

Multiverse analysis

First Author<sup>1</sup> & Ernst-August Doelle<sup>1,2</sup>

<sup>1</sup> Wilhelm-Wundt-University

<sup>2</sup> Konstanz Business School

Author Note

Add complete departmental affiliations for each author here. Each new line herein must be indented, like this line.

Enter author note here.

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

Correspondence concerning this article should be addressed to First Author, Postal address. E-mail: my@email.com

### 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

### Fixed Effect Model

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 fixed-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.

### **Without Log Transforming PA Volume**

Based on preliminary modelling on a subset of the data, we chose to log transform the physical activity volume variable. Below, we present the results had we not made this decision. These results are all moderated by age, as this was our primary analysis.

**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 4 and Figure 7.

**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 5 and Figure 8.

**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 5 and Figure 9.

**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 5 and Figure 10.

**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 5 and Figure 11.

### **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 6 and Figure 12

**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 6 and Figure 13.

**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 7 and Figure 14.

**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 7 and Figure 15.

**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 7 and Figure 16.

**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 7 and Figure 17.

**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 8 and Figure 18

**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 8 and Figure 19.

**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 9 and Figure 20.

**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 9 and Figure 21.

**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 9 and Figure 22.

**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 9 and Figure 23.

**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 10 and Figure 24

**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 10 and Figure 25.

**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 11 and Figure 26.

**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 11 and Figure 27.

**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 11 and Figure 28.

**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 11 and Figure 29.

**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 12 and Figure 30

**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 12 and Figure 31.

**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 13 and Figure 32.

**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 13 and Figure 33.

**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 13 and Figure 34.

**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 13 and Figure 35.

**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 14 and Figure 36

**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 14 and Figure 37.

**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 15 and Figure 38.

**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 15 and Figure 39.

**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 15 and Figure 40.

**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 15 and Figure 41.

**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 16 and Figure 42

**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 16 and Figure 43.

**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 17 and Figure 44.

**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 17 and Figure 45.

**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 17 and Figure 46.

**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 17 and Figure 47.

**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 18 and Figure 48

**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 18 and Figure 49.

**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 19 and Figure 50.

**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 19 and Figure 51.

**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 19 and Figure 52.

**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 19 and Figure 53.

**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 20 and Figure 54

**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 20 and Figure 55.

**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 21 and Figure 56.

**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 21 and Figure 57.

**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 21 and Figure 58.

**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 21 and Figure 59.

**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 22 and Figure 60

**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 22 and Figure 61.

**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 23 and Figure 62.

**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 23 and Figure 63.

**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 23 and Figure 64.

**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 23 and Figure 65.

Table 1

*Model diagnostics*

Model name	Skewness	Kurtosis	Converged (%)
Models moderated by age			
Scale sleep duration by log PA volume	0.09	2.39	100.00%
Scale sleep efficiency by log PA volume	-0.92	3.81	100.00%
Scale sleep onset by log PA volume	0.46	4.86	100.00%
Scale sleep regularity by log PA volume	-0.87	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	3.16	100.00%
Log PA volume by sleep duration(lagged)	-0.45	2.49	100.00%
Scale PA intensity by sleep duration(lagged)	0.13	2.64	100.00%
Log PA volume by sleep efficiency(lagged)	-0.45	2.51	100.00%
Scale PA intensity by sleep efficiency(lagged)	0.13	2.63	100.00%
Log PA volume by sleep onset(lagged)	-0.45	2.51	100.00%
Scale PA intensity by sleep onset(lagged)	0.13	2.63	100.00%
Log PA volume by sleep regularity(lagged)	-0.36	2.36	100.00%
Scale PA intensity by sleep regularity(lagged)	0.17	2.57	100.00%
Models moderated by age fixedef			
Scale sleep duration by log PA volume	0.10	2.39	100.00%
Scale sleep efficiency by log PA volume	-0.92	3.81	100.00%
Scale sleep onset by log PA volume	0.46	4.86	100.00%
Scale sleep regularity by log PA volume	-0.87	3.22	100.00%
Scale sleep duration by PA intensity	0.09	2.37	100.00%
Scale sleep efficiency by PA intensity	-0.92	3.77	100.00%
Scale sleep onset by PA intensity	0.47	4.75	100.00%
Scale sleep regularity by PA intensity	-0.86	3.16	100.00%
Log PA volume by sleep duration(lagged)	-0.45	2.49	100.00%
Scale PA intensity by sleep duration(lagged)	0.13	2.64	100.00%
Log PA volume by sleep efficiency(lagged)	-0.45	2.51	100.00%
Scale PA intensity by sleep efficiency(lagged)	0.13	2.62	100.00%
Log PA volume by sleep onset(lagged)	-0.45	2.51	100.00%
Scale PA intensity by sleep onset(lagged)	0.13	2.62	100.00%
Log PA volume by sleep regularity(lagged)	-0.36	2.36	100.00%
Scale PA intensity by sleep regularity(lagged)	0.17	2.57	100.00%

Table 1 continued

Model name		Skewness	Kurtosis	Converged (%)
Models moderated by age nolog				
Scale sleep duration by PA volume	0.09	2.39	100.00%	
Scale sleep efficiency by PA volume	-0.92	3.79	100.00%	
Scale sleep onset by PA volume	0.46	4.83	100.00%	
Scale sleep regularity by PA volume	-0.87	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	3.16	100.00%	
Scale PA volume by sleep duration(lagged)	1.16	12.89	100.00%	
Scale PA intensity by sleep duration(lagged)	0.13	2.64	100.00%	
Scale PA volume by sleep efficiency(lagged)	1.15	12.94	100.00%	
Scale PA intensity by sleep efficiency(lagged)	0.13	2.63	100.00%	
Scale PA volume by sleep onset(lagged)	1.16	12.88	100.00%	
Scale PA intensity by sleep onset(lagged)	0.13	2.63	100.00%	
Scale PA volume by sleep regularity(lagged)	1.20	13.24	100.00%	
Scale PA intensity by sleep regularity(lagged)	0.17	2.57	100.00%	
Models moderated by bmi				
Scale sleep duration by log PA volume	0.09	2.40	100.00%	
Scale sleep efficiency by log PA volume	-0.92	3.80	100.00%	
Scale sleep onset by log PA volume	0.46	4.84	100.00%	
Scale sleep regularity by log PA volume	-0.87	3.23	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	3.13	100.00%	
Log PA volume by sleep duration(lagged)	-0.45	2.49	100.00%	
Scale PA intensity by sleep duration(lagged)	0.13	2.63	100.00%	
Log PA volume by sleep efficiency(lagged)	-0.45	2.51	100.00%	
Scale PA intensity by sleep efficiency(lagged)	0.13	2.63	100.00%	
Log PA volume by sleep onset(lagged)	-0.45	2.51	100.00%	
Scale PA intensity by sleep onset(lagged)	0.13	2.62	100.00%	
Log PA volume by sleep regularity(lagged)	-0.36	2.36	100.00%	
Scale PA intensity by sleep regularity(lagged)	0.16	2.57	100.00%	
Models moderated by ses				

Table 1 continued

Model name	Skewness	Kurtosis	Converged (%)
Scale sleep duration by log PA volume	0.09	2.40	100.00%
Scale sleep efficiency by log PA volume	-0.93	3.78	100.00%
Scale sleep onset by log PA volume	0.46	4.84	100.00%
Scale sleep regularity by log PA volume	-0.87	3.21	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	3.11	100.00%
Log PA volume by sleep duration(lagged)	-0.45	2.49	100.00%
Scale PA intensity by sleep duration(lagged)	0.13	2.65	100.00%
Log PA volume by sleep efficiency(lagged)	-0.45	2.51	100.00%
Scale PA intensity by sleep efficiency(lagged)	0.13	2.63	100.00%
Log PA volume by sleep onset(lagged)	-0.45	2.50	100.00%
Scale PA intensity by sleep onset(lagged)	0.13	2.63	100.00%
Log PA volume by sleep regularity(lagged)	-0.37	2.36	100.00%
Scale PA intensity by sleep regularity(lagged)	0.16	2.57	100.00%
Models moderated by weekday			
Scale sleep duration by log PA volume	0.07	2.35	100.00%
Scale sleep efficiency by log PA volume	-0.91	3.78	100.00%
Scale sleep onset by log PA volume	0.44	4.92	100.00%
Scale sleep regularity by log PA volume	-0.92	3.55	100.00%
Scale sleep duration by PA intensity	0.07	2.34	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	-0.93	3.63	100.00%
Log PA volume by sleep duration(lagged)	-0.37	2.49	100.00%
Scale PA intensity by sleep duration(lagged)	0.18	2.73	100.00%
Log PA volume by sleep efficiency(lagged)	-0.38	2.52	100.00%
Scale PA intensity by sleep efficiency(lagged)	0.18	2.77	100.00%
Log PA volume by sleep onset(lagged)	-0.37	2.50	100.00%
Scale PA intensity by sleep onset(lagged)	0.19	2.78	100.00%
Log PA volume by sleep regularity(lagged)	-0.32	2.35	100.00%
Scale PA intensity by sleep regularity(lagged)	0.20	2.65	100.00%
Models moderated by season			
Scale sleep duration by log PA volume	0.09	2.39	100.00%

Table 1 continued

Model name	Skewness	Kurtosis	Converged (%)
Scale sleep efficiency by log PA volume	-0.92	3.79	100.00%
Scale sleep onset by log PA volume	0.46	4.82	100.00%
Scale sleep regularity by log PA volume	-0.87	3.24	100.00%
Scale sleep duration by PA intensity	0.09	2.35	100.00%
Scale sleep efficiency by PA intensity	-0.92	3.77	100.00%
Scale sleep onset by PA intensity	0.47	4.76	100.00%
Scale sleep regularity by PA intensity	-0.86	3.12	100.00%
Log PA volume by sleep duration(lagged)	-0.44	2.47	100.00%
Scale PA intensity by sleep duration(lagged)	0.13	2.65	100.00%
Log PA volume by sleep efficiency(lagged)	-0.45	2.49	100.00%
Scale PA intensity by sleep efficiency(lagged)	0.13	2.62	100.00%
Log PA volume by sleep onset(lagged)	-0.45	2.50	100.00%
Scale PA intensity by sleep onset(lagged)	0.13	2.63	100.00%
Log PA volume by sleep regularity(lagged)	-0.37	2.36	100.00%
Scale PA intensity by sleep regularity(lagged)	0.16	2.57	100.00%
Models moderated by region			
Scale sleep duration by log PA volume	0.10	2.39	100.00%
Scale sleep efficiency by log PA volume	-0.93	3.81	100.00%
Scale sleep onset by log PA volume	0.46	4.82	100.00%
Scale sleep regularity by log PA volume	-0.88	3.26	100.00%
Scale sleep duration by PA intensity	0.09	2.36	100.00%
Scale sleep efficiency by PA intensity	-0.92	3.77	100.00%
Scale sleep onset by PA intensity	0.46	4.73	100.00%
Scale sleep regularity by PA intensity	-0.85	3.07	100.00%
Log PA volume by sleep duration(lagged)	-0.45	2.48	100.00%
Scale PA intensity by sleep duration(lagged)	0.13	2.67	100.00%
Log PA volume by sleep efficiency(lagged)	-0.45	2.51	100.00%
Scale PA intensity by sleep efficiency(lagged)	0.13	2.64	100.00%
Log PA volume by sleep onset(lagged)	-0.45	2.50	100.00%
Scale PA intensity by sleep onset(lagged)	0.12	2.64	100.00%
Log PA volume by sleep regularity(lagged)	-0.36	2.33	100.00%
Scale PA intensity by sleep regularity(lagged)	0.16	2.57	100.00%
Models moderated by daylight			
Scale sleep duration by log PA volume	0.09	2.41	100.00%
Scale sleep efficiency by log PA volume	-0.92	3.79	100.00%

Table 1 continued

Model name	Skewness	Kurtosis	Converged (%)
Scale sleep onset by log PA volume	0.46	4.83	100.00%
Scale sleep regularity by log PA volume	-0.87	3.22	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	3.13	100.00%
Log PA volume by sleep duration(lagged)	-0.45	2.49	100.00%
Scale PA intensity by sleep duration(lagged)	0.13	2.65	100.00%
Log PA volume by sleep efficiency(lagged)	-0.45	2.50	100.00%
Scale PA intensity by sleep efficiency(lagged)	0.13	2.63	100.00%
Log PA volume by sleep onset(lagged)	-0.45	2.51	100.00%
Scale PA intensity by sleep onset(lagged)	0.13	2.63	100.00%
Log PA volume by sleep regularity(lagged)	-0.37	2.36	100.00%
Scale PA intensity by sleep regularity(lagged)	0.17	2.55	100.00%
Models moderated by wear location			
Scale sleep duration by log PA volume	0.09	2.40	100.00%
Scale sleep efficiency by log PA volume	-0.92	3.81	100.00%
Scale sleep onset by log PA volume	0.46	4.87	100.00%
Scale sleep regularity by log PA volume	-0.87	3.22	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	0.47	4.73	100.00%
Scale sleep regularity by PA intensity	-0.86	3.14	100.00%
Log PA volume by sleep duration(lagged)	-0.44	2.49	100.00%
Scale PA intensity by sleep duration(lagged)	0.13	2.65	100.00%
Log PA volume by sleep efficiency(lagged)	-0.45	2.51	100.00%
Scale PA intensity by sleep efficiency(lagged)	0.13	2.62	100.00%
Log PA volume by sleep onset(lagged)	-0.45	2.50	100.00%
Scale PA intensity by sleep onset(lagged)	0.13	2.62	100.00%
Log PA volume by sleep regularity(lagged)	-0.35	2.33	100.00%
Scale PA intensity by sleep regularity(lagged)	0.18	2.56	100.00%
Models moderated by PA mostactivehr			
Scale sleep duration by log PA volume	0.09	2.40	100.00%
Scale sleep efficiency by log PA volume	-0.92	3.79	100.00%
Scale sleep onset by log PA volume	0.46	4.83	100.00%

Table 1 continued

Model name	Skewness	Kurtosis	Converged (%)
Scale sleep regularity by log 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	4.74	100.00%
Scale sleep regularity by PA intensity	-0.85	3.07	100.00%
Log PA volume by sleep duration(lagged)	-0.45	2.49	100.00%
Scale PA intensity by sleep duration(lagged)	0.13	2.65	100.00%
Log PA volume by sleep efficiency(lagged)	-0.46	2.52	100.00%
Scale PA intensity by sleep efficiency(lagged)	0.13	2.62	100.00%
Log PA volume by sleep onset(lagged)	-0.45	2.51	100.00%
Scale PA intensity by sleep onset(lagged)	0.13	2.62	100.00%
Log PA volume by sleep regularity(lagged)	-0.37	2.34	100.00%
Scale PA intensity by sleep regularity(lagged)	0.16	2.56	100.00%

Table 2

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

Term	Physical activity volume (ln)				Physical activity intensity (z)					
	$\beta$	[95% CI]	SE	t	p	$\beta$	[95% CI]	SE	t	p
<i>Sleep duration (z)</i>										
(Intercept)	0.83	[0.08, 1.58]	0.38	2.16	.031	0.76	[0.60, 0.91]	0.08	9.73	< .001
Log pa volume	-0.19	[-0.61, 0.22]	0.21	-0.91	.362	0.08	[0.04, 0.13]	0.02	3.50	< .001
Age	-0.02	[-0.04, 0.01]	0.01	-1.37	.169	0.00	[0.00, 0.01]	0.00	0.16	.870
Log pa volume <sup>2</sup>	0.05	[-0.01, 0.11]	0.03	1.77	.076	0.02	[-0.01, 0.04]	0.01	1.12	.261
Log pa volume × age	0.01	[0.00, 0.02]	0.01	1.58	.114	0.00	[0.00, 0.00]	0.00	-0.91	.362
Age × log pa volume <sup>2</sup>	0.00	[0.00, 0.00]	0.00	-1.68	.093	0.00	[0.00, 0.00]	0.00	-1.12	.261
<i>Sleep efficiency (z)</i>										
(Intercept)	-2.43	[-3.20, -1.67]	0.39	-6.24	< .001	-0.37	[-0.53, -0.22]	0.08	-4.70	< .001
Log pa volume	1.05	[0.63, 1.48]	0.22	4.85	< .001	0.04	[0.00, 0.09]	0.02	1.83	.067
Age	0.03	[0.00, 0.05]	0.01	2.32	.020	0.00	[-0.01, 0.00]	0.00	-0.12	.904
Log pa volume <sup>2</sup>	-0.13	[-0.19, -0.07]	0.03	-4.19	< .001	-0.03	[-0.05, 0.00]	0.01	-1.88	.060
Log pa volume × age	-0.01	[-0.02, 0.00]	0.01	-1.90	.058	0.00	[0.00, 0.00]	0.00	-1.74	.082
Age × log pa volume <sup>2</sup>	0.00	[0.00, 0.00]	0.00	1.43	.152	0.00	[0.00, 0.00]	0.00	1.24	.216
<i>Sleep onset (z)</i>										
(Intercept)	-1.94	[-2.50, -1.37]	0.29	-6.69	< .001	-1.00	[-1.15, -0.86]	0.07	-13.82	< .001
Log pa volume	0.54	[0.23, 0.85]	0.16	3.44	.001	-0.06	[-0.10, -0.03]	0.02	-3.52	< .001
Age	0.02	[0.01, 0.04]	0.01	2.69	.007	0.00	[-0.01, 0.00]	0.00	-1.09	.277
Log pa volume <sup>2</sup>	-0.08	[-0.12, -0.04]	0.02	-3.59	< .001	-0.02	[-0.04, 0.00]	0.01	-2.20	.028
Log pa volume × age	-0.01	[-0.02, 0.00]	0.00	-2.37	.018	0.00	[0.00, 0.00]	0.00	0.25	.805
Age × log pa volume <sup>2</sup>	0.00	[0.00, 0.00]	0.00	1.73	.084	0.00	[0.00, 0.00]	0.00	2.46	.014
<i>Sleep regularity (z)</i>										

Table 2 continued

Term	Physical activity volume (ln)				Physical activity intensity (z)					
	$\beta$	[95% CI]	SE	t	p	$\beta$	[95% CI]	SE	t	p
(Intercept)	-2.90	[-3.62, -2.18]	0.37	-7.88	< .001	0.07	[-0.09, 0.23]	0.08	0.84	.412
Log pa volume	1.34	[0.94, 1.74]	0.20	6.56	< .001	0.27	[0.23, 0.31]	0.02	12.31	< .001
Age	-0.03	[-0.05, -0.01]	0.01	-2.88	.004	-0.01	[-0.01, 0.00]	0.00	-2.27	.023
Log pa volume <sup>2</sup>	-0.14	[-0.19, -0.08]	0.03	-4.74	< .001	-0.11	[-0.13, -0.08]	0.01	-8.38	< .001
Log pa volume × age	0.02	[0.01, 0.03]	0.01	3.06	.002	0.00	[-0.01, 0.00]	0.00	-9.52	< .001
Age × log pa volume <sup>2</sup>	0.00	[0.00, 0.00]	0.00	-3.23	.001	0.00	[0.00, 0.00]	0.00	3.12	.002

*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 (ln)				Physical activity intensity (z)			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Sleep duration (z)								
(Intercept)	3.66 [3.60, 3.73]	0.04	104.13	< .001	0.98 [0.80, 1.16]	0.09	10.93	< .001
Sleep duration	0.00 [-0.01, 0.01]	0.01	0.03	.973	-0.01 [-0.03, 0.01]	0.01	-1.06	.288
Age	-0.01 [-0.02, -0.01]	0.00	-10.94	< .001	-0.03 [-0.03, -0.02]	0.00	-13.47	< .001
Sleep duration <sup>2</sup>	-0.01 [-0.01, 0.00]	0.00	-3.56	< .001	-0.02 [-0.03, -0.01]	0.00	-3.27	.001
Sleep duration × age	0.00 [0.00, 0.00]	0.00	-1.59	.112	0.00 [0.00, 0.00]	0.00	2.39	.017
Age × Sleep duration <sup>2</sup>	0.00 [0.00, 0.00]	0.00	-1.26	.207	0.00 [0.00, 0.00]	0.00	1.28	.199
Sleep efficiency (z)								
(Intercept)	3.66 [3.59, 3.73]	0.04	103.52	< .001	0.97 [0.79, 1.15]	0.09	10.64	< .001
Sleep efficiency	0.02 [0.00, 0.03]	0.01	2.54	.014	0.02 [0.00, 0.05]	0.01	1.84	.070
Age	-0.01 [-0.02, -0.01]	0.00	-10.86	< .001	-0.03 [-0.03, -0.02]	0.00	-13.32	< .001
Sleep efficiency <sup>2</sup>	0.00 [0.00, 0.00]	0.00	-0.06	.955	0.00 [0.00, 0.01]	0.00	0.83	.408
Sleep efficiency × age	0.00 [0.00, 0.00]	0.00	-1.73	.086	0.00 [0.00, 0.00]	0.00	-1.64	.102
Age × Sleep efficiency <sup>2</sup>	0.00 [0.00, 0.00]	0.00	-0.69	.489	0.00 [0.00, 0.00]	0.00	-0.49	.623
Sleep onset (z)								
(Intercept)	3.67 [3.60, 3.74]	0.04	103.23	< .001	0.99 [0.81, 1.17]	0.09	10.87	< .001
Sleep onset	0.01 [-0.01, 0.02]	0.01	0.92	.360	0.02 [0.00, 0.04]	0.01	1.97	.049
Age	-0.01 [-0.02, -0.01]	0.00	-10.92	< .001	-0.03 [-0.03, -0.02]	0.00	-13.48	< .001
Sleep onset <sup>2</sup>	-0.01 [-0.02, 0.00]	0.01	-1.18	.238	-0.01 [-0.03, 0.01]	0.01	-0.60	.548
Sleep onset × age	0.00 [0.00, 0.00]	0.00	-0.01	.990	0.00 [0.00, 0.00]	0.00	-0.88	.378
Age × Sleep onset <sup>2</sup>	0.00 [0.00, 0.00]	0.00	-0.51	.610	0.00 [0.00, 0.00]	0.00	0.98	.325
Sleep regularity (z)								

Term	Physical activity volume (h)				Physical activity intensity (z)			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
(Intercept)	3.66 [3.59, 3.73]	0.04	103.24	< .001	0.98 [0.81, 1.16]	0.09	10.98	< .001
Sleep regularity	0.08 [0.07, 0.09]	0.01	12.73	< .001	0.09 [0.06, 0.11]	0.01	7.60	< .001
Age	-0.01 [-0.02, -0.01]	0.00	-10.94	< .001	-0.03 [-0.03, -0.02]	0.00	-13.40	< .001
Sleep regularity <sup>2</sup>	-0.01 [-0.01, 0.00]	0.00	-2.39	.017	0.00 [-0.02, 0.01]	0.01	-0.67	.504
Sleep regularity × age	0.00 [0.00, 0.00]	0.00	-2.97	.003	0.00 [0.00, 0.00]	0.00	-5.07	< .001
Age × Sleep regularity <sup>2</sup>	0.00 [0.00, 0.00]	0.00	-0.73	.467	0.00 [0.00, 0.00]	0.00	-1.67	.095

*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, sex, and BMI.*

Term	Physical activity volume (z)			Physical activity intensity (z)				
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
<b>Sleep duration (z)</b>								
(Intercept)	0.20 [-0.05, 0.44]	0.12	1.57	.117	0.20 [-0.03, 0.44]	0.12	1.71	.088
Physical activity	0.09 [0.05, 0.14]	0.02	4.53	< .001	0.08 [0.04, 0.13]	0.02	3.63	< .001
Age	0.00 [-0.01, 0.00]	0.00	-0.86	.391	0.00 [-0.01, 0.00]	0.00	-0.99	.320
Physical activity <sup>2</sup>	0.00 [-0.01, 0.01]	0.01	-0.58	.560	0.01 [-0.01, 0.04]	0.01	1.06	.288
Physical activity × age	0.00 [0.00, 0.00]	0.00	-0.47	.640	0.00 [0.00, 0.00]	0.00	-1.05	.294
Age × Physical activity <sup>2</sup>	0.00 [0.00, 0.00]	0.00	-0.80	.426	0.00 [0.00, 0.00]	0.00	-1.06	.289
<b>Sleep efficiency (z)</b>								
(Intercept)	0.26 [0.01, 0.50]	0.12	2.08	.038	0.29 [0.03, 0.54]	0.13	2.21	.028
Physical activity	0.09 [0.05, 0.13]	0.02	4.36	< .001	0.04 [0.00, 0.09]	0.02	1.75	.080
Age	0.00 [0.00, 0.01]	0.00	1.07	.284	0.00 [0.00, 0.01]	0.00	0.84	.400
Physical activity <sup>2</sup>	-0.02 [-0.03, -0.01]	0.01	-3.77	< .001	-0.02 [-0.05, 0.00]	0.01	-1.75	.080
Physical activity × age	0.00 [0.00, 0.00]	0.00	-3.27	.001	0.00 [0.00, 0.00]	0.00	-1.65	.100
Age × Physical activity <sup>2</sup>	0.00 [0.00, 0.00]	0.00	1.04	.298	0.00 [0.00, 0.00]	0.00	1.12	.261
<b>Sleep onset (z)</b>								
(Intercept)	0.05 [-0.29, 0.39]	0.17	0.29	.773	0.05 [-0.28, 0.39]	0.17	0.32	.753
Physical activity	-0.01 [-0.04, 0.02]	0.02	-0.63	.532	-0.06 [-0.10, -0.03]	0.02	-3.55	< .001
Age	0.00 [-0.01, 0.00]	0.00	-0.98	.329	0.00 [0.00, 0.00]	0.00	-0.69	.493
Physical activity <sup>2</sup>	-0.01 [-0.01, 0.00]	0.00	-1.89	.059	-0.02 [-0.04, 0.00]	0.01	-2.16	.031
Physical activity × age	0.00 [0.00, 0.00]	0.00	-5.03	< .001	0.00 [0.00, 0.00]	0.00	0.29	.776
Age × Physical activity <sup>2</sup>	0.00 [0.00, 0.00]	0.00	3.37	.001	0.00 [0.00, 0.00]	0.00	2.42	.015
<b>Sleep regularity (z)</b>								

Term	Physical activity volume (z)				Physical activity intensity (z)			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
(Intercept)	0.40 [0.19, 0.62]	0.11	3.72	< .001	0.57 [0.33, 0.81]	0.12	4.64	< .001
Physical activity	0.22 [0.18, 0.26]	0.02	11.27	< .001	0.27 [0.23, 0.31]	0.02	12.26	< .001
Age	0.00 [0.00, 0.00]	0.00	0.75	.456	0.00 [-0.01, 0.00]	0.00	-1.45	.147
Physical activity <sup>2</sup>	-0.02 [-0.03, -0.01]	0.00	-5.00	< .001	-0.11 [-0.13, -0.08]	0.01	-8.23	< .001
Physical activity × age	0.00 [0.00, 0.00]	0.00	-0.45	.653	0.00 [-0.01, 0.00]	0.00	-9.46	< .001
Age × Physical activity <sup>2</sup>	0.00 [0.00, 0.00]	0.00	-4.71	< .001	0.00 [0.00, 0.00]	0.00	2.98	.003

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

Table 5

*Sleep predicting physical activity controlling for SES, sex, and BMI*

Term	Physical activity volume (z)				Physical activity intensity (z)			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Sleep duration (z)								
(Intercept)	1.53 [1.15, 1.91]	0.19	7.88	< .001	1.36 [1.12, 1.60]	0.12	11.08	< .001
Sleep duration	0.00 [-0.02, 0.03]	0.01	0.34	.734	-0.01 [-0.03, 0.01]	0.01	-1.06	.291
Age	-0.03 [-0.03, -0.02]	0.00	-11.72	< .001	-0.03 [-0.03, -0.02]	0.00	-15.63	< .001
Sleep duration <sup>2</sup>	-0.02 [-0.03, -0.01]	0.01	-4.50	< .001	-0.02 [-0.03, -0.01]	0.00	-3.30	.001
Sleep duration × age	0.00 [0.00, 0.00]	0.00	-1.22	.222	0.00 [0.00, 0.00]	0.00	2.39	.017
Age × Sleep duration <sup>2</sup>	0.00 [0.00, 0.00]	0.00	0.68	.497	0.00 [0.00, 0.00]	0.00	1.30	.193
Sleep efficiency (z)								
(Intercept)	1.51 [1.13, 1.89]	0.19	7.78	< .001	1.34 [1.10, 1.58]	0.12	10.94	< .001
Sleep efficiency	0.01 [-0.02, 0.04]	0.01	0.55	.589	0.02 [0.00, 0.05]	0.01	1.87	.065
Age	-0.03 [-0.03, -0.02]	0.00	-11.65	< .001	-0.03 [-0.03, -0.02]	0.00	-15.48	< .001
Sleep efficiency <sup>2</sup>	0.00 [-0.01, 0.00]	0.00	-0.89	.375	0.00 [0.00, 0.01]	0.00	0.83	.409
Sleep efficiency × age	0.00 [0.00, 0.00]	0.00	-0.22	.826	0.00 [0.00, 0.00]	0.00	-1.66	.097
Age × Sleep efficiency <sup>2</sup>	0.00 [0.00, 0.00]	0.00	0.04	.965	0.00 [0.00, 0.00]	0.00	-0.49	.623
Sleep onset (z)								
(Intercept)	1.53 [1.15, 1.91]	0.19	7.86	< .001	1.35 [1.11, 1.59]	0.12	10.94	< .001
Sleep onset	-0.01 [-0.03, 0.01]	0.01	-0.88	.377	0.02 [0.00, 0.05]	0.01	2.02	.043
Age	-0.03 [-0.03, -0.02]	0.00	-11.77	< .001	-0.03 [-0.03, -0.02]	0.00	-15.64	< .001
Sleep onset <sup>2</sup>	-0.03 [-0.05, -0.01]	0.01	-2.51	.012	-0.01 [-0.03, 0.01]	0.01	-0.62	.532
Sleep onset × age	0.00 [0.00, 0.00]	0.00	0.85	.398	0.00 [0.00, 0.00]	0.00	-0.91	.361
Age × Sleep onset <sup>2</sup>	0.00 [0.00, 0.00]	0.00	1.00	.319	0.00 [0.00, 0.00]	0.00	1.00	.317
Sleep regularity (z)								

Table 5 continued

Term	Physical activity volume (z)				Physical activity intensity (z)					
	$\beta$	[95% CI]	SE	t	p	$\beta$	[95% CI]	SE	t	p
(Intercept)	1.47	[1.09, 1.84]	0.19	7.65	< .001	1.33	[1.10, 1.57]	0.12	11.00	< .001
Sleep regularity	0.12	[0.10, 0.14]	0.01	10.18	< .001	0.09	[0.07, 0.11]	0.01	7.67	< .001
Age	-0.02	[-0.03, -0.02]	0.00	-11.63	< .001	-0.03	[-0.03, -0.02]	0.00	-15.66	< .001
Sleep regularity <sup>2</sup>	0.00	[-0.02, 0.01]	0.01	-0.62	.533	0.00	[-0.02, 0.01]	0.01	-0.64	.522
Sleep regularity × age	0.00	[0.00, 0.00]	0.00	-3.38	.001	0.00	[0.00, 0.00]	0.00	-5.10	< .001
Age × Sleep regularity <sup>2</sup>	0.00	[0.00, 0.00]	0.00	-0.49	.623	0.00	[0.00, 0.00]	0.00	-1.69	.091

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

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

Term	Physical activity volume (ln)				Physical activity intensity (z)			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Sleep duration (z)								
(Intercept)	0.80 [0.99, 2.58]	0.91	0.88	.384	0.19 [-0.04, 0.42]	0.12	1.66	.097
Log pa volume	-0.56 [-1.61, 0.49]	0.54	-1.05	.302	0.08 [0.02, 0.15]	0.03	2.58	.010
Log pa volume <sup>2</sup>	0.11 [-0.05, 0.26]	0.08	1.35	.192	0.03 [-0.03, 0.08]	0.03	0.96	.371
Age	0.00 [-0.01, 0.00]	0.00	-0.83	.406	0.00 [-0.01, 0.00]	0.00	-1.04	.298
Log pa volume × bmi	0.03 [-0.02, 0.08]	0.03	1.05	.311	0.00 [0.00, 0.00]	0.00	-0.46	.648
Sleep efficiency (z)								
(Intercept)	-2.53 [-4.60, -0.47]	1.05	-2.40	.031	0.28 [0.02, 0.54]	0.13	2.12	.035
Log pa volume	1.43 [0.29, 2.58]	0.59	2.45	.026	0.04 [-0.05, 0.14]	0.05	0.86	.423
Log pa volume <sup>2</sup>	-0.18 [-0.34, -0.02]	0.08	-2.17	.045	-0.01 [-0.05, 0.03]	0.02	-0.36	.717
Age	0.00 [0.00, 0.01]	0.00	1.23	.220	0.00 [0.00, 0.01]	0.00	1.09	.275
Log pa volume × bmi	-0.03 [-0.09, 0.02]	0.03	-1.27	.219	0.00 [-0.01, 0.00]	0.00	-0.83	.429
Sleep onset (z)								
(Intercept)	-1.86 [-3.47, -0.25]	0.82	-2.26	.044	0.04 [-0.29, 0.38]	0.17	0.25	.801
Log pa volume	1.12 [0.20, 2.04]	0.47	2.38	.040	-0.06 [-0.11, -0.01]	0.02	-2.34	.020
Log pa volume <sup>2</sup>	-0.16 [-0.29, -0.03]	0.06	-2.47	.031	-0.01 [-0.04, 0.02]	0.02	-0.67	.505
Age	0.00 [0.00, 0.00]	0.00	-0.42	.676	0.00 [0.00, 0.00]	0.00	-0.46	.645
Log pa volume × bmi	-0.04 [-0.08, 0.00]	0.02	-2.08	.055	0.00 [0.00, 0.00]	0.00	-0.48	.634
Sleep regularity (z)								
(Intercept)	-1.85 [-7.23, 3.54]	2.75	-0.67	.562	0.57 [0.35, 0.80]	0.12	4.97	< .001
Log pa volume	0.94 [-1.66, 3.54]	1.33	0.71	.539	0.18 [0.12, 0.25]	0.04	5.26	< .001
Log pa volume <sup>2</sup>	-0.09 [-0.39, 0.22]	0.16	-0.55	.624	-0.04 [-0.13, 0.04]	0.04	-1.01	.388

Term	Physical activity volume (ln)				Physical activity intensity (z)			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Age	0.00 [0.00, 0.00]	0.00	0.04	.972	0.00 [0.00, 0.00]	0.00	-0.30	.763
Log pa volume $\times$ bmi	0.04 [-0.09, 0.17]	0.07	0.57	.618	0.00 [-0.01, 0.00]	0.00	-3.27	.002

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

Table 7

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

Term	Physical activity volume (ln)				Physical activity intensity (z)					
	$\beta$	[95% CI]	SE	t	p	$\beta$	[95% CI]	SE	t	p
Sleep duration (z)										
(Intercept)	4.33	[4.15, 4.51]	0.09	47.50	< .001	1.36	[1.13, 1.59]	0.12	11.63	< .001
Sleep duration	0.00	[-0.01, 0.02]	0.01	0.50	.621	-0.02	[-0.10, 0.07]	0.04	-0.43	.699
Sleep duration <sup>2</sup>	-0.01	[-0.02, 0.00]	0.00	-2.41	.016	-0.02	[-0.05, 0.02]	0.02	-1.02	.375
Age	-0.01	[-0.01, -0.01]	0.00	-11.04	< .001	-0.03	[-0.03, -0.02]	0.00	-15.64	< .001
Sleep duration × bmi	0.00	[0.00, 0.00]	0.00	-1.18	.240	0.00	[0.00, 0.00]	0.00	0.56	.611
Sleep efficiency (z)										
(Intercept)	4.32	[4.14, 4.50]	0.09	47.63	< .001	1.35	[1.11, 1.59]	0.12	10.96	< .001
Sleep efficiency	0.02	[-0.02, 0.05]	0.02	0.93	.385	0.01	[-0.04, 0.06]	0.03	0.53	.603
Sleep efficiency <sup>2</sup>	0.00	[-0.01, 0.00]	0.00	-1.27	.210	0.00	[-0.02, 0.01]	0.01	-0.57	.572
Age	-0.01	[-0.01, -0.01]	0.00	-11.03	< .001	-0.03	[-0.03, -0.02]	0.00	-15.61	< .001
Sleep efficiency × bmi	0.00	[0.00, 0.00]	0.00	-0.38	.716	0.00	[0.00, 0.00]	0.00	-0.16	.877
Sleep onset (z)										
(Intercept)	4.32	[4.15, 4.50]	0.09	47.51	< .001	1.33	[1.09, 1.58]	0.13	10.63	< .001
Sleep onset	0.01	[-0.03, 0.04]	0.02	0.37	.727	0.02	[-0.06, 0.10]	0.04	0.48	.657
Sleep onset <sup>2</sup>	-0.01	[-0.02, 0.01]	0.01	-0.81	.419	0.02	[-0.01, 0.04]	0.01	1.10	.269
Age	-0.01	[-0.01, -0.01]	0.00	-11.04	< .001	-0.03	[-0.03, -0.02]	0.00	-15.65	< .001
Sleep onset × bmi	0.00	[0.00, 0.00]	0.00	-0.02	.983	0.00	[0.00, 0.00]	0.00	0.05	.961
Sleep regularity (z)										
(Intercept)	4.29	[4.11, 4.46]	0.09	47.34	< .001	1.32	[1.10, 1.54]	0.11	11.67	< .001
Sleep regularity	0.09	[0.06, 0.13]	0.02	5.63	< .001	0.13	[0.07, 0.19]	0.03	4.20	< .001
Sleep regularity <sup>2</sup>	0.00	[-0.02, 0.01]	0.01	-0.36	.721	0.01	[-0.05, 0.07]	0.03	0.36	.741

Term	Physical activity volume (ln)				Physical activity intensity (z)					
	$\beta$	[95% CI]	SE	t	p	$\beta$	[95% CI]	SE	t	p
Age	-0.01	[-0.01, -0.01]	0.00	-11.04	< .001	-0.03	[-0.03, -0.02]	0.00	-15.67	< .001
Sleep regularity × bmi	0.00	[0.00, 0.00]	0.00	-1.93	.067	0.00	[0.01, 0.00]	0.00	-2.76	.010

