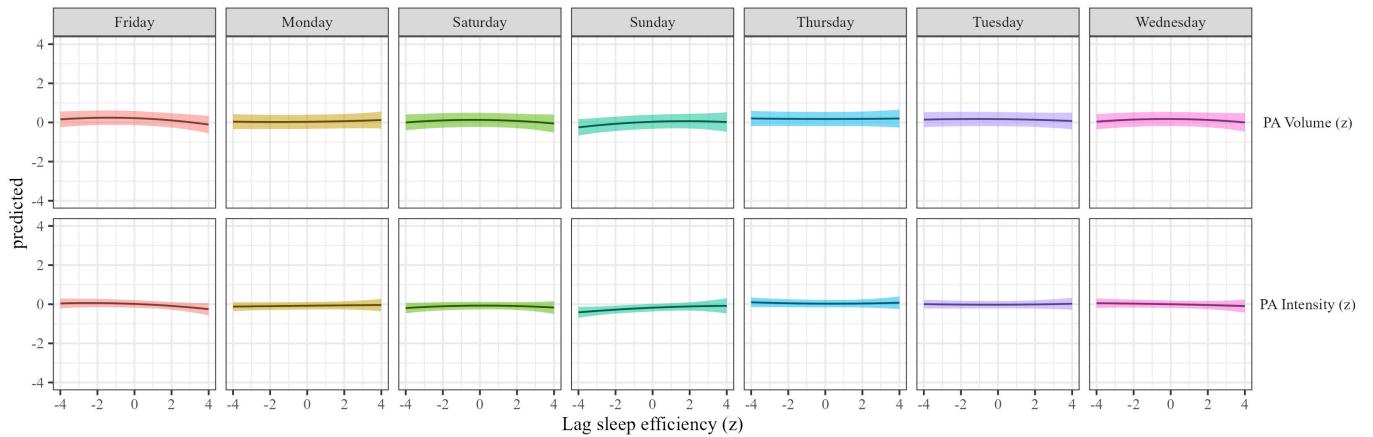


Figure 28. Physical activity by sleep efficiency moderated by weekday

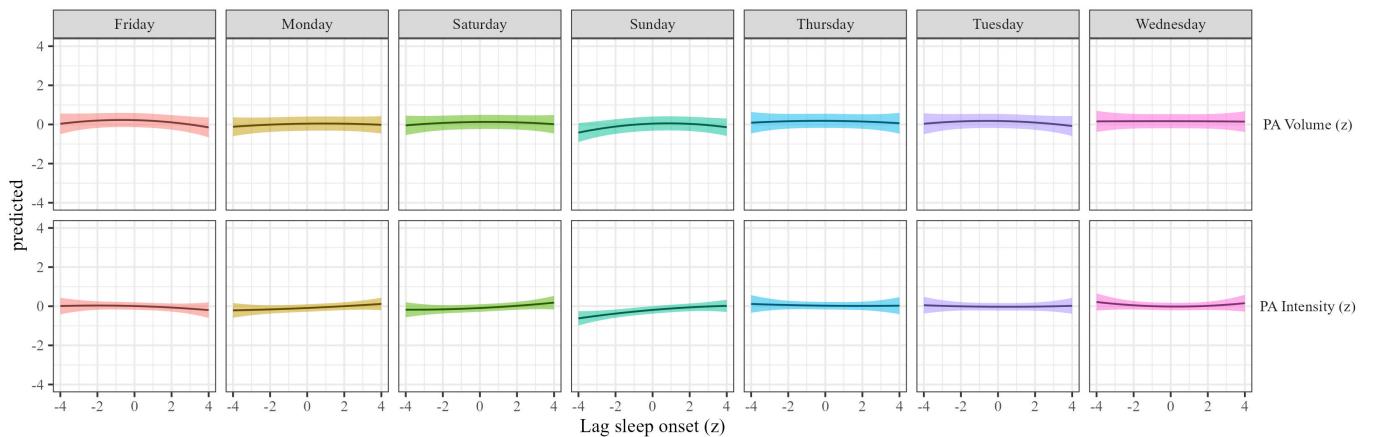


Figure 29. Physical activity by sleep onset moderated by weekday

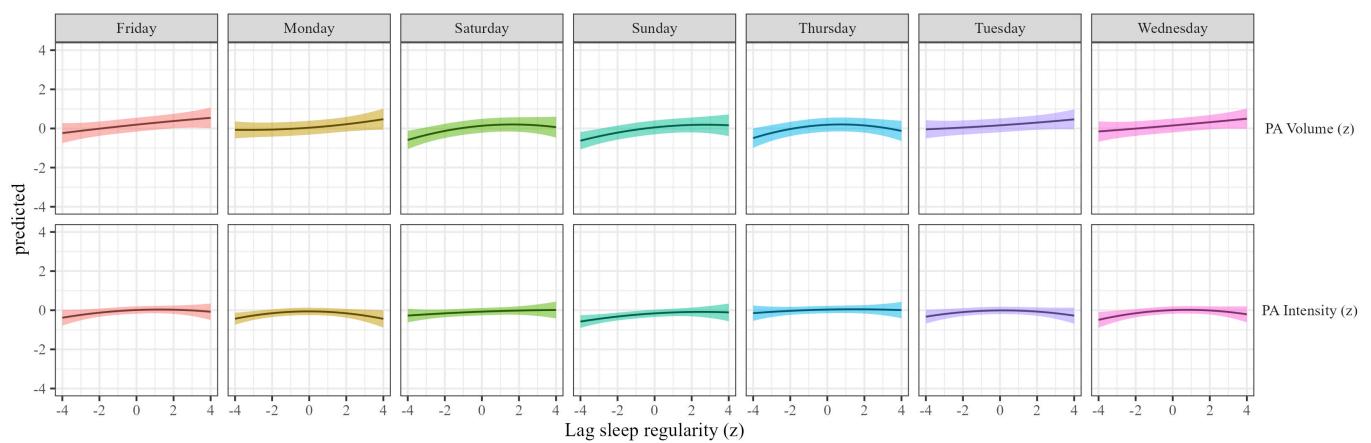