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

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

Term	Physical activity volume (ln)			Physical activity intensity (z)				
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Sleep duration (z)								
(Intercept)	-0.31 [-1.24, 0.63]	0.48	-0.65	.518	0.21 [-0.03, 0.44]	0.12	1.73	.085
Log pa volume	0.09 [-0.42, 0.61]	0.26	0.36	.722	0.07 [0.03, 0.11]	0.02	3.80	< .001
Log pa volume <sup>2</sup>	0.01 [-0.06, 0.09]	0.04	0.36	.721	0.02 [-0.01, 0.04]	0.01	1.39	.163
Age	0.00 [-0.01, 0.00]	0.00	-0.82	.412	0.00 [-0.01, 0.00]	0.00	-1.02	.310
Log pa volume × sesmedium	-0.26 [-1.01, 0.49]	0.38	-0.67	.502	-0.01 [-0.05, 0.04]	0.02	-0.22	.825
Log pa volume × seshigh	-0.02 [-0.76, 0.72]	0.38	-0.05	.959	0.01 [-0.04, 0.05]	0.02	0.29	.773
Sleep efficiency (z)								
(Intercept)	-0.25 [-1.32, 0.81]	0.54	-0.47	.642	0.28 [0.03, 0.54]	0.13	2.20	.029
Log pa volume	0.28 [-0.32, 0.87]	0.30	0.92	.366	0.00 [-0.04, 0.04]	0.02	0.00	.997
Log pa volume <sup>2</sup>	-0.04 [-0.12, 0.05]	0.04	-0.87	.388	0.00 [-0.03, 0.02]	0.01	-0.34	.736
Age	0.00 [0.00, 0.01]	0.00	1.30	.193	0.00 [0.00, 0.01]	0.00	1.09	.276
Log pa volume × sesmedium	0.11 [-0.76, 0.99]	0.45	0.26	.800	-0.01 [-0.06, 0.04]	0.02	-0.50	.618
Log pa volume × seshigh	0.91 [0.13, 1.70]	0.40	2.28	.029	0.02 [-0.03, 0.07]	0.03	0.66	.513
Sleep onset (z)								
(Intercept)	0.38 [-0.38, 1.14]	0.39	0.98	.329	0.02 [-0.30, 0.35]	0.17	0.15	.883
Log pa volume	-0.04 [-0.43, 0.35]	0.20	-0.20	.844	-0.07 [-0.11, -0.04]	0.02	-4.30	.001
Log pa volume <sup>2</sup>	-0.02 [-0.07, 0.04]	0.03	-0.58	.559	0.00 [-0.01, 0.02]	0.01	0.47	.641
Age	0.00 [0.00, 0.00]	0.00	-0.31	.756	0.00 [0.00, 0.00]	0.00	-0.42	.673
Log pa volume × sesmedium	0.33 [-0.21, 0.87]	0.28	1.19	.233	0.01 [-0.03, 0.05]	0.02	0.35	.730
Log pa volume × seshigh	0.38 [-0.14, 0.91]	0.27	1.44	.150	0.00 [-0.05, 0.04]	0.02	-0.03	.979
Sleep regularity (z)								

Term	Physical activity volume (ln)				Physical activity intensity (z)					
	$\beta$	[95% CI]	SE	t	p	$\beta$	[95% CI]	SE	t	p
(Intercept)	-3.53	[-4.48, -2.58]	0.49	-7.26	< .001	0.55	[0.32, 0.79]	0.12	4.64	< .001
Log pa volume	1.93	[1.40, 2.45]	0.27	7.24	< .001	0.07	[0.03, 0.10]	0.02	3.70	< .001
Log pa volume <sup>2</sup>	-0.23	[-0.30, -0.15]	0.04	-5.99	< .001	-0.02	[-0.05, 0.01]	0.01	-1.49	.163
Age	0.00	[0.00, 0.00]	0.00	0.15	.880	0.00	[0.00, 0.00]	0.00	-0.30	.766
Log pa volume × sesmedium	0.36	[-0.35, 1.07]	0.36	0.99	.325	0.00	[-0.05, 0.05]	0.02	0.06	.953
Log pa volume × seshigh	-0.78	[-1.51, -0.06]	0.37	-2.11	.042	0.02	[-0.03, 0.06]	0.02	0.82	.413

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

Table 9

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

Term	Physical activity volume (ln)				Physical activity intensity (z)			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Sleep duration (z)								
(Intercept)	4.33 [4.15, 4.51]	0.09	47.51	< .001	1.35 [1.11, 1.59]	0.12	11.00	< .001
Sleep duration	-0.01 [-0.02, 0.00]	0.01	-1.17	.244	0.01 [-0.01, 0.04]	0.01	1.23	.218
Sleep duration <sup>2</sup>	-0.01 [-0.02, -0.01]	0.00	-3.90	< .001	-0.01 [-0.02, 0.00]	0.01	-2.14	.033
Age	-0.01 [-0.01, -0.01]	0.00	-11.04	< .001	-0.03 [-0.03, -0.02]	0.00	-15.63	< .001
Sleep duration × sesmedium	0.01 [-0.01, 0.02]	0.01	0.83	.409	0.00 [-0.03, 0.04]	0.02	0.16	.873
Sleep duration × sesshigh	-0.01 [-0.02, 0.01]	0.01	-0.65	.519	-0.02 [-0.05, 0.01]	0.02	-1.11	.266
Sleep efficiency (z)								
(Intercept)	4.32 [4.14, 4.49]	0.09	47.33	< .001	1.34 [1.10, 1.58]	0.12	10.96	< .001
Sleep efficiency	0.00 [-0.01, 0.01]	0.01	0.16	.876	0.01 [-0.02, 0.03]	0.01	0.39	.694
Sleep efficiency <sup>2</sup>	0.00 [0.00, 0.01]	0.00	0.22	.823	0.00 [-0.01, 0.01]	0.00	0.10	.921
Age	-0.01 [-0.01, -0.01]	0.00	-11.02	< .001	-0.03 [-0.03, -0.02]	0.00	-15.64	< .001
Sleep efficiency × sesmedium	0.01 [-0.01, 0.03]	0.01	0.92	.366	0.00 [-0.04, 0.04]	0.02	0.06	.950
Sleep efficiency × sesshigh	0.01 [-0.01, 0.03]	0.01	1.20	.230	0.01 [-0.03, 0.05]	0.02	0.39	.700
Sleep onset (z)								
(Intercept)	4.33 [4.15, 4.50]	0.09	47.40	< .001	1.34 [1.10, 1.58]	0.12	10.92	< .001
Sleep onset	0.00 [-0.01, 0.01]	0.01	-0.19	.852	0.01 [-0.01, 0.04]	0.01	0.94	.349
Sleep onset <sup>2</sup>	-0.01 [-0.02, 0.00]	0.00	-2.88	.004	0.00 [0.01, 0.02]	0.01	0.60	.551
Age	-0.01 [-0.01, -0.01]	0.00	-11.02	< .001	-0.03 [-0.03, -0.02]	0.00	-15.64	< .001
Sleep onset × sesmedium	0.01 [-0.01, 0.02]	0.01	0.61	.544	0.01 [-0.02, 0.05]	0.02	0.80	.422
Sleep onset × sesshigh	0.01 [-0.01, 0.03]	0.01	1.34	.180	0.01 [-0.03, 0.04]	0.02	0.36	.716
Sleep regularity (z)								

Table 9 continued

Term	Physical activity volume (ln)			Physical activity intensity (z)				
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
(Intercept)	4.29 [4.11, 4.46]	0.09	47.89	< .001	1.32 [1.08, 1.56]	0.12	10.89	< .001
Sleep regularity	0.07 [0.05, 0.09]	0.01	7.36	< .001	0.04 [0.01, 0.07]	0.02	2.72	.007
Sleep regularity <sup>2</sup>	-0.01 [-0.02, 0.00]	0.00	-2.25	.024	0.00 [-0.02, 0.01]	0.01	-0.38	.701
Age	-0.01 [-0.01, -0.01]	0.00	-11.05	< .001	-0.03 [-0.03, -0.02]	0.00	-15.60	< .001
Sleep regularity × sesmedium	-0.01 [-0.04, 0.01]	0.01	-1.13	.283	0.00 [-0.04, 0.04]	0.02	0.02	.984
Sleep regularity × seshigh	0.00 [-0.02, 0.02]	0.01	0.10	.918	0.00 [-0.04, 0.04]	0.02	0.19	.852

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

Table 10

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

Term	Physical activity volume (ln)				Physical activity intensity (z)			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
<i>Sleep duration (z)</i>								
(Intercept)	-0.19 [-1.00, 0.62]	0.41	-0.46	.643	0.22 [-0.01, 0.45]	0.12	1.84	.067
Log pa volume	0.04 [-0.40, 0.48]	0.22	0.19	.851	0.06 [0.03, 0.09]	0.01	4.15	< .001
Log pa volume <sup>2</sup>	0.02 [-0.04, 0.08]	0.03	0.57	.567	0.01 [-0.01, 0.02]	0.01	0.69	.492
Age	0.00 [-0.01, 0.00]	0.00	-0.84	.401	0.00 [-0.01, 0.00]	0.00	-1.05	.295
Log pa volume × sexmale	-0.06 [-0.64, 0.53]	0.30	-0.19	.849	0.02 [-0.02, 0.06]	0.02	1.15	.249
<i>Sleep efficiency (z)</i>								
(Intercept)	-1.37 [-2.19, -0.56]	0.42	-3.29	.001	0.29 [0.03, 0.54]	0.13	2.22	.027
Log pa volume	0.90 [0.46, 1.35]	0.23	3.98	< .001	-0.02 [-0.05, 0.01]	0.02	-1.07	.283
Log pa volume <sup>2</sup>	-0.12 [-0.19, -0.06]	0.03	-3.82	< .001	-0.01 [-0.03, 0.01]	0.01	-1.34	.180
Age	0.00 [0.00, 0.01]	0.00	1.28	.200	0.00 [0.00, 0.01]	0.00	1.11	.267
Log pa volume × sexmale	-0.38 [-0.97, 0.21]	0.30	-1.25	.210	0.03 [-0.01, 0.07]	0.02	1.70	.090
<i>Sleep onset (z)</i>								
(Intercept)	-0.64 [-1.31, 0.03]	0.34	-1.87	.061	0.04 [-0.29, 0.37]	0.17	0.21	.831
Log pa volume	0.54 [0.22, 0.87]	0.17	3.27	.001	-0.08 [-0.10, -0.05]	0.01	-6.87	< .001
Log pa volume <sup>2</sup>	-0.10 [-0.14, -0.05]	0.02	-4.13	< .001	0.00 [-0.02, 0.01]	0.01	-0.71	.480
Age	0.00 [0.00, 0.00]	0.00	-0.38	.704	0.00 [0.00, 0.00]	0.00	-0.46	.646
Log pa volume × sexmale	-0.59 [-1.02, -0.15]	0.22	-2.66	.008	0.01 [-0.02, 0.04]	0.01	0.58	.559
<i>Sleep regularity (z)</i>								
(Intercept)	-3.55 [-4.34, -2.76]	0.40	-8.82	< .001	0.57 [0.33, 0.80]	0.12	4.73	< .001
Log pa volume	1.94 [1.49, 2.39]	0.23	8.51	< .001	0.06 [0.03, 0.09]	0.01	4.40	< .001
Log pa volume <sup>2</sup>	-0.23 [-0.29, -0.16]	0.03	-6.96	< .001	-0.04 [-0.05, -0.02]	0.01	-4.30	< .001

Term	Physical activity volume (ln)				Physical activity intensity (z)					
	$\beta$	[95% CI]	SE	t	p	$\beta$	[95% CI]	SE	t	p
Age	0.00	[0.00, 0.00]	0.00	0.14	.890	0.00	[0.00, 0.00]	0.00	-0.28	.779
Log pa volume $\times$ sexmale	-0.38	[-0.93, 0.18]	0.28	-1.33	.185	0.02	[-0.02, 0.05]	0.02	1.03	.304

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

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

Term	Physical activity volume (in)				Physical activity intensity (z)			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Sleep duration (z)								
(Intercept)	4.33 [4.15, 4.51]	0.09	47.42	< .001	1.35 [1.11, 1.60]	0.12	11.01	< .001
Sleep duration	-0.01 [-0.02, 0.00]	0.00	-1.80	.075	0.01 [-0.01, 0.03]	0.01	1.25	.213
Sleep duration <sup>2</sup>	-0.01 [-0.02, -0.01]	0.00	-6.06	< .001	-0.01 [-0.02, 0.00]	0.00	-2.72	.007
Age	-0.01 [-0.01, -0.01]	0.00	-11.05	< .001	-0.03 [-0.03, -0.02]	0.00	-15.64	< .001
Sleep duration × sexmale	0.00 [-0.01, 0.02]	0.01	0.67	.506	0.00 [-0.03, 0.02]	0.01	-0.37	.710
Sleep efficiency (z)								
(Intercept)	4.32 [4.14, 4.50]	0.09	47.36	< .001	1.35 [1.11, 1.59]	0.12	11.04	< .001
Sleep efficiency	0.02 [0.00, 0.03]	0.01	2.68	.009	0.01 [-0.01, 0.03]	0.01	0.85	.403
Sleep efficiency <sup>2</sup>	0.00 [-0.01, 0.00]	0.00	-1.38	.169	0.00 [-0.01, 0.00]	0.00	-0.91	.363
Age	-0.01 [-0.01, -0.01]	0.00	-11.07	< .001	-0.03 [-0.03, -0.02]	0.00	-15.62	< .001
Sleep efficiency × sexmale	-0.02 [-0.03, 0.00]	0.01	-1.94	.054	-0.01 [-0.04, 0.03]	0.02	-0.34	.735
Sleep onset (z)								
(Intercept)	4.32 [4.15, 4.50]	0.09	47.32	< .001	1.35 [1.10, 1.59]	0.12	10.87	< .001
Sleep onset	0.01 [0.00, 0.03]	0.01	2.78	.006	0.01 [-0.01, 0.03]	0.01	1.25	.210
Sleep onset <sup>2</sup>	-0.01 [-0.01, 0.00]	0.00	-2.41	.016	0.00 [-0.01, 0.01]	0.01	0.22	.829
Age	-0.01 [-0.01, -0.01]	0.00	-11.09	< .001	-0.03 [-0.03, -0.02]	0.00	-15.65	< .001
Sleep onset × sexmale	-0.02 [-0.03, -0.01]	0.01	-2.74	.007	0.01 [-0.02, 0.04]	0.01	0.79	.430
Sleep regularity (z)								
(Intercept)	4.29 [4.11, 4.47]	0.09	47.94	< .001	1.34 [1.10, 1.57]	0.12	10.95	< .001
Sleep regularity	0.06 [0.05, 0.07]	0.01	10.56	< .001	0.04 [0.02, 0.06]	0.01	3.97	< .001
Sleep regularity <sup>2</sup>	-0.01 [-0.02, -0.01]	0.00	-4.01	< .001	-0.02 [-0.03, -0.01]	0.01	-3.67	< .001

Term	Physical activity volume (ln)				Physical activity intensity (z)					
	$\beta$	[95% CI]	SE	t	p	$\beta$	[95% CI]	SE	t	p
Age	-0.01	[-0.01, -0.01]	0.00	-11.04	< .001	-0.03	[-0.03, -0.02]	0.00	-15.66	< .001
Sleep regularity × sexmale	0.01	[0.00, 0.03]	0.01	1.68	.094	0.01	[0.02, 0.04]	0.01	0.48	.628

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

Table 12

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

Term	Physical activity volume (ln)					Physical activity intensity (z)				
	$\beta$	[95% CI]	SE	t	p	$\beta$	[95% CI]	SE	t	p
Sleep duration (z)										
(Intercept)	-0.47	[-1.65, 0.71]	0.60	-0.78	.435	0.25	[0.02, 0.49]	0.12	2.10	.037
Log pa volume	0.25	[-0.38, 0.89]	0.32	0.78	.437	0.08	[0.05, 0.12]	0.02	4.42	< .001
Weekdaymonday	0.31	[1.21, 1.83]	0.77	0.40	.689	-0.07	[-0.13, -0.01]	0.03	-2.43	.015
Weekdaysaturday	-0.02	[-1.56, 1.53]	0.79	-0.02	.982	0.03	[-0.03, 0.09]	0.03	1.03	.301
Weekdaysunday	0.77	[-0.69, 2.24]	0.75	1.04	.300	-0.03	[-0.08, 0.03]	0.03	-0.91	.364
Weekdaythursday	0.79	[-0.82, 2.39]	0.82	0.96	.337	-0.06	[-0.12, 0.00]	0.03	-1.94	.052
Weekdaytuesday	0.76	[-0.89, 2.41]	0.84	0.91	.364	-0.06	[-0.12, 0.00]	0.03	-2.01	.045
Weekdaywednesday	0.15	[-1.48, 1.78]	0.83	0.18	.854	-0.11	[-0.17, -0.05]	0.03	-3.66	< .001
Log pa volume <sup>2</sup>	-0.02	[-0.10, 0.07]	0.04	-0.36	.717	0.00	[-0.03, 0.03]	0.01	-0.14	.885
Age	0.00	[-0.01, 0.00]	0.00	-0.85	.394	0.00	[-0.01, 0.00]	0.00	-1.03	.303
Log pa volume × weekdaymonday	-0.29	[-1.14, 0.56]	0.43	-0.67	.501	0.02	[-0.03, 0.06]	0.02	0.67	.505
Log pa volume × weekdaysaturday	0.01	[0.85, 0.86]	0.44	0.01	.990	-0.03	[-0.08, 0.01]	0.02	-1.37	.172
Log pa volume × weekdaysunday	-0.48	[-1.30, 0.34]	0.42	-1.15	.252	-0.07	[-0.11, -0.02]	0.02	-2.85	.004
Log pa volume × weekdaythursday	-0.50	[-1.38, 0.38]	0.45	-1.11	.267	0.02	[-0.02, 0.07]	0.02	1.04	.300
Log pa volume × weekdaytuesday	-0.47	[-1.38, 0.43]	0.46	-1.02	.306	0.00	[-0.05, 0.05]	0.02	-0.01	.993
Log pa volume × weekdaywednesday	-0.13	[-1.02, 0.77]	0.46	-0.27	.784	0.00	[-0.05, 0.04]	0.02	-0.07	.944
Weekdaymonday × log pa volume <sup>2</sup>	0.05	[-0.06, 0.17]	0.06	0.87	.382	0.01	[-0.02, 0.04]	0.02	0.53	.599
Weekdaysaturday × log pa volume <sup>2</sup>	0.00	[-0.12, 0.12]	0.06	0.04	.967	0.00	[-0.03, 0.04]	0.02	0.20	.844
Weekdaysunday × log pa volume <sup>2</sup>	0.07	[-0.04, 0.19]	0.06	1.23	.219	0.01	[-0.03, 0.04]	0.02	0.53	.599
Weekdaythursday × log pa volume <sup>2</sup>	0.07	[-0.05, 0.19]	0.06	1.19	.234	0.00	[-0.03, 0.04]	0.02	0.22	.823
Weekdaytuesday × log pa volume <sup>2</sup>	0.07	[-0.06, 0.19]	0.06	1.07	.284	0.01	[-0.03, 0.05]	0.02	0.50	.617

Table 12 continued

## TITLE

Term	Physical activity volume (ln)					Physical activity intensity (z)				
	$\beta$	[95% CI]	SE	t	p	$\beta$	[95% CI]	SE	t	p
Weekdaywednesday $\times$ log pa volume <sup>2</sup>	0.02	[0.11, 0.14]	0.06	0.26	.797	0.02	[-0.01, 0.06]	0.02	1.15	.249
Sleep efficiency (z)										
(Intercept)	-1.70	[-2.89, -0.51]	0.61	-2.80	.005	0.33	[0.08, 0.59]	0.13	2.54	.012
Log pa volume	1.06	[0.42, 1.71]	0.33	3.24	.001	0.00	[-0.04, 0.04]	0.02	-0.04	.967
Weekdaymonday	1.37	[-0.16, 2.90]	0.78	1.75	.080	-0.03	[-0.09, 0.03]	0.03	-1.00	.317
Weekdaysaturday	1.11	[-0.45, 2.67]	0.80	1.40	.163	-0.13	[-0.19, -0.07]	0.03	-4.44	< .001
Weekdaysunday	0.16	[-1.31, 1.64]	0.75	0.21	.830	-0.10	[-0.16, -0.04]	0.03	-3.48	.001
Weekdaythursday	1.61	[-0.01, 3.22]	0.83	1.94	.052	0.00	[-0.06, 0.06]	0.03	-0.03	.973
Weekdaytuesday	0.76	[-0.91, 2.44]	0.85	0.90	.370	0.00	[-0.05, 0.06]	0.03	0.14	.893
Weekdaywednesday	1.10	[-0.56, 2.77]	0.85	1.30	.194	0.00	[-0.06, 0.06]	0.03	0.06	.954
Log pa volume <sup>2</sup>	-0.14	[-0.23, -0.05]	0.05	-3.10	.002	-0.01	[-0.04, 0.01]	0.01	-0.93	.350
Age	0.00	[0.00, 0.01]	0.00	1.28	.200	0.00	[0.00, 0.01]	0.00	1.05	.294
Log pa volume $\times$ weekdaymonday	-0.76	[-1.61, 0.09]	0.44	-1.75	.081	-0.02	[-0.06, 0.03]	0.02	-0.74	.458
Log pa volume $\times$ weekdaysaturday	-0.69	[-1.56, 0.17]	0.44	-1.58	.115	-0.03	[-0.08, 0.01]	0.02	-1.42	.155
Log pa volume $\times$ weekdaysunday	-0.18	[-1.01, 0.65]	0.42	-0.43	.668	-0.02	[-0.06, 0.03]	0.02	-0.74	.457
Log pa volume $\times$ weekdaythursday	-0.85	[-1.73, 0.04]	0.45	-1.87	.062	0.02	[-0.03, 0.07]	0.02	0.85	.393
Log pa volume $\times$ weekdaytuesday	-0.33	[-1.25, 0.59]	0.47	-0.71	.479	-0.02	[-0.06, 0.03]	0.02	-0.66	.506
Log pa volume $\times$ weekdaywednesday	-0.58	[-1.49, 0.34]	0.47	-1.24	.217	0.02	[-0.03, 0.06]	0.02	0.78	.434
Weekdaymonday $\times$ log pa volume <sup>2</sup>	0.10	[-0.02, 0.22]	0.06	1.69	.091	0.00	[-0.04, 0.03]	0.02	-0.07	.943
Weekdaysaturday $\times$ log pa volume <sup>2</sup>	0.10	[-0.02, 0.22]	0.06	1.62	.106	0.03	[-0.01, 0.07]	0.02	1.64	.100
Weekdaysunday $\times$ log pa volume <sup>2</sup>	0.03	[-0.08, 0.15]	0.06	0.53	.599	0.00	[-0.03, 0.04]	0.02	0.03	.976
Weekdaythursday $\times$ log pa volume <sup>2</sup>	0.11	[-0.01, 0.23]	0.06	1.79	.073	0.02	[-0.02, 0.05]	0.02	0.97	.331
Weekdaytuesday $\times$ log pa volume <sup>2</sup>	0.03	[-0.09, 0.16]	0.06	0.51	.611	0.00	[-0.04, 0.04]	0.02	-0.04	.966

Table 12 continued

Term	Physical activity volume (ln)					Physical activity intensity (z)				
	$\beta$	[95% CI]	SE	t	p	$\beta$	[95% CI]	SE	t	p
Weekdaywednesday $\times$ log pa volume <sup>2</sup>	0.07	[0.05, 0.20]	0.06	1.16	.245	0.00	[-0.03, 0.04]	0.02	0.15	.882
Sleep onset (z)										
(Intercept)	0.18	[-0.73, 1.10]	0.47	0.39	.695	0.01	[-0.32, 0.35]	0.17	0.08	.933
Log pa volume	-0.04	[-0.51, 0.43]	0.24	-0.16	.876	-0.04	[-0.06, -0.01]	0.01	-2.55	.011
Weekdaymonday	-0.49	[-1.60, 0.63]	0.57	-0.85	.393	-0.06	[-0.10, -0.02]	0.02	-2.83	.005
Weekdaysaturday	0.10	[-1.04, 1.23]	0.58	0.16	.869	0.08	[0.04, 0.12]	0.02	3.79	< .001
Weekdaysunday	-1.37	[-2.44, -0.29]	0.55	-2.49	.013	0.08	[0.04, 0.12]	0.02	3.77	< .001
Weekdaythursday	-0.05	[-1.23, 1.13]	0.60	-0.09	.930	-0.06	[-0.10, -0.01]	0.02	-2.62	.009
Weekdaytuesday	-0.17	[-1.38, 1.04]	0.62	-0.28	.780	-0.04	[-0.08, 0.01]	0.02	-1.63	.103
Weekdaywednesday	0.66	[-0.53, 1.86]	0.61	1.09	.277	-0.01	[-0.06, 0.03]	0.02	-0.59	.557
Log pa volume <sup>2</sup>	0.00	[-0.07, 0.06]	0.03	-0.06	.953	0.01	[-0.01, 0.03]	0.01	0.89	.373
Age	0.00	[0.00, 0.00]	0.00	-0.22	.829	0.00	[0.00, 0.00]	0.00	-0.37	.714
Log pa volume $\times$ weekdaymonday	0.36	[-0.26, 0.98]	0.32	1.15	.251	-0.06	[-0.09, -0.02]	0.02	-3.36	.001
Log pa volume $\times$ weekdaysaturday	-0.09	[-0.72, 0.54]	0.32	-0.29	.775	0.00	[-0.04, 0.03]	0.02	-0.12	.908
Log pa volume $\times$ weekdaysunday	0.82	[0.21, 1.42]	0.31	2.66	.008	-0.03	[-0.07, 0.00]	0.02	-1.97	.048
Log pa volume $\times$ weekdaythursday	0.12	[-0.53, 0.77]	0.33	0.37	.712	-0.04	[-0.08, -0.01]	0.02	-2.62	.009
Log pa volume $\times$ weekdaytuesday	0.22	[-0.45, 0.89]	0.34	0.65	.516	-0.03	[-0.06, 0.00]	0.02	-1.68	.093
Log pa volume $\times$ weekdaywednesday	-0.23	[-0.89, 0.42]	0.34	-0.70	.483	-0.02	[-0.06, 0.01]	0.02	-1.33	.183
Weekdaymonday $\times$ log pa volume <sup>2</sup>	-0.07	[-0.15, 0.02]	0.04	-1.57	.116	-0.01	[-0.04, 0.01]	0.01	-1.11	.269
Weekdaysaturday $\times$ log pa volume <sup>2</sup>	0.02	[-0.06, 0.11]	0.04	0.54	.587	0.00	[-0.03, 0.02]	0.01	-0.23	.815
Weekdaysunday $\times$ log pa volume <sup>2</sup>	-0.11	[-0.20, -0.03]	0.04	-2.65	.008	-0.01	[-0.04, 0.01]	0.01	-0.84	.398
Weekdaythursday $\times$ log pa volume <sup>2</sup>	-0.03	[-0.12, 0.05]	0.05	-0.76	.446	0.00	[-0.03, 0.02]	0.01	-0.22	.829
Weekdaytuesday $\times$ log pa volume <sup>2</sup>	-0.05	[-0.14, 0.04]	0.05	-1.10	.270	-0.01	[-0.04, 0.01]	0.01	-0.93	.354

Table 12 continued

Term	Physical activity volume (ln)					Physical activity intensity (z)				
	$\beta$	[95% CI]	SE	t	p	$\beta$	[95% CI]	SE	t	p
Weekdaywednesday $\times$ log pa volume <sup>2</sup>	0.01	[0.08, 0.10]	0.05	0.25	.806	-0.01	[-0.04, 0.01]	0.01	-1.07	.285
Sleep regularity (z)										
(Intercept)	-1.48	[-2.64, -0.33]	0.59	-2.52	.014	0.59	[0.34, 0.83]	0.13	4.66	< .001
Log pa volume	0.86	[0.23, 1.49]	0.32	2.68	.009	-0.02	[-0.05, 0.02]	0.02	-0.99	.322
Weekdaymonday	-2.85	[4.24, -1.46]	0.71	-4.01	< .001	0.01	[0.04, 0.07]	0.03	0.50	.617
Weekdaysaturday	-1.89	[-3.34, -0.44]	0.74	-2.56	.011	-0.13	[-0.18, -0.07]	0.03	-4.58	< .001
Weekdaysunday	-1.54	[-2.88, -0.19]	0.69	-2.24	.025	-0.19	[-0.24, -0.14]	0.03	-7.39	< .001
Weekdaythursday	-0.85	[-2.33, 0.63]	0.76	-1.12	.262	0.20	[0.15, 0.26]	0.03	7.16	< .001
Weekdaytuesday	-0.35	[-2.13, 1.44]	0.91	-0.38	.709	0.21	[0.15, 0.27]	0.03	6.63	< .001
Weekdaywednesday	-0.81	[-2.41, 0.79]	0.82	-0.99	.325	0.23	[0.18, 0.29]	0.03	8.46	< .001
Log pa volume <sup>2</sup>	-0.09	[-0.17, 0.00]	0.04	-2.03	.045	-0.01	[-0.04, 0.01]	0.01	-0.95	.341
Age	0.00	[0.00, 0.00]	0.00	-0.01	.989	0.00	[-0.01, 0.00]	0.00	-0.65	.517
Log pa volume $\times$ weekdaymonday	1.55	[0.77, 2.34]	0.40	3.89	< .001	0.13	[0.09, 0.17]	0.02	5.93	< .001
Log pa volume $\times$ weekdaysaturday	0.96	[0.16, 1.75]	0.41	2.36	.019	-0.04	[-0.08, 0.01]	0.02	-1.68	.094
Log pa volume $\times$ weekdaysunday	0.65	[-0.10, 1.40]	0.38	1.69	.091	0.00	[-0.04, 0.04]	0.02	-0.06	.950
Log pa volume $\times$ weekdaythursday	0.54	[-0.27, 1.35]	0.41	1.30	.195	0.10	[0.06, 0.14]	0.02	4.55	< .001
Log pa volume $\times$ weekdaytuesday	0.29	[-0.69, 1.26]	0.50	0.57	.573	0.14	[0.10, 0.18]	0.02	6.78	< .001
Log pa volume $\times$ weekdaywednesday	0.56	[-0.31, 1.43]	0.44	1.27	.208	0.09	[0.04, 0.13]	0.02	4.05	< .001
Weekdaymonday $\times$ log pa volume <sup>2</sup>	-0.21	[-0.32, -0.10]	0.06	-3.71	< .001	-0.03	[-0.06, 0.00]	0.02	-2.00	.045
Weekdaysaturday $\times$ log pa volume <sup>2</sup>	-0.13	[-0.24, -0.02]	0.06	-2.31	.021	-0.02	[-0.05, 0.01]	0.02	-1.10	.272
Weekdaysunday $\times$ log pa volume <sup>2</sup>	-0.07	[-0.18, 0.03]	0.05	-1.36	.173	-0.02	[-0.05, 0.01]	0.02	-1.21	.227
Weekdaythursday $\times$ log pa volume <sup>2</sup>	-0.07	[-0.18, 0.04]	0.06	-1.23	.220	-0.04	[-0.07, 0.00]	0.02	-2.21	.027
Weekdaytuesday $\times$ log pa volume <sup>2</sup>	-0.04	[-0.17, 0.10]	0.07	-0.55	.589	-0.02	[-0.06, 0.02]	0.02	-1.08	.285

Term	Physical activity volume (ln)				Physical activity intensity (z)					
	$\beta$	[95% CI]	SE	t	p	$\beta$	[95% CI]	SE	t	p
Weekdaywednesday $\times$ log pa volume <sup>2</sup>	-0.08 [-0.20, 0.04]	0.06	-1.32	.188	-0.07 [-0.10, -0.03]	0.02	-4.03	< .001		

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

Table 13

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

TITLE

Term	Physical activity volume (ln)				Physical activity intensity (z)			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Sleep duration (z)								
(Intercept)	4.37 [4.19, 4.55]	0.09	47.55	< .001	1.41 [1.17, 1.65]	0.12	11.41	< .001
Sleep duration	0.01 [0.00, 0.03]	0.01	1.46	.148	0.04 [0.01, 0.07]	0.02	2.41	.016
Weekdaymonday	-0.10 [-0.12, -0.08]	0.01	-10.16	< .001	-0.08 [-0.12, -0.05]	0.02	-4.46	< .001
Weekdaysaturday	-0.04 [-0.06, -0.02]	0.01	-4.00	< .001	-0.07 [-0.11, -0.03]	0.02	-3.73	< .001
Weekdaysunday	-0.10 [-0.12, -0.08]	0.01	-10.29	< .001	-0.18 [-0.22, -0.14]	0.02	-9.78	< .001
Weekdaythursday	-0.02 [-0.03, 0.00]	0.01	-1.63	.103	0.02 [-0.01, 0.06]	0.02	1.28	.200
Weekdaytuesday	-0.02 [-0.04, 0.00]	0.01	-1.97	.049	-0.03 [-0.07, 0.01]	0.02	-1.65	.098
Weekdaywednesday	-0.02 [-0.04, 0.00]	0.01	-2.10	.036	-0.01 [-0.05, 0.03]	0.02	-0.41	.683
Sleep duration <sup>2</sup>	0.00 [-0.01, 0.00]	0.00	-0.95	.342	-0.01 [-0.02, 0.01]	0.01	-0.73	.466
Age	-0.01 [-0.01, -0.01]	0.00	-10.98	< .001	-0.03 [-0.03, -0.02]	0.00	-15.57	< .001
Sleep duration × weekdaymonday	-0.01 [-0.03, 0.01]	0.01	-1.21	.229	-0.04 [-0.08, 0.00]	0.02	-1.85	.064
Sleep duration × weekdaysaturday	-0.02 [-0.05, 0.00]	0.01	-2.20	.029	-0.04 [-0.08, 0.00]	0.02	-1.90	.059
Sleep duration × weekdaysunday	-0.04 [-0.06, -0.02]	0.01	-3.62	< .001	-0.07 [-0.10, -0.03]	0.02	-3.34	.001
Sleep duration × weekdaythursday	0.00 [-0.02, 0.02]	0.01	-0.06	.950	0.02 [-0.02, 0.07]	0.02	1.11	.268
Sleep duration × weekdaytuesday	0.00 [-0.02, 0.02]	0.01	-0.30	.763	0.00 [-0.04, 0.04]	0.02	0.01	.994
Sleep duration × weekdaywednesday	-0.01 [-0.04, 0.01]	0.01	-1.08	.283	0.00 [-0.04, 0.04]	0.02	0.00	.997
Weekdaymonday × Sleep duration <sup>2</sup>	-0.01 [-0.02, 0.00]	0.01	-1.14	.253	0.00 [-0.02, 0.02]	0.01	-0.04	.967
Weekdaysaturday × Sleep duration <sup>2</sup>	-0.01 [-0.02, 0.00]	0.01	-2.22	.027	-0.02 [-0.04, 0.01]	0.01	-1.43	.152
Weekdaysunday × Sleep duration <sup>2</sup>	-0.01 [-0.02, 0.00]	0.01	-2.00	.046	-0.01 [-0.03, 0.01]	0.01	-0.59	.553
Weekdaythursday × Sleep duration <sup>2</sup>	0.00 [-0.01, 0.01]	0.01	0.37	.714	0.01 [-0.02, 0.03]	0.01	0.66	.512
Weekdaytuesday × Sleep duration <sup>2</sup>	0.00 [-0.01, 0.01]	0.01	-0.46	.644	0.01 [-0.01, 0.03]	0.01	0.76	.449

Table 13 continued

TITLE

Term	Physical activity volume (ln)				Physical activity intensity (z)					
	$\beta$	[95% CI]	SE	t	p	$\beta$	[95% CI]	SE	t	p
Weekdaywednesday × Sleep duration <sup>2</sup>	0.00	[ -0.01, 0.01]	0.01	-0.40	.690	0.00	[ -0.02, 0.02]	0.01	-0.13	.898
Sleep efficiency (z)										
(Intercept)	4.37	[4.19, 4.55]	0.09	47.68	< .001	1.41	[1.17, 1.66]	0.12	11.40	< .001
Sleep efficiency	-0.02	[ -0.04, -0.01]	0.01	-2.57	.010	-0.04	[ -0.07, 0.00]	0.02	-2.00	.051
Weekdaymonday	-0.11	[ -0.13, -0.10]	0.01	-12.05	< .001	-0.09	[ -0.13, -0.06]	0.02	-5.02	< .001
Weekdaysaturday	-0.06	[ -0.07, -0.04]	0.01	-5.75	< .001	-0.09	[ -0.13, -0.05]	0.02	-4.66	< .001
Weekdaysunday	-0.11	[ -0.13, -0.09]	0.01	-10.86	< .001	-0.20	[ -0.23, -0.16]	0.02	-10.17	< .001
Weekdaythursday	-0.02	[ -0.04, 0.00]	0.01	-2.44	.015	0.01	[ -0.02, 0.05]	0.02	0.71	.479
Weekdaytuesday	-0.03	[ -0.05, -0.01]	0.01	-3.11	.002	-0.04	[ -0.08, 0.00]	0.02	-2.21	.027
Weekdaywednesday	-0.02	[ -0.04, 0.00]	0.01	-2.42	.016	-0.02	[ -0.05, 0.02]	0.02	-0.88	.380
Sleep efficiency <sup>2</sup>	-0.01	[ -0.01, 0.00]	0.00	-2.28	.023	-0.01	[ -0.02, 0.00]	0.01	-1.28	.201
Age	-0.01	[ -0.01, -0.01]	0.00	-10.97	< .001	-0.03	[ -0.03, -0.02]	0.00	-15.54	< .001
Sleep efficiency × weekdaymonday	0.03	[0.01, 0.06]	0.01	3.00	.003	0.05	[0.00, 0.09]	0.02	1.86	.069
Sleep efficiency × weekdaysaturday	0.03	[0.00, 0.05]	0.01	2.20	.028	0.04	[ -0.01, 0.09]	0.03	1.62	.114
Sleep efficiency × weekdaysunday	0.05	[0.03, 0.08]	0.01	4.42	< .001	0.08	[0.04, 0.13]	0.02	3.63	< .001
Sleep efficiency × weekdaythursday	0.02	[0.00, 0.05]	0.01	1.81	.071	0.03	[ -0.02, 0.08]	0.02	1.14	.258
Sleep efficiency × weekdaytuesday	0.02	[ -0.01, 0.04]	0.01	1.50	.135	0.04	[0.00, 0.09]	0.02	1.81	.071
Sleep efficiency × weekdaywednesday	0.01	[ -0.01, 0.04]	0.01	1.02	.311	0.02	[ -0.03, 0.06]	0.02	0.74	.462
Weekdaymonday × Sleep efficiency <sup>2</sup>	0.01	[0.00, 0.02]	0.00	2.20	.028	0.01	[ -0.01, 0.02]	0.01	0.90	.367
Weekdaysaturday × Sleep efficiency <sup>2</sup>	0.00	[ -0.01, 0.01]	0.00	0.78	.435	0.00	[ -0.02, 0.02]	0.01	0.13	.896
Weekdaysunday × Sleep efficiency <sup>2</sup>	0.00	[ -0.01, 0.01]	0.01	-0.67	.505	0.00	[ -0.02, 0.03]	0.01	0.46	.643
Weekdaythursday × Sleep efficiency <sup>2</sup>	0.01	[0.00, 0.02]	0.00	1.78	.075	0.01	[ -0.01, 0.03]	0.01	1.26	.207
Weekdaytuesday × Sleep efficiency <sup>2</sup>	0.01	[0.00, 0.01]	0.00	1.62	.105	0.01	[0.00, 0.02]	0.01	1.46	.143

Table 13 continued

TITLE

Term	Physical activity volume (ln)				Physical activity intensity (z)					
	$\beta$	[95% CI]	SE	t	p	$\beta$	[95% CI]	SE	t	p
Weekdaywednesday × Sleep efficiency <sup>2</sup>	0.00	[0.01, 0.01]	0.00	-0.02	.980	0.01	[-0.01, 0.02]	0.01	0.76	.450
Sleep onset (z)										
(Intercept)	4.37	[4.19, 4.55]	0.09	47.74	< .001	1.41	[1.17, 1.66]	0.12	11.35	< .001
Sleep onset	-0.01	[-0.03, 0.00]	0.01	-1.73	.084	-0.03	[-0.05, 0.00]	0.01	-1.86	.063
Weekdaymonday	-0.11	[-0.13, -0.08]	0.01	-9.74	< .001	-0.10	[-0.14, -0.06]	0.02	-4.81	< .001
Weekdaysaturday	-0.05	[-0.07, -0.03]	0.01	-4.86	< .001	-0.10	[-0.15, -0.06]	0.02	-4.93	< .001
Weekdaysunday	-0.10	[-0.12, -0.08]	0.01	-9.56	< .001	-0.20	[-0.24, -0.16]	0.02	-9.60	< .001
Weekdaythursday	-0.02	[-0.04, 0.00]	0.01	-1.84	.066	0.02	[-0.03, 0.06]	0.02	0.72	.469
Weekdaytuesday	-0.02	[-0.04, 0.00]	0.01	-2.00	.046	-0.04	[-0.08, 0.00]	0.02	-1.80	.072
Weekdaywednesday	-0.03	[-0.05, 0.00]	0.01	-2.26	.024	-0.03	[-0.07, 0.01]	0.02	-1.29	.197
Sleep onset <sup>2</sup>	-0.01	[-0.02, 0.01]	0.01	-0.98	.326	-0.01	[-0.03, 0.02]	0.01	-0.64	.524
Age	-0.01	[-0.01, -0.01]	0.00	-10.96	< .001	-0.03	[-0.03, -0.02]	0.00	-15.57	< .001
Sleep onset × weekdaymonday	0.02	[0.00, 0.04]	0.01	1.96	.050	0.07	[0.03, 0.10]	0.02	3.76	< .001
Sleep onset × weekdaysaturday	0.03	[0.01, 0.05]	0.01	2.98	.003	0.07	[0.04, 0.11]	0.02	4.09	< .001
Sleep onset × weekdaysunday	0.06	[0.04, 0.08]	0.01	6.21	< .001	0.11	[0.07, 0.14]	0.02	6.03	< .001
Sleep onset × weekdaythursday	0.01	[-0.01, 0.03]	0.01	0.84	.399	0.02	[-0.02, 0.05]	0.02	0.84	.399
Sleep onset × weekdaytuesday	0.01	[-0.01, 0.02]	0.01	0.55	.582	0.02	[-0.01, 0.06]	0.02	1.24	.214
Sleep onset × weekdaywednesday	0.01	[-0.01, 0.03]	0.01	1.24	.214	0.02	[-0.02, 0.06]	0.02	1.11	.269
Weekdaymonday × Sleep onset <sup>2</sup>	0.00	[-0.01, 0.02]	0.01	0.16	.869	0.01	[-0.02, 0.04]	0.01	0.70	.484
Weekdaysaturday × Sleep onset <sup>2</sup>	0.00	[-0.01, 0.02]	0.01	0.09	.928	0.01	[-0.02, 0.04]	0.01	0.94	.346
Weekdaysunday × Sleep onset <sup>2</sup>	-0.01	[-0.03, 0.00]	0.01	-1.62	.106	0.00	[-0.03, 0.03]	0.01	0.04	.966
Weekdaythursday × Sleep onset <sup>2</sup>	0.01	[-0.01, 0.02]	0.01	0.79	.427	0.01	[-0.02, 0.04]	0.02	0.64	.525
Weekdaytuesday × Sleep onset <sup>2</sup>	0.00	[-0.02, 0.02]	0.01	-0.04	.965	0.01	[-0.02, 0.04]	0.02	0.72	.472

Table 13 continued

TITLE

Term	Physical activity volume (ln)					Physical activity intensity (z)				
	$\beta$	[95% CI]	SE	t	p	$\beta$	[95% CI]	SE	t	p
Weekdaywednesday $\times$ Sleep onset <sup>2</sup>	0.00	[ -0.01, 0.02 ]	0.01	0.34	.734	0.02	[ -0.01, 0.05 ]	0.02	1.26	.207
Sleep regularity (z)										
(Intercept)	4.33	[ 4.15, 4.51 ]	0.09	48.08	< .001	1.39	[ 1.15, 1.63 ]	0.12	11.19	< .001
Sleep regularity	0.06	[ 0.04, 0.08 ]	0.01	7.08	< .001	0.04	[ 0.01, 0.07 ]	0.02	2.45	.014
Weekdaymonday	-0.10	[ -0.12, -0.08 ]	0.01	-10.12	< .001	-0.07	[ -0.11, -0.03 ]	0.02	-3.73	< .001
Weekdaysaturday	-0.03	[ -0.05, -0.01 ]	0.01	-3.39	.001	-0.08	[ -0.12, -0.05 ]	0.02	-4.42	< .001
Weekdaysunday	-0.08	[ -0.10, -0.06 ]	0.01	-8.22	< .001	-0.17	[ -0.21, -0.13 ]	0.02	-9.07	< .001
Weekdaythursday	-0.01	[ -0.03, 0.01 ]	0.01	-0.68	.498	0.02	[ -0.02, 0.06 ]	0.02	1.14	.255
Weekdaytuesday	-0.02	[ -0.04, 0.00 ]	0.01	-1.99	.047	-0.02	[ -0.06, 0.02 ]	0.02	-1.05	.295
Weekdaywednesday	-0.02	[ -0.04, 0.00 ]	0.01	-2.38	.017	-0.01	[ -0.04, 0.03 ]	0.02	-0.26	.798
Sleep regularity <sup>2</sup>	-0.01	[ -0.02, 0.00 ]	0.01	-1.71	.091	-0.02	[ -0.04, 0.01 ]	0.01	-1.38	.167
Age	-0.01	[ -0.01, -0.01 ]	0.00	-11.01	< .001	-0.03	[ -0.03, -0.02 ]	0.00	-15.58	< .001
Sleep regularity $\times$ weekdaymonday	0.00	[ -0.02, 0.02 ]	0.01	0.08	.940	-0.04	[ -0.09, 0.01 ]	0.02	-1.66	.098
Sleep regularity $\times$ weekdaysaturday	0.01	[ -0.02, 0.03 ]	0.01	0.57	.568	-0.01	[ -0.05, 0.04 ]	0.02	-0.30	.761
Sleep regularity $\times$ weekdaysunday	0.01	[ -0.01, 0.04 ]	0.01	1.10	.273	0.02	[ -0.03, 0.07 ]	0.02	0.86	.392
Sleep regularity $\times$ weekdaythursday	-0.02	[ -0.04, 0.00 ]	0.01	-1.68	.093	-0.02	[ -0.07, 0.02 ]	0.02	-0.95	.344
Sleep regularity $\times$ weekdaytuesday	-0.02	[ -0.05, 0.00 ]	0.01	-2.05	.040	-0.03	[ -0.08, 0.01 ]	0.02	-1.52	.128
Sleep regularity $\times$ weekendwednesday	-0.01	[ -0.03, 0.02 ]	0.01	-0.56	.576	-0.01	[ -0.05, 0.04 ]	0.02	-0.26	.798
Weekdaymonday $\times$ Sleep regularity <sup>2</sup>	0.02	[ 0.01, 0.04 ]	0.01	2.65	.009	-0.01	[ -0.04, 0.02 ]	0.01	-0.51	.608
Weekdaysaturday $\times$ Sleep regularity <sup>2</sup>	-0.01	[ -0.03, 0.01 ]	0.01	-1.18	.240	0.01	[ -0.02, 0.04 ]	0.02	0.79	.428
Weekdaysunday $\times$ Sleep regularity <sup>2</sup>	-0.01	[ -0.03, 0.01 ]	0.01	-1.21	.228	0.00	[ -0.03, 0.03 ]	0.02	0.30	.762
Weekdaythursday $\times$ Sleep regularity <sup>2</sup>	-0.01	[ -0.03, 0.01 ]	0.01	-1.17	.241	0.01	[ -0.02, 0.04 ]	0.02	0.59	.553
Weekdaytuesday $\times$ Sleep regularity <sup>2</sup>	0.01	[ -0.01, 0.02 ]	0.01	0.94	.351	0.00	[ -0.03, 0.03 ]	0.02	-0.19	.853

Table 13 continued

TITLE

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Term	Physical activity volume (ln)			Physical activity intensity (z)				
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Weekdaywednesday $\times$ Sleep regularity <sup>2</sup>	0.00 [-0.02, 0.02]	0.01	0.20	.839	-0.01 [-0.04, 0.02]	0.02	-0.43	.668

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

Table 14

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

Term	Physical activity volume (ln)						Physical activity intensity (z)			
	$\beta$	[95% CI]	SE	t	p	$\beta$	[95% CI]	SE	t	p
Sleep duration (z)										
(Intercept)	0.15	[0.91, 1.21]	0.54	0.28	.778	0.20	[-0.04, 0.43]	0.12	1.65	.100
Log pa volume	-0.16	[-0.75, 0.42]	0.30	-0.54	.589	0.07	[0.03, 0.11]	0.02	3.69	< .001
Seasonspring	0.23	[-1.20, 1.66]	0.73	0.32	.751	0.00	[-0.07, 0.07]	0.04	0.02	.983
Seasonsummer	-2.04	[-3.81, -0.26]	0.91	-2.25	.024	-0.10	[-0.18, -0.02]	0.04	-2.58	.010
Seasonwinter	-0.28	[-1.62, 1.06]	0.68	-0.41	.682	0.10	[0.03, 0.17]	0.04	2.70	.007
Log pa volume <sup>2</sup>	0.05	[-0.03, 0.13]	0.04	1.14	.256	0.03	[0.01, 0.06]	0.01	2.50	.012
Age	0.00	[-0.01, 0.00]	0.00	-0.66	.509	0.00	[-0.01, 0.00]	0.00	-0.92	.358
Log pa volume × seasonspring	-0.15	[-0.96, 0.66]	0.41	-0.37	.715	0.01	[-0.04, 0.06]	0.03	0.29	.773
Log pa volume × seasonsummer	1.11	[0.10, 2.11]	0.51	2.16	.031	-0.03	[-0.08, 0.03]	0.03	-0.88	.378
Log pa volume × seasonwinter	0.28	[-0.47, 1.03]	0.38	0.73	.468	-0.01	[-0.06, 0.04]	0.03	-0.29	.771
Seasonspring × log pa volume <sup>2</sup>	0.02	[-0.09, 0.13]	0.06	0.35	.726	-0.04	[-0.07, -0.01]	0.02	-2.34	.019
Seasonsummer × log pa volume <sup>2</sup>	-0.16	[-0.30, -0.02]	0.07	-2.20	.028	-0.05	[-0.08, -0.01]	0.02	-2.45	.014
Seasonwinter × log pa volume <sup>2</sup>	-0.05	[-0.15, 0.06]	0.05	-0.90	.366	-0.02	[-0.05, 0.01]	0.02	-1.12	.263
Sleep efficiency (z)										
(Intercept)	-0.39	[-1.46, 0.68]	0.55	-0.71	.475	0.20	[-0.05, 0.45]	0.13	1.58	.114
Log pa volume	0.20	[-0.39, 0.80]	0.31	0.67	.503	0.04	[0.00, 0.08]	0.02	2.05	.041
Seasonspring	0.05	[-1.41, 1.50]	0.74	0.06	.951	0.10	[0.03, 0.18]	0.04	2.65	.008
Seasonsummer	-2.61	[-4.43, -0.80]	0.93	-2.83	.005	0.06	[-0.02, 0.14]	0.04	1.36	.172
Seasonwinter	-0.97	[-2.33, 0.39]	0.69	-1.39	.164	0.12	[0.05, 0.20]	0.04	3.16	.002
Log pa volume <sup>2</sup>	-0.01	[-0.10, 0.07]	0.04	-0.25	.803	0.02	[0.00, 0.05]	0.01	1.72	.086
Age	0.00	[0.00, 0.01]	0.00	1.34	.181	0.00	[0.00, 0.01]	0.00	1.09	.274

Table 14 continued

Term	Physical activity volume (ln)				Physical activity intensity (z)			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Log pa volume × seasonspring	0.15 [-0.67, 0.97]	0.42	0.36	.717	-0.07 [-0.12, -0.02]	0.03	-2.84	.005
Log pa volume × seasonsummer	1.57 [0.55, 2.60]	0.52	3.01	.003	-0.07 [-0.13, -0.01]	0.03	-2.35	.019
Log pa volume × seasonwinter	0.68 [-0.09, 1.44]	0.39	1.74	.083	-0.03 [-0.08, 0.02]	0.03	-1.22	.224
Seasonspring × log pa volume <sup>2</sup>	-0.04 [-0.16, 0.08]	0.06	-0.68	.496	-0.03 [-0.07, 0.00]	0.02	-1.97	.049
Seasonsummer × log pa volume <sup>2</sup>	-0.23 [-0.37, -0.09]	0.07	-3.13	.002	-0.05 [-0.09, -0.01]	0.02	-2.67	.008
Seasonwinter × log pa volume <sup>2</sup>	-0.10 [-0.21, 0.00]	0.05	-1.91	.056	-0.03 [-0.06, 0.01]	0.02	-1.66	.097
Sleep onset (z)								
(Intercept)	0.03 [-0.81, 0.87]	0.43	0.07	.946	0.02 [-0.31, 0.35]	0.17	0.12	.903
Log pa volume	0.08 [-0.36, 0.51]	0.22	0.34	.735	-0.05 [-0.08, -0.02]	0.01	-3.59	< .001
Seasonspring	0.37 [-0.70, 1.44]	0.55	0.68	.495	0.02 [-0.03, 0.08]	0.03	0.78	.434
Seasonsummer	-0.14 [-1.46, 1.19]	0.68	-0.20	.839	0.06 [0.00, 0.12]	0.03	1.98	.048
Seasonwinter	-0.55 [-1.55, 0.45]	0.51	-1.08	.280	0.02 [-0.04, 0.07]	0.03	0.65	.518
Log pa volume <sup>2</sup>	-0.02 [-0.08, 0.04]	0.03	-0.70	.484	0.00 [-0.02, 0.01]	0.01	-0.44	.661
Age	0.00 [0.00, 0.00]	0.00	-0.36	.722	0.00 [0.00, 0.00]	0.00	-0.55	.580
Log pa volume × seasonspring	-0.11 [-0.71, 0.49]	0.31	-0.35	.723	-0.03 [-0.06, 0.01]	0.02	-1.47	.141
Log pa volume × seasonsummer	0.10 [-0.65, 0.85]	0.38	0.25	.801	-0.01 [-0.05, 0.04]	0.02	-0.30	.763
Log pa volume × seasonwinter	0.35 [-0.21, 0.91]	0.29	1.21	.225	-0.03 [-0.07, 0.01]	0.02	-1.68	.092
Seasonspring × log pa volume <sup>2</sup>	0.00 [-0.08, 0.09]	0.04	0.09	.926	0.01 [-0.01, 0.04]	0.01	1.04	.296
Seasonsummer × log pa volume <sup>2</sup>	-0.01 [-0.12, 0.09]	0.05	-0.20	.841	0.00 [-0.02, 0.03]	0.01	0.31	.757
Seasonwinter × log pa volume <sup>2</sup>	-0.05 [-0.13, 0.03]	0.04	-1.31	.190	-0.01 [-0.03, 0.02]	0.01	-0.72	.471
Sleep regularity (z)								
(Intercept)	-3.22 [-4.23, -2.21]	0.52	-6.25	< .001	0.57 [0.33, 0.81]	0.12	4.61	< .001
Log pa volume	1.77 [1.20, 2.34]	0.29	6.05	< .001	0.11 [0.08, 0.15]	0.02	6.19	< .001

Table 14 continued

Term	Physical activity volume (ln)				Physical activity intensity (z)					
	$\beta$	[95% CI]	SE	t	p	$\beta$	[95% CI]	SE	t	p
Seasonspring	-0.94	[-2.30, 0.42]	0.69	-1.35	.177	-0.04	[-0.11, 0.03]	0.04	-1.11	.267
Seasonsummer	-0.95	[-2.61, 0.71]	0.85	-1.12	.262	0.03	[-0.04, 0.11]	0.04	0.84	.399
Seasonwinter	1.05	[-0.20, 2.30]	0.64	1.64	.101	0.02	[-0.05, 0.09]	0.04	0.59	.557
Log pa volume <sup>2</sup>	-0.21	[-0.29, -0.12]	0.04	-4.91	< .001	-0.02	[-0.04, 0.01]	0.01	-1.40	.161
Age	0.00	[0.00, 0.00]	0.00	0.23	.821	0.00	[0.00, 0.00]	0.00	-0.26	.792
Log pa volume × seasonspring	0.46	[-0.31, 1.23]	0.39	1.18	.238	-0.07	[-0.12, -0.02]	0.02	-2.79	.005
Log pa volume × seasonsummer	0.53	[-0.41, 1.47]	0.48	1.11	.267	-0.04	[-0.09, 0.01]	0.03	-1.47	.141
Log pa volume × seasonwinter	-0.61	[-1.31, 0.10]	0.36	-1.69	.090	-0.05	[-0.10, 0.00]	0.02	-1.93	.053
Seasonspring × log pa volume <sup>2</sup>	-0.06	[-0.17, 0.05]	0.06	-1.06	.291	-0.01	[-0.04, 0.03]	0.02	-0.32	.748
Seasonsummer × log pa volume <sup>2</sup>	-0.07	[-0.20, 0.06]	0.07	-1.06	.291	-0.01	[-0.05, 0.03]	0.02	-0.57	.567
Seasonwinter × log pa volume <sup>2</sup>	0.09	[-0.01, 0.18]	0.05	1.69	.090	-0.04	[-0.07, -0.01]	0.02	-2.32	.020

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

Table 15

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

Term	Physical activity volume (ln)				Physical activity intensity (z)					
	$\beta$	[95% CI]	SE	t	p	$\beta$	[95% CI]	SE	t	p
Sleep duration (z)										
(Intercept)	4.34	[4.16, 4.52]	0.09	46.84	< .001	1.37	[1.13, 1.61]	0.12	11.17	< .001
Sleep duration	0.00	[0.01, 0.01]	0.01	0.14	.892	0.02	[-0.01, 0.04]	0.01	1.22	.230
Seasonspring	0.00	[-0.03, 0.03]	0.02	0.08	.934	0.00	[-0.05, 0.06]	0.03	0.04	.966
Seasonsummer	-0.03	[-0.06, 0.00]	0.02	-1.77	.077	-0.11	[-0.17, -0.05]	0.03	-3.63	< .001
Seasonwinter	-0.02	[-0.05, 0.01]	0.02	-1.24	.214	0.00	[-0.06, 0.06]	0.03	-0.01	.990
Sleep duration <sup>2</sup>	-0.01	[-0.01, 0.00]	0.00	-2.90	.004	0.00	[-0.01, 0.01]	0.01	-0.72	.469
Age	-0.01	[-0.01, -0.01]	0.00	-11.15	< .001	-0.03	[-0.03, -0.02]	0.00	-15.67	< .001
Sleep duration × seasonspring	-0.03	[-0.05, -0.01]	0.01	-3.12	.002	-0.03	[-0.07, 0.00]	0.02	-1.79	.077
Sleep duration × seasonsummer	-0.01	[-0.03, 0.02]	0.01	-0.50	.614	0.00	[-0.04, 0.04]	0.02	0.04	.969
Sleep duration × seasonwinter	0.00	[-0.01, 0.02]	0.01	0.45	.654	0.00	[-0.03, 0.04]	0.02	0.19	.850
Seasonspring × Sleep duration <sup>2</sup>	-0.01	[-0.02, 0.00]	0.00	-2.27	.023	-0.01	[-0.03, 0.00]	0.01	-1.74	.082
Seasonsummer × Sleep duration <sup>2</sup>	0.00	[-0.01, 0.01]	0.00	0.30	.764	-0.01	[-0.03, 0.01]	0.01	-0.83	.408
Seasonwinter × Sleep duration <sup>2</sup>	-0.01	[-0.01, 0.00]	0.00	-1.36	.173	-0.01	[-0.03, 0.00]	0.01	-1.37	.173
Sleep efficiency (z)										
(Intercept)	4.33	[4.15, 4.51]	0.09	47.08	< .001	1.36	[1.12, 1.60]	0.12	11.16	< .001
Sleep efficiency	0.02	[0.01, 0.04]	0.01	3.05	.002	0.03	[0.00, 0.06]	0.01	1.81	.076
Seasonspring	0.00	[-0.03, 0.03]	0.02	0.03	.977	0.00	[-0.05, 0.06]	0.03	0.14	.888
Seasonsummer	-0.03	[-0.07, 0.00]	0.02	-1.94	.053	-0.12	[-0.18, -0.06]	0.03	-4.11	< .001
Seasonwinter	-0.02	[-0.05, 0.01]	0.02	-1.37	.172	0.00	[-0.06, 0.05]	0.03	-0.13	.894
Sleep efficiency <sup>2</sup>	0.00	[0.00, 0.00]	0.00	-0.38	.705	0.00	[-0.01, 0.01]	0.00	0.75	.455
Age	-0.01	[-0.01, -0.01]	0.00	-11.04	< .001	-0.03	[-0.03, -0.02]	0.00	-15.59	< .001

Table 15 continued

## TITLE

Term	Physical activity volume (ln)					Physical activity intensity (z)				
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p		
Sleep efficiency $\times$ seasonspring	-0.03 [-0.05, -0.01]	0.01	-2.46	.015	-0.04 [-0.08, -0.01]	0.02	-2.26	.025		
Sleep efficiency $\times$ seasonsummer	-0.01 [-0.03, 0.02]	0.01	-0.47	.635	0.00 [-0.04, 0.04]	0.02	-0.13	.896		
Sleep efficiency $\times$ seasonwinter	-0.02 [-0.04, 0.00]	0.01	-1.95	.051	-0.02 [-0.07, 0.02]	0.02	-1.18	.242		
Seasonspring $\times$ Sleep efficiency <sup>2</sup>	0.00 [-0.01, 0.00]	0.00	-0.91	.364	-0.01 [-0.02, 0.00]	0.01	-1.36	.175		
Seasonsummer $\times$ Sleep efficiency <sup>2</sup>	0.00 [0.00, 0.01]	0.00	1.00	.318	0.00 [-0.01, 0.01]	0.01	0.38	.707		
Seasonwinter $\times$ Sleep efficiency <sup>2</sup>	0.00 [-0.01, 0.00]	0.00	-0.77	.440	0.00 [-0.02, 0.01]	0.01	-0.57	.567		
Sleep onset (z)										
(Intercept)	4.34 [4.16, 4.52]	0.09	47.09	< .001	1.37 [1.13, 1.61]	0.12	11.19	< .001		
Sleep onset	0.01 [0.00, 0.03]	0.01	2.11	.034	0.02 [0.00, 0.05]	0.01	1.85	.064		
Seasonspring	-0.01 [-0.05, 0.02]	0.02	-0.76	.449	-0.03 [-0.09, 0.03]	0.03	-1.05	.294		
Seasonsummer	-0.03 [-0.07, 0.00]	0.02	-1.79	.073	-0.13 [-0.19, -0.06]	0.03	-4.02	< .001		
Seasonwinter	-0.02 [-0.05, 0.02]	0.02	-0.93	.353	0.00 [-0.06, 0.06]	0.03	0.06	.951		
Sleep onset <sup>2</sup>	-0.01 [-0.02, 0.00]	0.00	-2.58	.010	-0.01 [-0.02, 0.01]	0.01	-0.90	.370		
Age	-0.01 [-0.01, -0.01]	0.00	-11.05	< .001	-0.03 [-0.03, -0.02]	0.00	-15.64	< .001		
Sleep onset $\times$ seasonspring	-0.01 [-0.03, 0.01]	0.01	-0.72	.473	0.01 [-0.03, 0.04]	0.02	0.28	.779		
Sleep onset $\times$ seasonsummer	0.00 [-0.02, 0.02]	0.01	-0.29	.775	-0.01 [-0.05, 0.03]	0.02	-0.37	.709		
Sleep onset $\times$ seasonwinter	-0.03 [-0.05, -0.01]	0.01	-2.97	.003	-0.03 [-0.06, 0.01]	0.02	-1.47	.141		
Seasonspring $\times$ Sleep onset <sup>2</sup>	0.01 [0.00, 0.02]	0.01	1.54	.125	0.02 [0.00, 0.04]	0.01	1.90	.057		
Seasonsummer $\times$ Sleep onset <sup>2</sup>	0.00 [-0.01, 0.01]	0.01	0.10	.920	0.01 [-0.02, 0.03]	0.01	0.55	.580		
Seasonwinter $\times$ Sleep onset <sup>2</sup>	-0.01 [-0.02, 0.01]	0.01	-1.03	.302	-0.01 [-0.03, 0.02]	0.01	-0.60	.546		
Sleep regularity (z)										
(Intercept)	4.30 [4.12, 4.47]	0.09	47.46	< .001	1.35 [1.11, 1.58]	0.12	11.13	< .001		
Sleep regularity	0.06 [0.05, 0.08]	0.01	7.99	< .001	0.08 [0.05, 0.10]	0.01	5.06	< .001		

Table 15 continued

Term	Physical activity volume (ln)				Physical activity intensity (z)			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Seasonspring	0.01 [-0.02, 0.04]	0.02	0.51	.608	0.00 [-0.05, 0.06]	0.03	0.05	.956
Seasonsummer	-0.03 [-0.06, 0.00]	0.02	-1.86	.063	-0.12 [-0.18, -0.06]	0.03	-3.87	< .001
Seasonwinter	-0.02 [-0.05, 0.01]	0.02	-1.04	.297	-0.01 [-0.06, 0.05]	0.03	-0.28	.777
Sleep regularity <sup>2</sup>	-0.01 [-0.02, 0.00]	0.00	-1.53	.128	-0.01 [-0.03, 0.01]	0.01	-0.96	.337
Age	-0.01 [-0.01, -0.01]	0.00	-11.09	< .001	-0.03 [-0.03, -0.02]	0.00	-15.64	< .001
Sleep regularity × seasonspring	0.00 [-0.02, 0.02]	0.01	0.24	.807	-0.04 [-0.08, 0.00]	0.02	-2.07	.038
Sleep regularity × seasonsummer	0.00 [-0.03, 0.02]	0.01	-0.20	.843	-0.05 [-0.10, 0.00]	0.02	-2.12	.034
Sleep regularity × seasonwinter	0.00 [-0.03, 0.02]	0.01	-0.44	.658	-0.04 [-0.08, 0.00]	0.02	-1.82	.069
Seasonspring × Sleep regularity <sup>2</sup>	-0.01 [-0.02, 0.00]	0.01	-1.24	.218	-0.01 [-0.04, 0.01]	0.01	-1.01	.312
Seasonsummer × Sleep regularity <sup>2</sup>	0.00 [-0.01, 0.02]	0.01	0.39	.694	-0.01 [-0.03, 0.02]	0.01	-0.59	.558
Seasonwinter × Sleep regularity <sup>2</sup>	0.00 [-0.02, 0.01]	0.01	-0.76	.449	0.00 [-0.02, 0.02]	0.01	0.05	.962

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

Table 16

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

Term	Physical activity volume (ln)				Physical activity intensity (z)			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
<b>Sleep duration (z)</b>								
(Intercept)	2.53 [0.64, 4.41]	0.96	2.63	.009	0.41 [0.12, 0.70]	0.15	2.74	.007
Log pa volume	-1.25 [-2.18, -0.31]	0.48	-2.61	.009	0.02 [-0.07, 0.11]	0.05	0.49	.627
Regioneurope	-2.82 [-4.80, -0.84]	1.01	-2.80	.005	-0.22 [-0.40, -0.03]	0.09	-2.33	.020
Regionafrica	-5.74 [-8.84, -2.63]	1.58	-3.62	<.001	-0.26 [-0.47, -0.04]	0.11	-2.33	.020
Regionasia	-3.70 [-7.73, 0.34]	2.06	-1.80	.072	-0.48 [-0.71, -0.25]	0.12	-4.09	<.001
Regionnorth america	-1.43 [-4.12, 1.26]	1.37	-1.04	.298	-0.08 [-0.29, 0.12]	0.11	-0.79	.427
Regionsouth america	-3.61 [-6.29, -0.92]	1.37	-2.63	.009	-0.41 [-0.60, -0.22]	0.10	-4.24	<.001
Log pa volume <sup>2</sup>	0.18 [0.06, 0.30]	0.06	2.96	.003	0.03 [-0.01, 0.07]	0.02	1.61	.109
Age	0.00 [-0.01, 0.00]	0.00	-0.62	.533	0.00 [-0.01, 0.00]	0.00	-0.87	.386
Log pa volume × regioneurope	1.36 [0.34, 2.37]	0.52	2.62	.009	0.05 [-0.05, 0.14]	0.05	0.97	.330
Log pa volume × regionafrica	3.17 [1.41, 4.93]	0.90	3.53	<.001	0.06 [-0.14, 0.27]	0.11	0.61	.543
Log pa volume × regionasia	1.66 [-0.78, 4.09]	1.24	1.33	.182	0.16 [-0.04, 0.37]	0.10	1.56	.118
Log pa volume × regionnorth america	0.58 [-0.92, 2.08]	0.76	0.76	.447	0.04 [-0.11, 0.19]	0.08	0.51	.611
Log pa volume × regionsouth america	1.66 [0.18, 3.15]	0.76	2.20	.028	0.04 [-0.08, 0.16]	0.06	0.63	.527
Regioneurope × log pa volume <sup>2</sup>	-0.17 [-0.30, -0.04]	0.07	-2.60	.009	-0.03 [-0.07, 0.01]	0.02	-1.35	.178
Regionafrica × log pa volume <sup>2</sup>	-0.45 [-0.70, -0.20]	0.13	-3.50	<.001	-0.02 [-0.15, 0.10]	0.07	-0.38	.705
Regionasia × log pa volume <sup>2</sup>	-0.21 [-0.58, 0.17]	0.19	-1.09	.278	-0.08 [-0.25, 0.09]	0.08	-0.95	.343
Regionnorth america × log pa volume <sup>2</sup>	-0.05 [-0.26, 0.16]	0.11	-0.48	.629	0.02 [-0.08, 0.12]	0.05	0.42	.676
Regionsouth america × log pa volume <sup>2</sup>	-0.21 [-0.42, -0.01]	0.11	-2.03	.042	-0.07 [-0.16, 0.01]	0.04	-1.79	.073
<b>Sleep efficiency (z)</b>								
(Intercept)	0.96 [-0.92, 2.83]	0.96	1.00	.316	0.37 [0.08, 0.66]	0.15	2.49	.013

Table 16 continued

TITLE

Term	Physical activity volume (ln)				Physical activity intensity (z)			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Log pa volume	-0.25 [-1.19, 0.69]	0.48	-0.52	.603	-0.08 [-0.17, 0.01]	0.05	-1.81	.070
Regioneurope	-1.56 [-3.55, 0.43]	1.02	-1.53	.126	-0.11 [-0.30, 0.08]	0.10	-1.17	.242
Regionafrica	0.82 [-2.31, 3.95]	1.60	0.51	.607	-0.05 [-0.28, 0.17]	0.11	-0.48	.633
Regionasia	-5.04 [-9.11, -0.97]	2.08	-2.43	.015	-0.49 [-0.73, -0.25]	0.12	-4.00	< .001
Regionnorth america	-2.71 [-5.43, 0.01]	1.39	-1.96	.051	-0.03 [-0.25, 0.18]	0.11	-0.29	.770
Regionsouth america	-5.28 [-7.99, -2.58]	1.38	-3.83	< .001	-0.14 [-0.34, 0.05]	0.10	-1.43	.154
Log pa volume <sup>2</sup>	0.02 [-0.10, 0.14]	0.06	0.30	.767	0.02 [-0.02, 0.06]	0.02	0.83	.405
Age	0.00 [0.00, 0.01]	0.00	1.33	.184	0.00 [0.00, 0.01]	0.00	1.16	.245
Log pa volume × regioneurope	0.68 [-0.35, 1.70]	0.52	1.30	.194	0.09 [0.00, 0.18]	0.05	1.88	.060
Log pa volume × regionafrica	-0.58 [-2.36, 1.19]	0.91	-0.64	.521	0.00 [-0.21, 0.21]	0.11	-0.01	.989
Log pa volume × regionasia	2.71 [0.25, 5.16]	1.25	2.16	.031	0.13 [-0.08, 0.34]	0.11	1.23	.217
Log pa volume × regionnorth america	1.29 [-0.22, 2.81]	0.77	1.67	.094	0.24 [0.09, 0.40]	0.08	3.03	.002
Log pa volume × regionsouth america	2.66 [1.17, 4.15]	0.76	3.49	< .001	0.03 [-0.09, 0.16]	0.06	0.55	.580
Regioneurope × log pa volume <sup>2</sup>	-0.07 [-0.20, 0.06]	0.07	-1.08	.282	-0.02 [-0.06, 0.02]	0.02	-0.87	.382
Regionafrica × log pa volume <sup>2</sup>	0.09 [-0.16, 0.35]	0.13	0.71	.477	0.01 [-0.12, 0.14]	0.07	0.15	.878
Regionasia × log pa volume <sup>2</sup>	-0.39 [-0.77, -0.02]	0.19	-2.06	.040	0.04 [-0.13, 0.20]	0.09	0.43	.670
Regionnorth america × log pa volume <sup>2</sup>	-0.14 [-0.35, 0.07]	0.11	-1.28	.202	-0.06 [-0.16, 0.04]	0.05	-1.18	.240
Regionsouth america × log pa volume <sup>2</sup>	-0.33 [-0.54, -0.12]	0.11	-3.13	.002	-0.03 [-0.11, 0.05]	0.04	-0.74	.459
Sleep onset (z)								
(Intercept)	-1.25 [-2.67, 0.16]	0.72	-1.74	.082	-0.06 [-0.41, 0.29]	0.18	-0.33	.740
Log pa volume	0.75 [0.06, 1.44]	0.35	2.12	.034	-0.10 [-0.16, -0.03]	0.03	-2.86	.004
Regioneurope	1.73 [0.26, 3.20]	0.75	2.31	.021	0.15 [0.00, 0.29]	0.08	1.91	.056
Regionafrica	1.35 [-0.95, 3.65]	1.17	1.15	.250	0.05 [-0.12, 0.22]	0.09	0.56	.574

Table 16 continued

## TITLE

Term	Physical activity volume (ln)				Physical activity intensity (z)			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Regionasia	-0.39 [-3.38, 2.61]	1.53	-0.25	.799	0.11 [-0.07, 0.29]	0.09	1.21	.227
Regionnorth america	1.06 [-0.95, 3.07]	1.03	1.04	.300	0.01 [-0.15, 0.18]	0.08	0.15	.881
Regionsouth america	0.23 [-1.74, 2.20]	1.01	0.23	.816	0.15 [-0.01, 0.30]	0.08	1.85	.064
Log pa volume <sup>2</sup>	-0.12 [-0.21, -0.03]	0.04	-2.66	.008	-0.02 [-0.05, 0.01]	0.02	-1.31	.191
Age	0.00 [0.00, 0.00]	0.00	-0.44	.663	0.00 [0.00, 0.00]	0.00	-0.55	.579
Log pa volume × regioneurope	-0.85 [-1.61, -0.10]	0.38	-2.21	.027	0.03 [-0.03, 0.10]	0.04	0.97	.333
Log pa volume × regionafrica	-0.80 [-2.11, 0.50]	0.67	-1.20	.229	0.00 [-0.16, 0.15]	0.08	-0.05	.961
Log pa volume × regionasia	0.51 [-1.30, 2.32]	0.92	0.55	.581	-0.03 [-0.18, 0.12]	0.08	-0.35	.730
Log pa volume × regionnorth america	-0.73 [-1.85, 0.39]	0.57	-1.27	.204	0.14 [0.02, 0.25]	0.06	2.35	.019
Log pa volume × regionsouth america	-0.01 [-1.09, 1.08]	0.56	-0.01	.990	-0.04 [-0.13, 0.05]	0.05	-0.87	.384
Regioneurope × log pa volume <sup>2</sup>	0.12 [0.02, 0.21]	0.05	2.33	.020	0.02 [-0.01, 0.05]	0.02	1.29	.198
Regionafrica × log pa volume <sup>2</sup>	0.12 [-0.06, 0.31]	0.10	1.30	.194	0.03 [-0.06, 0.13]	0.05	0.72	.474
Regionasia × log pa volume <sup>2</sup>	-0.10 [-0.38, 0.17]	0.14	-0.73	.467	0.07 [-0.05, 0.20]	0.06	1.15	.249
Regionnorth america × log pa volume <sup>2</sup>	0.13 [-0.03, 0.29]	0.08	1.58	.114	-0.03 [-0.10, 0.05]	0.04	-0.74	.458
Regionsouth america × log pa volume <sup>2</sup>	0.00 [-0.15, 0.15]	0.08	0.01	.992	0.11 [0.05, 0.17]	0.03	3.70	< .001
Sleep regularity (z)								
(Intercept)	-2.89 [-4.64, -1.13]	0.89	-3.23	.001	0.57 [0.30, 0.85]	0.14	4.08	< .001
Log pa volume	1.40 [0.51, 2.29]	0.45	3.09	.002	0.01 [-0.07, 0.10]	0.04	0.30	.767
Regioneurope	-0.45 [-2.33, 1.42]	0.96	-0.47	.637	0.09 [-0.09, 0.27]	0.09	0.95	.342
Regionafrica	-0.51 [-3.82, 2.80]	1.69	-0.30	.765	0.22 [0.00, 0.43]	0.11	1.99	.047
Regionasia	-2.04 [-5.80, 1.72]	1.92	-1.06	.288	0.15 [-0.08, 0.38]	0.12	1.27	.206
Regionnorth america	-2.61 [-5.17, -0.05]	1.31	-2.00	.046	-0.14 [-0.35, 0.06]	0.10	-1.38	.169
Regionsouth america	-0.18 [-2.72, 2.35]	1.29	-0.14	.888	-0.12 [-0.31, 0.07]	0.10	-1.21	.228