Figure 30. Physical activity by sleep regularity moderated by weekday

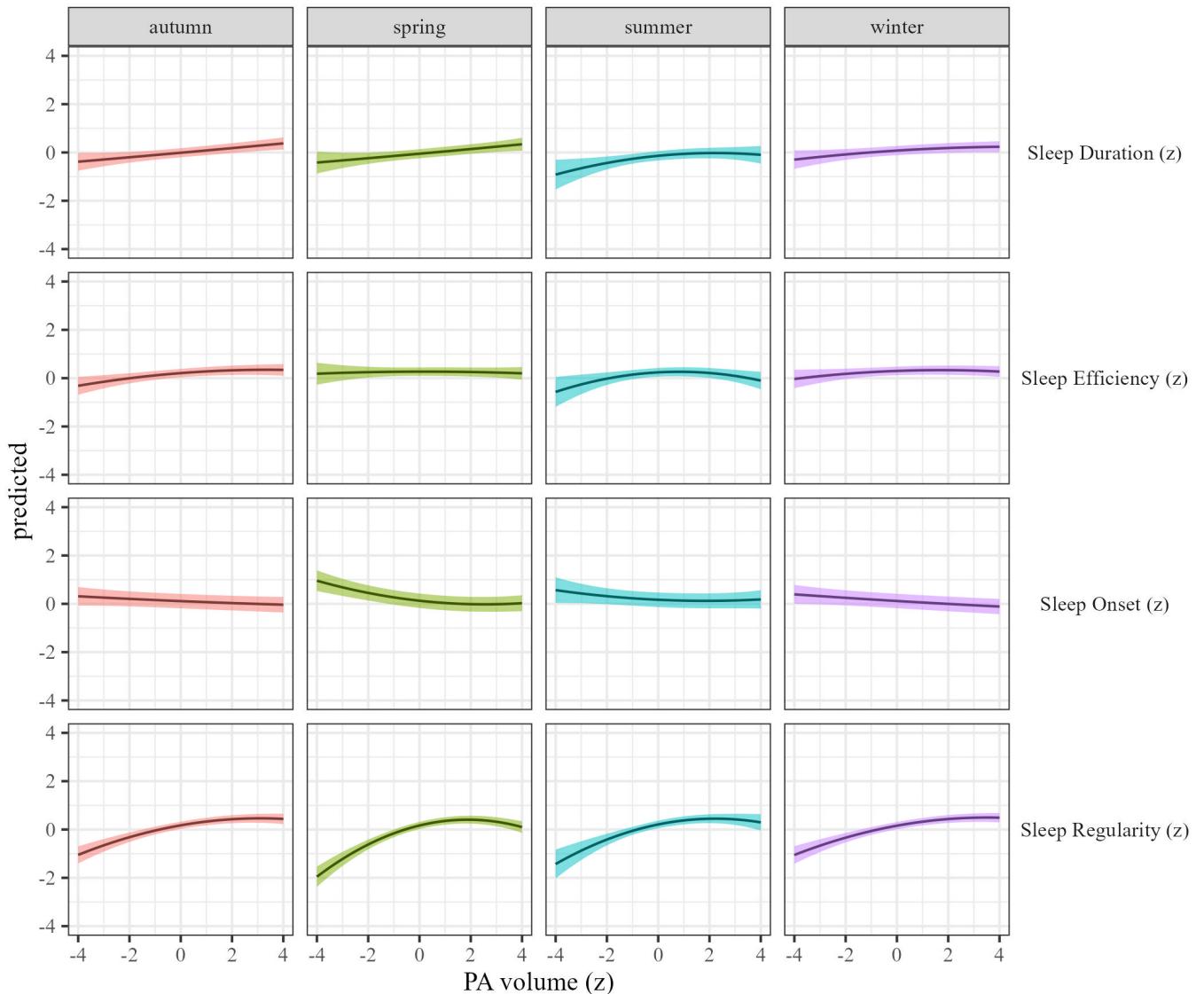


Figure 31. Sleep metrics on Physical activity volume by season

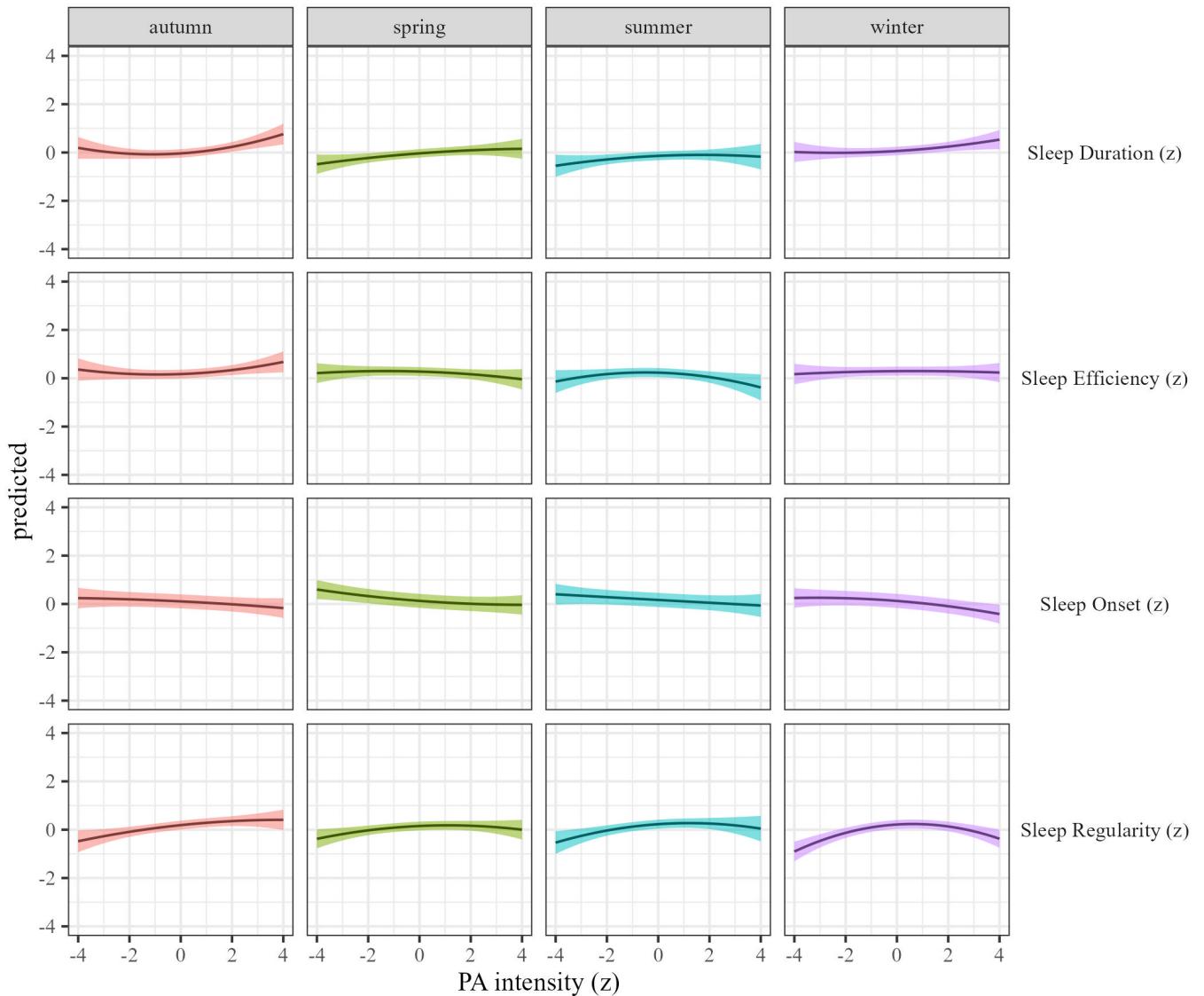
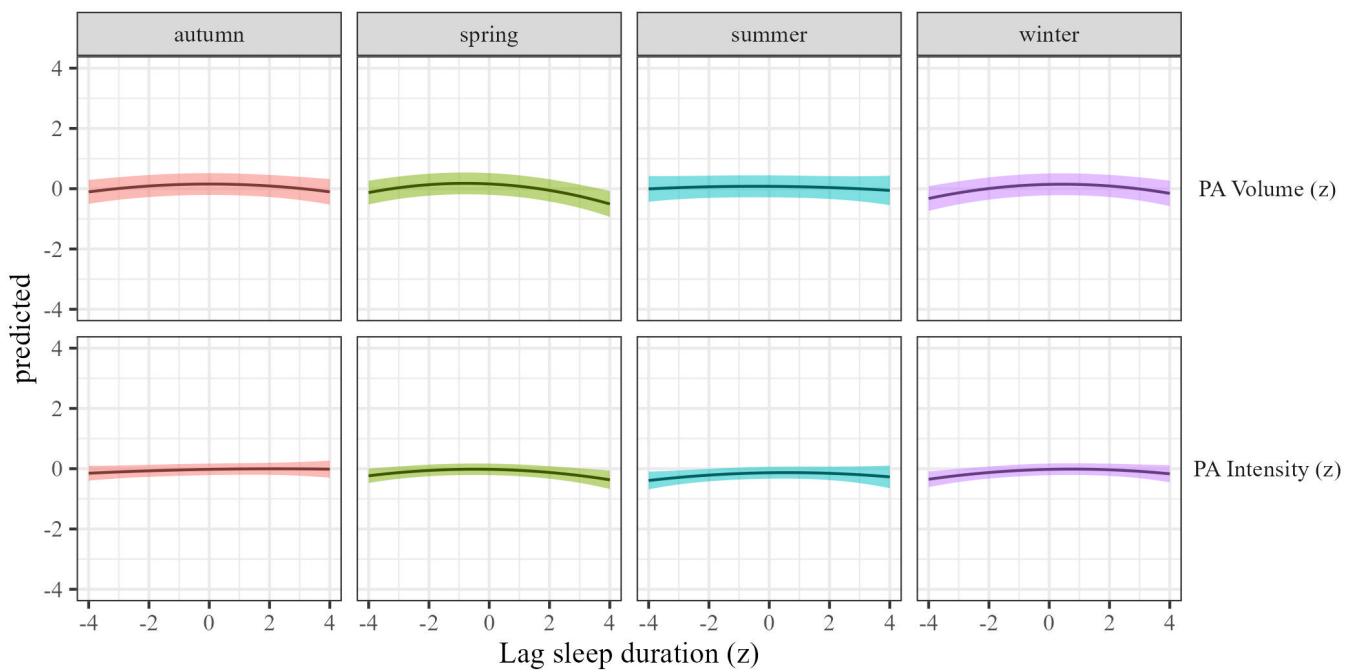
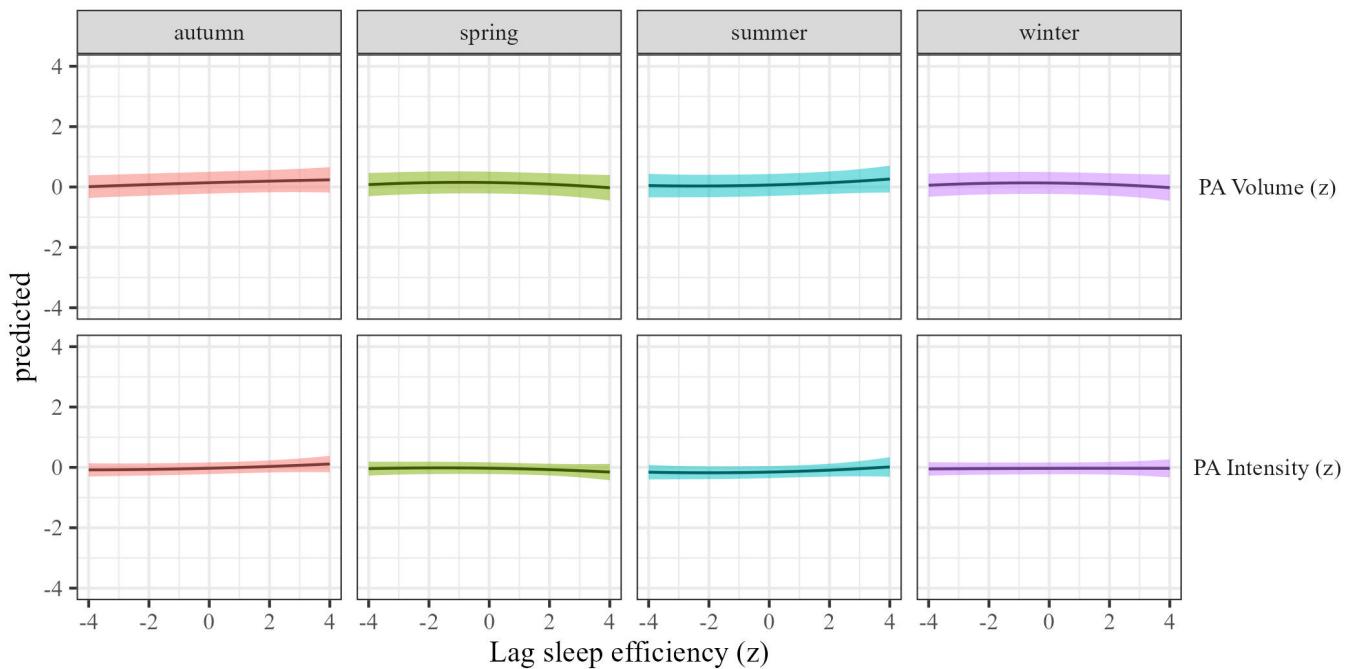


Figure 32. Sleep metrics on Physical activity intensity moderated by season



*Figure 33.* Physical activity by sleep duration moderated by season



*Figure 34.* Physical activity by sleep efficiency moderated by season

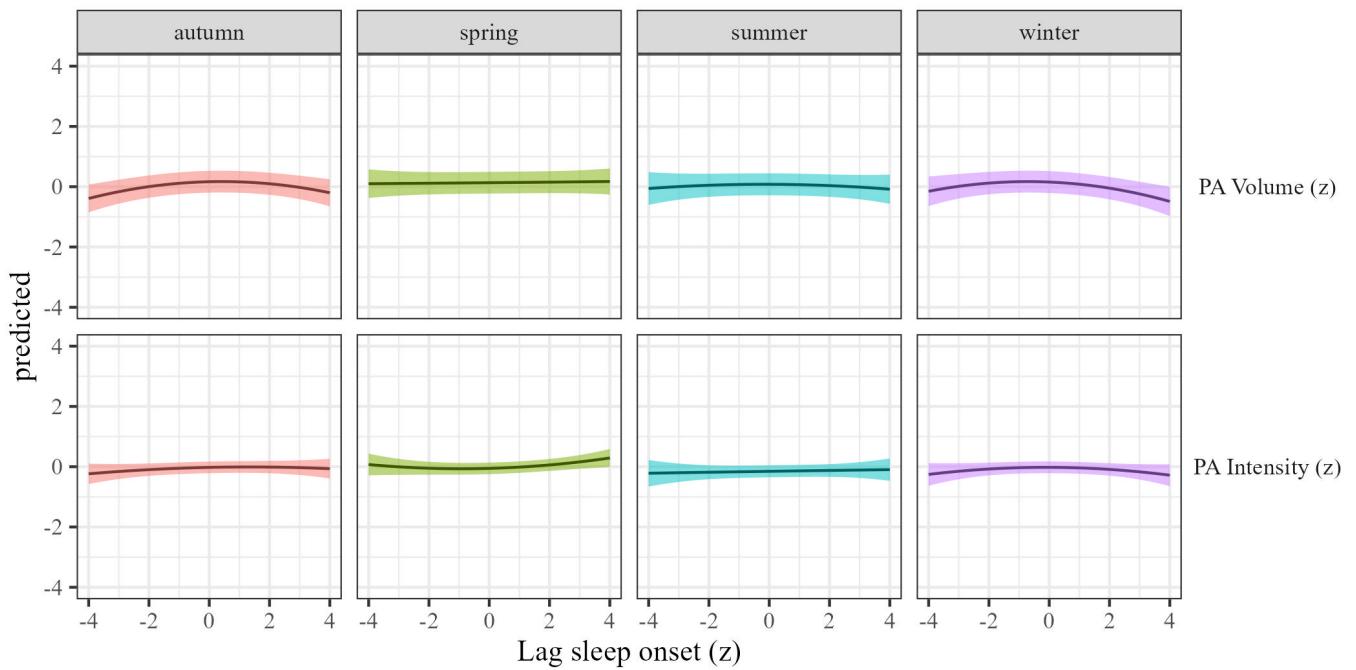


Figure 35. Physical activity by sleep onset moderated by season

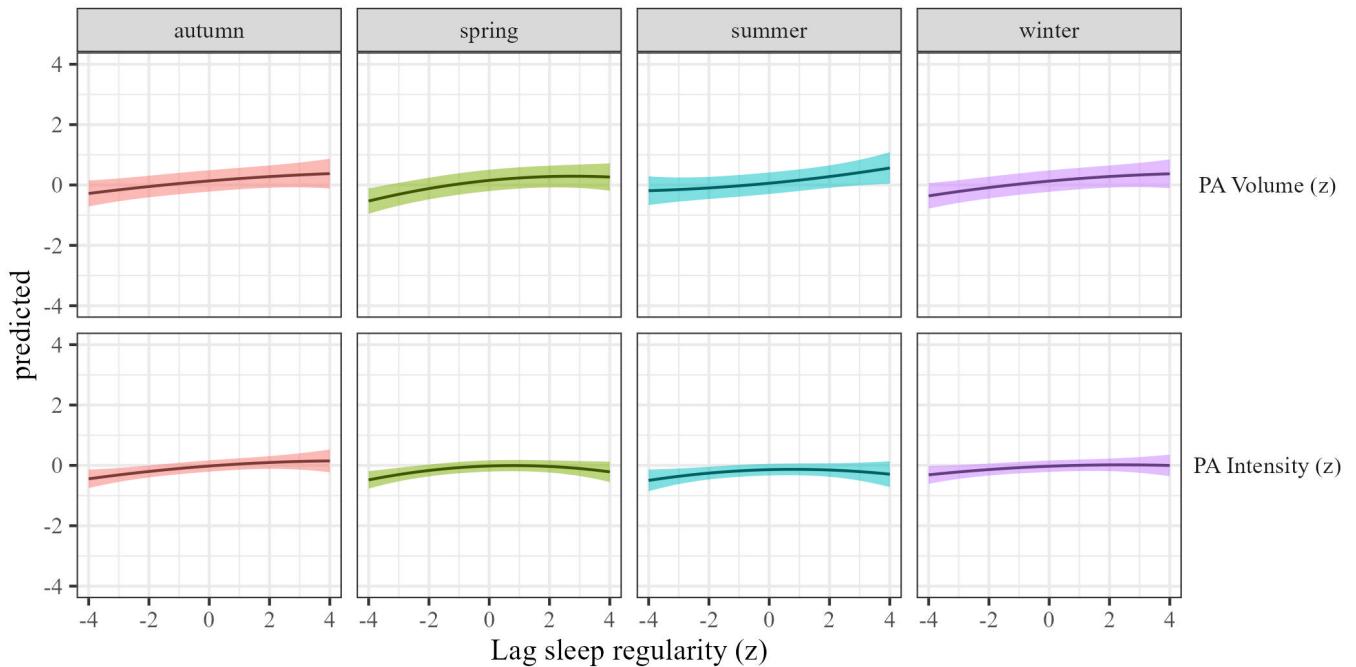


Figure 36. Physical activity by sleep regularity moderated by season

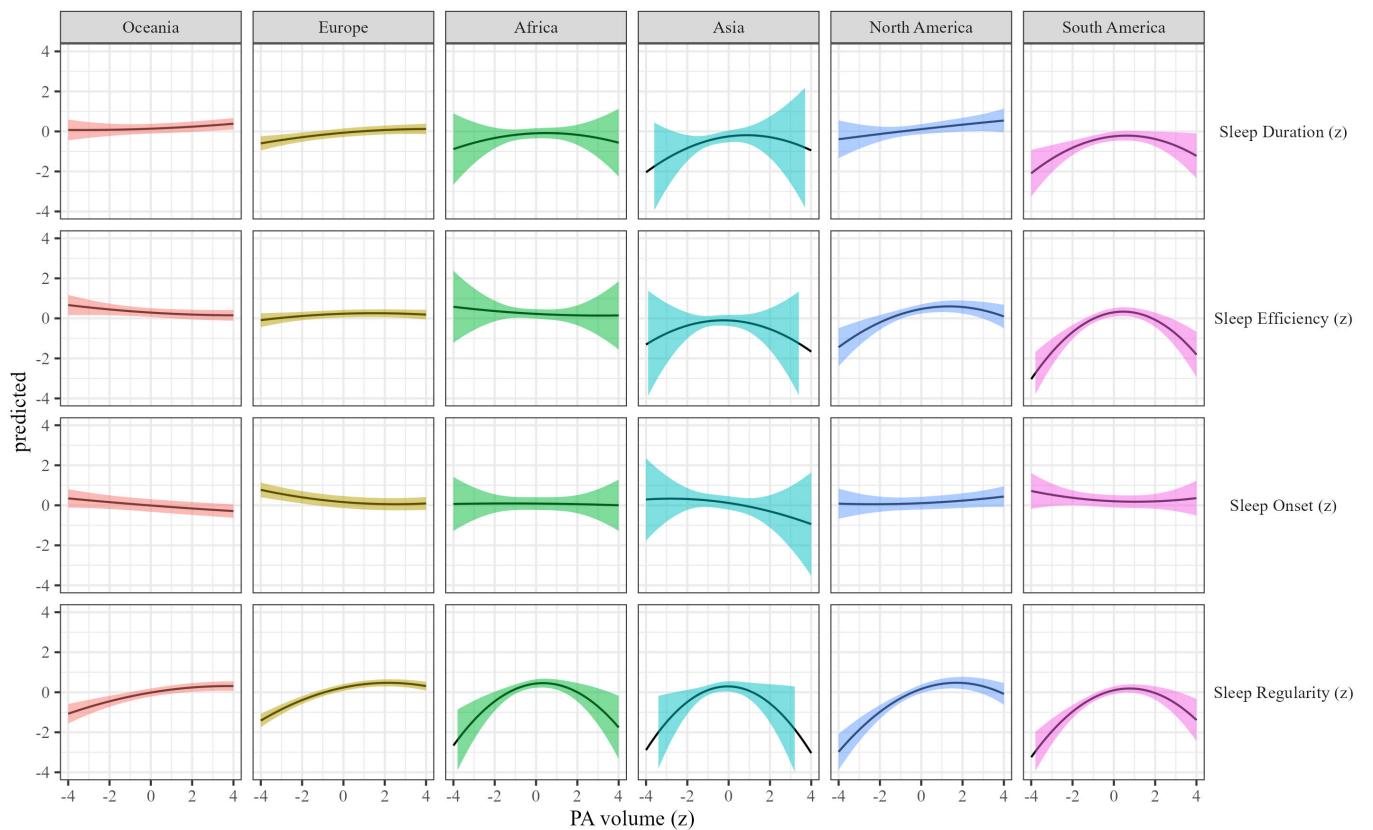


Figure 37. Sleep metrics on Physical activity volume by region

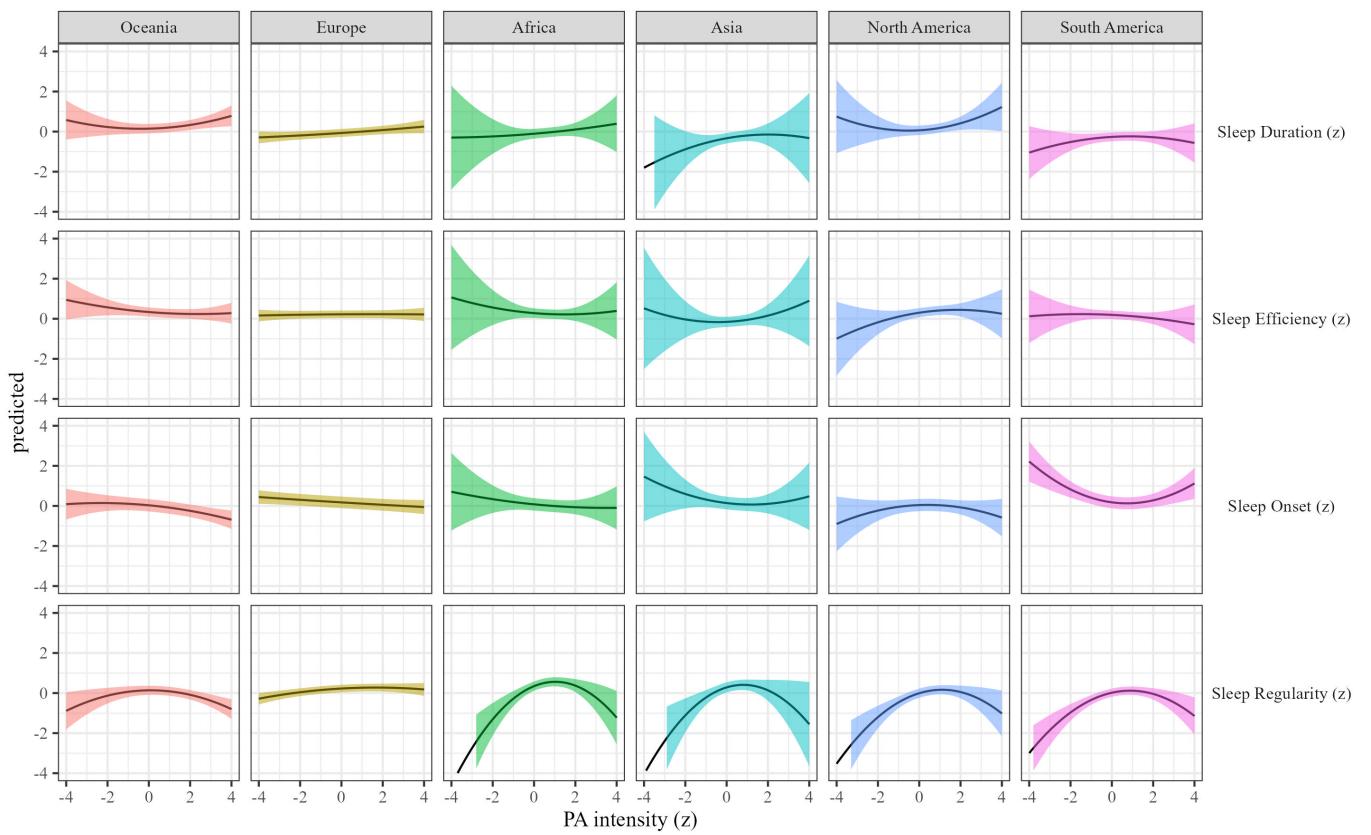


Figure 38. Sleep metrics on Physical activity intensity moderated by region