Table 16 continued

Term	Physical activity volume (ln)				Physical activity intensity (z)			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Log pa volume <sup>2</sup>	-0.14 [-0.26, -0.03]	0.06	-2.50	.013	-0.06 [-0.10, -0.02]	0.02	-3.20	.001
Age	0.00 [0.00, 0.00]	0.00	-0.18	.861	0.00 [-0.01, 0.00]	0.00	-1.06	.287
Log pa volume × regioneurope	0.47 [-0.50, 1.44]	0.50	0.94	.347	0.05 [-0.04, 0.13]	0.04	1.03	.302
Log pa volume × regionafrica	0.82 [-1.07, 2.71]	0.96	0.85	.400	0.39 [0.19, 0.59]	0.10	3.88	< .001
Log pa volume × regionasia	1.85 [-0.41, 4.12]	1.16	1.60	.109	0.30 [0.11, 0.49]	0.10	3.10	.002
Log pa volume × regionnorth america	1.60 [0.17, 3.02]	0.72	2.20	.028	0.31 [0.16, 0.45]	0.07	4.15	< .001
Log pa volume × regionsouth america	0.20 [-1.20, 1.61]	0.72	0.28	.777	0.21 [0.10, 0.32]	0.06	3.70	< .001
Regioneurope × log pa volume <sup>2</sup>	-0.07 [-0.20, 0.05]	0.06	-1.16	.248	0.05 [0.00, 0.09]	0.02	2.19	.029
Regionafrica × log pa volume <sup>2</sup>	-0.16 [-0.43, 0.11]	0.14	-1.14	.263	-0.13 [-0.25, -0.01]	0.06	-2.15	.032
Regionasia × log pa volume <sup>2</sup>	-0.34 [-0.68, 0.01]	0.18	-1.92	.055	-0.13 [-0.28, 0.03]	0.08	-1.63	.104
Regionnorth america × log pa volume <sup>2</sup>	-0.23 [-0.43, -0.03]	0.10	-2.26	.024	-0.08 [-0.17, 0.02]	0.05	-1.62	.105
Regionsouth america × log pa volume <sup>2</sup>	-0.04 [-0.23, 0.16]	0.10	-0.38	.702	-0.06 [-0.14, 0.01]	0.04	-1.62	.105

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

Table 17

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

TITLE

Term	Physical activity volume (ln)				Physical activity intensity (z)			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Sleep duration (z)								
(Intercept)	4.55 [4.35, 4.74]	0.10	46.14	< .001	1.58 [1.31, 1.84]	0.14	11.68	< .001
Sleep duration	-0.01 [-0.03, 0.02]	0.01	-0.49	.626	0.00 [-0.04, 0.04]	0.02	-0.06	.949
Regioneurope	-0.27 [-0.36, -0.17]	0.05	-5.56	< .001	-0.25 [-0.39, -0.10]	0.07	-3.34	.001
Regionafrica	-0.17 [-0.28, -0.07]	0.05	-3.27	.001	-0.16 [-0.33, 0.01]	0.09	-1.86	.063
Regionasia	-0.41 [-0.52, -0.30]	0.06	-7.02	< .001	-0.53 [-0.71, -0.34]	0.09	-5.62	< .001
Regionnorth america	-0.37 [-0.47, -0.26]	0.05	-6.91	< .001	-0.36 [-0.52, -0.19]	0.09	-4.20	< .001
Regionsouth america	-0.28 [-0.38, -0.19]	0.05	-5.68	< .001	-0.42 [-0.58, -0.27]	0.08	-5.31	< .001
Sleep duration <sup>2</sup>	-0.01 [-0.02, 0.00]	0.00	-2.25	.025	-0.01 [-0.02, 0.01]	0.01	-0.85	.394
Age	-0.01 [-0.01, -0.01]	0.00	-11.19	< .001	-0.03 [-0.03, -0.02]	0.00	-16.47	< .001
Sleep duration × regioneurope	0.00 [-0.03, 0.02]	0.01	-0.38	.708	0.02 [-0.02, 0.06]	0.02	0.90	.369
Sleep duration × regionafrica	0.01 [0.03, 0.04]	0.02	0.38	.706	-0.03 [-0.10, 0.05]	0.04	-0.68	.498
Sleep duration × regionasia	0.01 [-0.05, 0.07]	0.03	0.36	.719	0.00 [-0.11, 0.11]	0.05	0.00	.996
Sleep duration × regionnorth america	0.03 [0.00, 0.07]	0.02	1.73	.089	0.02 [-0.05, 0.08]	0.03	0.44	.663
Sleep duration × regionsouth america	-0.01 [-0.04, 0.01]	0.01	-0.94	.350	-0.02 [-0.07, 0.03]	0.03	-0.76	.450
Regioneurope × Sleep duration <sup>2</sup>	-0.01 [-0.01, 0.00]	0.00	-1.35	.178	-0.01 [-0.02, 0.01]	0.01	-0.82	.413
Regionafrica × Sleep duration <sup>2</sup>	0.00 [-0.02, 0.02]	0.01	0.21	.834	-0.02 [-0.05, 0.02]	0.02	-1.11	.267
Regionasia × Sleep duration <sup>2</sup>	0.01 [-0.02, 0.03]	0.01	0.49	.625	0.02 [-0.03, 0.06]	0.02	0.66	.508
Regionnorth america × Sleep duration <sup>2</sup>	0.01 [-0.01, 0.02]	0.01	1.00	.319	0.00 [-0.03, 0.03]	0.02	0.15	.882
Regionsouth america × Sleep duration <sup>2</sup>	0.00 [-0.01, 0.01]	0.01	-0.39	.694	-0.01 [-0.03, 0.01]	0.01	-1.00	.318
Sleep efficiency (z)								
(Intercept)	4.54 [4.34, 4.73]	0.10	46.14	< .001	1.57 [1.31, 1.83]	0.13	11.76	< .001 <sup>61</sup>

Table 17 continued

TITLE

Term	Physical activity volume (ln)				Physical activity intensity (z)			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Sleep efficiency	0.00 [-0.03, 0.03]	0.01	0.22	.830	0.00 [-0.05, 0.05]	0.03	-0.02	.987
Regioneurope	-0.27 [-0.36, -0.18]	0.05	-5.72	< .001	-0.25 [-0.39, -0.10]	0.07	-3.37	.001
Regionafrica	-0.17 [-0.27, -0.07]	0.05	-3.24	.001	-0.20 [-0.37, -0.04]	0.08	-2.40	.016
Regionasia	-0.39 [-0.50, -0.28]	0.06	-6.76	< .001	-0.51 [-0.69, -0.33]	0.09	-5.47	< .001
Regionnorth america	-0.35 [-0.45, -0.24]	0.05	-6.66	< .001	-0.35 [-0.51, -0.19]	0.08	-4.28	< .001
Regionsouth america	-0.29 [-0.38, -0.19]	0.05	-5.81	< .001	-0.44 [-0.60, -0.29]	0.08	-5.67	< .001
Sleep efficiency <sup>2</sup>	-0.01 [-0.02, 0.00]	0.00	-1.15	.249	-0.01 [-0.02, 0.01]	0.01	-0.68	.495
Age	-0.01 [-0.01, -0.01]	0.00	-11.14	< .001	-0.03 [-0.03, -0.02]	0.00	-16.56	< .001
Sleep efficiency × regioneurope	0.01 [-0.02, 0.03]	0.01	0.40	.687	0.01 [-0.04, 0.06]	0.03	0.33	.741
Sleep efficiency × regionafrica	0.00 [-0.05, 0.04]	0.02	-0.15	.878	-0.02 [-0.11, 0.06]	0.04	-0.47	.637
Sleep efficiency × regionasia	0.03 [-0.03, 0.08]	0.03	0.93	.359	0.08 [-0.01, 0.18]	0.05	1.73	.083
Sleep efficiency × regionnorth america	0.00 [-0.04, 0.05]	0.02	0.11	.911	0.05 [-0.03, 0.14]	0.04	1.19	.236
Sleep efficiency × regionsouth america	0.00 [-0.03, 0.04]	0.02	0.13	.900	-0.01 [-0.08, 0.05]	0.03	-0.43	.670
Regioneurope × Sleep efficiency <sup>2</sup>	0.00 [-0.01, 0.01]	0.01	0.65	.517	0.00 [-0.02, 0.02]	0.01	0.40	.687
Regionafrica × Sleep efficiency <sup>2</sup>	0.00 [-0.01, 0.02]	0.01	0.40	.688	0.01 [-0.02, 0.04]	0.01	0.77	.439
Regionasia × Sleep efficiency <sup>2</sup>	0.01 [-0.01, 0.02]	0.01	0.89	.373	0.02 [-0.01, 0.05]	0.01	1.59	.112
Regionnorth america × Sleep efficiency <sup>2</sup>	0.00 [-0.01, 0.02]	0.01	0.66	.510	0.01 [-0.01, 0.04]	0.01	1.05	.294
Regionsouth america × Sleep efficiency <sup>2</sup>	0.00 [-0.01, 0.02]	0.01	0.83	.406	0.00 [-0.02, 0.02]	0.01	0.40	.691
Sleep onset (z)								
(Intercept)	4.54 [4.34, 4.73]	0.10	45.95	< .001	1.57 [1.31, 1.84]	0.13	11.65	< .001
Sleep onset	0.00 [-0.02, 0.03]	0.01	0.42	.671	0.03 [-0.01, 0.08]	0.02	1.47	.143
Regioneurope	-0.26 [-0.36, -0.16]	0.05	-5.31	< .001	-0.24 [-0.39, -0.10]	0.08	-3.22	.001
Regionafrica	-0.20 [-0.31, -0.08]	0.06	-3.32	.001	-0.24 [-0.43, -0.04]	0.10	-2.40	.017

Table 17 continued

TITLE

Term	Physical activity volume (ln)				Physical activity intensity (z)			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Regionasia	-0.38 [-0.51, -0.26]	0.06	-5.94	< .001	-0.47 [-0.68, -0.26]	0.11	-4.35	< .001
Regionnorth america	-0.37 [-0.49, -0.26]	0.06	-6.34	< .001	-0.36 [-0.54, -0.17]	0.09	-3.76	< .001
Regionsouth america	-0.29 [-0.39, -0.19]	0.05	-5.61	< .001	-0.45 [-0.61, -0.29]	0.08	-5.48	< .001
Sleep onset <sup>2</sup>	0.00 [-0.02, 0.01]	0.01	-0.27	.790	0.01 [-0.02, 0.04]	0.02	0.66	.512
Age	-0.01 [-0.01, -0.01]	0.00	-11.19	< .001	-0.03 [-0.03, -0.02]	0.00	-16.55	< .001
Sleep onset × regioneurope	0.00 [-0.02, 0.03]	0.01	0.11	.915	-0.02 [-0.07, 0.03]	0.02	-0.71	.479
Sleep onset × regionafrica	0.05 [0.00, 0.10]	0.03	1.97	.050	0.01 [-0.08, 0.11]	0.05	0.27	.788
Sleep onset × regionasia	0.01 [-0.05, 0.08]	0.03	0.47	.641	-0.02 [-0.14, 0.10]	0.06	-0.30	.766
Sleep onset × regionnorth america	0.01 [-0.05, 0.06]	0.03	0.27	.788	0.02 [-0.07, 0.11]	0.05	0.41	.685
Sleep onset × regionsouth america	0.00 [-0.03, 0.03]	0.02	0.03	.978	-0.02 [-0.08, 0.04]	0.03	-0.60	.547
Regioneurope × Sleep onset <sup>2</sup>	-0.01 [-0.03, 0.01]	0.01	-1.17	.243	-0.01 [-0.04, 0.02]	0.02	-0.72	.472
Regionafrica × Sleep onset <sup>2</sup>	0.05 [-0.01, 0.12]	0.03	1.67	.099	0.05 [-0.07, 0.17]	0.06	0.87	.387
Regionasia × Sleep onset <sup>2</sup>	-0.01 [-0.09, 0.07]	0.04	-0.27	.790	-0.07 [-0.20, 0.07]	0.07	-0.93	.353
Regionnorth america × Sleep onset <sup>2</sup>	0.03 [-0.04, 0.09]	0.03	0.81	.426	0.02 [-0.10, 0.13]	0.06	0.28	.785
Regionsouth america × Sleep onset <sup>2</sup>	0.00 [-0.02, 0.03]	0.01	0.35	.727	0.01 [-0.04, 0.05]	0.02	0.26	.796
Sleep regularity (z)								
(Intercept)	4.50 [4.31, 4.69]	0.10	46.38	< .001	1.54 [1.28, 1.80]	0.13	11.52	< .001
Sleep regularity	0.04 [0.02, 0.06]	0.01	4.03	< .001	-0.03 [-0.07, 0.00]	0.02	-1.86	.063
Regioneurope	-0.27 [-0.36, -0.18]	0.05	-5.77	< .001	-0.22 [-0.37, -0.08]	0.07	-3.08	.002
Regionafrica	-0.17 [-0.27, -0.06]	0.05	-3.21	.001	-0.18 [-0.35, -0.02]	0.08	-2.15	.031
Regionasia	-0.41 [-0.52, -0.30]	0.06	-7.18	< .001	-0.49 [-0.67, -0.31]	0.09	-5.25	< .001
Regionnorth america	-0.33 [-0.43, -0.23]	0.05	-6.47	< .001	-0.29 [-0.46, -0.13]	0.08	-3.56	< .001
Regionsouth america	-0.27 [-0.37, -0.18]	0.05	-5.69	< .001	-0.42 [-0.58, -0.27]	0.08	-5.38	< .001 <sup>63</sup>

Table 17 continued

TITLE

Term	Physical activity volume (ln)				Physical activity intensity (z)			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Sleep regularity <sup>2</sup>	-0.01 [-0.02, 0.00]	0.01	-1.32	.190	-0.02 [-0.04, 0.01]	0.01	-1.41	.159
Age	-0.01 [-0.01, -0.01]	0.00	-11.18	< .001	-0.03 [-0.03, -0.02]	0.00	-16.55	< .001
Sleep regularity × regioneurope	0.03 [0.01, 0.05]	0.01	2.97	.003	0.08 [0.04, 0.12]	0.02	3.91	< .001
Sleep regularity × regionafrica	-0.04 [-0.09, 0.00]	0.02	-2.09	.037	0.07 [-0.01, 0.15]	0.04	1.75	.080
Sleep regularity × regionasia	0.05 [0.00, 0.10]	0.03	1.94	.053	0.14 [0.04, 0.24]	0.05	2.69	.007
Sleep regularity × regionnorth america	0.05 [0.01, 0.09]	0.02	2.21	.027	0.13 [0.05, 0.21]	0.04	3.11	.002
Sleep regularity × regionsouth america	0.05 [0.02, 0.08]	0.01	3.67	< .001	0.12 [0.07, 0.18]	0.03	4.55	< .001
Regioneurope × Sleep regularity <sup>2</sup>	-0.01 [-0.02, 0.01]	0.01	-0.96	.337	0.00 [-0.03, 0.02]	0.01	-0.37	.712
Regionafrica × Sleep regularity <sup>2</sup>	-0.03 [-0.05, -0.01]	0.01	-2.49	.013	0.01 [-0.03, 0.05]	0.02	0.43	.671
Regionasia × Sleep regularity <sup>2</sup>	0.01 [-0.02, 0.05]	0.02	0.77	.443	0.00 [-0.06, 0.07]	0.03	0.04	.969
Regionnorth america × Sleep regularity <sup>2</sup>	0.00 [-0.02, 0.03]	0.01	0.33	.743	-0.01 [-0.05, 0.03]	0.02	-0.47	.641
Regionsouth america × Sleep regularity <sup>2</sup>	0.01 [0.00, 0.03]	0.01	1.47	.143	0.03 [0.00, 0.06]	0.02	2.22	.027

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

Table 18

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

Term	Physical activity volume (ln)				Physical activity intensity (z)					
	$\beta$	[95% CI]	SE	t	p	$\beta$	[95% CI]	SE	t	p
Sleep duration (z)										
(Intercept)	0.62	[2.10, 3.34]	1.39	0.45	.655	0.58	[0.31, 0.85]	0.14	4.26	< .001
Log pa volume	-0.07	[-1.62, 1.47]	0.79	-0.09	.928	0.06	[-0.04, 0.16]	0.05	1.17	.241
Daylight hours	-0.07	[-0.30, 0.16]	0.12	-0.57	.568	-0.03	[-0.04, -0.02]	0.01	-4.97	< .001
Log pa volume <sup>2</sup>	0.02	[-0.20, 0.24]	0.11	0.17	.865	0.04	[-0.02, 0.10]	0.03	1.33	.182
Age	0.00	[-0.01, 0.00]	0.00	-0.68	.495	0.00	[-0.01, 0.00]	0.00	-0.92	.358
Log pa volume × daylight hours	0.01	[-0.12, 0.14]	0.07	0.15	.882	0.00	[-0.01, 0.01]	0.00	0.24	.810
Daylight hours × log pa volume <sup>2</sup>	0.00	[-0.02, 0.02]	0.01	-0.03	.978	0.00	[-0.01, 0.00]	0.00	-1.11	.266
Sleep efficiency (z)										
(Intercept)	-1.15	[-3.93, 1.63]	1.42	-0.81	.417	0.33	[0.04, 0.62]	0.15	2.22	.027
Log pa volume	0.69	[-0.89, 2.26]	0.80	0.86	.392	0.08	[-0.02, 0.18]	0.05	1.60	.110
Daylight hours	0.01	[-0.23, 0.24]	0.12	0.07	.942	-0.01	[-0.02, 0.01]	0.01	-0.78	.436
Log pa volume <sup>2</sup>	-0.07	[-0.30, 0.15]	0.11	-0.65	.513	0.03	[-0.03, 0.09]	0.03	1.03	.303
Age	0.00	[0.00, 0.01]	0.00	1.39	.165	0.00	[0.00, 0.01]	0.00	1.20	.230
Log pa volume × daylight hours	0.00	[-0.13, 0.13]	0.07	-0.02	.986	-0.01	[-0.01, 0.00]	0.00	-1.64	.100
Daylight hours × log pa volume <sup>2</sup>	0.00	[-0.02, 0.02]	0.01	-0.10	.919	0.00	[-0.01, 0.00]	0.00	-1.19	.234
Sleep onset (z)										
(Intercept)	-1.69	[-3.75, 0.37]	1.05	-1.61	.108	-0.02	[-0.37, 0.33]	0.18	-0.11	.915
Log pa volume	1.10	[-0.05, 2.26]	0.59	1.87	.062	-0.06	[-0.13, 0.02]	0.04	-1.47	.141
Daylight hours	0.14	[-0.04, 0.31]	0.09	1.55	.122	0.00	[0.00, 0.01]	0.00	0.94	.348
Log pa volume <sup>2</sup>	-0.18	[-0.34, -0.01]	0.08	-2.13	.033	-0.03	[-0.07, 0.02]	0.02	-1.13	.258
Age	0.00	[0.00, 0.00]	0.00	-0.38	.703	0.00	[0.00, 0.00]	0.00	-0.48	.632

Term	Physical activity volume (ln)				Physical activity intensity (z)					
	$\beta$	[95% CI]	SE	t	p	$\beta$	[95% CI]	SE	t	p
Log pa volume × daylight hours	-0.08	[-0.18, 0.02]	0.05	-1.56	.119	0.00	[-0.01, 0.00]	0.00	-0.41	.679
Daylight hours × log pa volume <sup>2</sup>	0.01	[0.00, 0.03]	0.01	1.64	.101	0.00	[0.00, 0.01]	0.00	1.04	.301
Sleep regularity (z)										
(Intercept)	1.74	[−0.87, 4.35]	1.33	1.31	.191	0.58	[0.30, 0.85]	0.14	4.12	< .001
Log pa volume	-1.13	[-2.60, 0.35]	0.75	-1.50	.134	0.16	[0.06, 0.25]	0.05	3.28	.001
Daylight hours	-0.43	[-0.65, -0.21]	0.11	-3.83	< .001	0.00	[-0.01, 0.01]	0.01	-0.27	.788
Log pa volume <sup>2</sup>	0.21	[0.00, 0.42]	0.11	1.97	.049	-0.06	[-0.12, 0.00]	0.03	-1.95	.051
Age	0.00	[0.00, 0.00]	0.00	0.22	.825	0.00	[0.00, 0.00]	0.00	-0.22	.822
Log pa volume × daylight hours	0.25	[0.12, 0.37]	0.06	3.93	< .001	-0.01	[-0.01, 0.00]	0.00	-1.82	.069
Daylight hours × log pa volume <sup>2</sup>	-0.04	[-0.05, -0.02]	0.01	-3.96	< .001	0.00	[0.00, 0.01]	0.00	0.90	.366

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

Table 19

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

Term	Physical activity volume (ln)				Physical activity intensity (z)					
	$\beta$	[95% CI]	SE	t	p	$\beta$	[95% CI]	SE	t	p
Sleep duration (z)										
(Intercept)	4.26	[4.07, 4.45]	0.10	43.78	< .001	1.48	[1.22, 1.75]	0.14	10.94	< .001
Sleep duration	0.02	[-0.01, 0.06]	0.02	1.17	.244	0.03	[-0.04, 0.10]	0.04	0.83	.409
Daylight hours	0.01	[0.00, 0.01]	0.00	2.01	.045	-0.01	[-0.02, 0.00]	0.00	-2.30	.021
Sleep duration <sup>2</sup>	-0.01	[-0.03, 0.01]	0.01	-1.34	.181	-0.01	[-0.04, 0.03]	0.02	-0.40	.693
Age	-0.01	[-0.01, -0.01]	0.00	-11.14	< .001	-0.03	[-0.03, -0.02]	0.00	-15.63	< .001
Sleep duration × daylight hours	0.00	[-0.01, 0.00]	0.00	-1.52	.128	0.00	[-0.01, 0.00]	0.00	-0.60	.550
Daylight hours × Sleep duration <sup>2</sup>	0.00	[0.00, 0.00]	0.00	0.01	.992	0.00	[0.00, 0.00]	0.00	-0.30	.767
Sleep efficiency (z)										
(Intercept)	4.26	[4.06, 4.45]	0.10	43.46	< .001	1.47	[1.21, 1.74]	0.14	10.73	< .001
Sleep efficiency	0.01	[-0.04, 0.06]	0.02	0.40	.693	0.05	[-0.03, 0.14]	0.04	1.27	.206
Daylight hours	0.01	[0.00, 0.01]	0.00	1.87	.062	-0.01	[-0.02, 0.00]	0.00	-2.27	.023
Sleep efficiency <sup>2</sup>	-0.02	[-0.03, 0.00]	0.01	-2.13	.034	0.00	[-0.03, 0.03]	0.02	-0.29	.769
Age	-0.01	[-0.01, -0.01]	0.00	-11.13	< .001	-0.03	[-0.03, -0.02]	0.00	-15.63	< .001
Sleep efficiency × daylight hours	0.00	[0.00, 0.00]	0.00	-0.06	.954	0.00	[-0.01, 0.00]	0.00	-1.05	.298
Daylight hours × Sleep efficiency <sup>2</sup>	0.00	[0.00, 0.00]	0.00	1.94	.053	0.00	[0.00, 0.00]	0.00	0.33	.740
Sleep onset (z)										
(Intercept)	4.28	[4.09, 4.48]	0.10	43.84	< .001	1.53	[1.26, 1.79]	0.14	11.22	< .001
Sleep onset	-0.01	[-0.05, 0.03]	0.02	-0.53	.597	0.01	[-0.07, 0.09]	0.04	0.26	.792
Daylight hours	0.00	[0.00, 0.01]	0.00	1.24	.213	-0.02	[-0.03, -0.01]	0.01	-3.05	.002
Sleep onset <sup>2</sup>	-0.04	[-0.07, -0.01]	0.01	-3.01	.003	-0.05	[-0.10, 0.00]	0.03	-1.88	.060
Age	-0.01	[-0.01, -0.01]	0.00	-11.12	< .001	-0.03	[-0.03, -0.02]	0.00	-15.64	< .001

Table 19 continued

Term	Physical activity volume (ln)				Physical activity intensity (z)			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Sleep onset × daylight hours	0.00 [0.00, 0.00]	0.00	0.71	.476	0.00 [-0.01, 0.01]	0.00	0.16	.869
Daylight hours × Sleep onset <sup>2</sup>	0.00 [0.00, 0.00]	0.00	2.33	.020	0.00 [0.00, 0.01]	0.00	1.92	.055
Sleep regularity (z)								
(Intercept)	4.21 [4.03, 4.40]	0.10	44.12	< .001	1.47 [1.21, 1.73]	0.13	10.90	< .001
Sleep regularity	0.09 [0.05, 0.13]	0.02	4.31	< .001	0.16 [0.08, 0.24]	0.04	4.03	< .001
Daylight hours	0.01 [0.00, 0.01]	0.00	2.30	.022	-0.01 [-0.02, 0.00]	0.00	-2.46	.014
Sleep regularity <sup>2</sup>	-0.01 [-0.03, 0.02]	0.01	-0.50	.618	-0.02 [-0.06, 0.03]	0.02	-0.64	.520
Age	-0.01 [-0.01, -0.01]	0.00	-11.13	< .001	-0.03 [-0.03, -0.02]	0.00	-15.64	< .001
Sleep regularity × daylight hours	0.00 [-0.01, 0.00]	0.00	-1.33	.182	-0.01 [-0.02, 0.00]	0.00	-3.02	.003
Daylight hours × Sleep regularity <sup>2</sup>	0.00 [0.00, 0.00]	0.00	-0.32	.745	0.00 [0.00, 0.00]	0.00	0.10	.920

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

Table 20

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

Term	Physical activity volume (ln)				Physical activity intensity (z)			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
<b>Sleep duration (z)</b>								
(Intercept)	0.39 [-0.54, 1.32]	0.48	0.82	.412	0.67 [0.37, 0.97]	0.15	4.35	< .001
Log pa volume	0.00 [-0.54, 0.54]	0.28	0.00	.998	0.09 [0.04, 0.13]	0.02	3.88	< .001
Acc wear locwrist	-0.37 [-1.57, 0.84]	0.62	-0.59	.553	-0.56 [-0.88, -0.25]	0.16	-3.54	< .001
Log pa volume <sup>2</sup>	0.03 [-0.06, 0.11]	0.04	0.63	.531	0.01 [-0.02, 0.04]	0.02	0.52	.605
Age	0.00 [-0.01, 0.00]	0.00	-0.94	.346	0.00 [-0.01, 0.00]	0.00	-1.02	.308
Log pa volume × acc wear locwrist	-0.12 [-0.80, 0.56]	0.35	-0.35	.724	-0.02 [-0.07, 0.03]	0.03	-0.83	.404
Acc wear locwrist × log pa volume <sup>2</sup>	0.01 [-0.09, 0.11]	0.05	0.21	.831	0.00 [-0.04, 0.03]	0.02	-0.11	.911
<b>Sleep efficiency (z)</b>								
(Intercept)	-1.64 [-2.55, -0.74]	0.46	-3.57	< .001	-0.46 [-0.57, -0.34]	0.06	-7.98	< .001
Log pa volume	0.49 [-0.06, 1.04]	0.28	1.75	.080	0.07 [0.03, 0.12]	0.02	3.24	.001
Acc wear locwrist	1.98 [0.80, 3.16]	0.60	3.29	.001	0.95 [0.85, 1.05]	0.05	18.34	< .001
Log pa volume <sup>2</sup>	-0.04 [-0.12, 0.05]	0.04	-0.90	.371	-0.02 [-0.05, 0.01]	0.02	-1.20	.232
Age	0.00 [0.00, 0.00]	0.00	-0.32	.753	0.00 [0.00, 0.00]	0.00	-0.25	.799
Log pa volume × acc wear locwrist	-0.33 [-1.02, 0.35]	0.35	-0.95	.340	-0.11 [-0.16, -0.06]	0.03	-4.03	< .001
Acc wear locwrist × log pa volume <sup>2</sup>	0.01 [-0.09, 0.11]	0.05	0.13	.899	0.01 [-0.03, 0.04]	0.02	0.47	.639
<b>Sleep onset (z)</b>								
(Intercept)	-1.54 [-2.33, -0.74]	0.41	-3.80	< .001	-0.97 [-1.41, -0.53]	0.22	-4.32	< .001
Log pa volume	0.35 [-0.05, 0.75]	0.20	1.70	.089	-0.04 [-0.07, 0.00]	0.02	-2.09	.037
Acc wear locwrist	2.78 [1.79, 3.77]	0.51	5.49	< .001	1.25 [0.78, 1.71]	0.24	5.20	< .001
Log pa volume <sup>2</sup>	-0.05 [-0.11, 0.01]	0.03	-1.69	.090	-0.01 [-0.03, 0.02]	0.01	-0.47	.638
Age	0.00 [0.00, 0.00]	0.00	-0.92	.359	0.00 [0.00, 0.00]	0.00	-0.79	.431

Table 20 continued

Term	Physical activity volume (ln)				Physical activity intensity (z)			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Log pa volume × acc wear locwrist	-0.67 [-1.18, -0.17]	0.26	-2.62	.009	-0.05 [-0.09, -0.02]	0.02	-2.75	.006
Acc wear locwrist × log pa volume <sup>2</sup>	0.07 [0.00, 0.14]	0.04	1.88	.060	0.00 [-0.03, 0.02]	0.01	-0.13	.900
Sleep regularity (z)								
(Intercept)	-3.78 [-4.68, -2.88]	0.46	-8.19	< .001	0.13 [-0.19, 0.44]	0.16	0.77	.442
Log pa volume	1.96 [1.44, 2.48]	0.26	7.41	< .001	0.27 [0.22, 0.31]	0.02	12.32	< .001
Acc wear locwrist	0.56 [-0.62, 1.74]	0.60	0.93	.352	0.64 [0.32, 0.97]	0.16	3.92	< .001
Log pa volume	-0.24 [-0.32, -0.16]	0.04	-5.91	< .001	-0.10 [-0.13, -0.07]	0.01	-6.96	< .001
Age	0.00 [0.00, 0.00]	0.00	-0.09	.929	0.00 [-0.01, 0.00]	0.00	-1.75	.080
Log pa volume × acc wear locwrist	-0.20 [-0.86, 0.46]	0.34	-0.58	.560	-0.26 [-0.31, -0.21]	0.03	-10.26	< .001
Acc wear locwrist × log pa volume <sup>2</sup>	0.04 [-0.06, 0.13]	0.05	0.78	.439	0.07 [0.04, 0.10]	0.02	4.13	< .001

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

Table 21

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

Term	Physical activity volume (ln)				Physical activity intensity (z)					
	$\beta$	[95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p	
<b>Sleep duration (z)</b>										
(Intercept)	3.73	[3.54, 3.92]	0.10	38.36	< .001	1.01	[0.66, 1.36]	0.18	5.67	< .001
Sleep duration	0.01	[0.00, 0.02]	0.01	1.95	.052	0.01	[-0.02, 0.03]	0.01	0.43	.665
Acc wear locwrist	0.73	[0.52, 0.93]	0.11	6.91	< .001	0.44	[0.10, 0.79]	0.17	2.54	.011
Sleep duration <sup>2</sup>	0.00	[-0.01, 0.00]	0.00	-0.86	.389	-0.01	[-0.02, 0.00]	0.01	-1.82	.069
Age	-0.01	[-0.01, -0.01]	0.00	-12.52	< .001	-0.03	[-0.03, -0.02]	0.00	-16.47	< .001
Sleep duration × acc wear locwrist	-0.03	[-0.04, -0.01]	0.01	-4.02	< .001	0.01	[-0.02, 0.03]	0.01	0.44	.660
Acc wear locwrist × Sleep duration <sup>2</sup>	-0.01	[-0.02, -0.01]	0.00	-3.96	< .001	0.00	[-0.01, 0.01]	0.01	-0.25	.800
<b>Sleep efficiency (z)</b>										
(Intercept)	3.74	[3.55, 3.93]	0.10	38.51	< .001	1.01	[0.65, 1.36]	0.18	5.59	< .001
Sleep efficiency	0.03	[0.01, 0.04]	0.01	3.91	< .001	0.03	[0.01, 0.06]	0.01	2.44	.022
Acc wear locwrist	0.71	[0.50, 0.91]	0.10	6.78	< .001	0.45	[0.10, 0.79]	0.18	2.53	.011
Sleep efficiency <sup>2</sup>	0.00	[0.00, 0.00]	0.00	0.79	.431	0.00	[0.00, 0.01]	0.00	1.52	.133
Age	-0.01	[-0.01, -0.01]	0.00	-12.46	< .001	-0.03	[-0.03, -0.02]	0.00	-16.41	< .001
Sleep efficiency × acc wear locwrist	-0.03	[-0.05, -0.01]	0.01	-3.28	.003	-0.04	[-0.07, -0.01]	0.02	-2.64	.009
Acc wear locwrist × Sleep efficiency <sup>2</sup>	0.00	[-0.01, 0.00]	0.00	-1.32	.188	-0.01	[-0.02, 0.00]	0.01	-1.32	.188
<b>Sleep onset (z)</b>										
(Intercept)	3.73	[3.54, 3.92]	0.10	38.39	< .001	1.00	[0.64, 1.35]	0.18	5.49	< .001
Sleep onset	0.02	[0.01, 0.04]	0.01	3.16	.002	0.04	[0.02, 0.07]	0.01	3.07	.002
Acc wear locwrist	0.72	[0.51, 0.93]	0.10	6.87	< .001	0.45	[0.10, 0.80]	0.18	2.53	.011
Sleep onset <sup>2</sup>	0.01	[0.00, 0.03]	0.01	1.43	.154	0.03	[0.00, 0.07]	0.02	1.83	.067
Age	-0.01	[-0.01, -0.01]	0.00	-12.47	< .001	-0.03	[-0.03, -0.02]	0.00	-16.41	< .001

Table 21 continued

Term	Physical activity volume (ln)					Physical activity intensity (z)				
	$\beta$	[95% CI]	SE	t	p	$\beta$	[95% CI]	SE	t	p
Sleep onset × acc wear locwrist	-0.03	[-0.04, -0.01]	0.01	-2.73	.006	-0.04	[-0.07, 0.00]	0.02	-2.04	.042
Acc wear locwrist × Sleep onset <sup>2</sup>	-0.02	[-0.04, 0.00]	0.01	-2.19	.029	-0.03	[-0.07, 0.01]	0.02	-1.61	.107
Sleep regularity (z)										
(Intercept)	3.72	[3.54, 3.91]	0.09	39.81	< .001	1.00	[0.66, 1.35]	0.18	5.63	< .001
Sleep regularity	0.09	[0.07, 0.10]	0.01	12.45	< .001	0.11	[0.08, 0.14]	0.01	8.27	< .001
Acc wear locwrist	0.69	[0.49, 0.89]	0.10	6.82	< .001	0.44	[0.09, 0.78]	0.17	2.50	.012
Sleep regularity <sup>2</sup>	-0.01	[-0.02, 0.00]	0.00	-2.17	.030	0.00	[-0.01, 0.02]	0.01	0.16	.871
Age	-0.01	[-0.01, -0.01]	0.00	-12.59	< .001	-0.03	[-0.03, -0.02]	0.00	-16.46	< .001
Sleep regularity × acc wear locwrist	-0.04	[-0.06, -0.02]	0.01	-4.49	< .001	-0.10	[-0.14, -0.07]	0.02	-6.23	< .001
Acc wear locwrist × Sleep regularity <sup>2</sup>	0.00	[-0.01, 0.01]	0.00	-0.02	.983	-0.02	[-0.03, 0.00]	0.01	-1.71	.087

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

Table 22

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

Term	Physical activity volume (ln)				Physical activity intensity (z)			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
<i>Sleep duration (z)</i>								
(Intercept)	0.17 [-0.94, 1.27]	0.56	0.29	.769	0.25 [0.02, 0.49]	0.12	2.10	.036
Log pa volume	-0.12 [-0.71, 0.47]	0.30	-0.40	.688	0.09 [0.05, 0.12]	0.02	4.24	< .001
Pa mostactivehr	-0.02 [-0.10, 0.05]	0.04	-0.59	.555	0.00 [-0.01, 0.00]	0.00	-1.64	.101
Log pa volume <sup>2</sup>	0.04 [-0.04, 0.12]	0.04	0.93	.354	0.00 [-0.02, 0.03]	0.01	0.25	.804
Age	0.00 [-0.01, 0.00]	0.00	-0.86	.388	0.00 [-0.01, 0.00]	0.00	-1.03	.304
Log pa volume × pa mostactivehr	0.01 [-0.03, 0.05]	0.02	0.50	.615	0.00 [0.00, 0.00]	0.00	-0.76	.447
Pa mostactivehr × log pa volume <sup>2</sup>	0.00 [-0.01, 0.00]	0.00	-0.49	.623	0.00 [0.00, 0.00]	0.00	0.37	.714
<i>Sleep efficiency (z)</i>								
(Intercept)	0.02 [-1.10, 1.13]	0.57	0.03	.979	0.29 [0.04, 0.54]	0.13	2.24	.026
Log pa volume	0.17 [-0.43, 0.77]	0.31	0.56	.576	-0.01 [-0.05, 0.03]	0.02	-0.31	.759
Pa mostactivehr	-0.08 [-0.15, -0.01]	0.04	-2.10	.036	0.00 [0.00, 0.00]	0.00	-0.60	.551
Log pa volume <sup>2</sup>	-0.03 [-0.11, 0.05]	0.04	-0.67	.504	0.00 [-0.03, 0.03]	0.01	0.02	.981
Age	0.00 [0.00, 0.01]	0.00	1.27	.203	0.00 [0.00, 0.01]	0.00	1.13	.259
Log pa volume × pa mostactivehr	0.04 [0.00, 0.08]	0.02	1.80	.072	0.00 [0.00, 0.00]	0.00	0.44	.663
Pa mostactivehr × log pa volume <sup>2</sup>	0.00 [-0.01, 0.00]	0.00	-1.51	.131	0.00 [0.00, 0.00]	0.00	-0.33	.744
<i>Sleep onset (z)</i>								
(Intercept)	0.21 [-0.66, 1.08]	0.44	0.48	.631	-0.03 [-0.36, 0.30]	0.17	-0.19	.852
Log pa volume	0.02 [-0.42, 0.46]	0.22	0.10	.921	-0.05 [-0.08, -0.02]	0.01	-3.61	< .001
Pa mostactivehr	-0.02 [-0.08, 0.03]	0.03	-0.90	.369	0.01 [0.00, 0.01]	0.00	4.08	< .001
Log pa volume <sup>2</sup>	-0.03 [-0.09, 0.04]	0.03	-0.82	.413	-0.01 [-0.03, 0.01]	0.01	-0.56	.573
Age	0.00 [0.00, 0.00]	0.00	-0.35	.723	0.00 [0.00, 0.00]	0.00	-0.42	.674

Table 22 continued

Term	Physical activity volume (ln)				Physical activity intensity (z)			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Log pa volume × pa mostactivehr	0.01 [-0.02, 0.04]	0.02	0.91	.365	0.00 [0.00, 0.00]	0.00	-1.43	.154
Pa mostactivehr × log pa volume <sup>2</sup>	0.00 [-0.01, 0.00]	0.00	-0.70	.481	0.00 [0.00, 0.00]	0.00	0.38	.701
Sleep regularity (z)								
(Intercept)	-2.60 [-3.64, -1.56]	0.53	-4.92	< .001	0.62 [0.38, 0.86]	0.12	5.06	< .001
Log pa volume	1.51 [0.94, 2.08]	0.29	5.20	< .001	0.01 [-0.02, 0.05]	0.02	0.76	.447
Pa mostactivehr	-0.04 [-0.11, 0.03]	0.03	-1.21	.226	0.00 [-0.01, 0.00]	0.00	-2.48	.013
Log pa volume <sup>2</sup>	-0.18 [-0.26, -0.10]	0.04	-4.53	< .001	-0.05 [-0.07, -0.02]	0.01	-3.82	< .001
Age	0.00 [0.00, 0.00]	0.00	0.08	.936	0.00 [0.00, 0.00]	0.00	-0.38	.706
Log pa volume × pa mostactivehr	0.01 [-0.02, 0.05]	0.02	0.74	.461	0.00 [0.00, 0.01]	0.00	3.51	< .001
Pa mostactivehr × log pa volume <sup>2</sup>	0.00 [-0.01, 0.00]	0.00	-0.31	.755	0.00 [0.00, 0.00]	0.00	1.52	.128

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

Table 23

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

Term	Physical activity volume (ln)				Physical activity intensity (z)			
	$\beta$ [95% CI]	SE	t	p	$\beta$ [95% CI]	SE	t	p
Sleep duration (z)								
(Intercept)	4.30 [4.12, 4.48]	0.09	46.51	< .001	1.34 [1.09, 1.58]	0.12	10.71	< .001
Sleep duration	0.00 [-0.01, 0.02]	0.01	0.15	.882	0.03 [0.00, 0.05]	0.01	1.74	.083
Pa mostactivehr	0.00 [0.00, 0.00]	0.00	4.66	< .001	0.00 [0.00, 0.00]	0.00	1.22	.224
Sleep duration <sup>2</sup>	-0.01 [-0.01, 0.00]	0.00	-2.41	.016	-0.01 [-0.02, 0.01]	0.01	-0.98	.325
Age	-0.01 [-0.01, -0.01]	0.00	-11.03	< .001	-0.03 [-0.03, -0.02]	0.00	-15.60	< .001
Sleep duration × pa mostactivehr	0.00 [0.00, 0.00]	0.00	-1.24	.215	0.00 [0.00, 0.00]	0.00	-1.25	.212
Pa mostactivehr × Sleep duration <sup>2</sup>	0.00 [0.00, 0.00]	0.00	-1.06	.290	0.00 [0.00, 0.00]	0.00	-0.80	.424
Sleep efficiency (z)								
(Intercept)	4.29 [4.11, 4.47]	0.09	46.40	< .001	1.34 [1.10, 1.58]	0.12	10.81	< .001
Sleep efficiency	-0.01 [-0.02, 0.01]	0.01	-0.81	.420	-0.03 [-0.06, 0.01]	0.02	-1.54	.125
Pa mostactivehr	0.00 [0.00, 0.00]	0.00	3.70	< .001	0.00 [0.00, 0.00]	0.00	0.37	.710
Sleep efficiency <sup>2</sup>	-0.01 [-0.01, 0.00]	0.00	-1.89	.058	-0.01 [-0.02, 0.00]	0.01	-1.26	.208
Age	-0.01 [-0.01, -0.01]	0.00	-11.03	< .001	-0.03 [-0.03, -0.02]	0.00	-15.61	< .001
Sleep efficiency × pa mostactivehr	0.00 [0.00, 0.00]	0.00	1.84	.071	0.00 [0.00, 0.01]	0.00	2.37	.018
Pa mostactivehr × Sleep efficiency <sup>2</sup>	0.00 [0.00, 0.00]	0.00	1.44	.152	0.00 [0.00, 0.00]	0.00	1.56	.118
Sleep onset (z)								
(Intercept)	4.30 [4.11, 4.48]	0.09	46.50	< .001	1.32 [1.08, 1.57]	0.13	10.56	< .001
Sleep onset	-0.01 [-0.02, 0.00]	0.01	-1.34	.182	-0.01 [-0.04, 0.02]	0.01	-0.60	.550
Pa mostactivehr	0.00 [0.00, 0.00]	0.00	3.64	< .001	0.00 [0.00, 0.00]	0.00	1.56	.120
Sleep onset <sup>2</sup>	-0.01 [-0.02, 0.00]	0.01	-2.18	.029	0.01 [-0.01, 0.03]	0.01	1.14	.255
Age	-0.01 [-0.01, -0.01]	0.00	-11.01	< .001	-0.03 [-0.03, -0.02]	0.00	-15.61	< .001

Table 23 continued

Term	Physical activity volume (ln)				Physical activity intensity (z)					
	$\beta$	[95% CI]	SE	t	p	$\beta$	[95% CI]	SE	t	p
Sleep onset × pa mostactivehr	0.00	[0.00, 0.00]	0.00	2.24	.025	0.00	[0.00, 0.00]	0.00	2.10	.036
Pa mostactivehr × Sleep onset <sup>2</sup>	0.00	[0.00, 0.00]	0.00	0.50	.620	0.00	[0.00, 0.00]	0.00	-1.21	.225
Sleep regularity (z)										
(Intercept)	4.25	[4.07, 4.42]	0.09	46.68	< .001	1.31	[1.06, 1.55]	0.12	10.53	< .001
Sleep regularity	0.04	[0.02, 0.05]	0.01	4.86	< .001	0.01	[-0.02, 0.04]	0.02	0.60	.550
Pa mostactivehr	0.00	[0.00, 0.00]	0.00	5.96	< .001	0.00	[0.00, 0.00]	0.00	1.65	.099
Sleep regularity <sup>2</sup>	0.00	[-0.01, 0.01]	0.00	0.05	.961	-0.01	[-0.03, 0.01]	0.01	-0.74	.461
Age	-0.01	[-0.01, -0.01]	0.00	-11.04	< .001	-0.03	[-0.03, -0.02]	0.00	-15.61	< .001
Sleep regularity × pa mostactivehr	0.00	[0.00, 0.00]	0.00	3.43	.001	0.00	[0.00, 0.01]	0.00	2.41	.016
Pa mostactivehr × Sleep regularity <sup>2</sup>	0.00	[0.00, 0.00]	0.00	-2.24	.025	0.00	[0.00, 0.00]	0.00	-0.67	.501