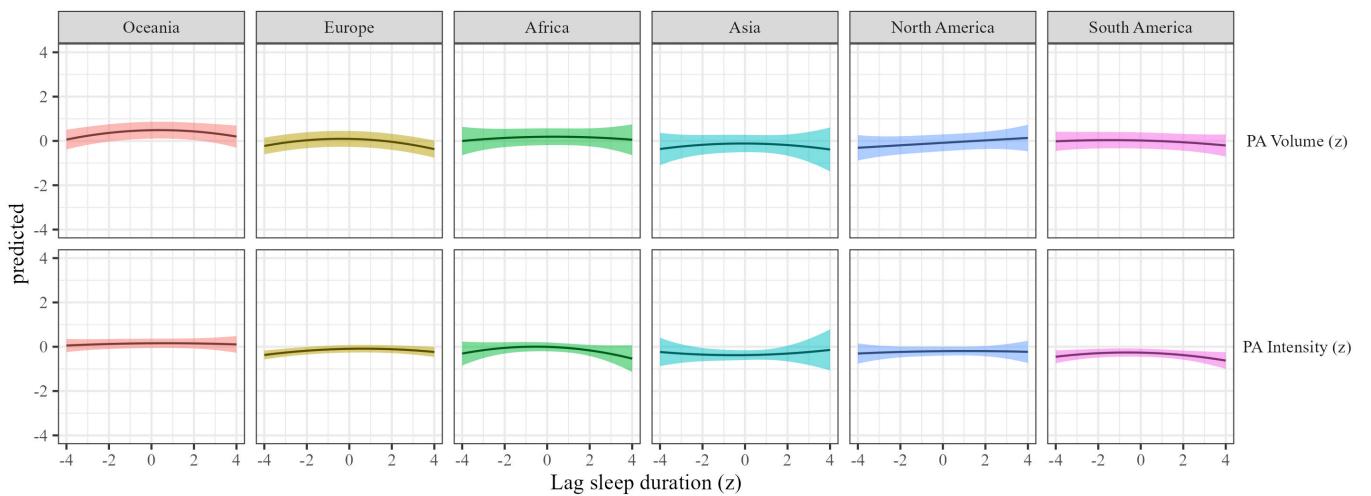


Figure 39. Physical activity by sleep duration moderated by region

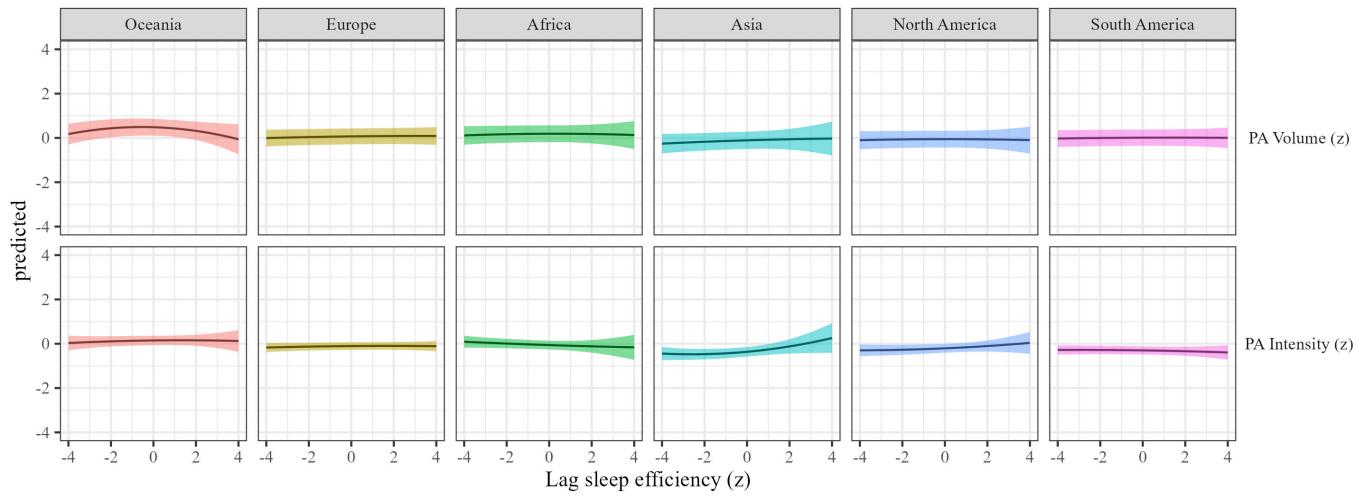


Figure 40. Physical activity by sleep efficiency moderated by region

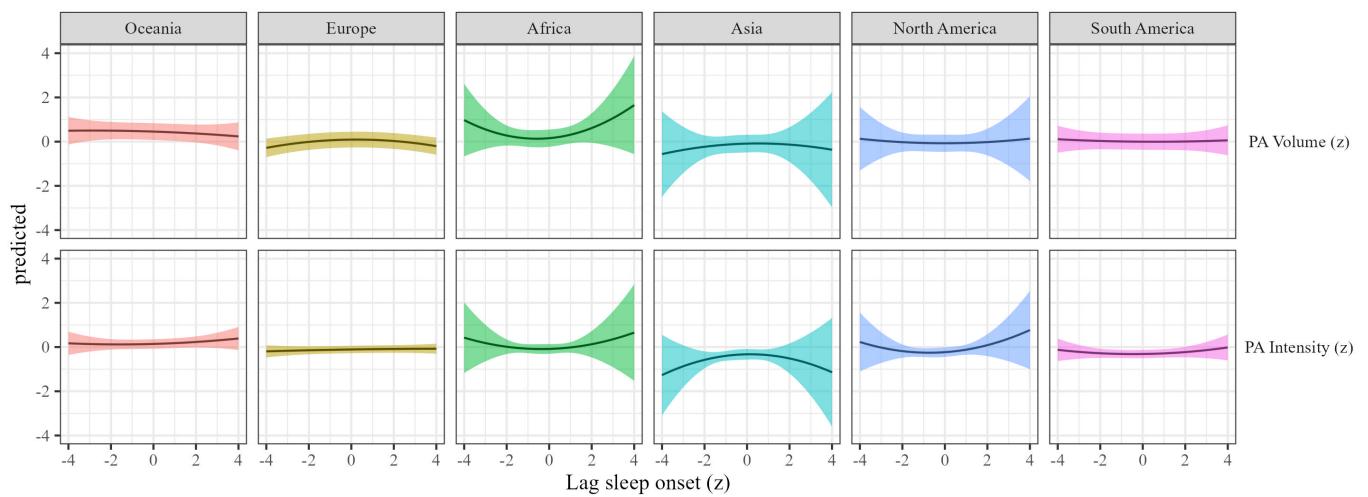


Figure 41. Physical activity by sleep onset moderated by region

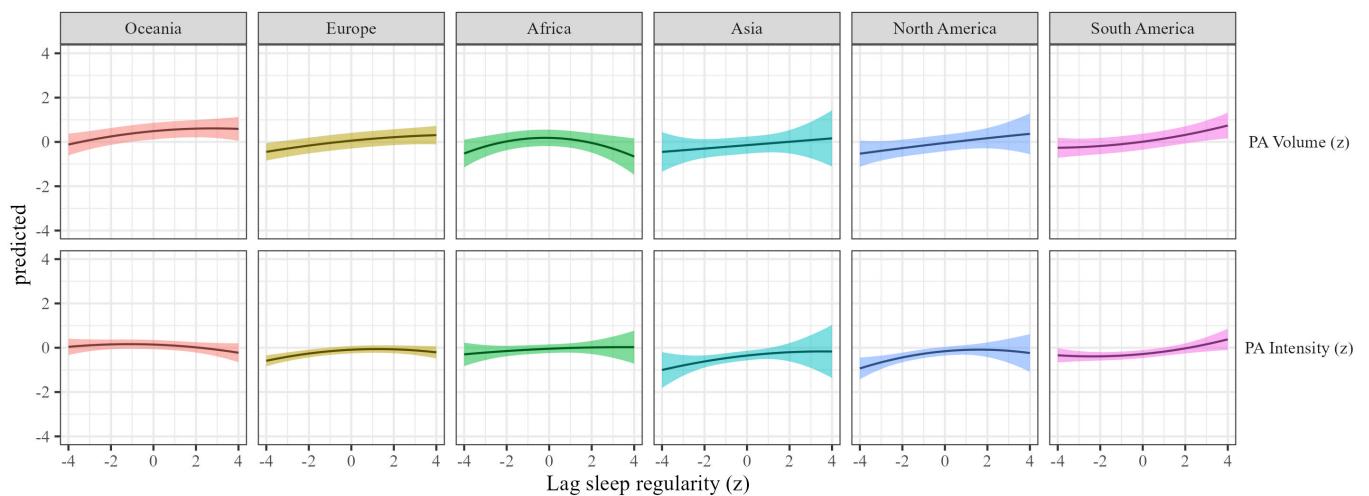


Figure 42. Physical activity by sleep regularity moderated by region

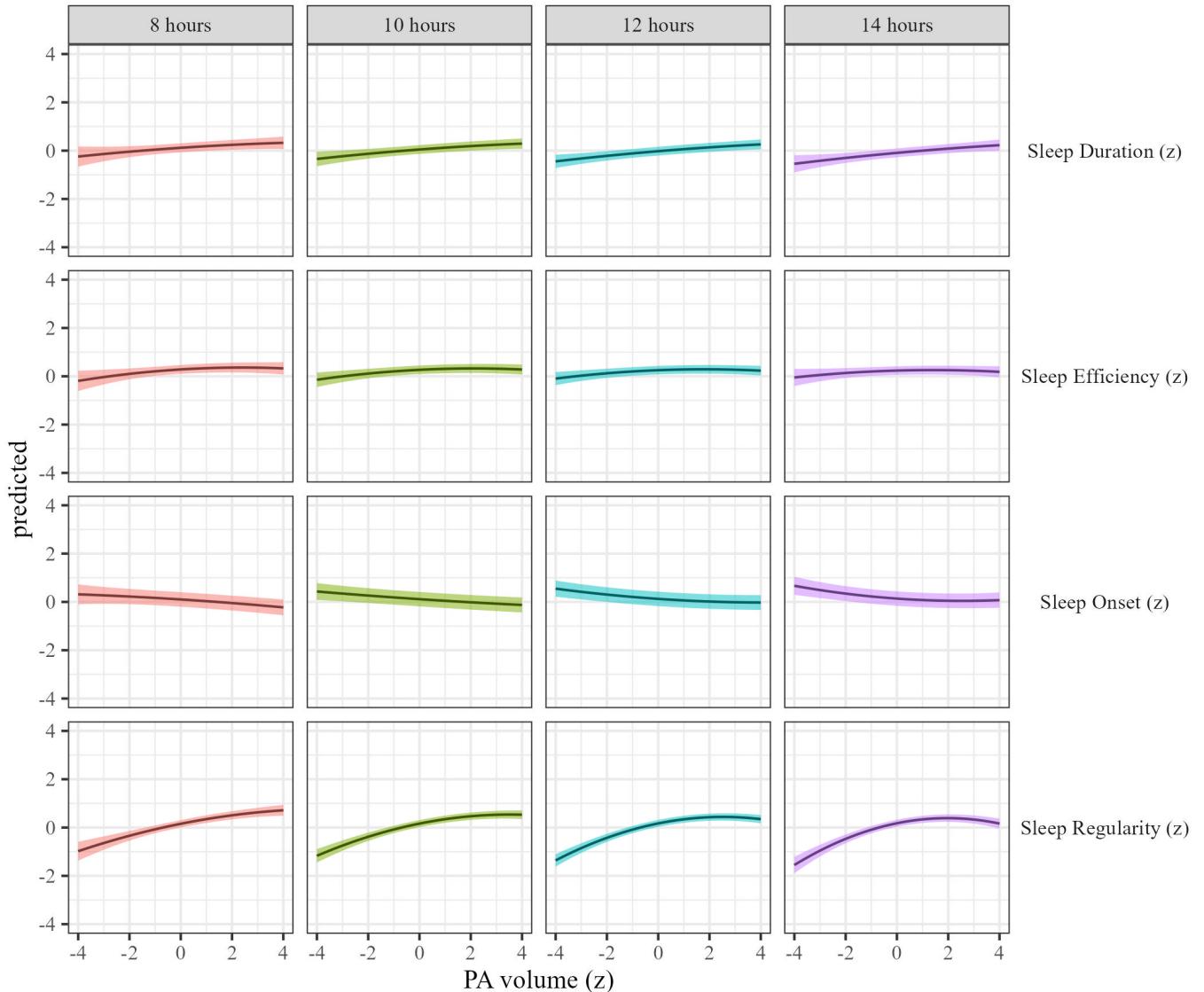


Figure 43. Sleep metrics on Physical activity volume by daylight hours

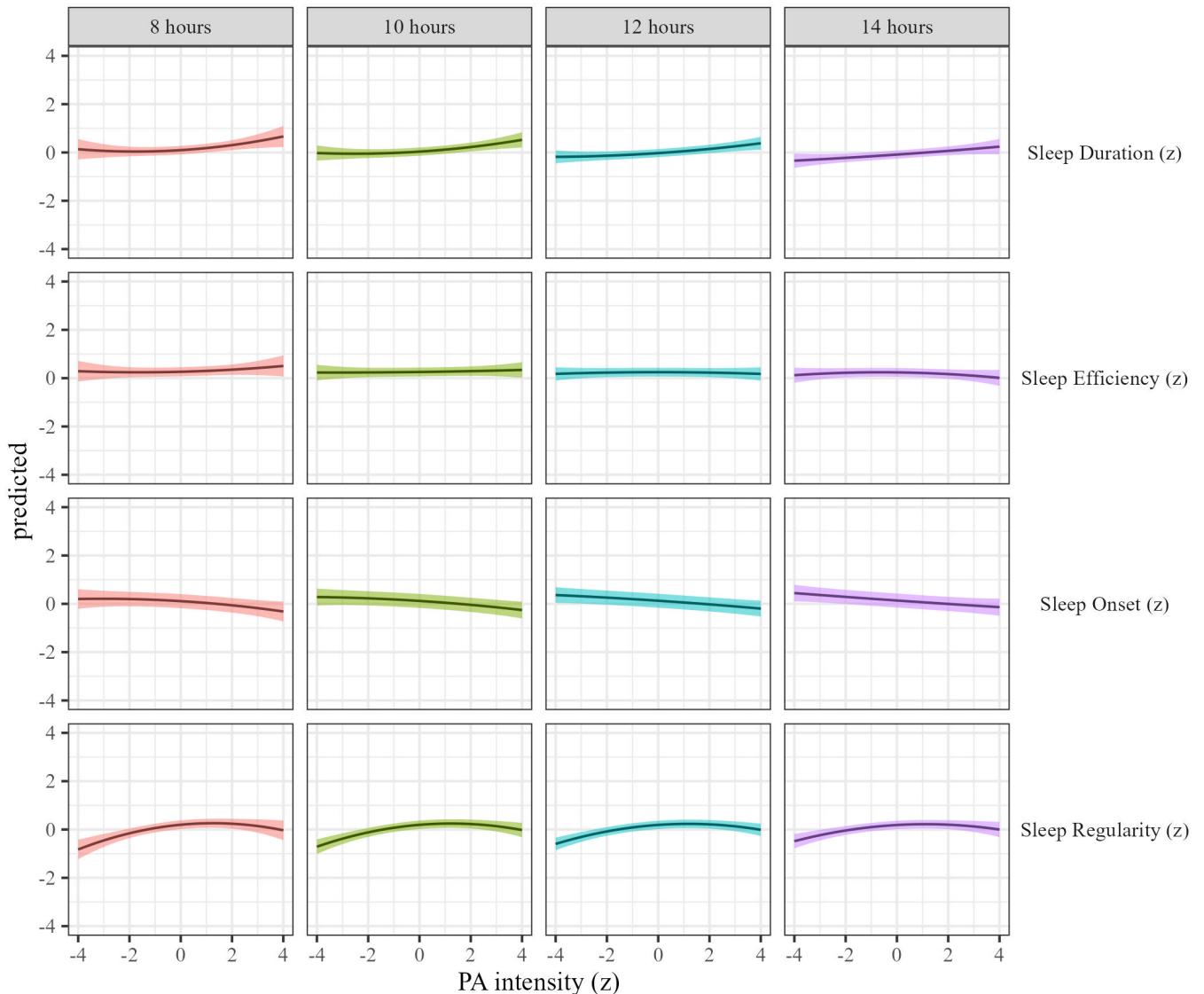


Figure 44. Sleep metrics on Physical activity intensity moderated by daylight hours

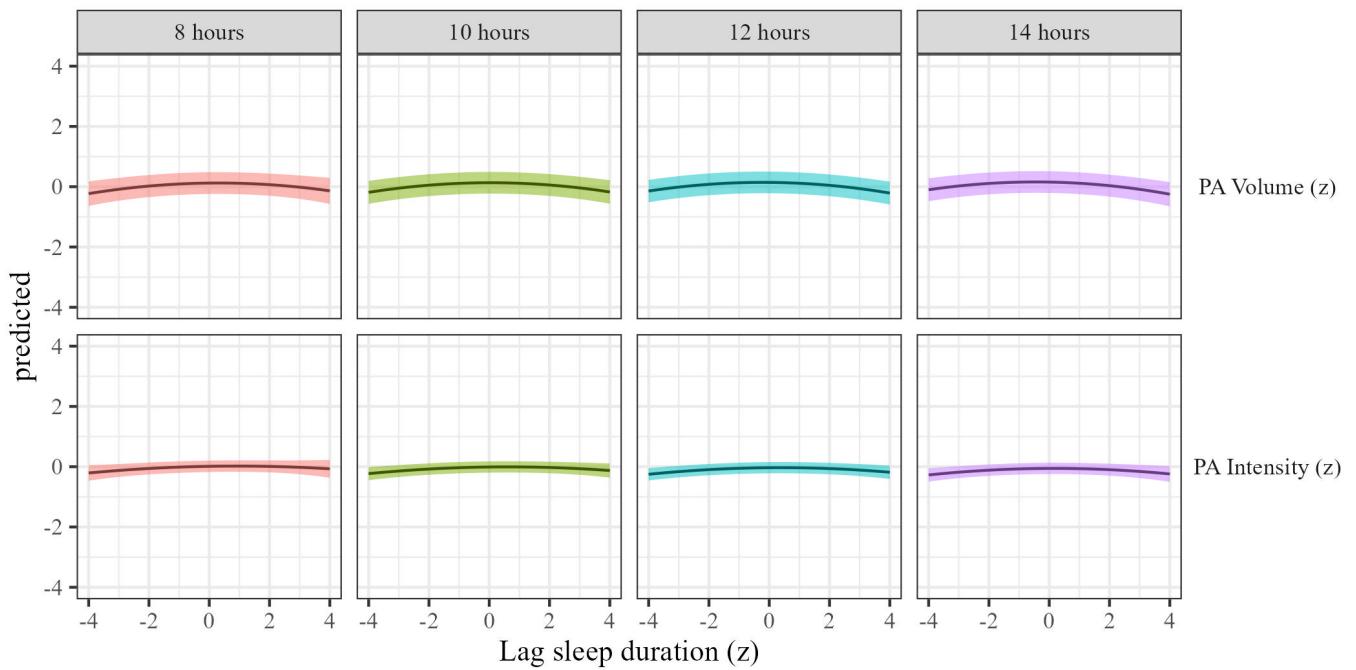


Figure 45. Physical activity by sleep duration moderated by daylight hours

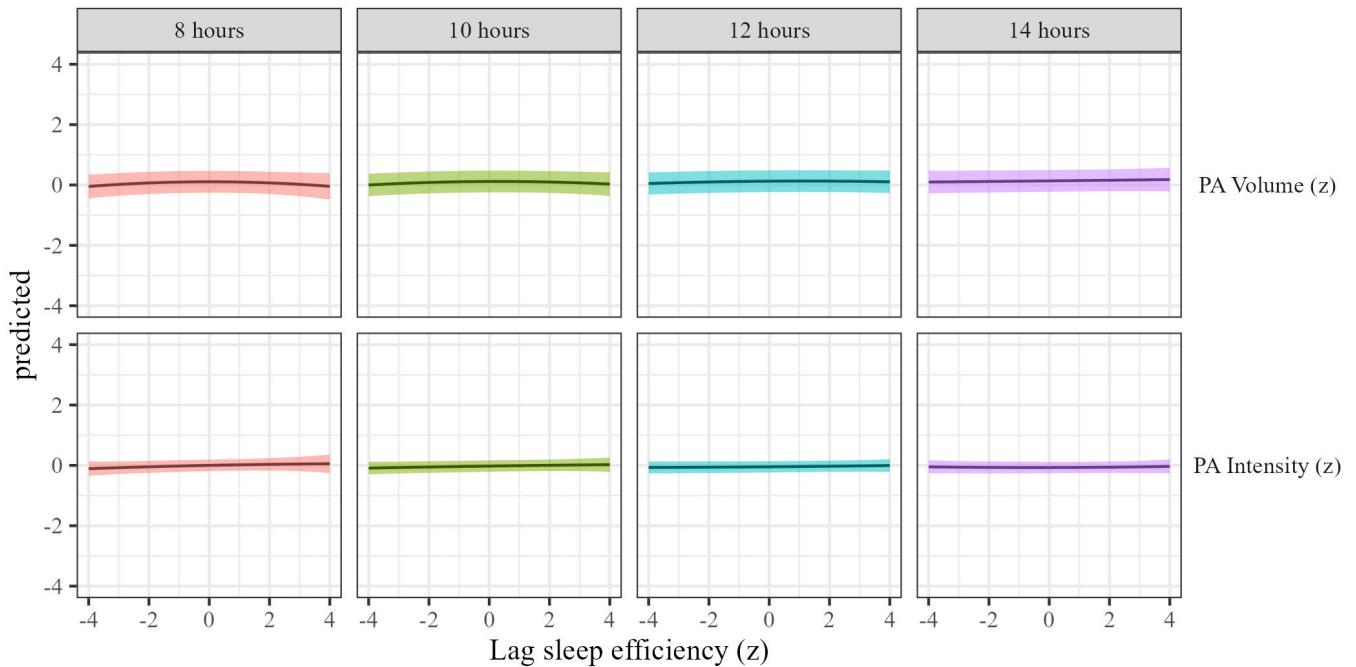


Figure 46. Physical activity by sleep efficiency moderated by daylight hours

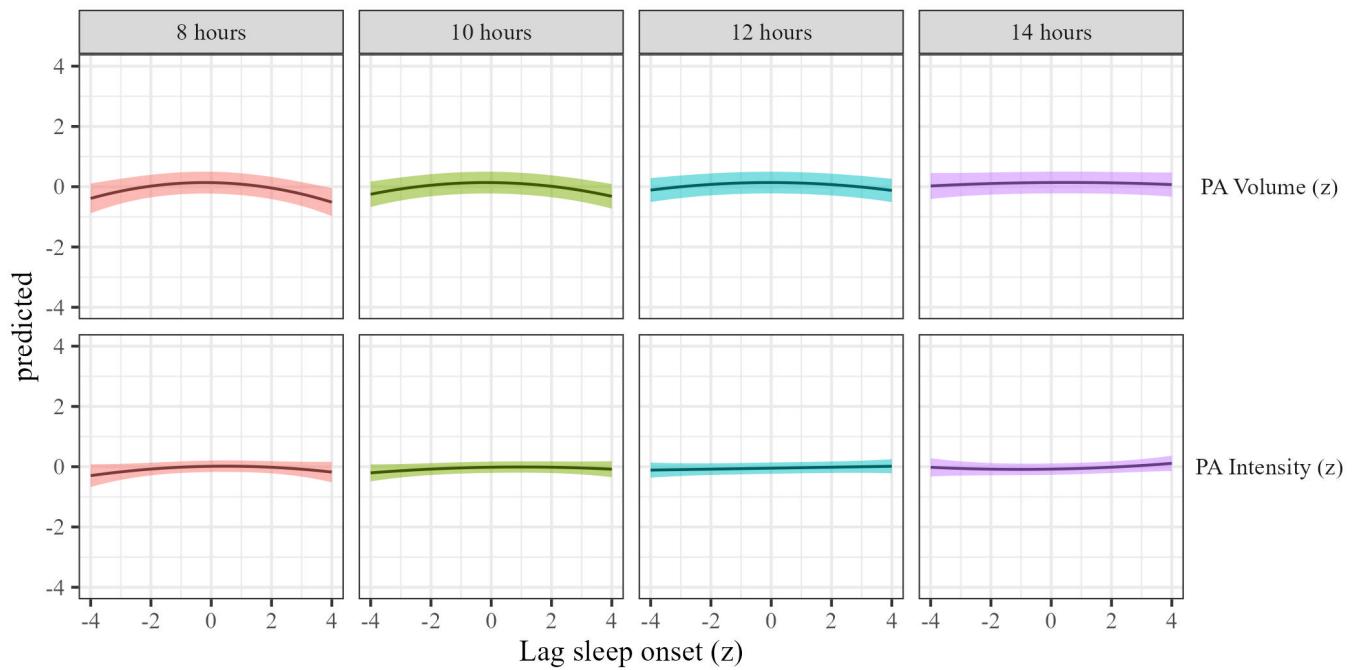


Figure 47. Physical activity by sleep onset moderated by daylight hours

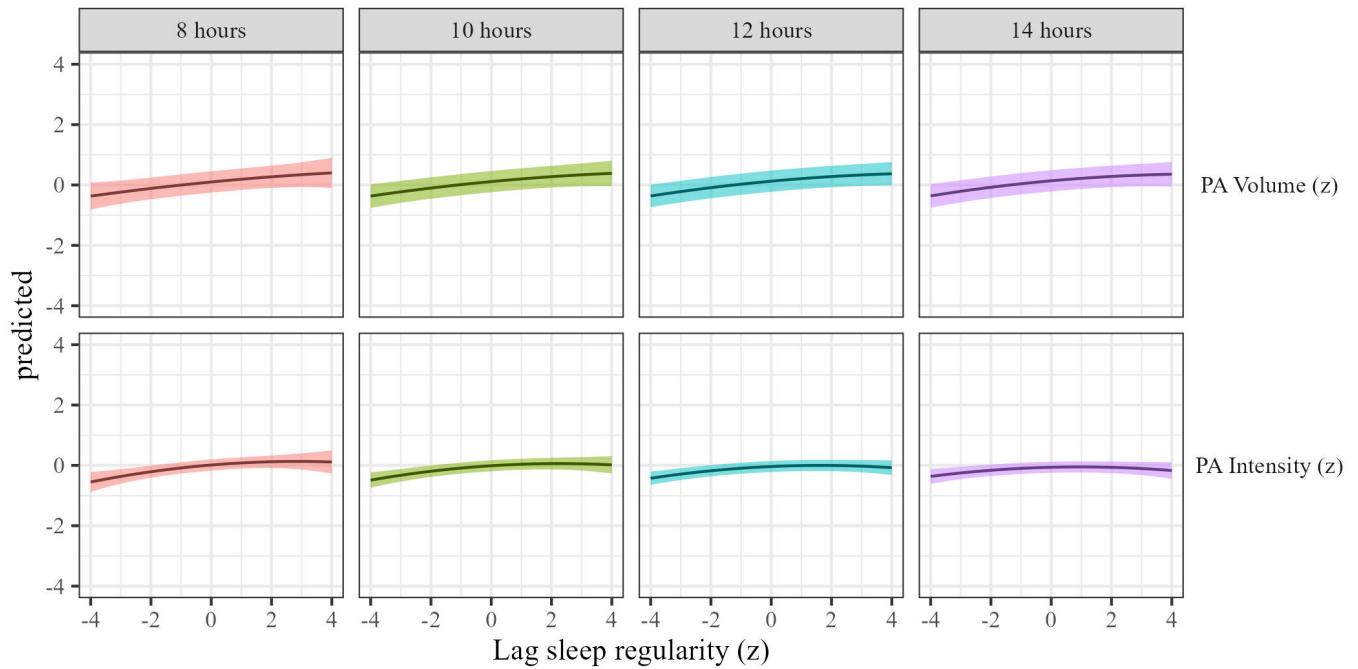


Figure 48. Physical activity by sleep regularity moderated by daylight hours

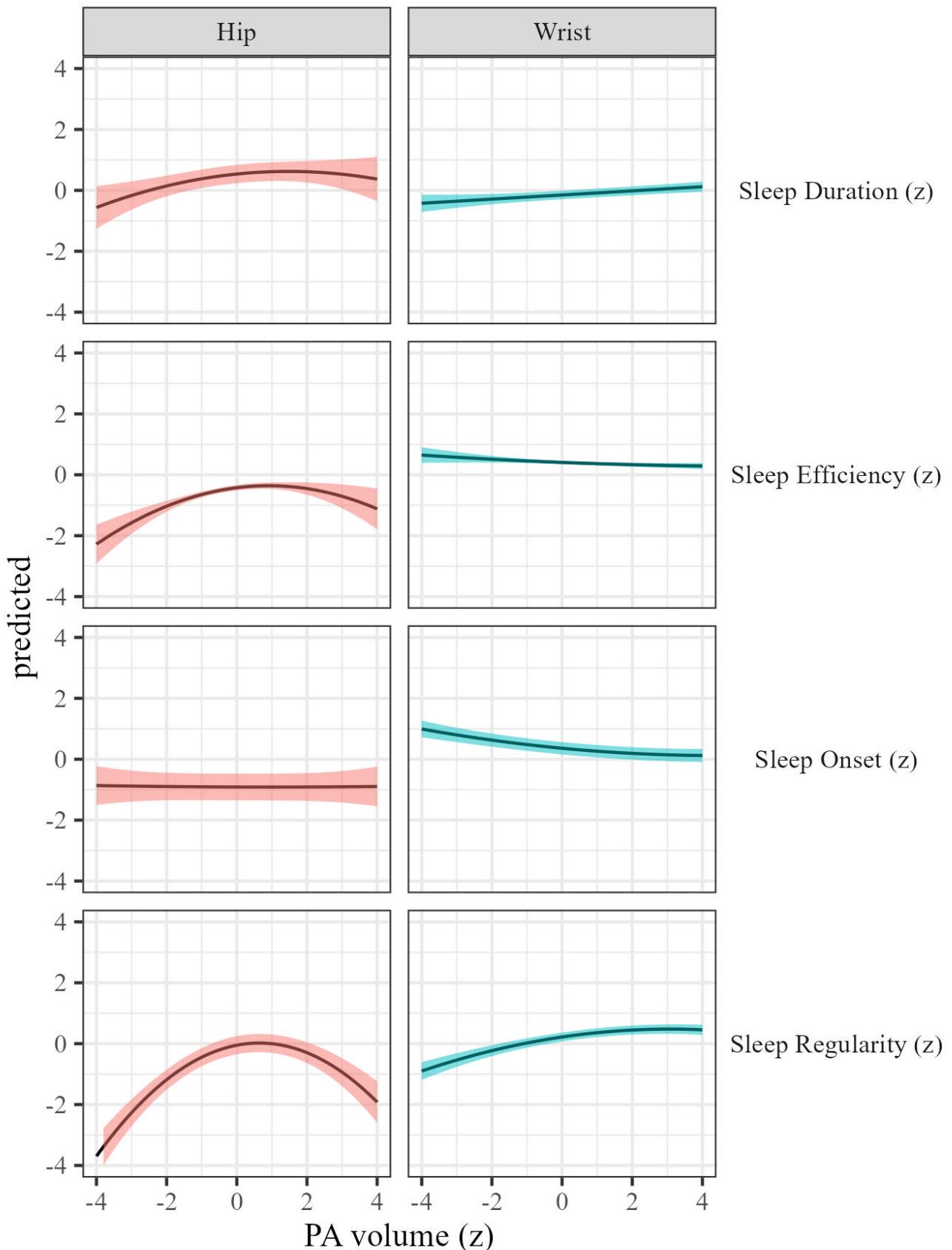


Figure 49. Sleep metrics on Physical activity volume by wear location

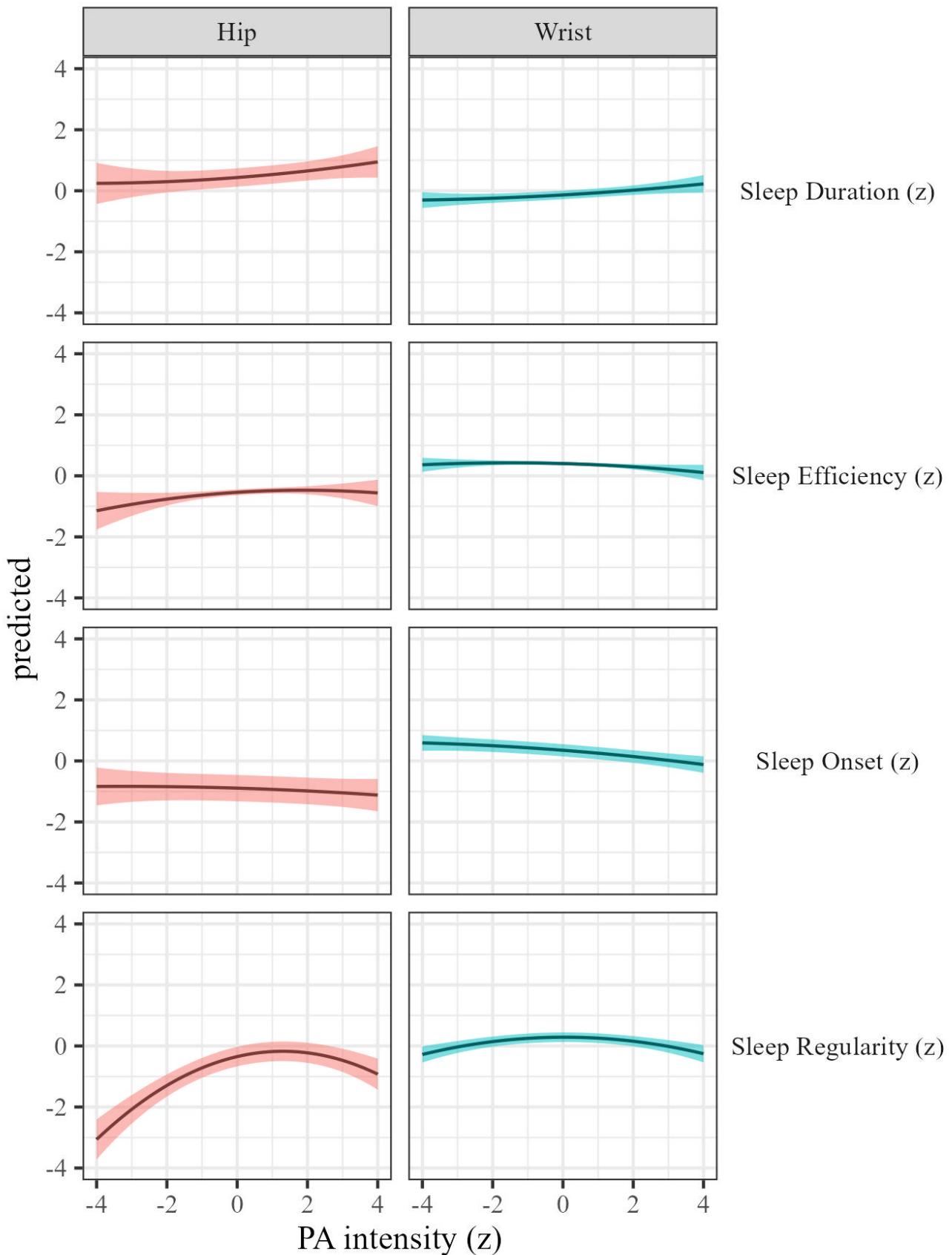


Figure 50. Sleep metrics on Physical activity intensity moderated by wear location