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

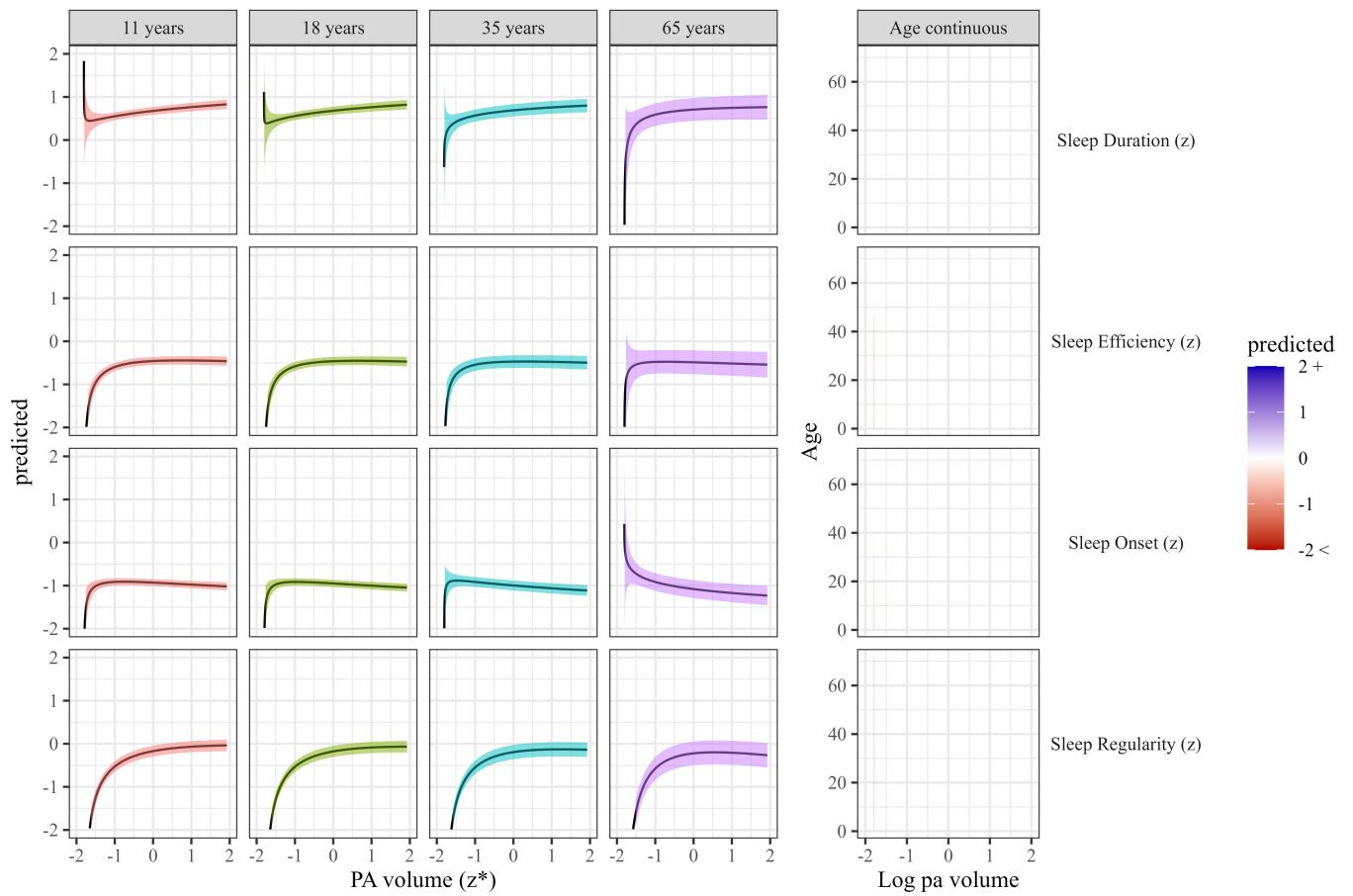


Figure 1. Sleep metrics on Physical activity volume

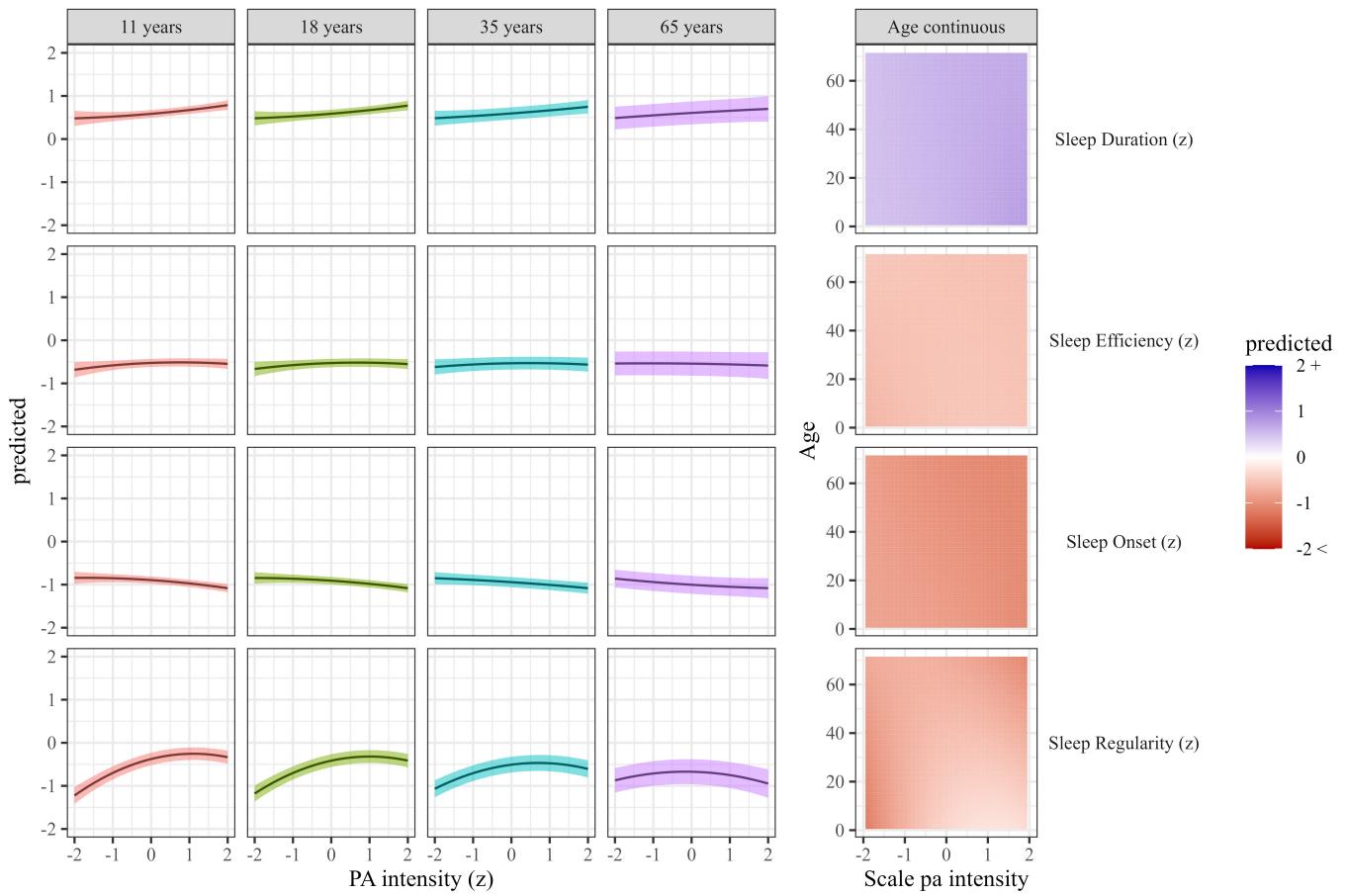


Figure 2. Sleep metrics on Physical activity intensity

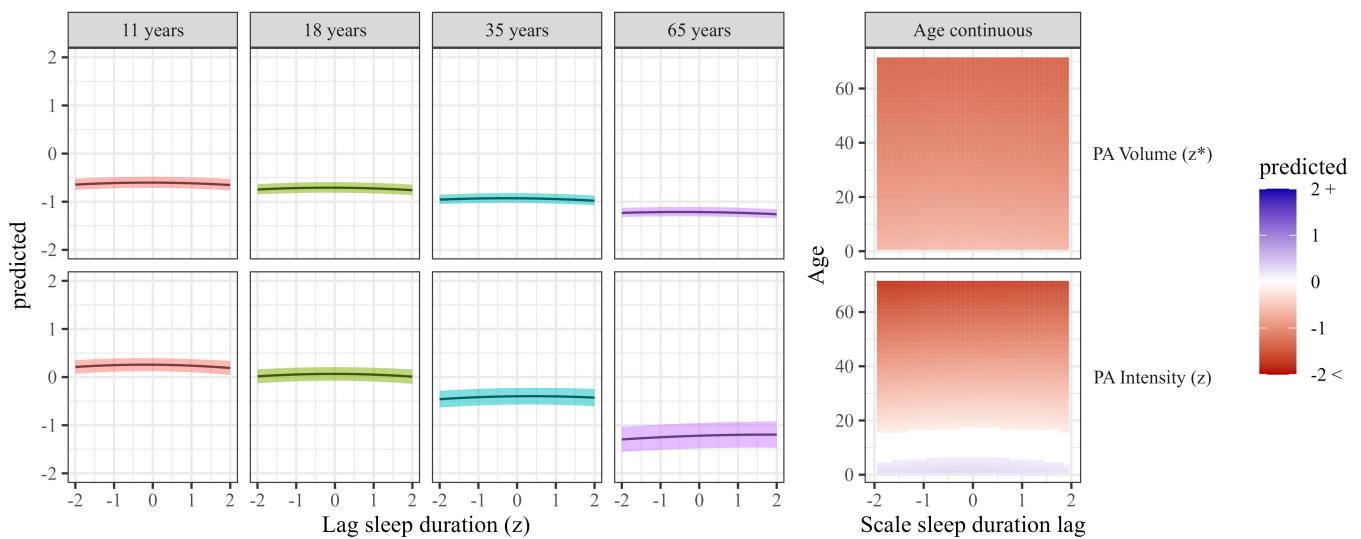


Figure 3. Physical activity by sleep duration

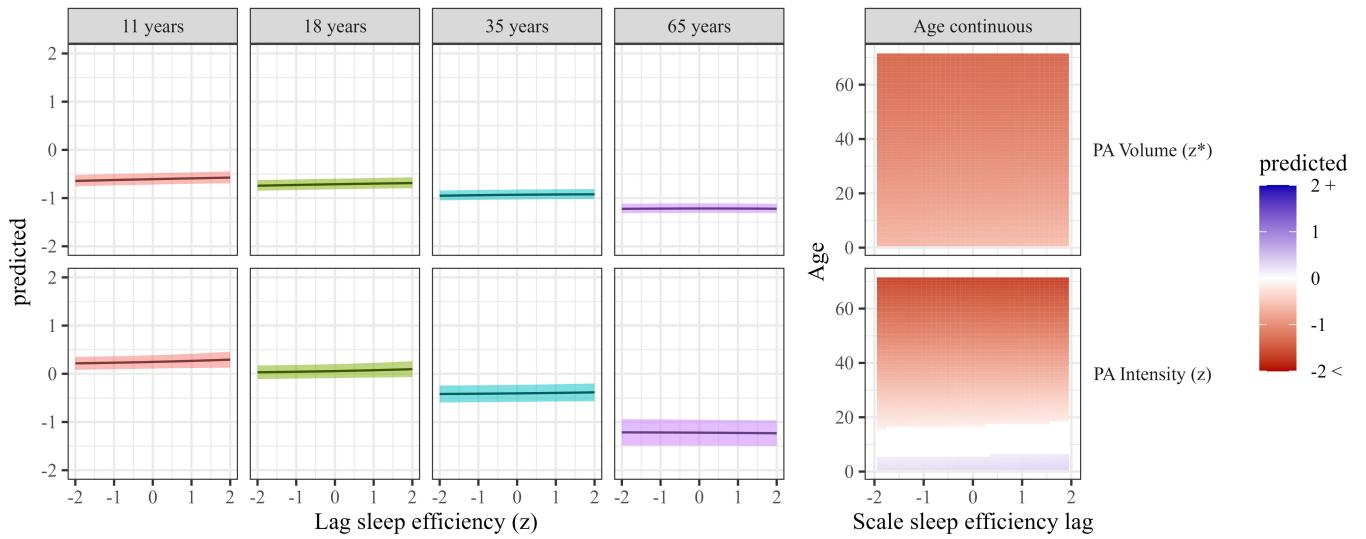


Figure 4. Physical activity by sleep efficiency

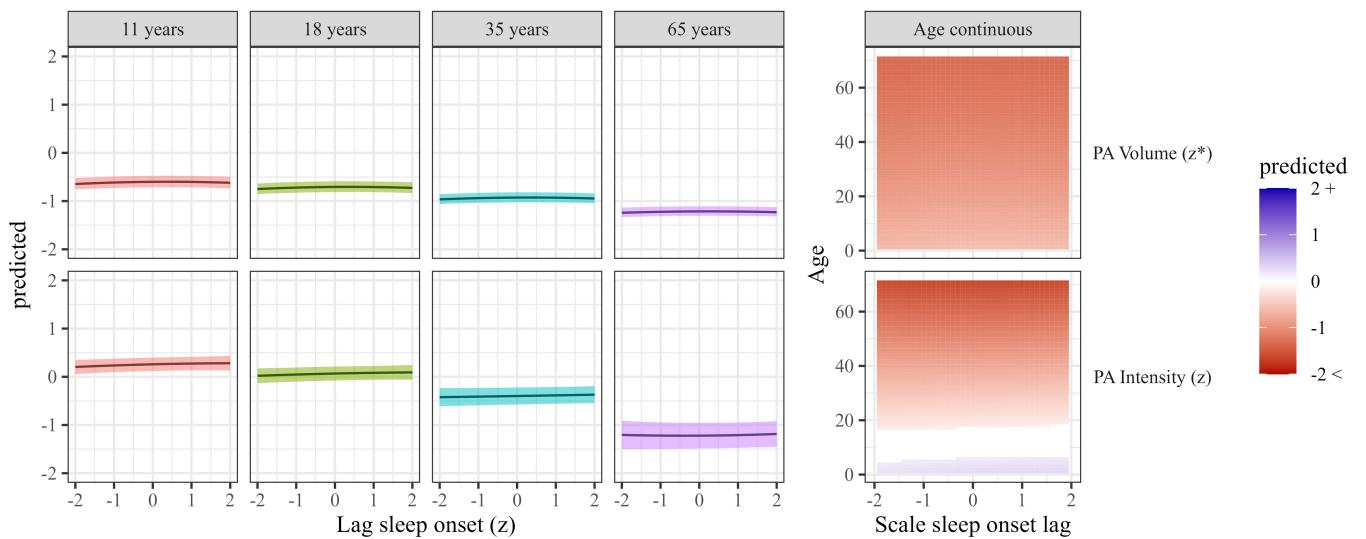


Figure 5. Physical activity by sleep onset

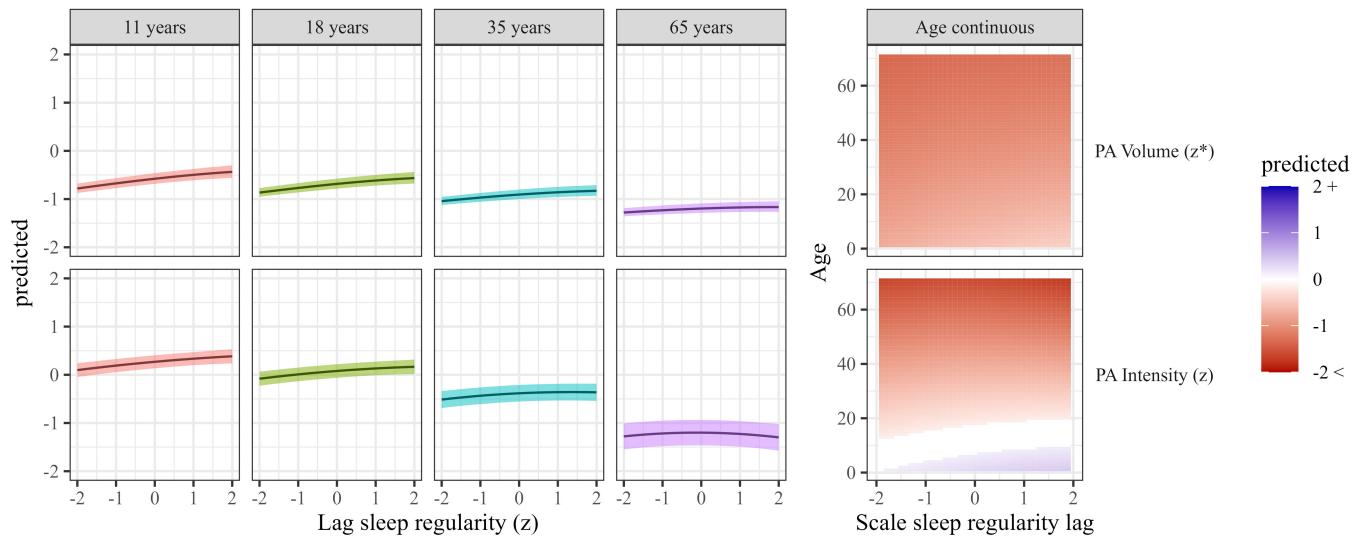


Figure 6. Physical activity by sleep regularity

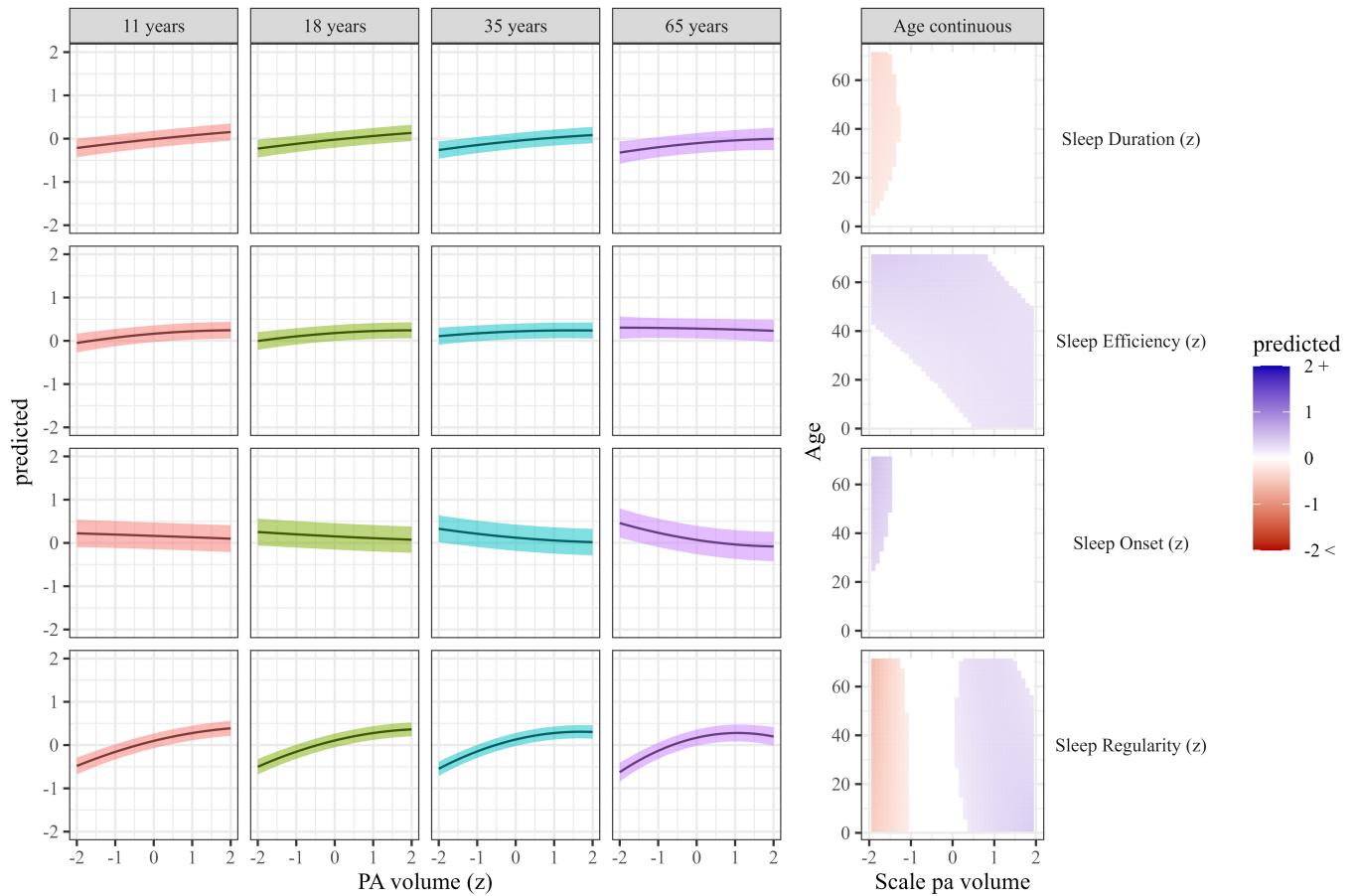


Figure 7. Sleep metrics on Physical activity volume

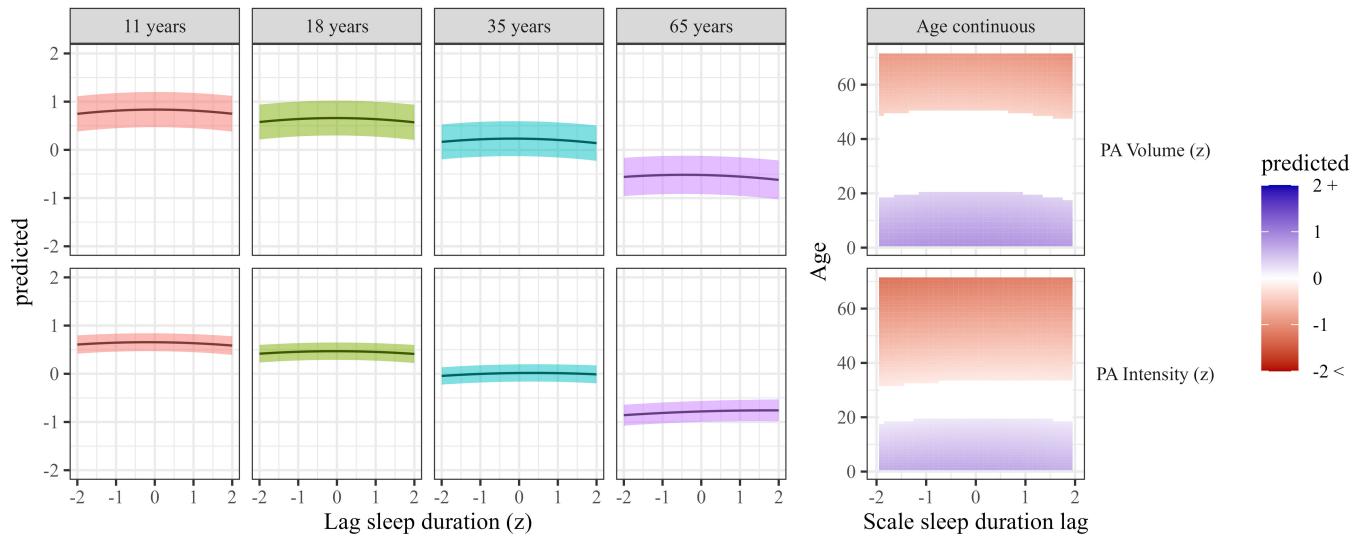


Figure 8. Physical activity by sleep duration

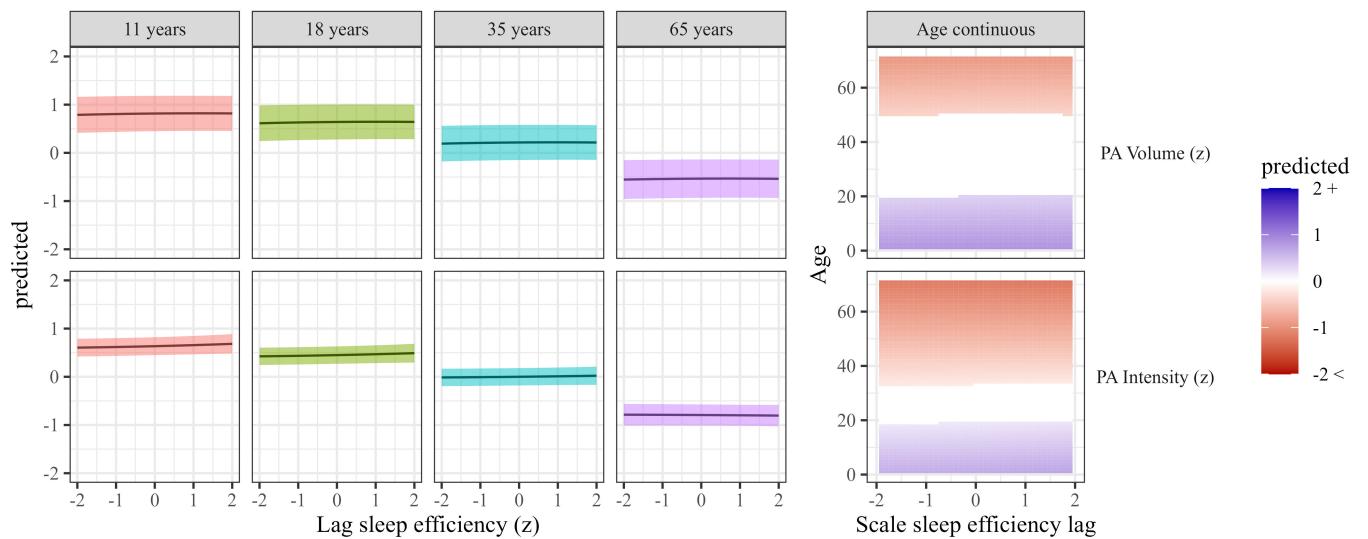


Figure 9. Physical activity by sleep efficiency

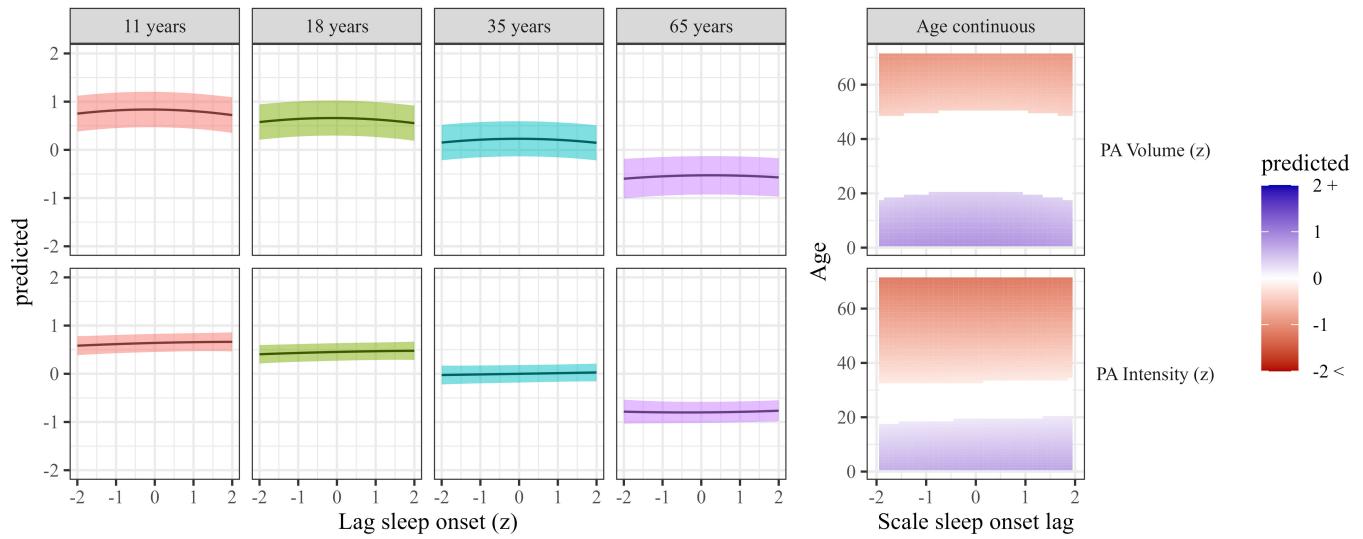


Figure 10. Physical activity by sleep onset

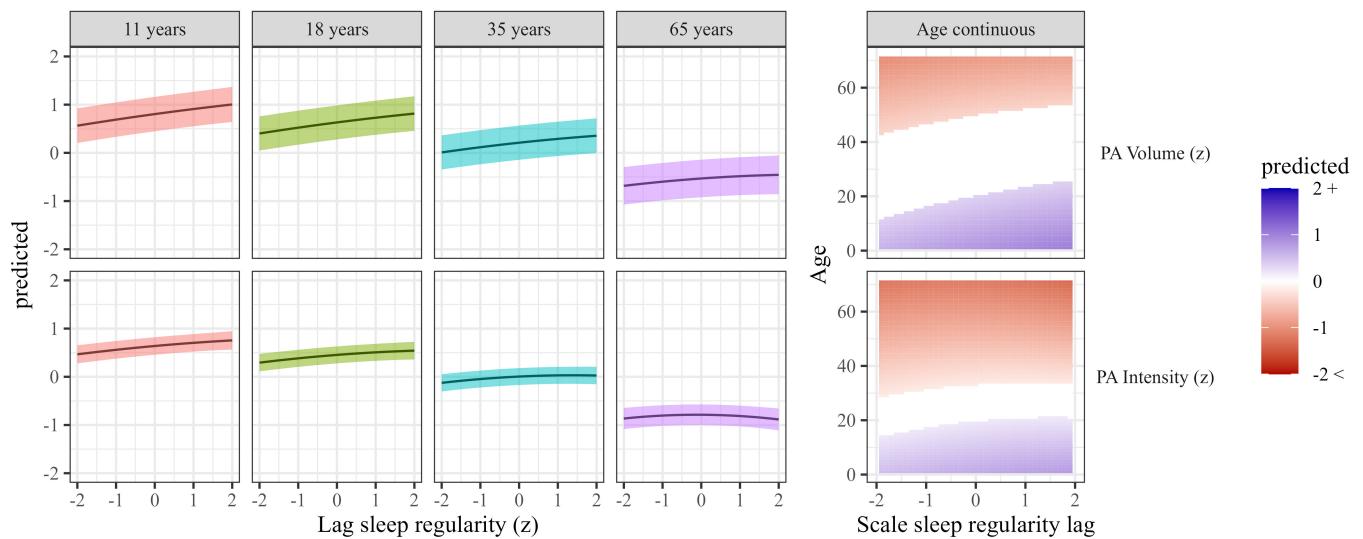


Figure 11. Physical activity by sleep regularity

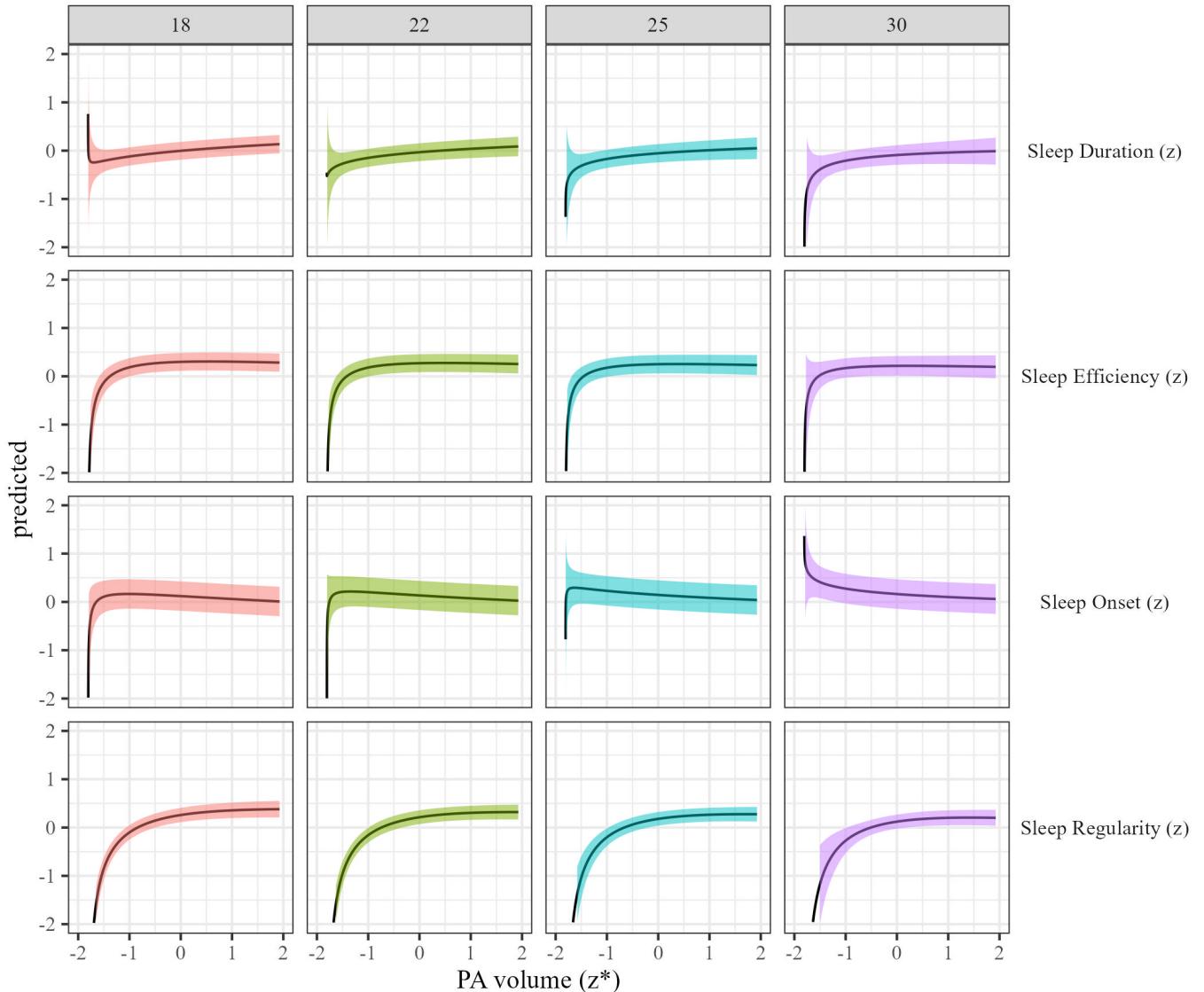


Figure 12. Sleep metrics on Physical activity volume by BMI

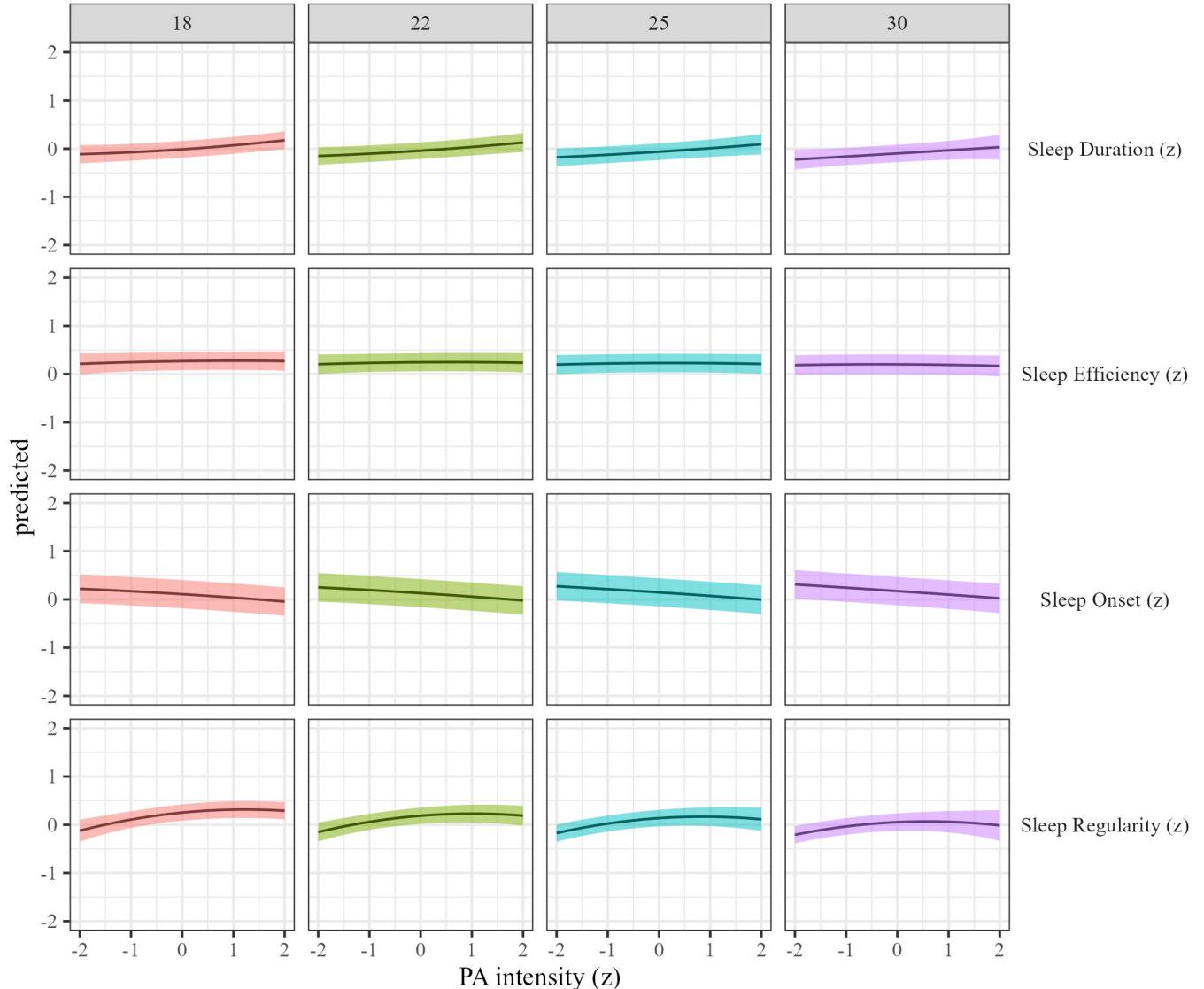


Figure 13. Sleep metrics on Physical activity intensity moderated by BMI

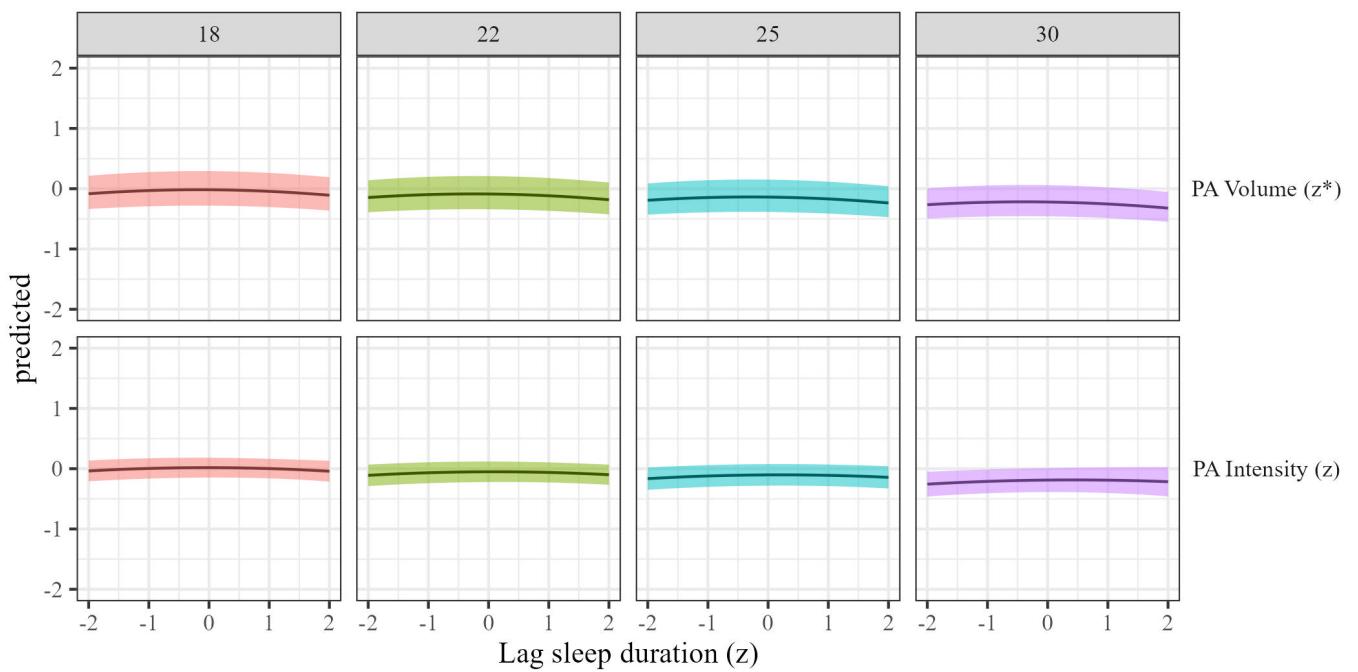


Figure 14. Physical activity by sleep duration moderated by BMI

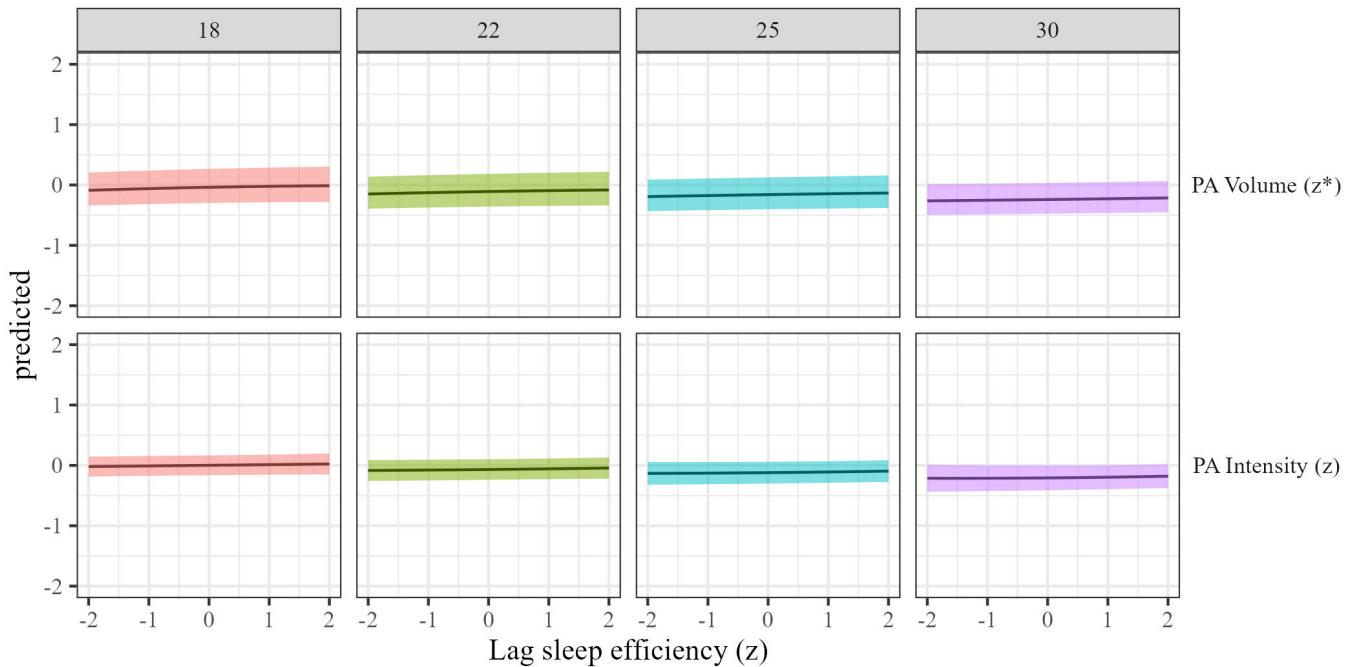


Figure 15. Physical activity by sleep efficiency moderated by BMI

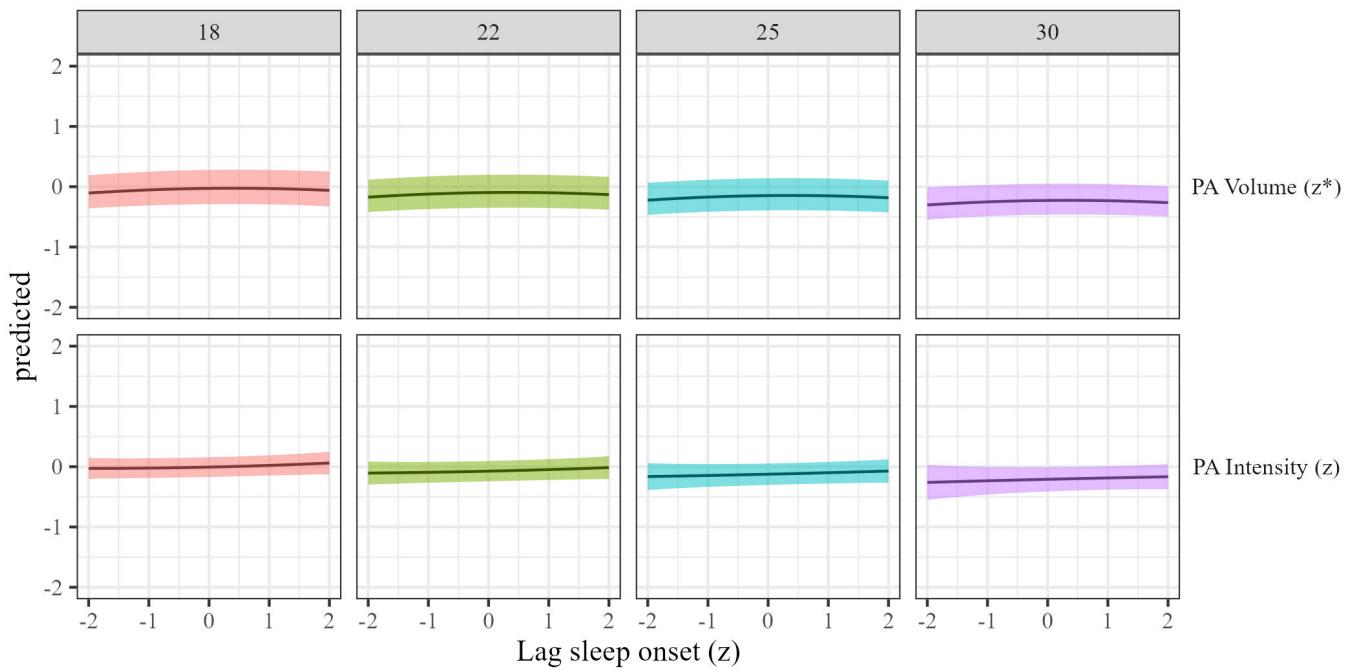


Figure 16. Physical activity by sleep onset moderated by BMI

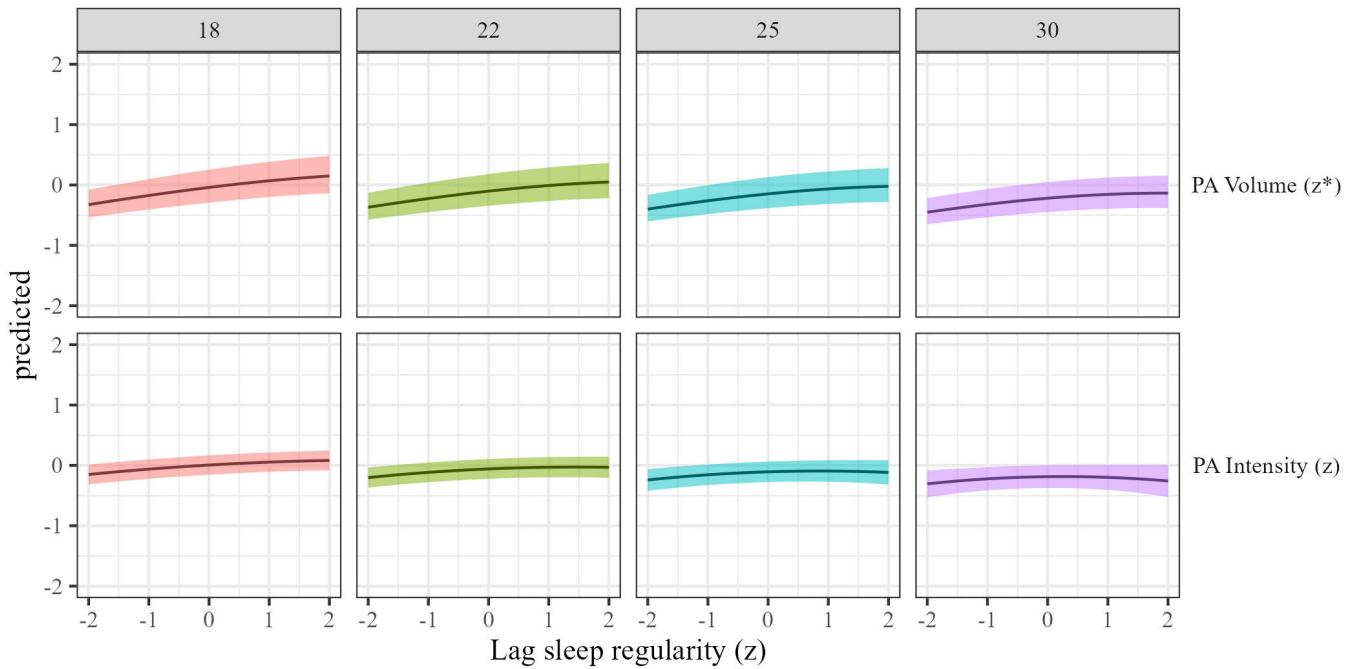