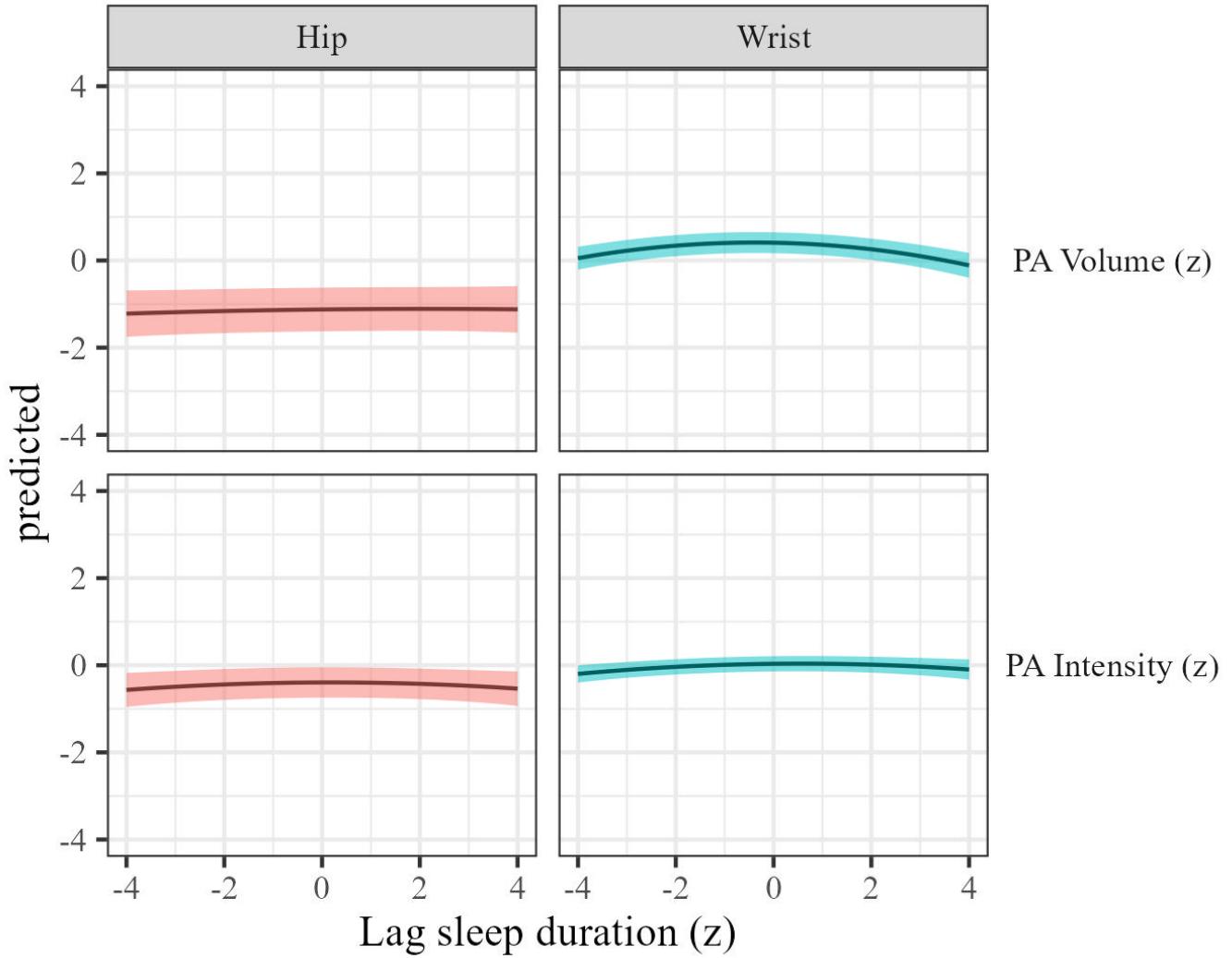


Figure 51. Physical activity by sleep duration moderated by wear location

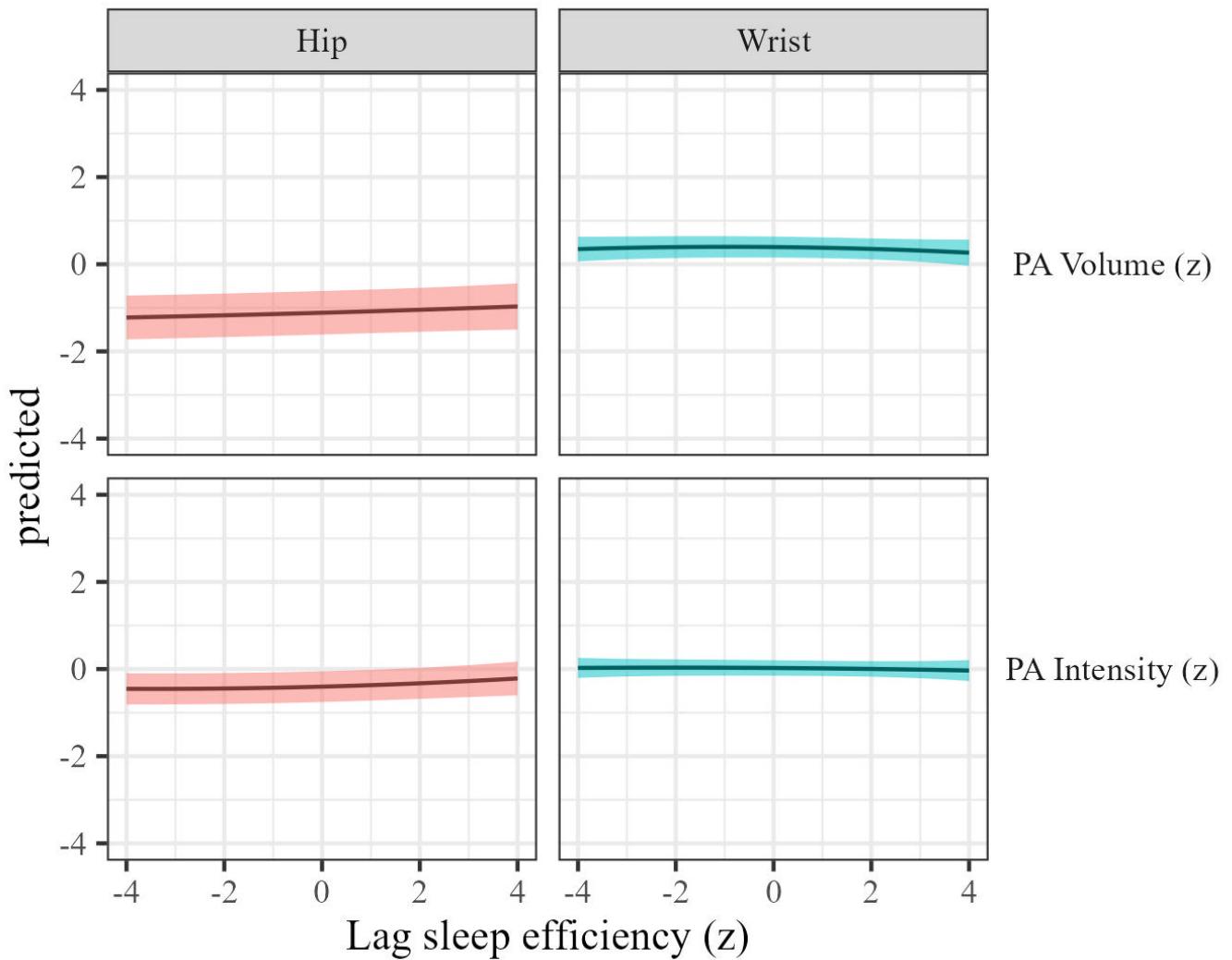


Figure 52. Physical activity by sleep efficiency moderated by wear location

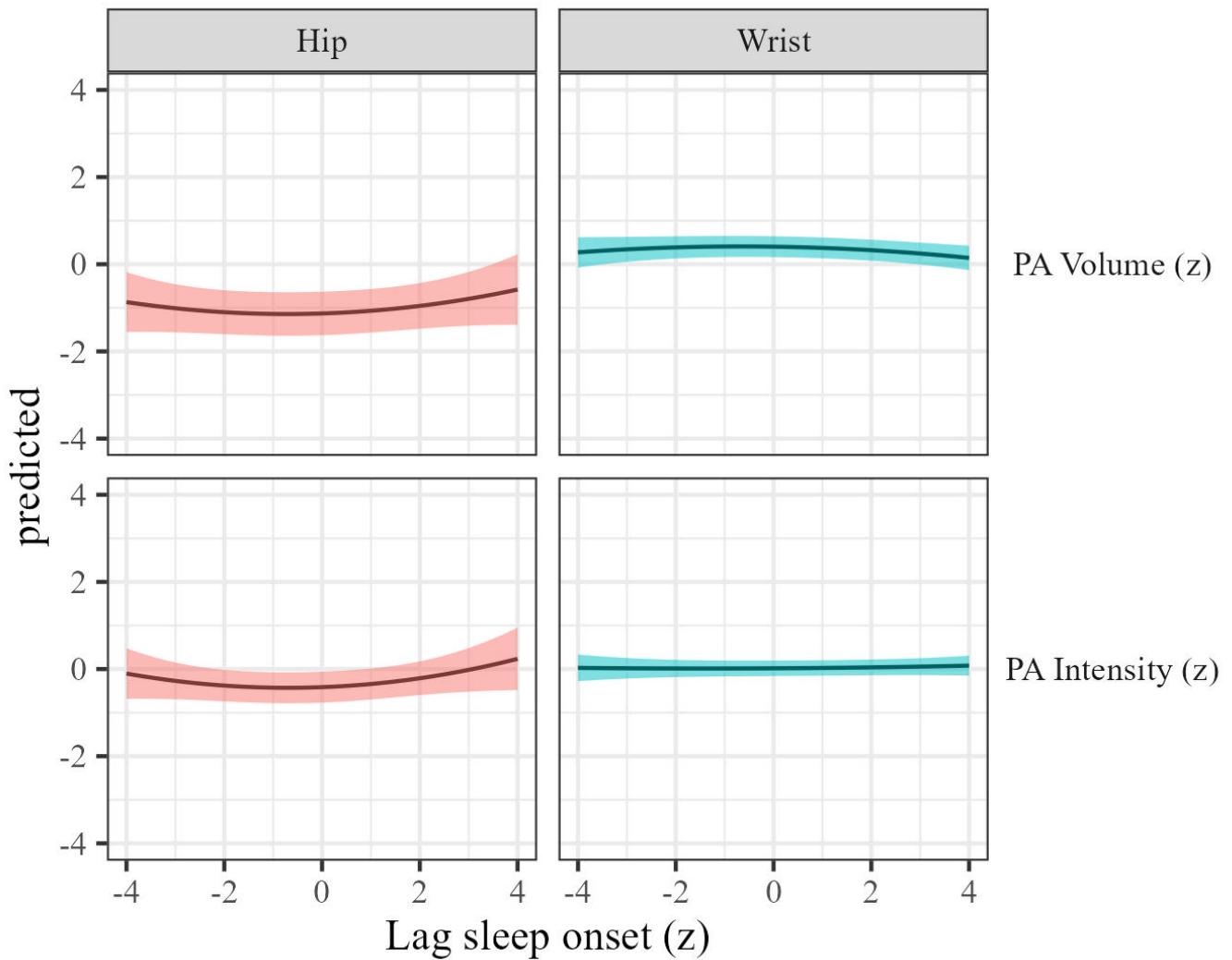


Figure 53. Physical activity by sleep onset moderated by wear location

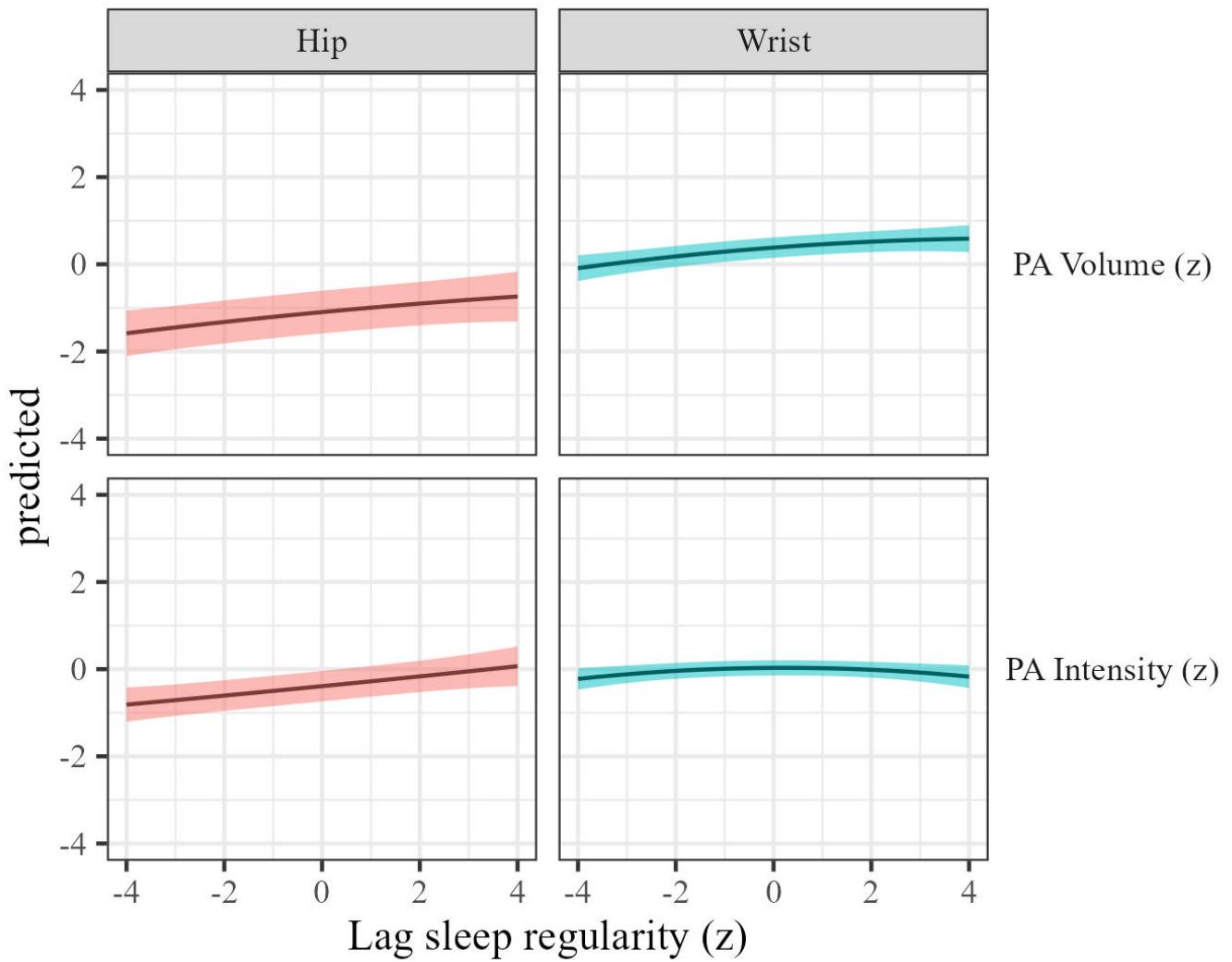


Figure 54. Physical activity by sleep regularity moderated by wear location

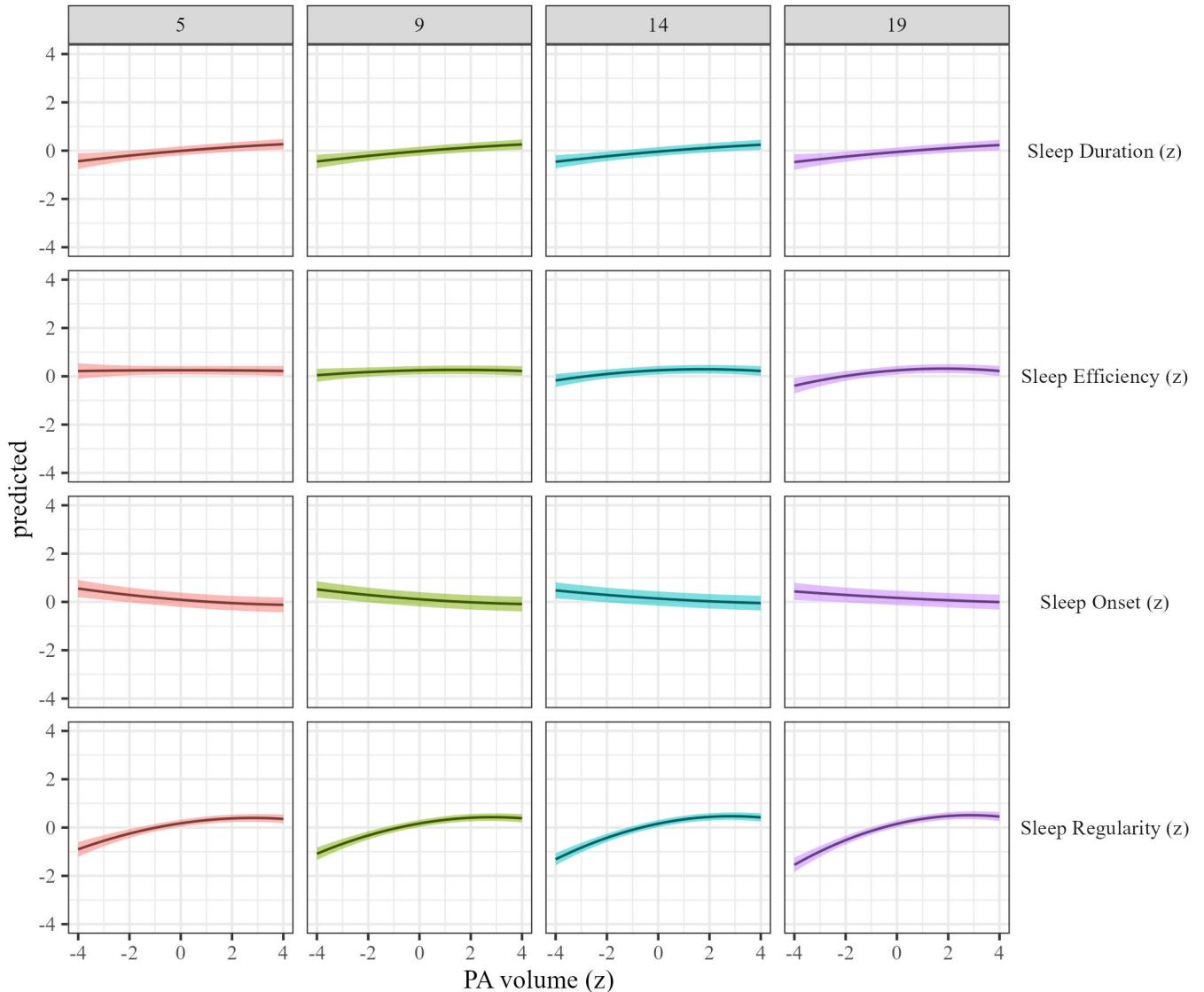


Figure 55. Sleep metrics on Physical activity volume by most active hour

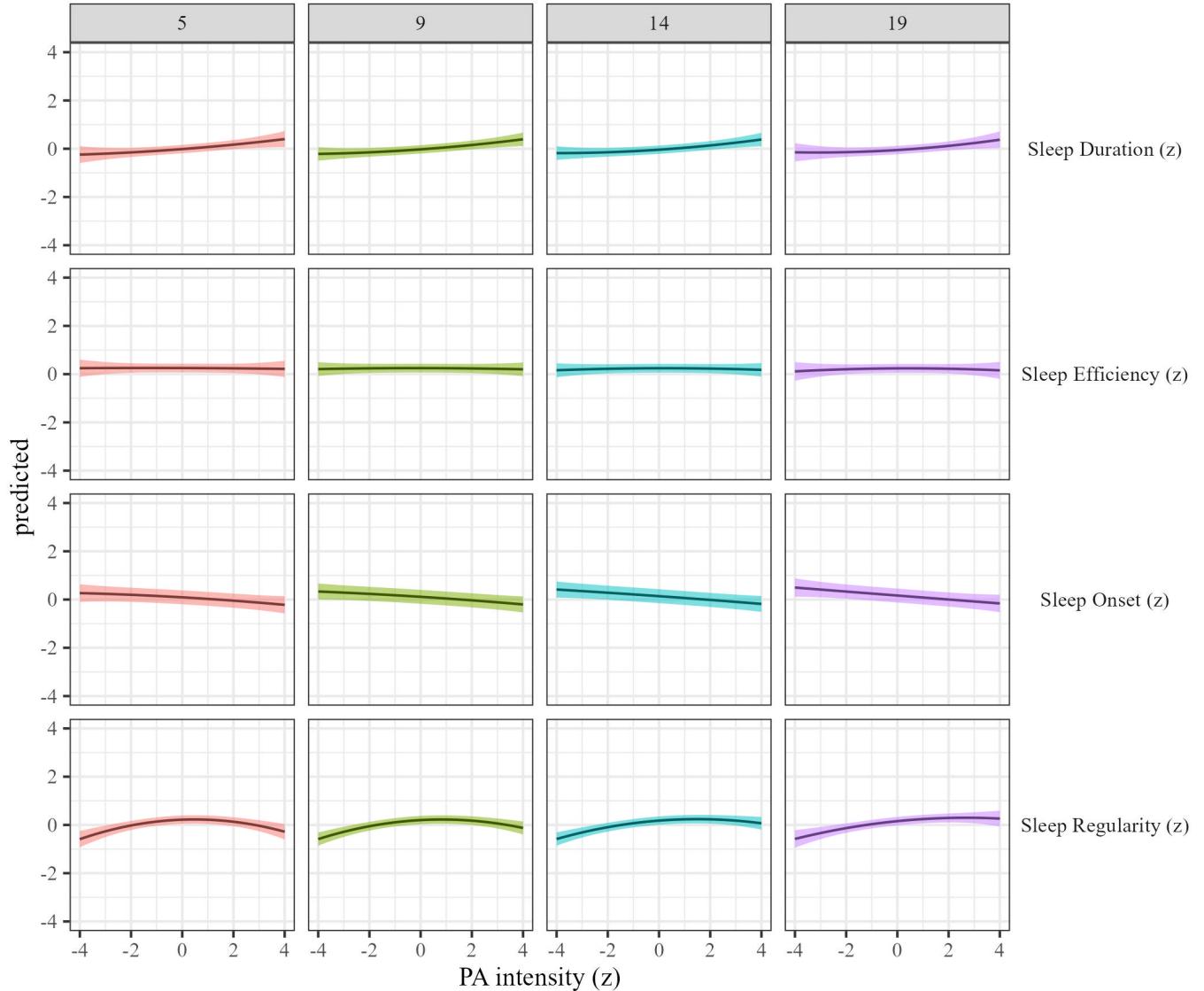


Figure 56. Sleep metrics on Physical activity intensity moderated by most active hour