Figure 17. Physical activity by sleep regularity moderated by BMI

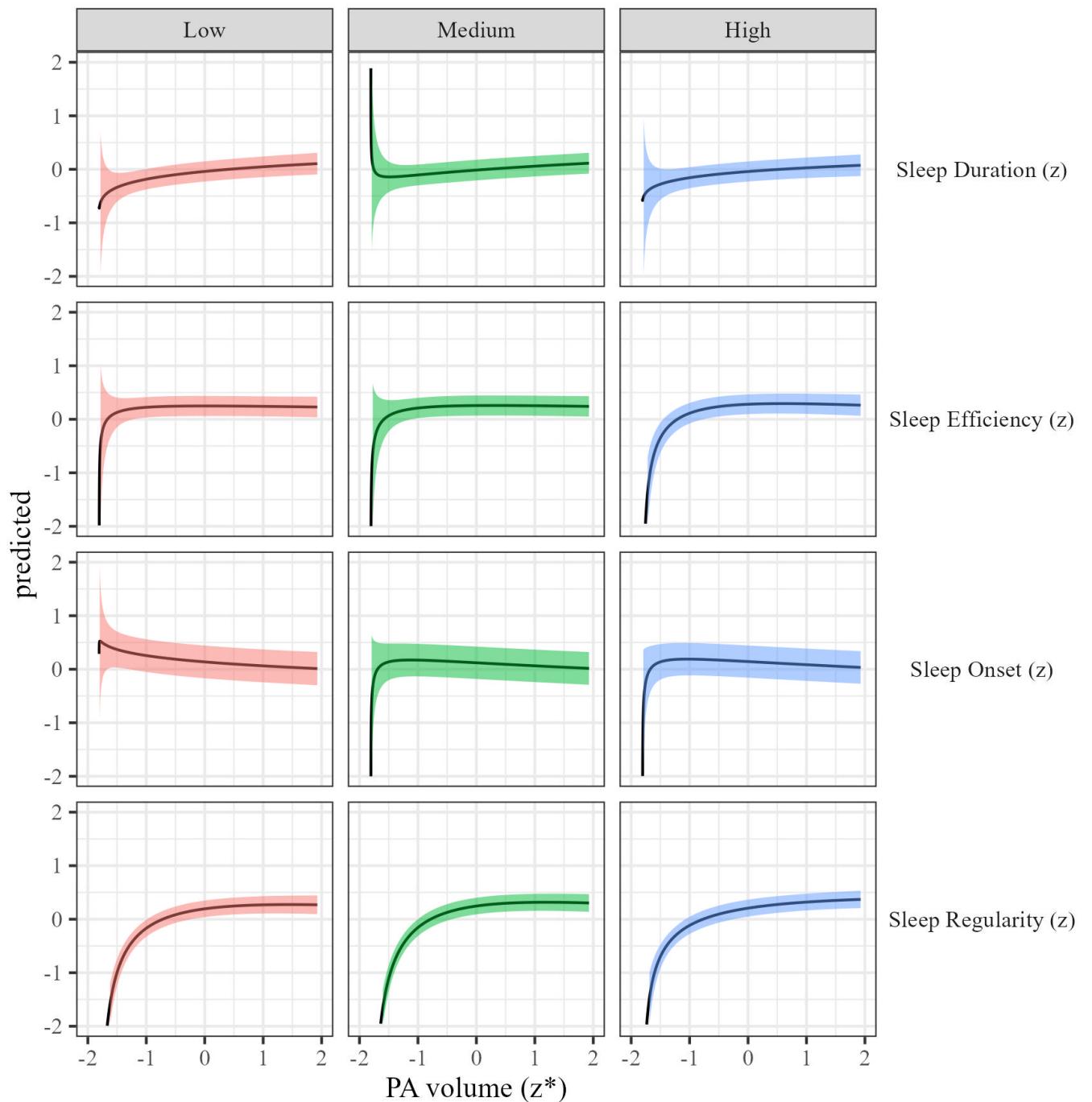


Figure 18. Sleep metrics on Physical activity volume by SES

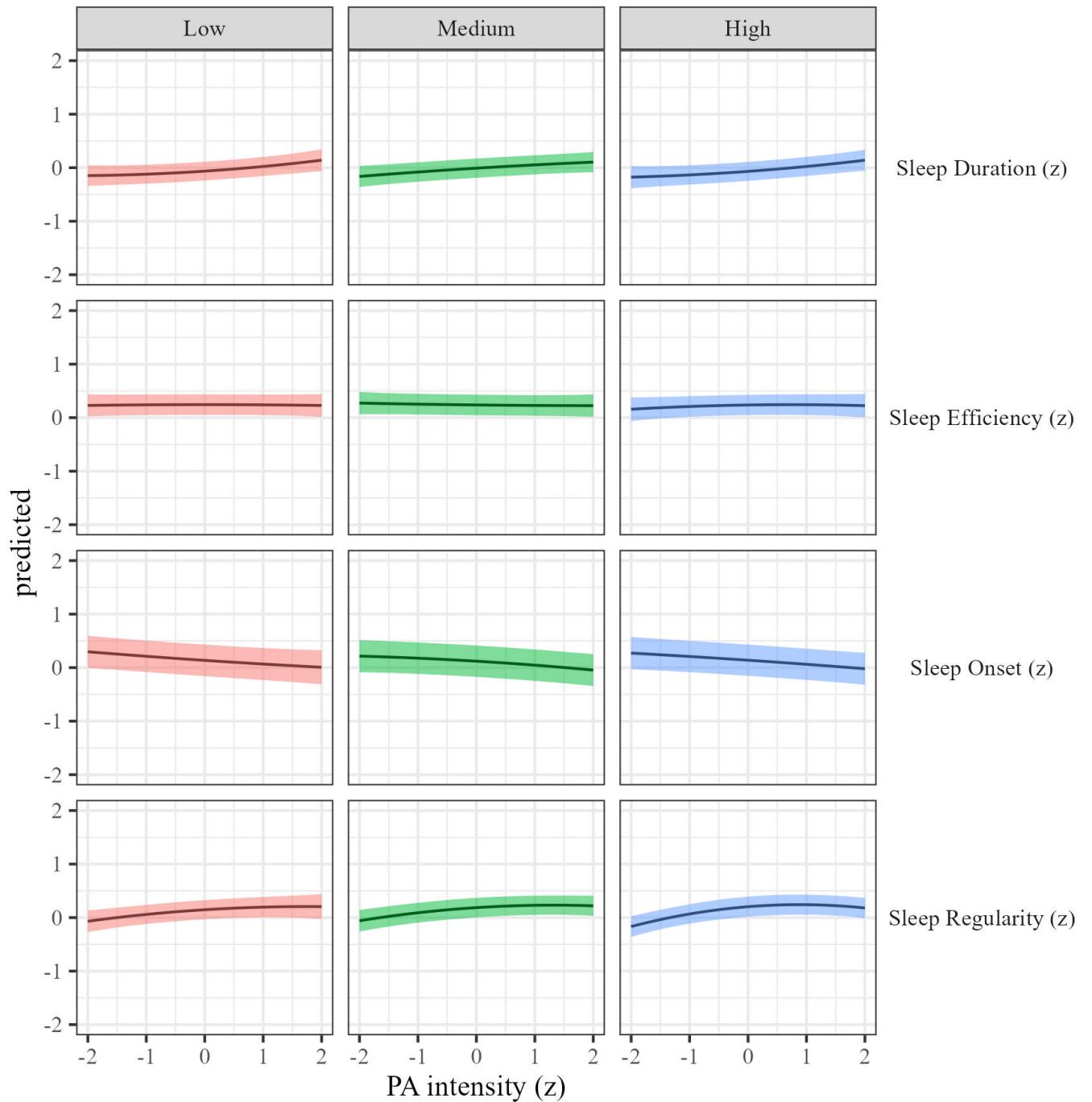


Figure 19. Sleep metrics on Physical activity intensity moderated by SES

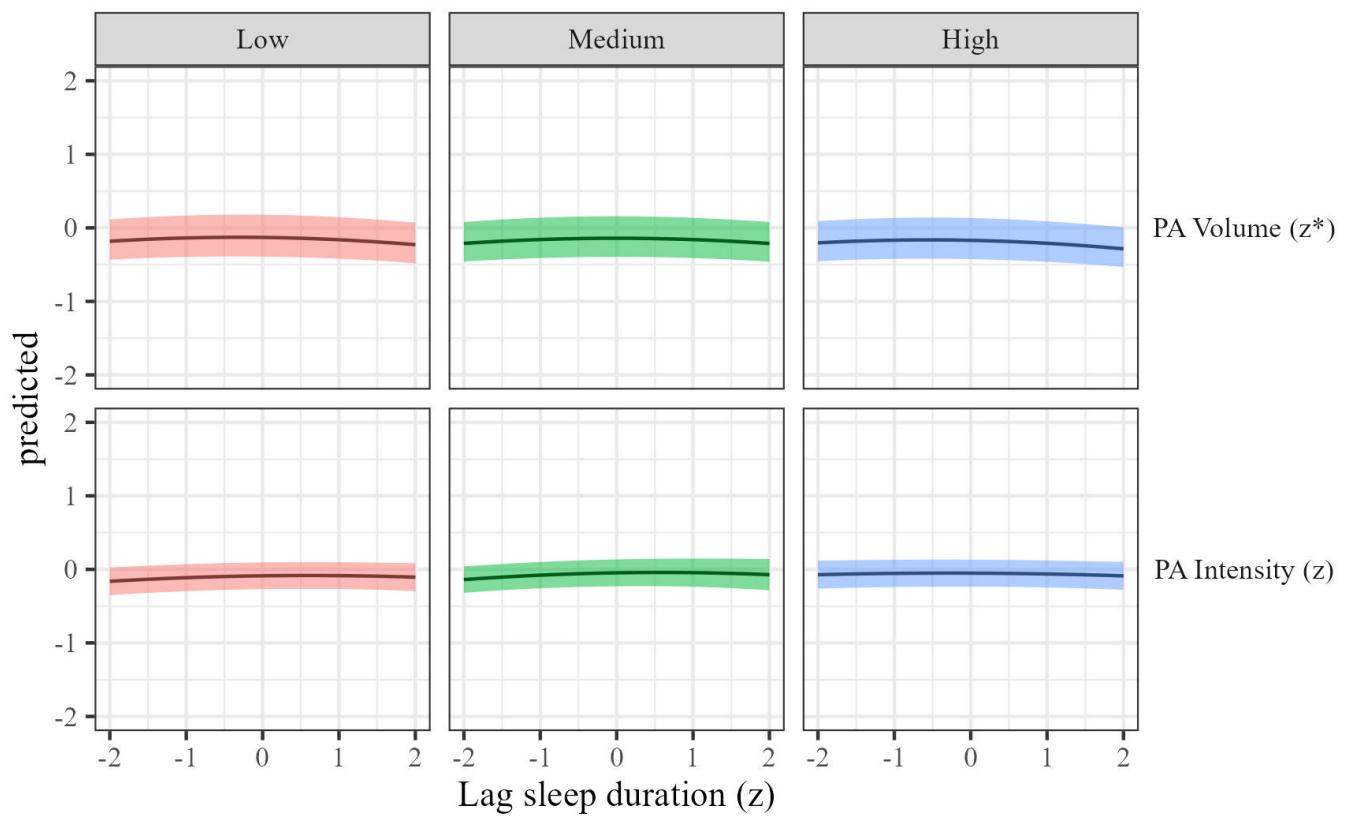


Figure 20. Physical activity by sleep duration moderated by SES

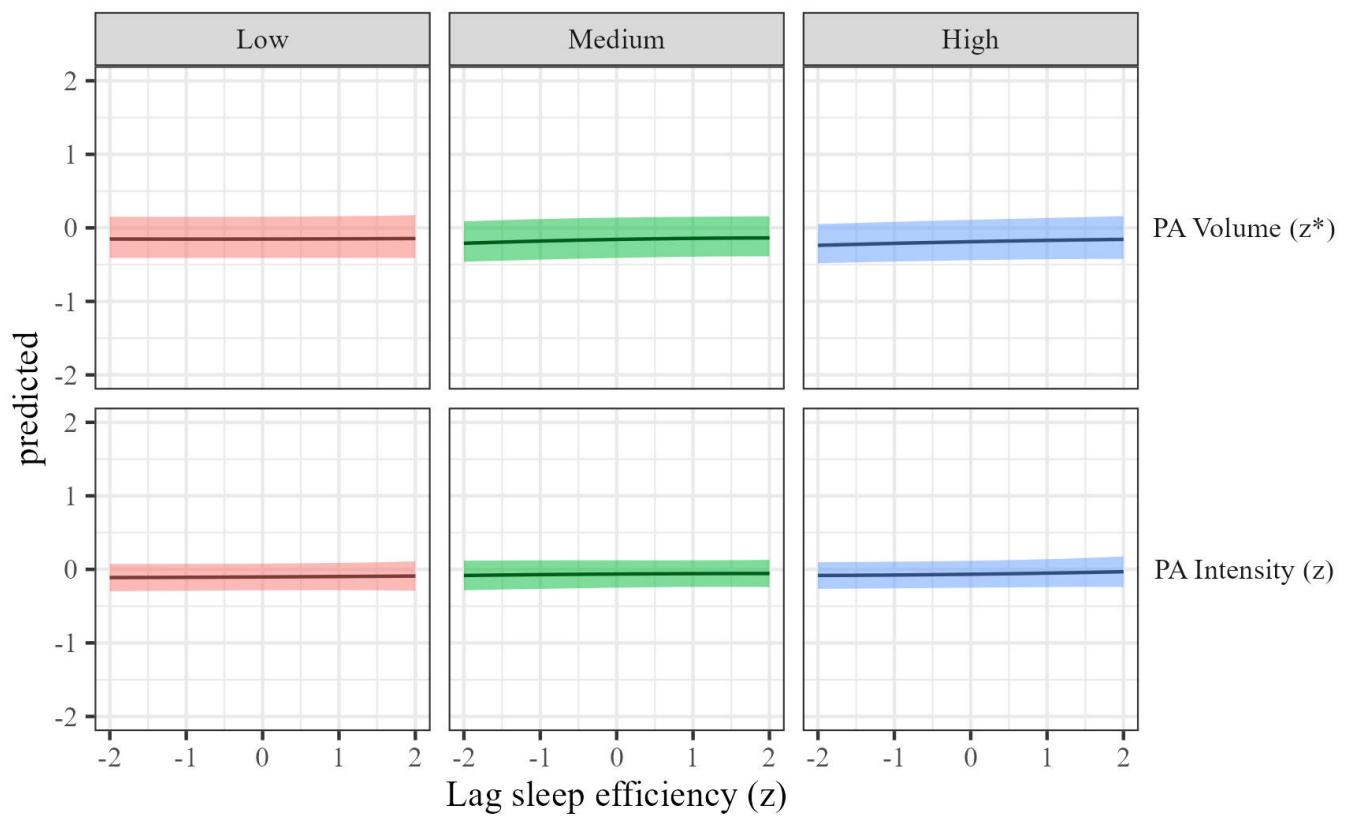


Figure 21. Physical activity by sleep efficiency moderated by SES

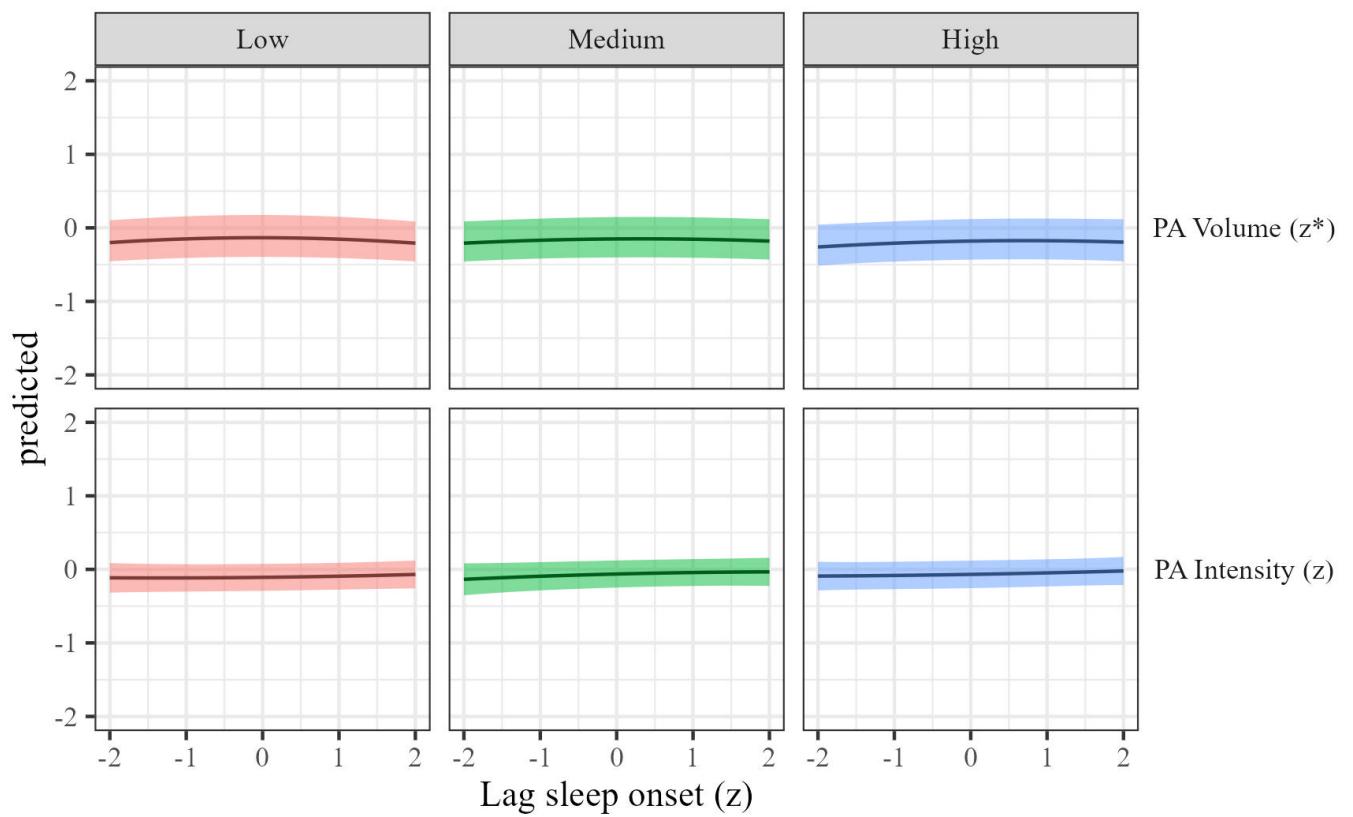


Figure 22. Physical activity by sleep onset moderated by SES

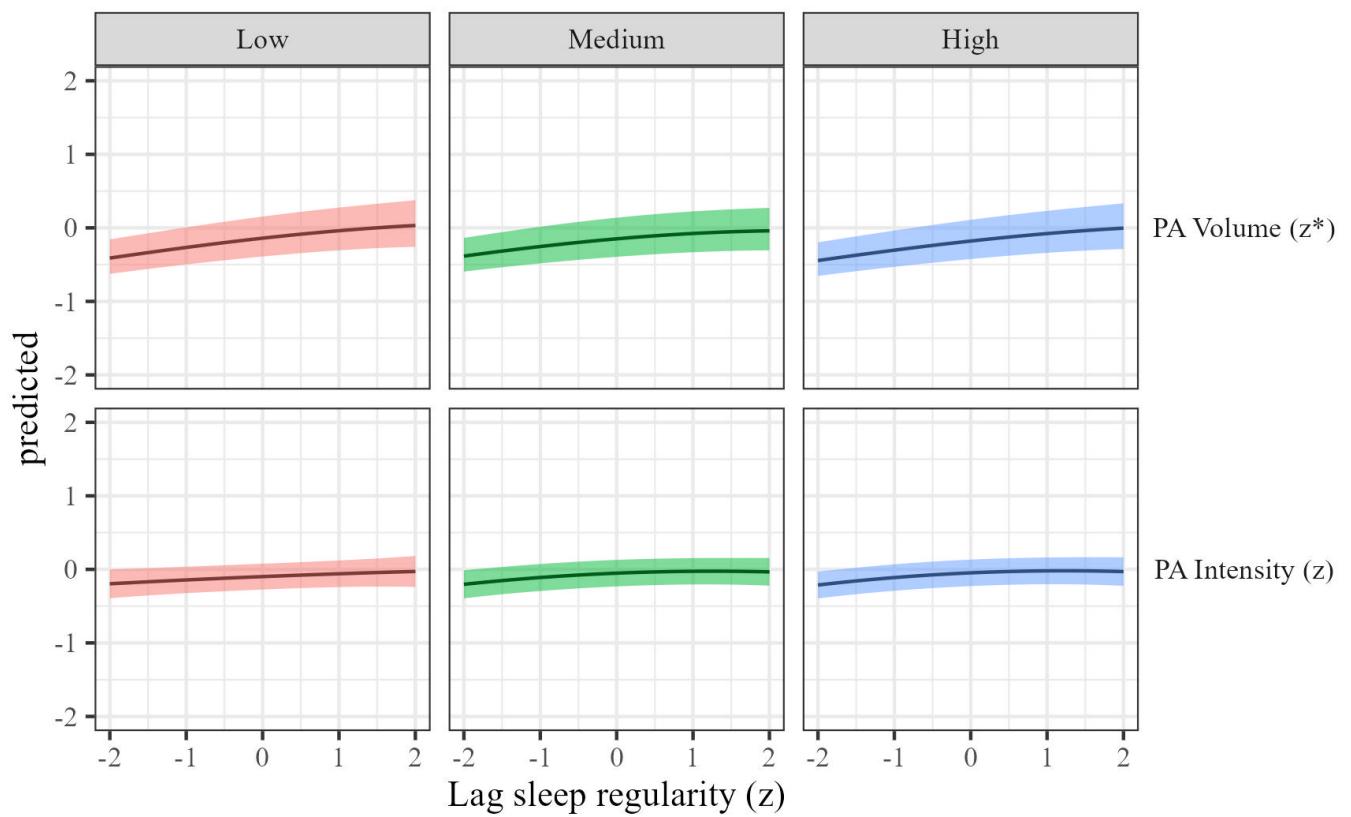


Figure 23. Physical activity by sleep regularity moderated by SES

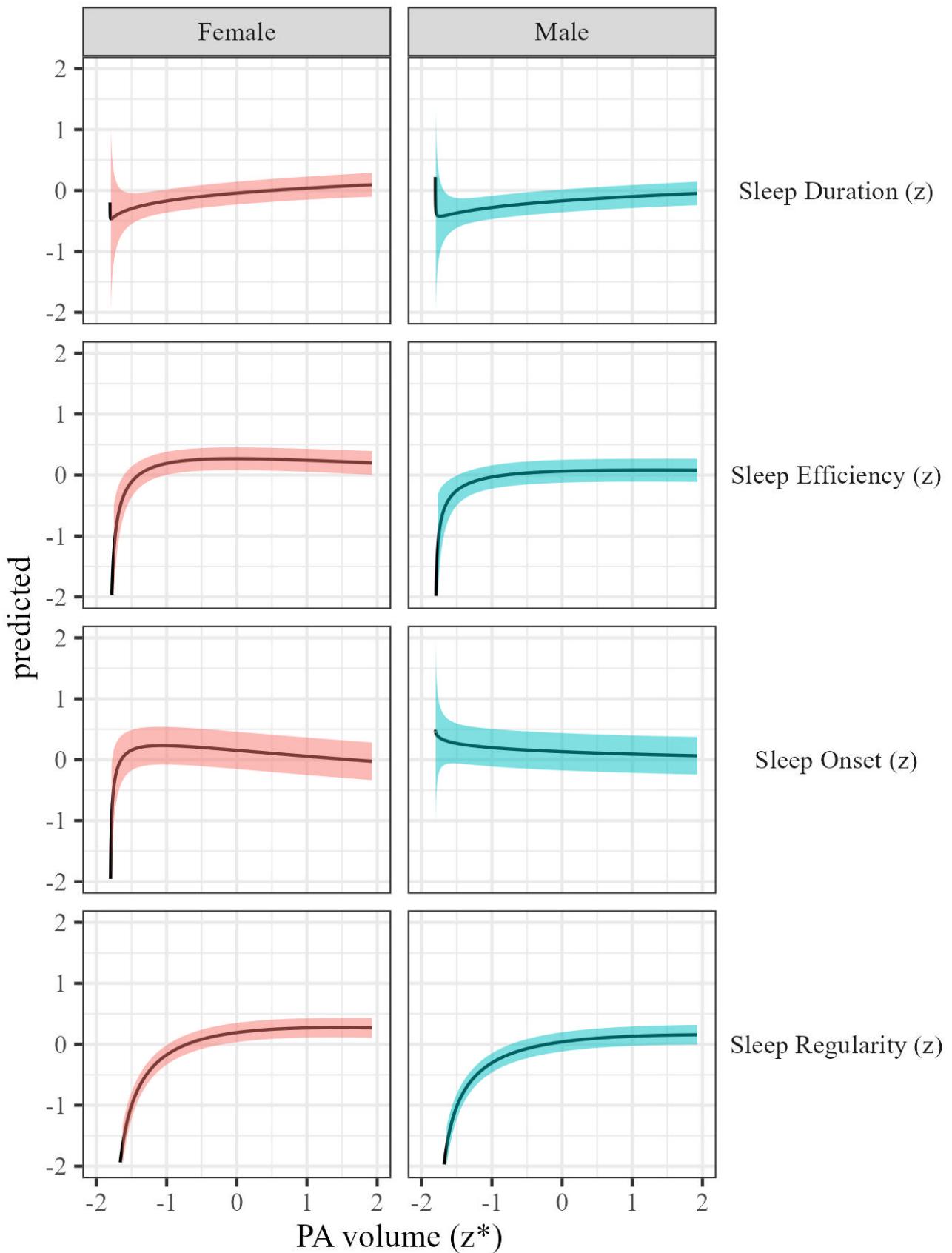


Figure 24. Sleep metrics on Physical activity volume by sex

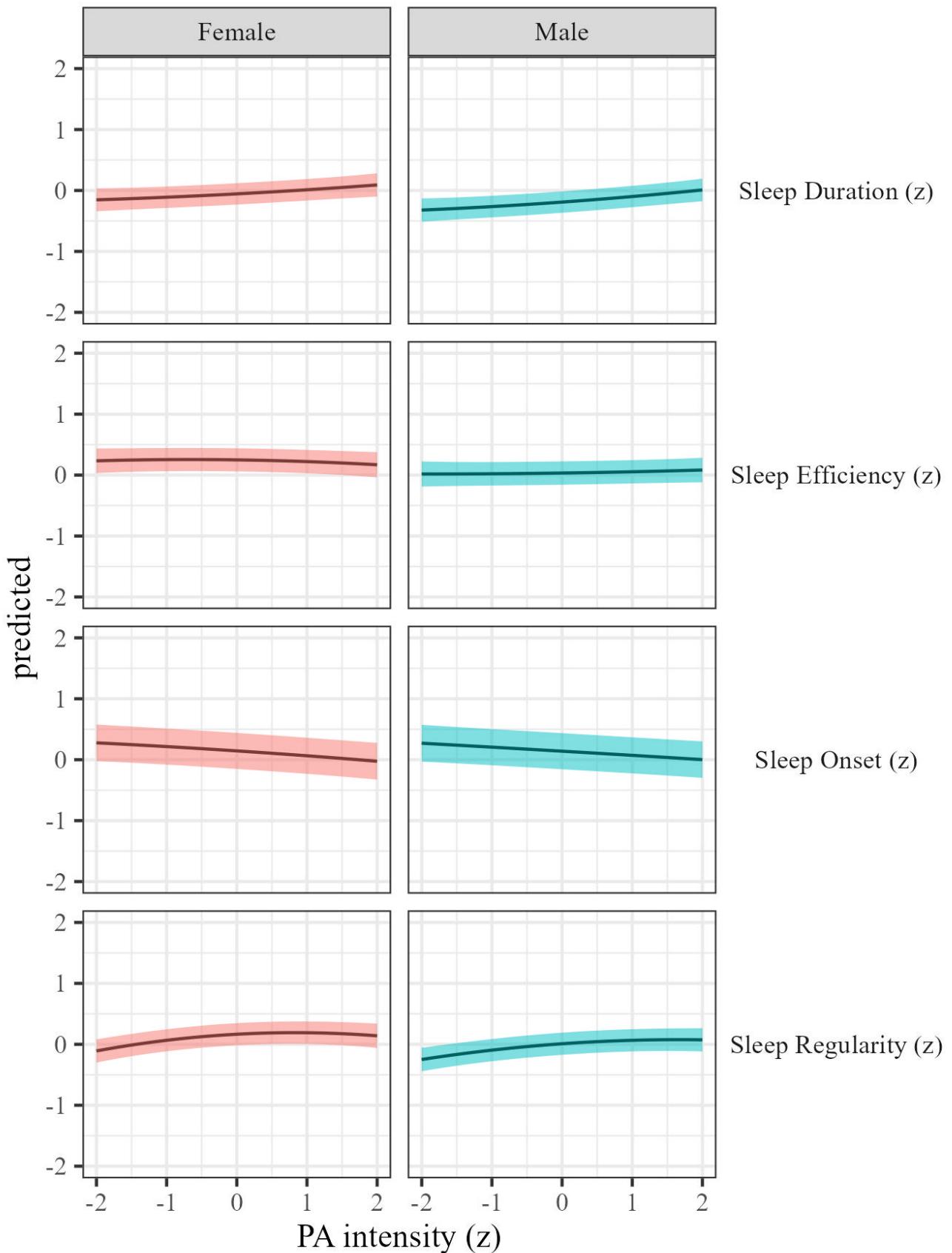


Figure 25. Sleep metrics on Physical activity intensity moderated by sex

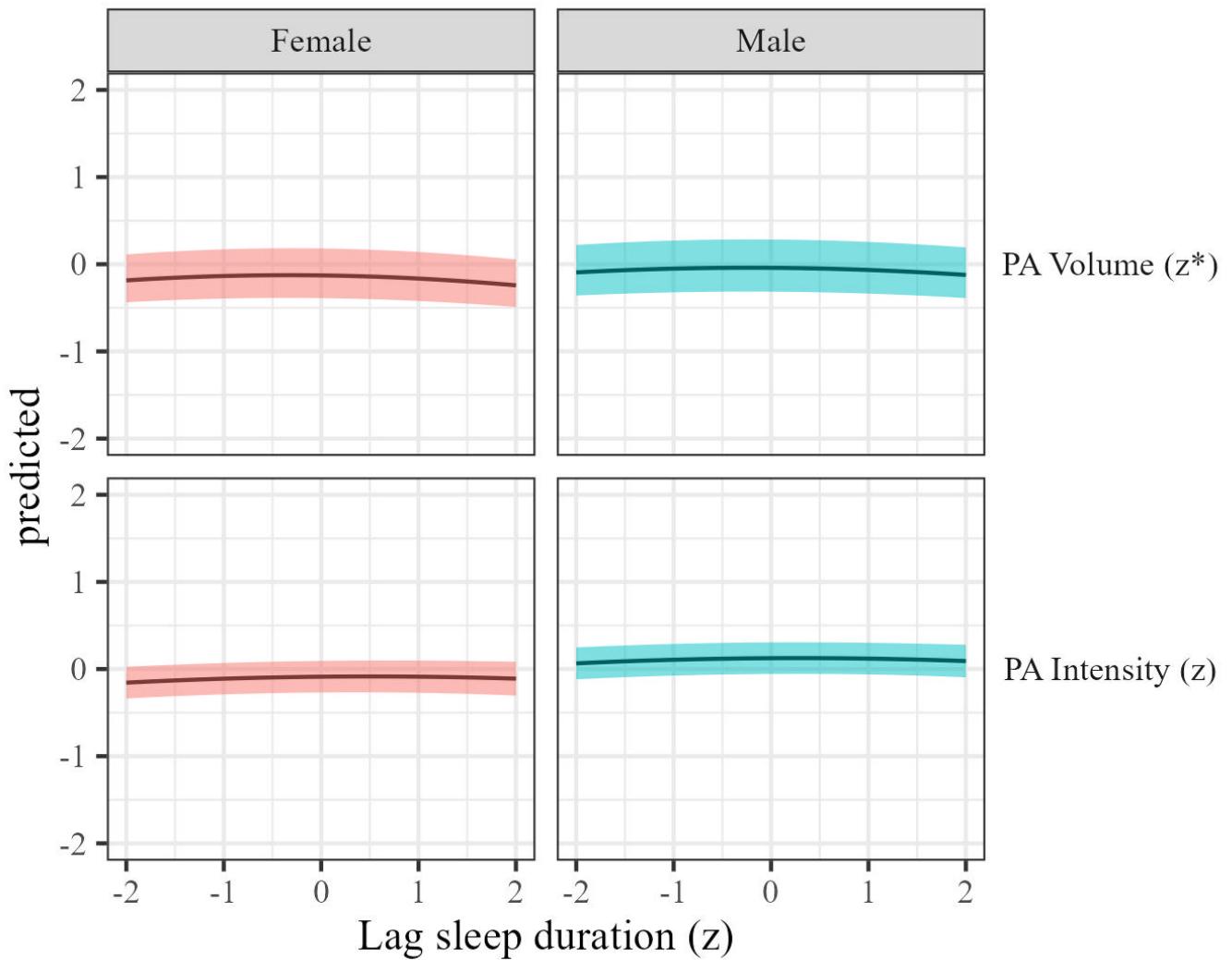


Figure 26. Physical activity by sleep duration moderated by sex

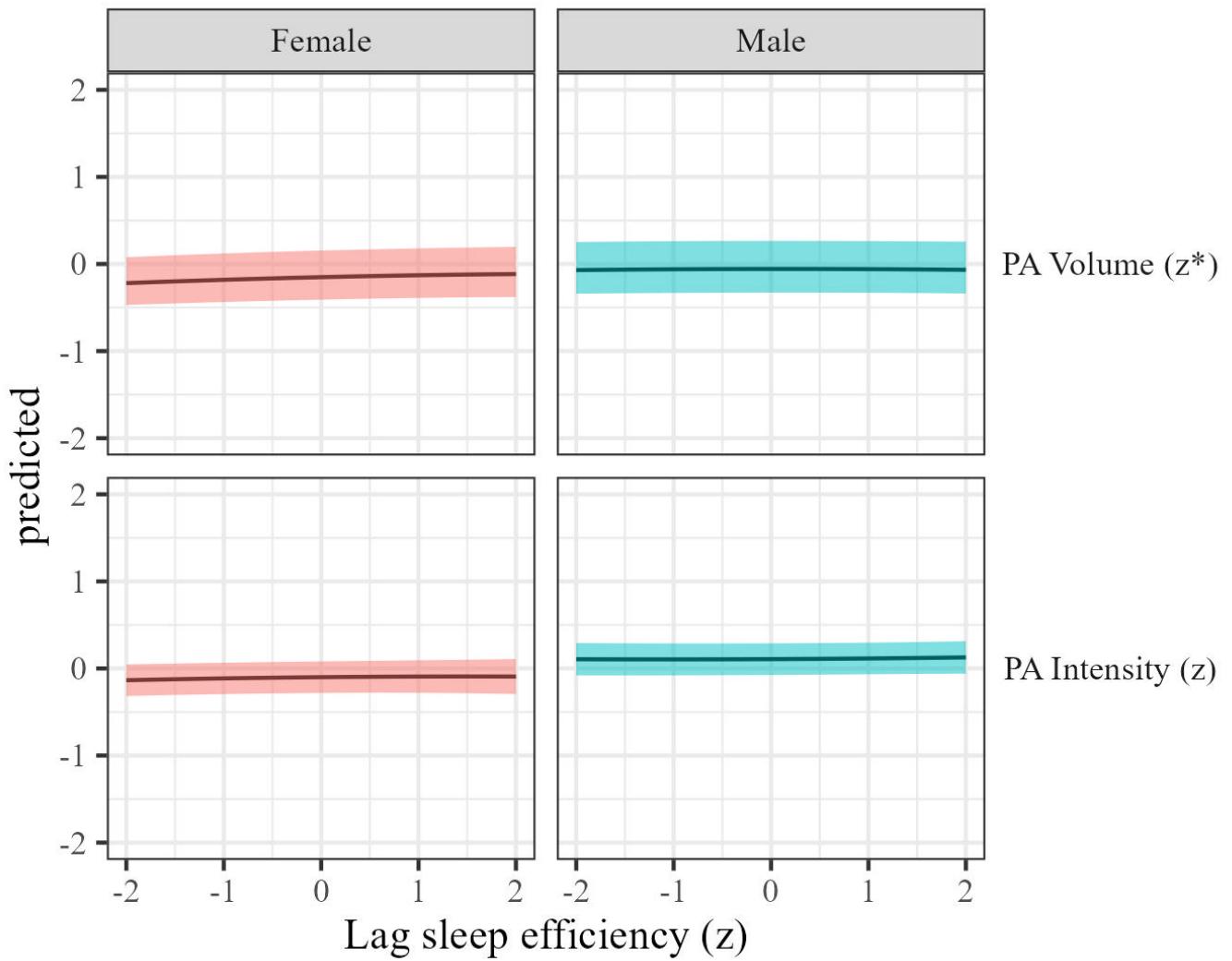


Figure 27. Physical activity by sleep efficiency moderated by sex

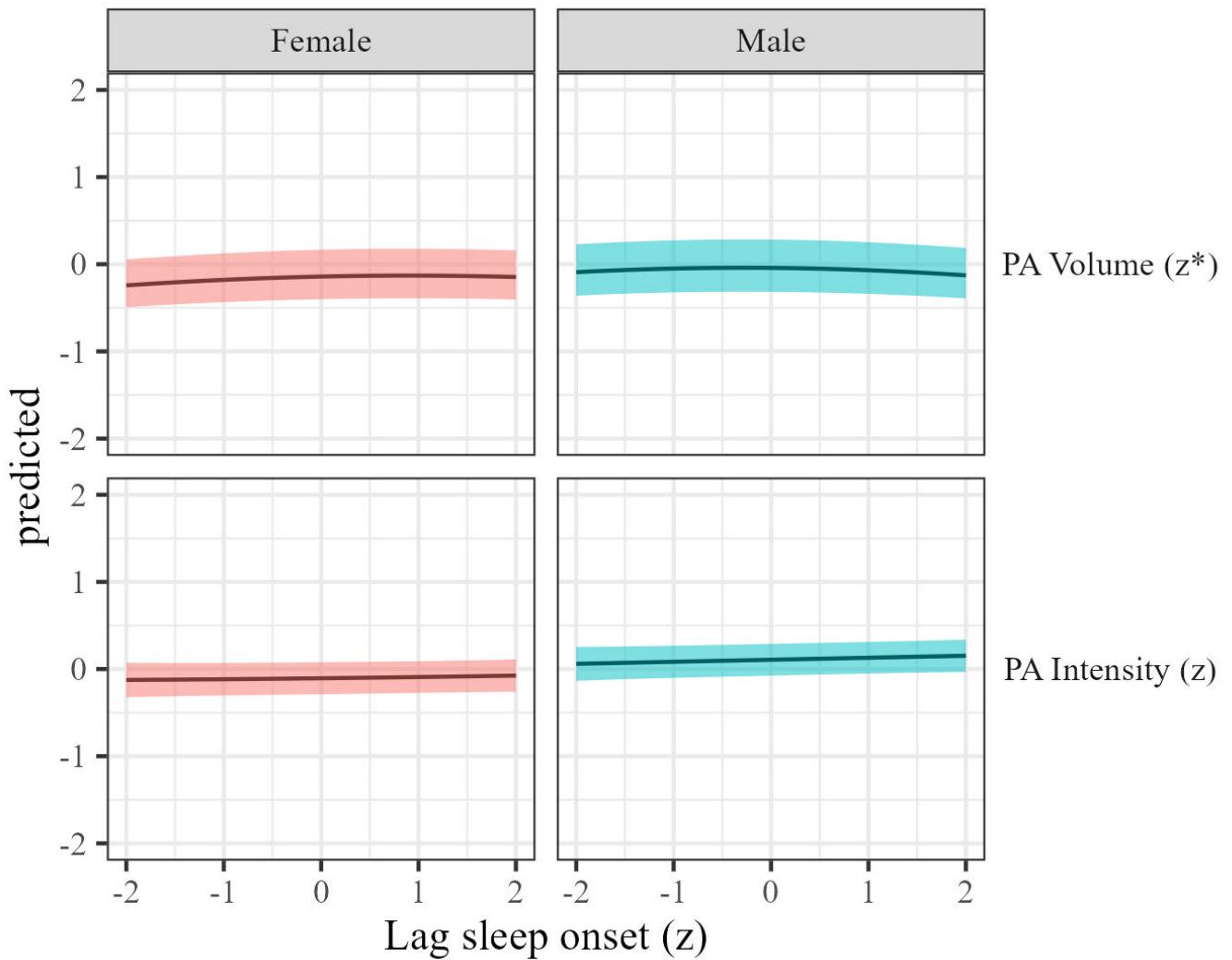


Figure 28. Physical activity by sleep onset moderated by sex

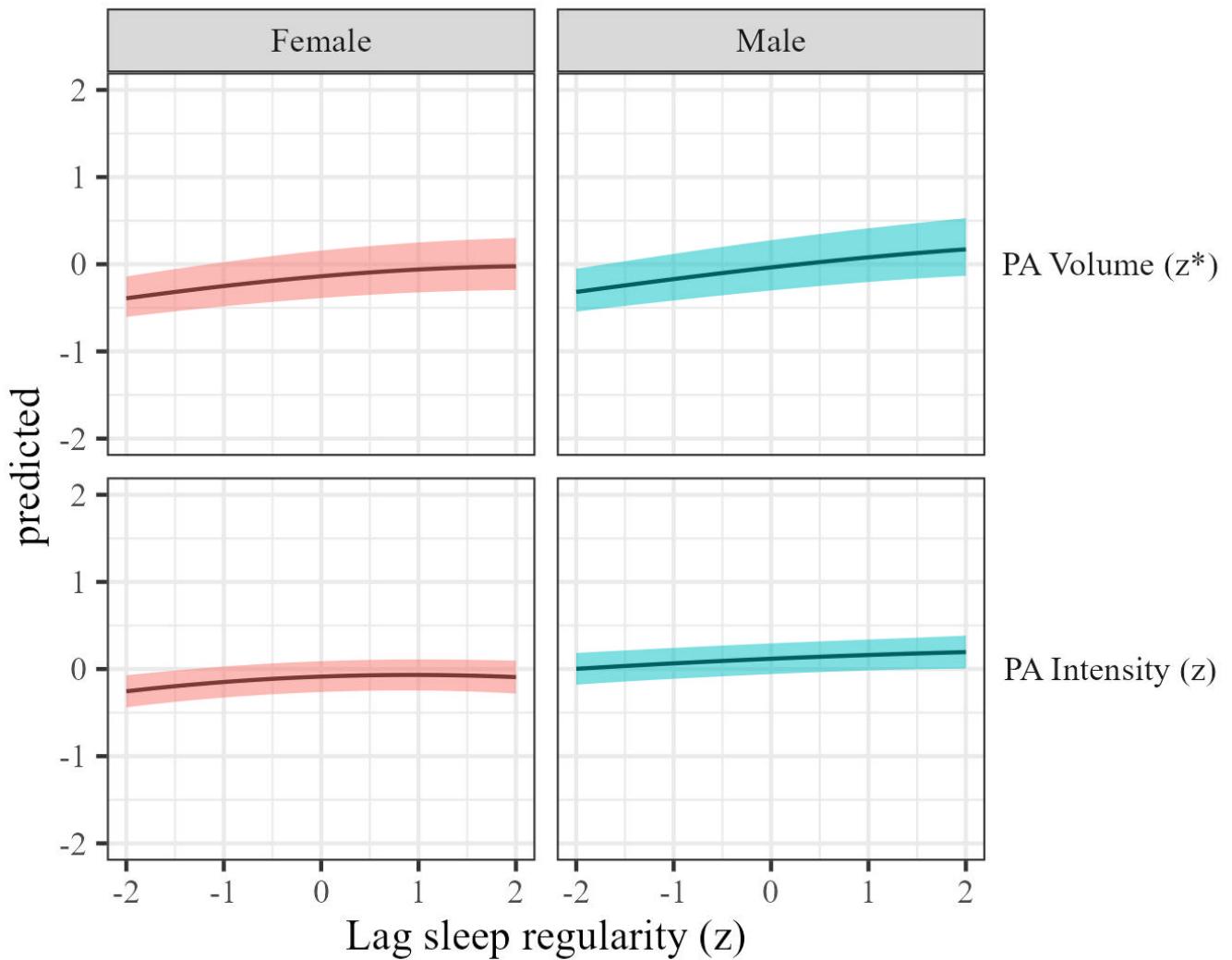


Figure 29. Physical activity by sleep regularity moderated by sex

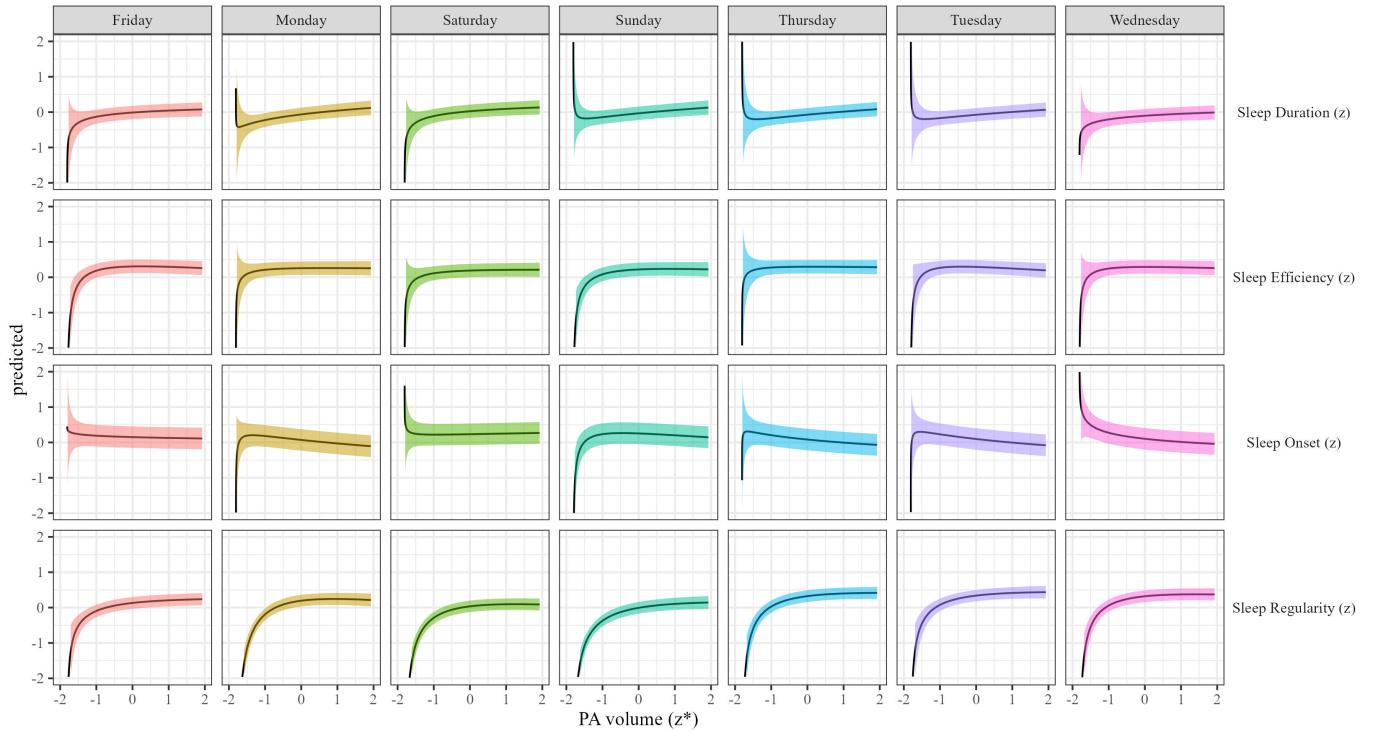


Figure 30. Sleep metrics on Physical activity volume by weekday

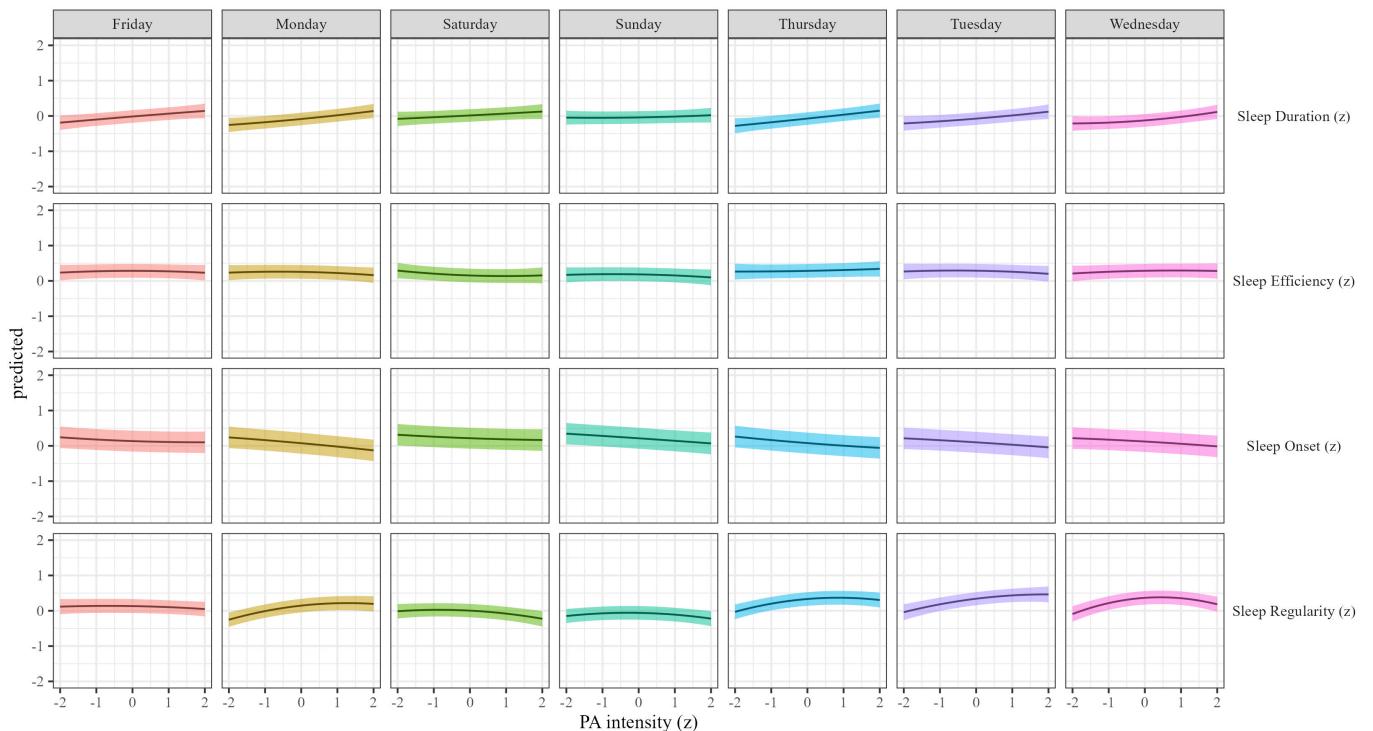


Figure 31. Sleep metrics on Physical activity intensity moderated by weekday

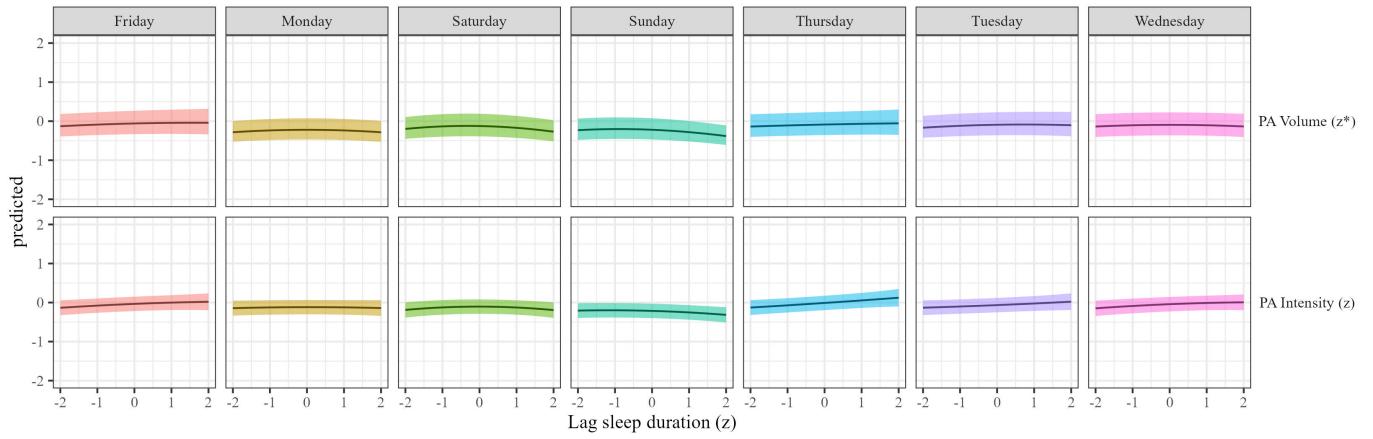


Figure 32. Physical activity by sleep duration moderated by weekday