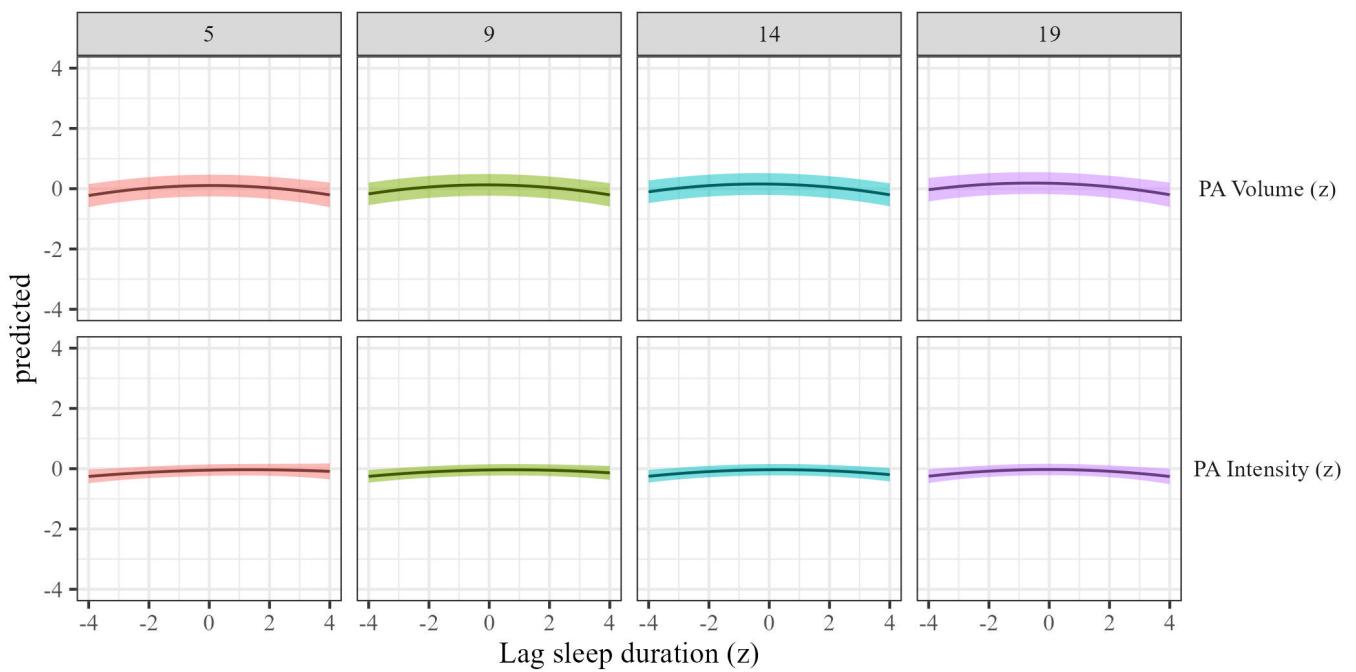


Figure 57. Physical activity by sleep duration moderated by most active hour

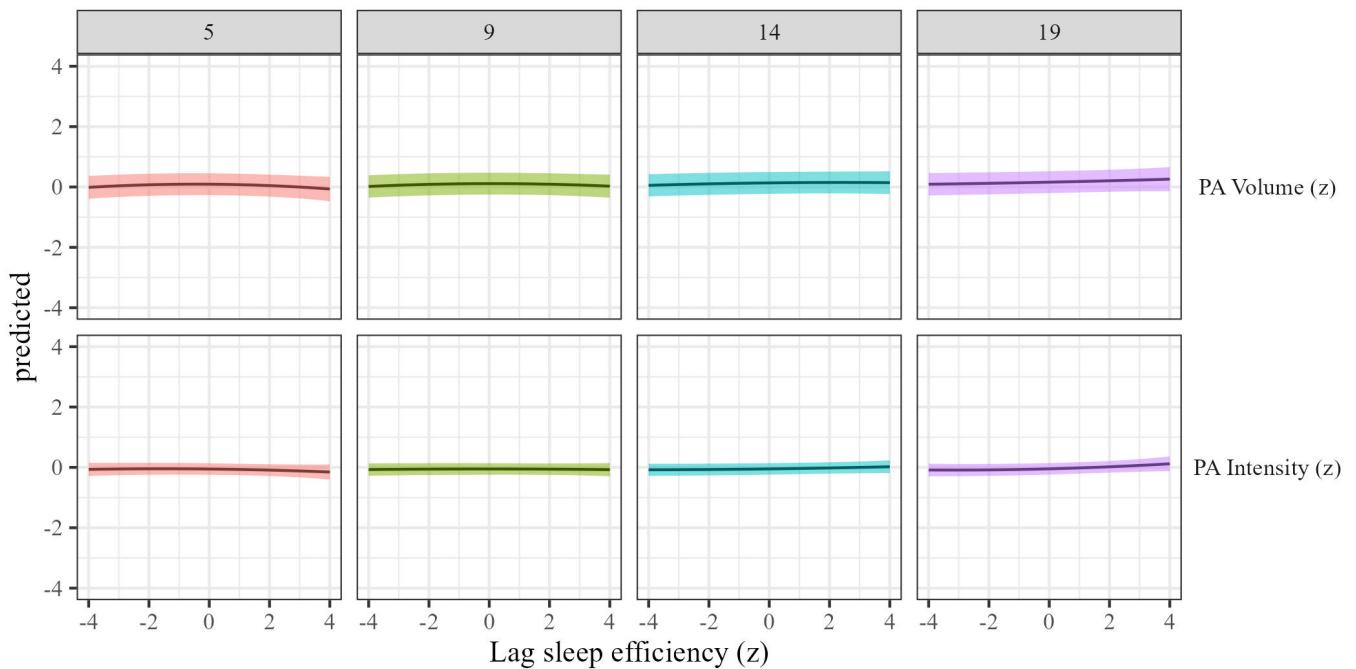
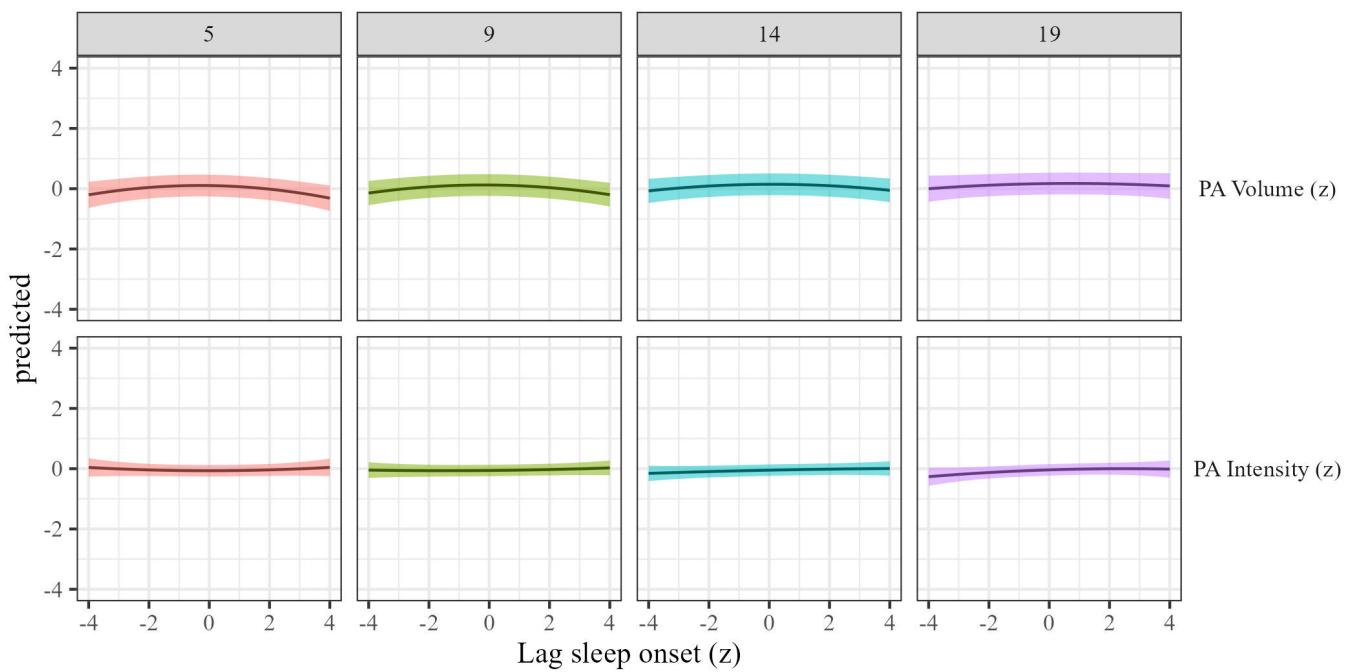
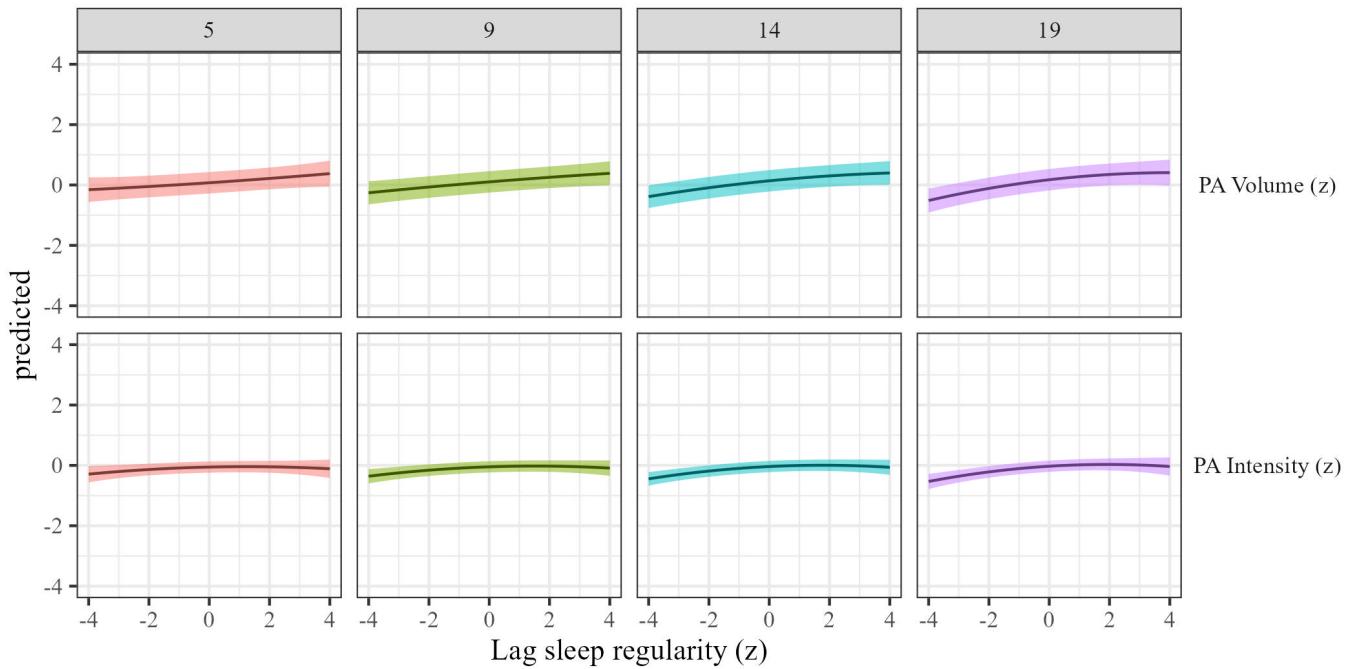


Figure 58. Physical activity by sleep efficiency moderated by most active hour



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



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