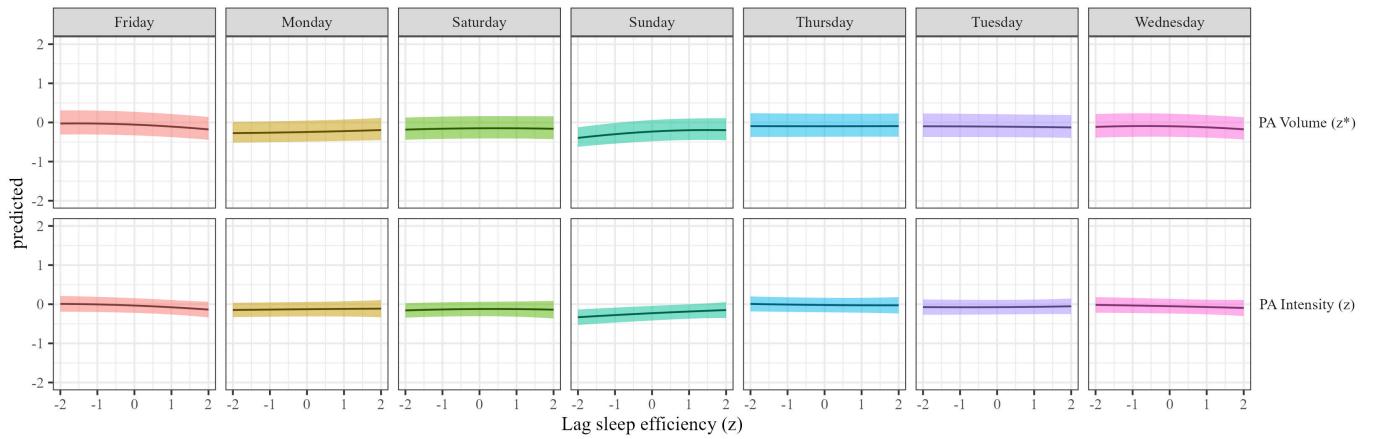


Figure 33. Physical activity by sleep efficiency moderated by weekday

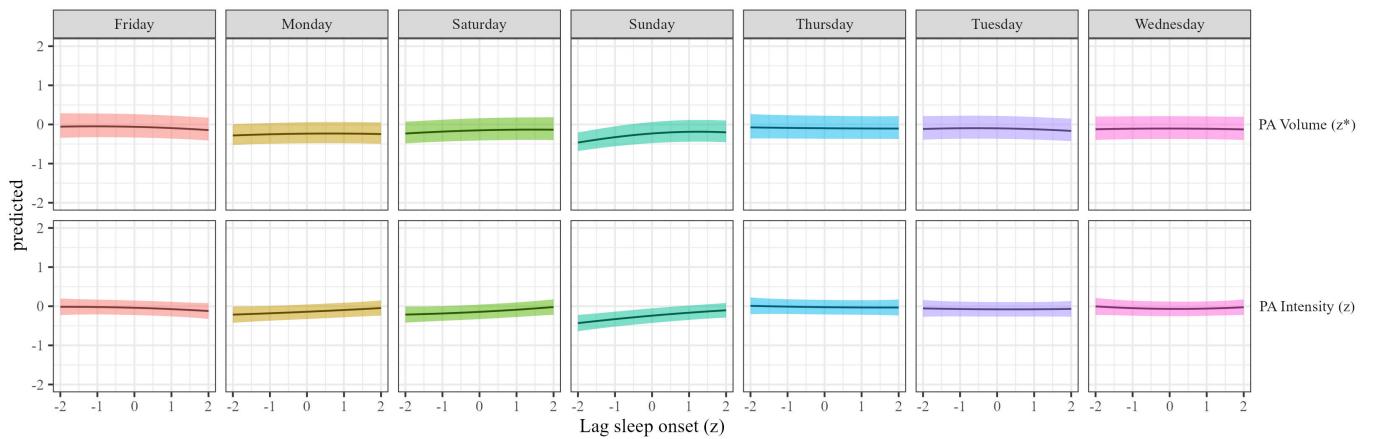


Figure 34. Physical activity by sleep onset moderated by weekday

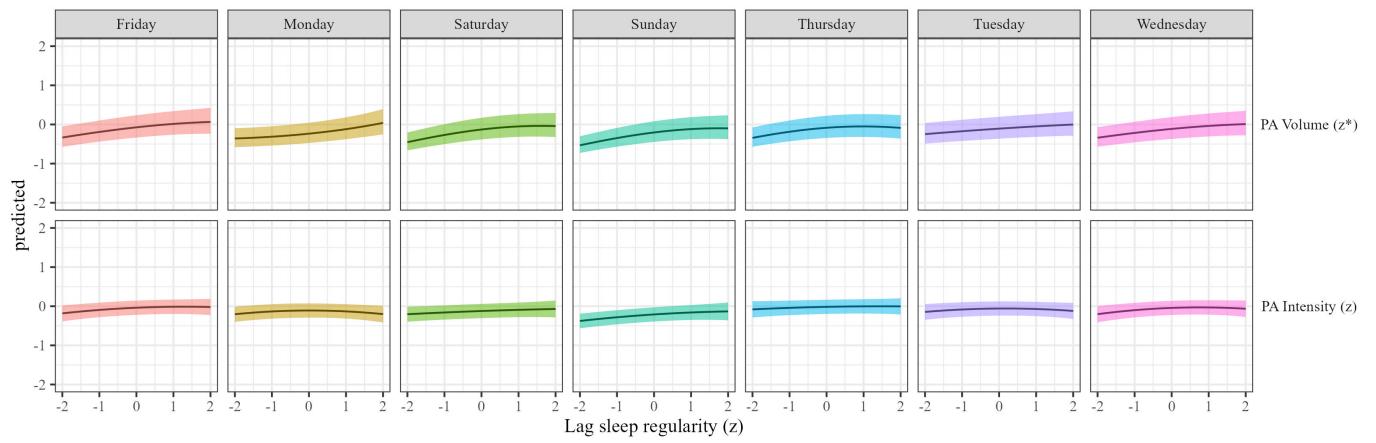


Figure 35. Physical activity by sleep regularity moderated by weekday

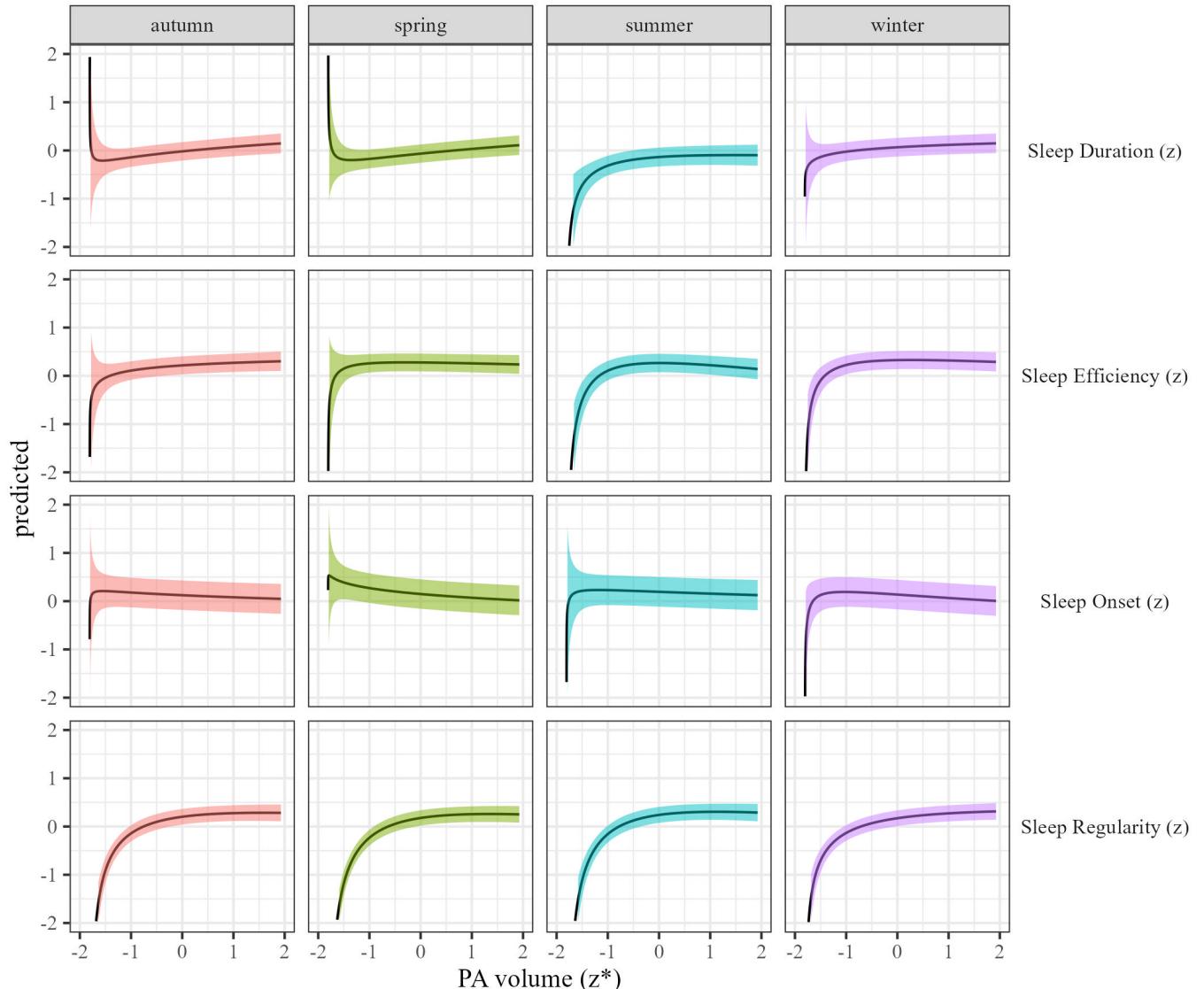


Figure 36. Sleep metrics on Physical activity volume by season

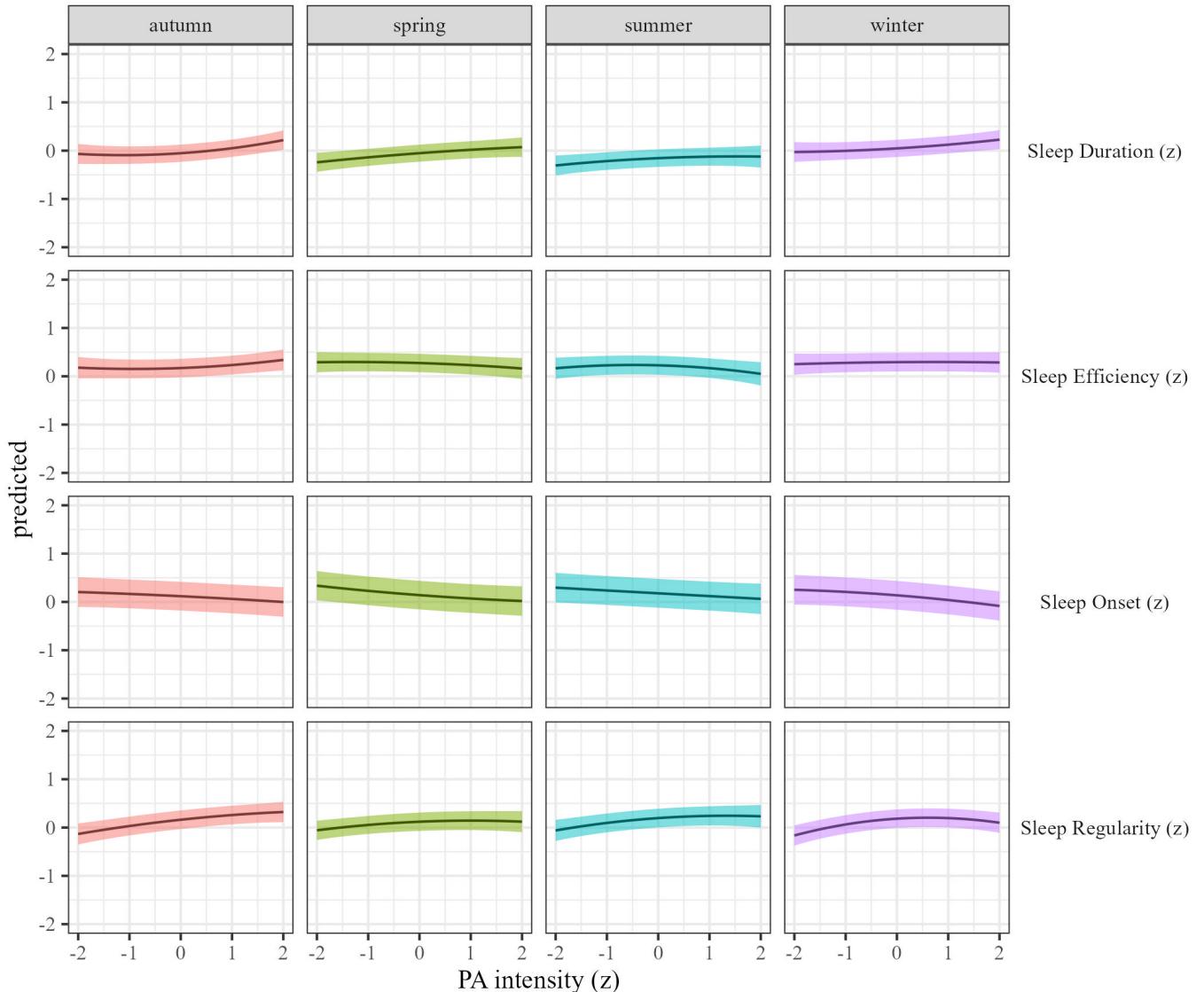


Figure 37. Sleep metrics on Physical activity intensity moderated by season

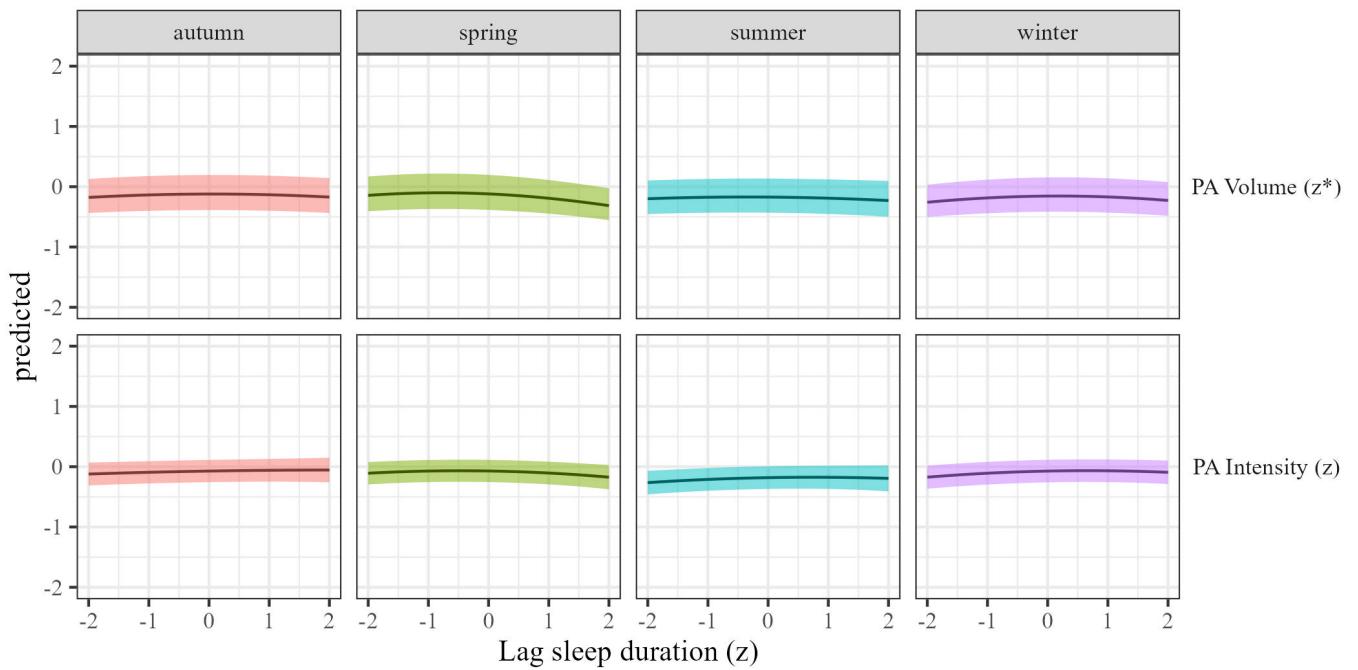


Figure 38. Physical activity by sleep duration moderated by season

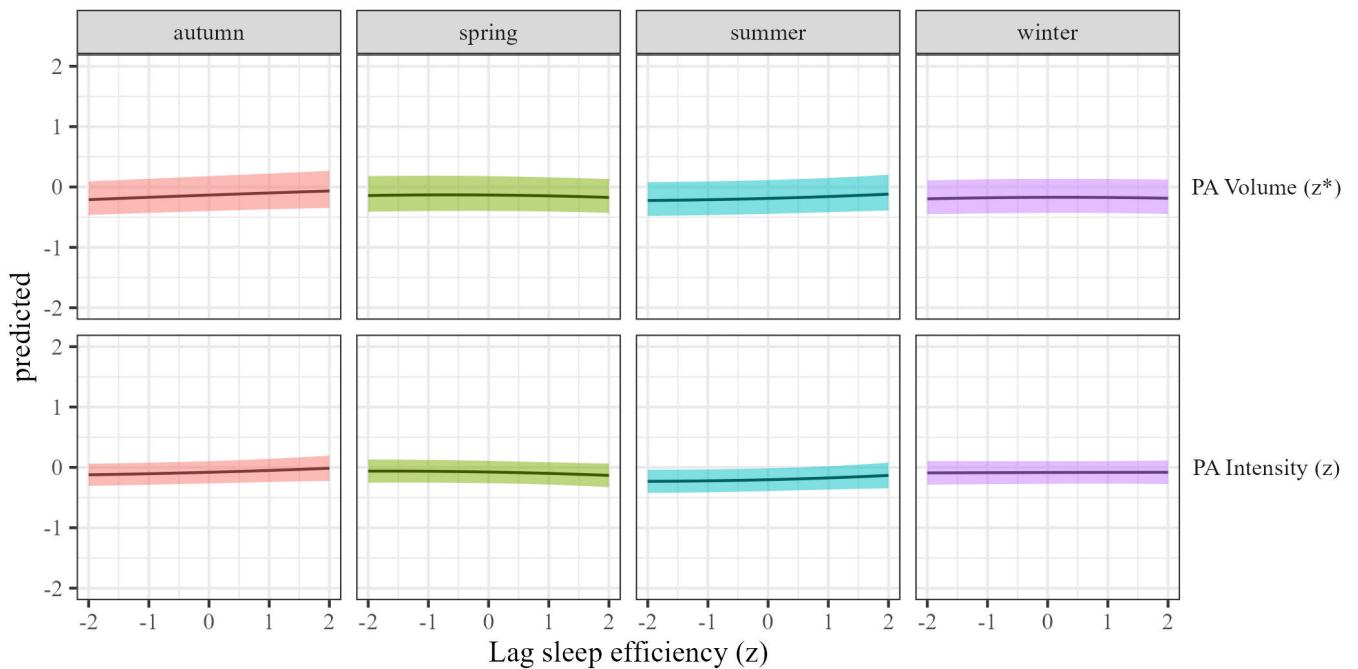


Figure 39. Physical activity by sleep efficiency moderated by season

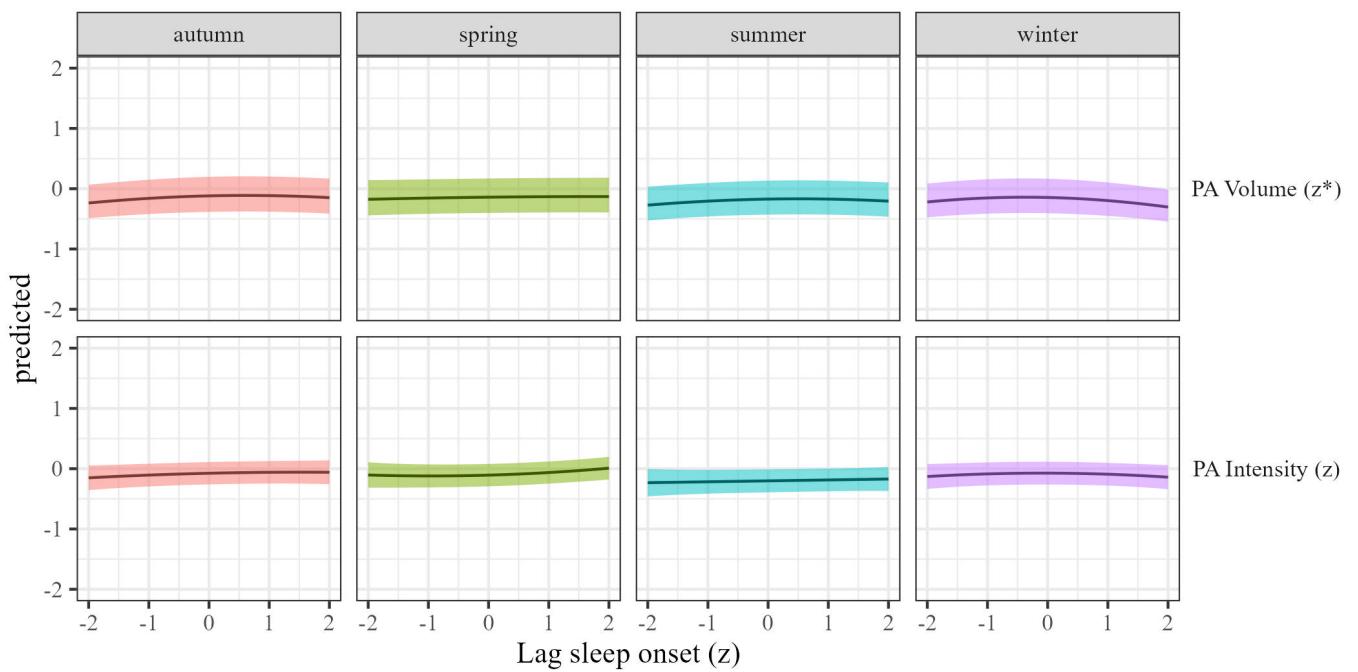


Figure 40. Physical activity by sleep onset moderated by season

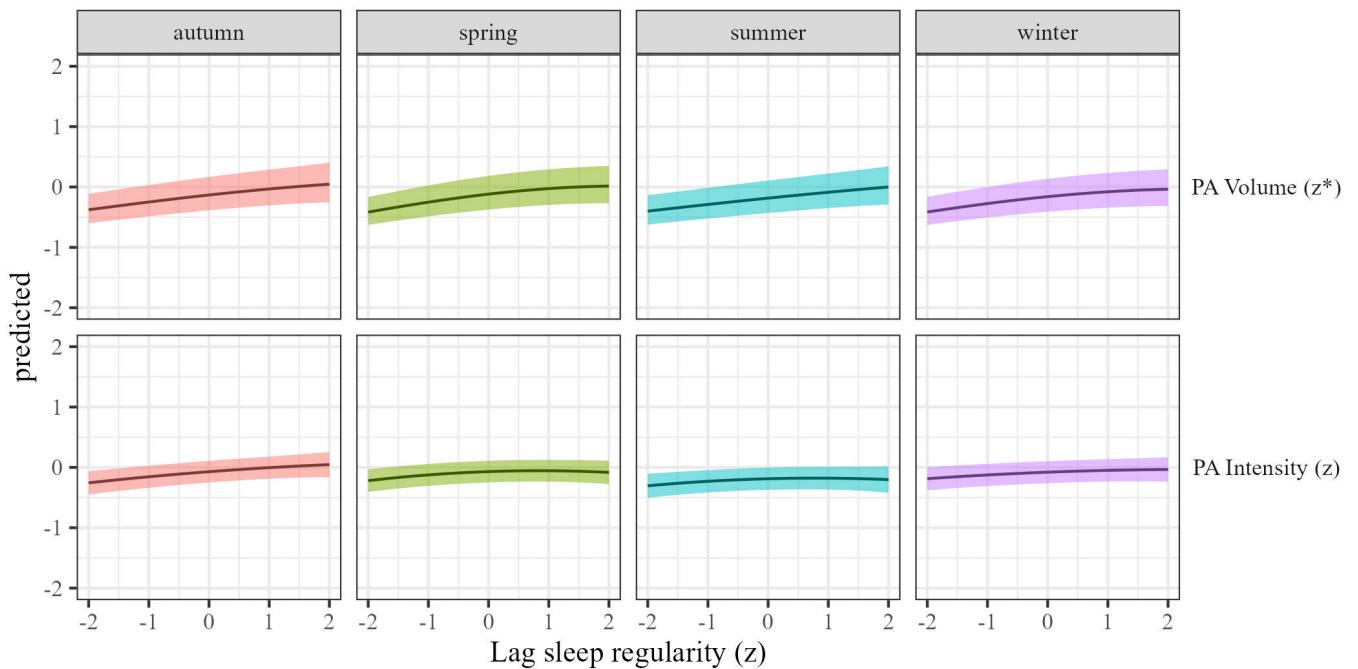


Figure 41. Physical activity by sleep regularity moderated by season

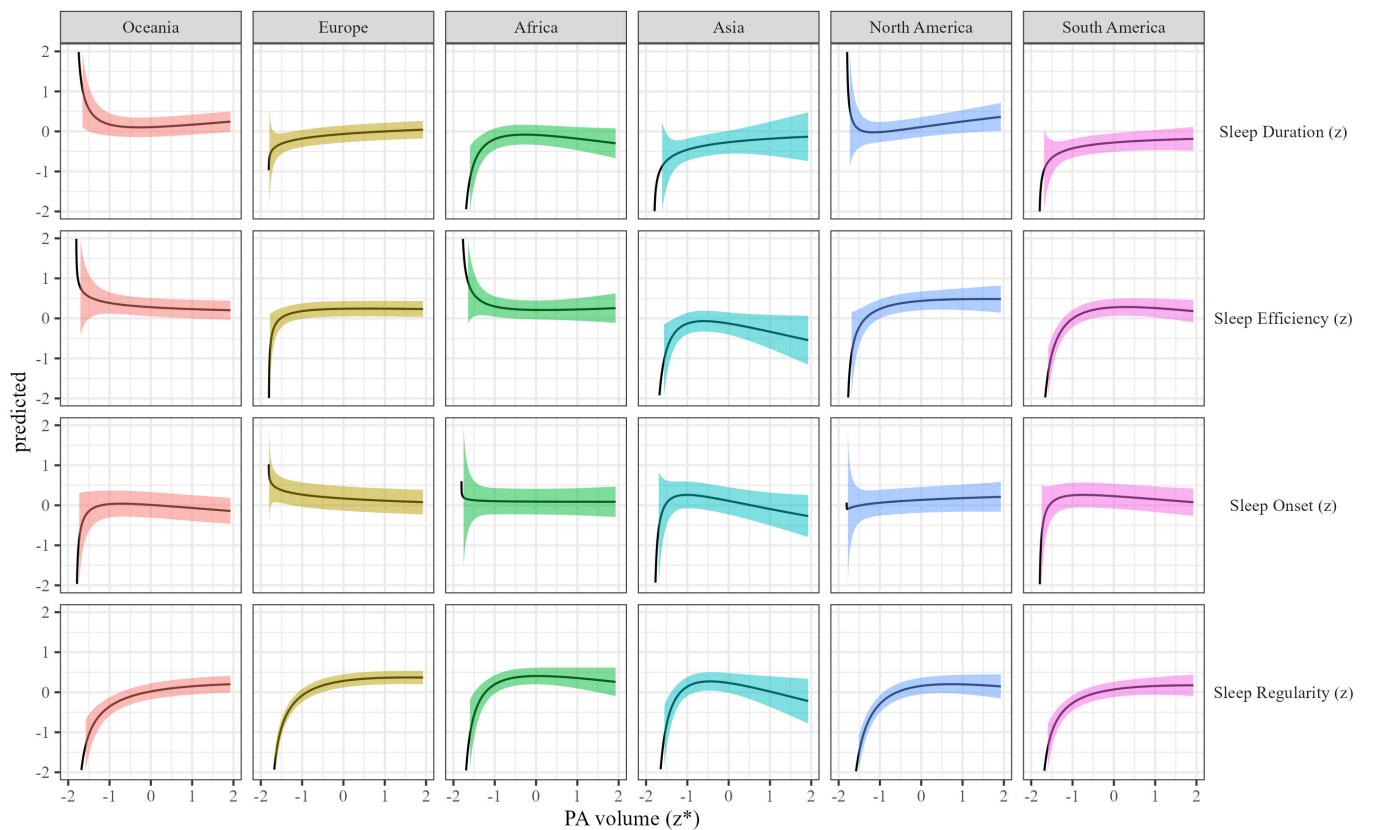


Figure 42. Sleep metrics on Physical activity volume by region

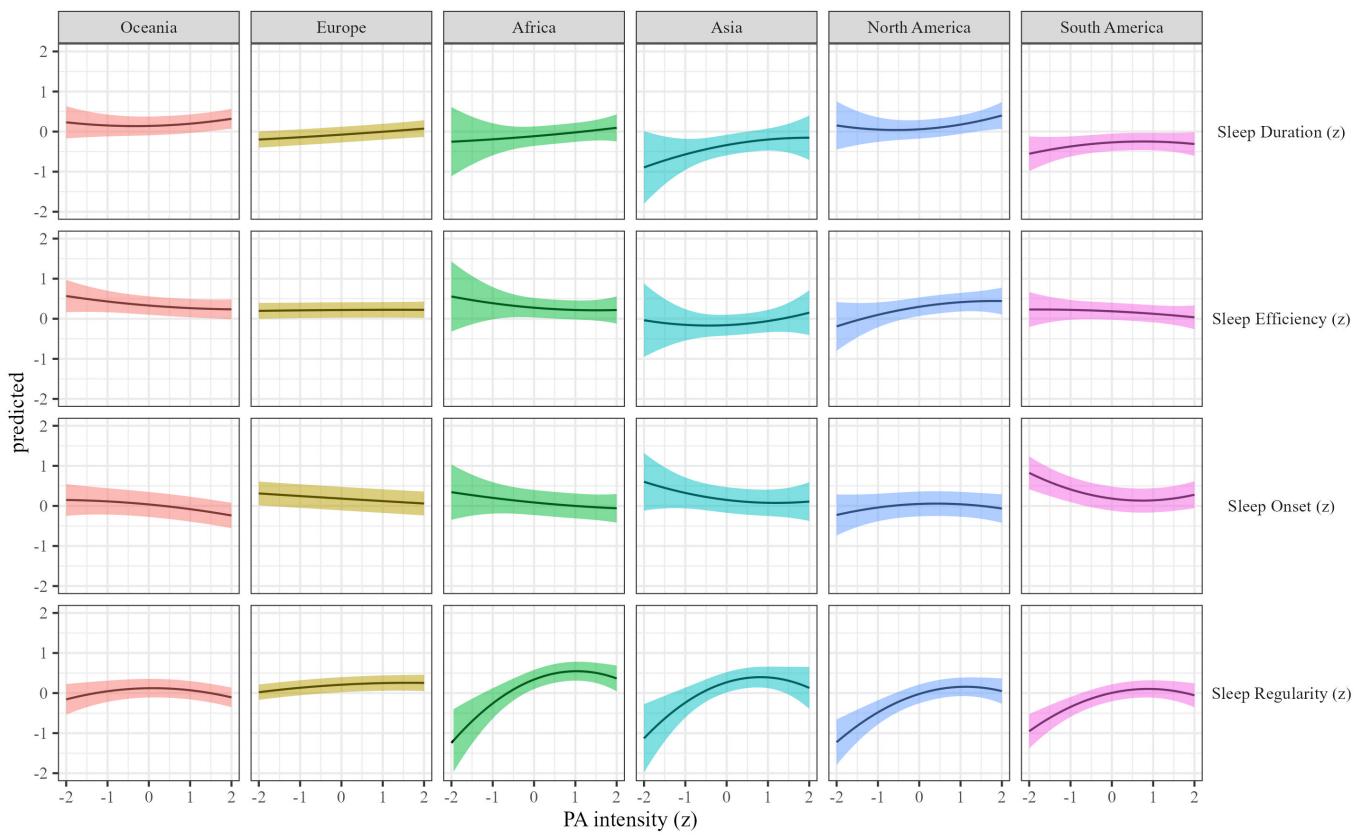


Figure 43. Sleep metrics on Physical activity intensity moderated by region

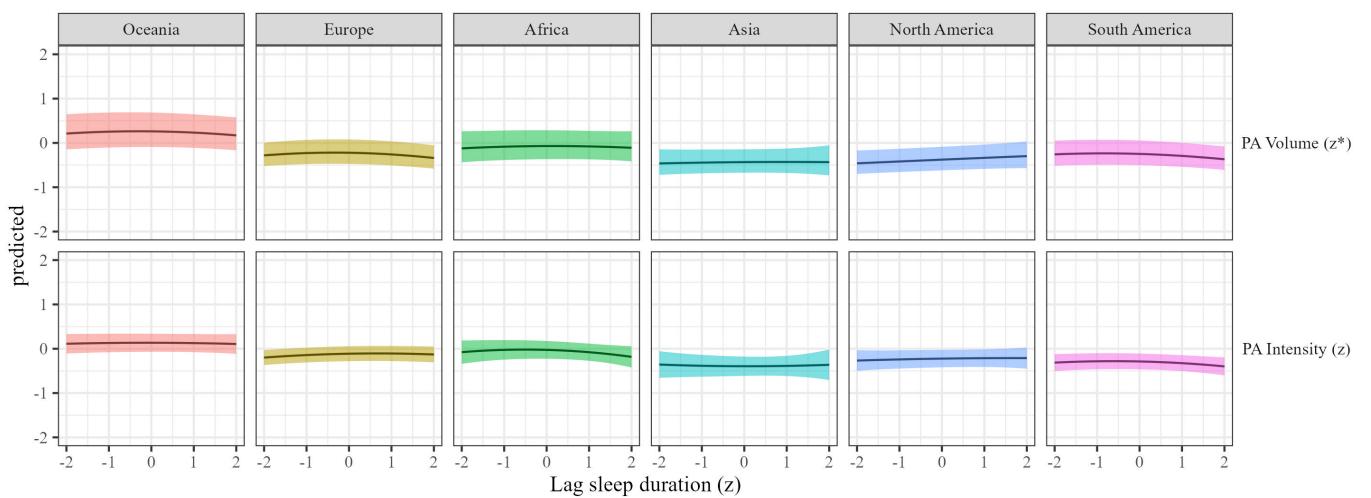


Figure 44. Physical activity by sleep duration moderated by region

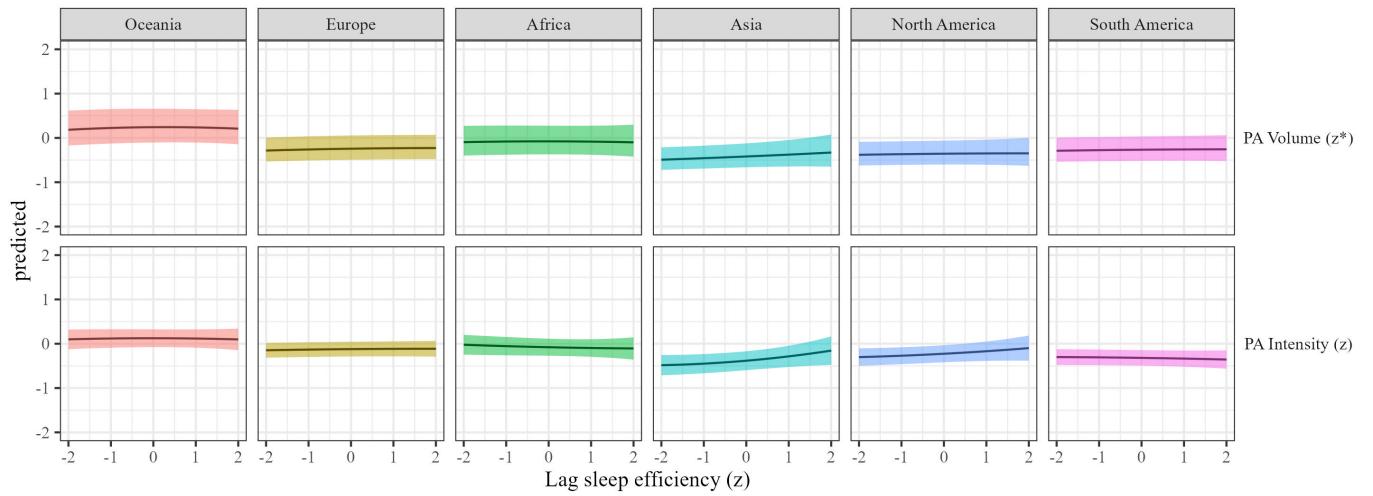


Figure 45. Physical activity by sleep efficiency moderated by region

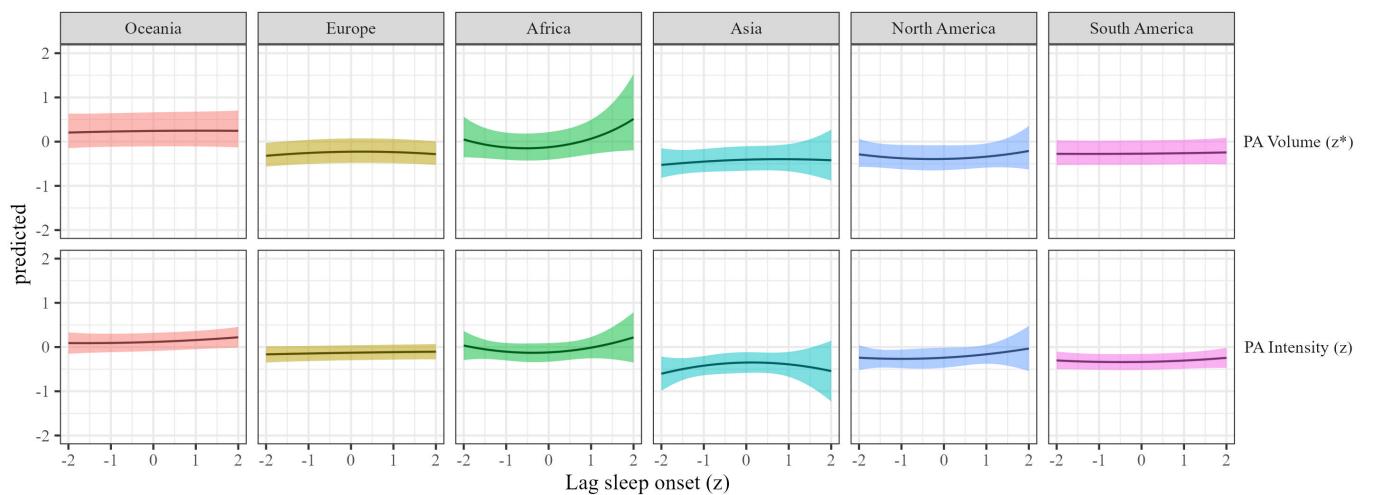


Figure 46. Physical activity by sleep onset moderated by region

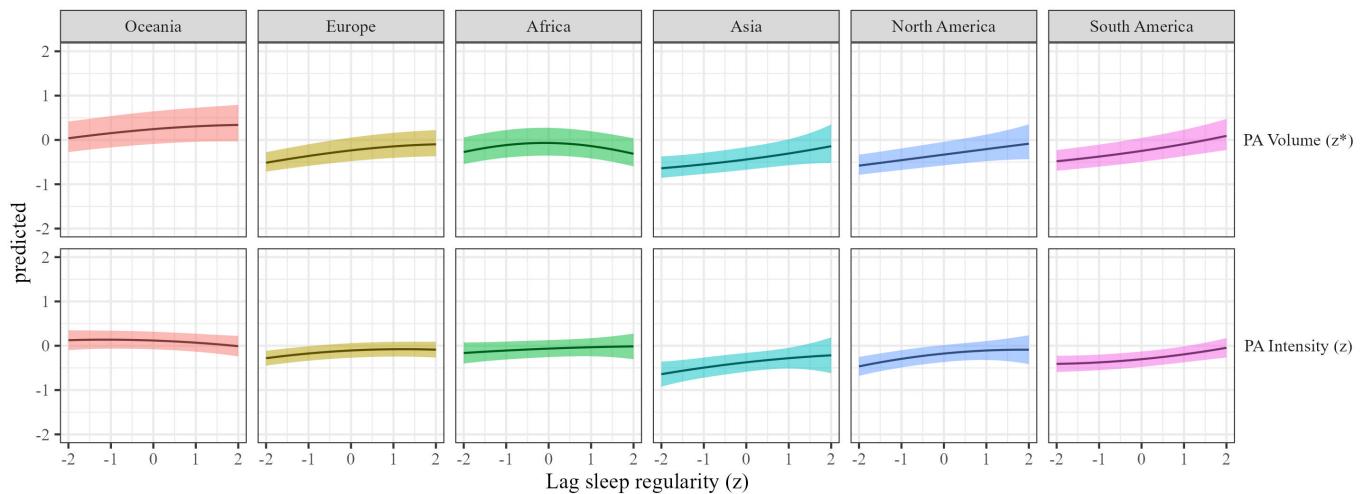


Figure 47. Physical activity by sleep regularity moderated by region

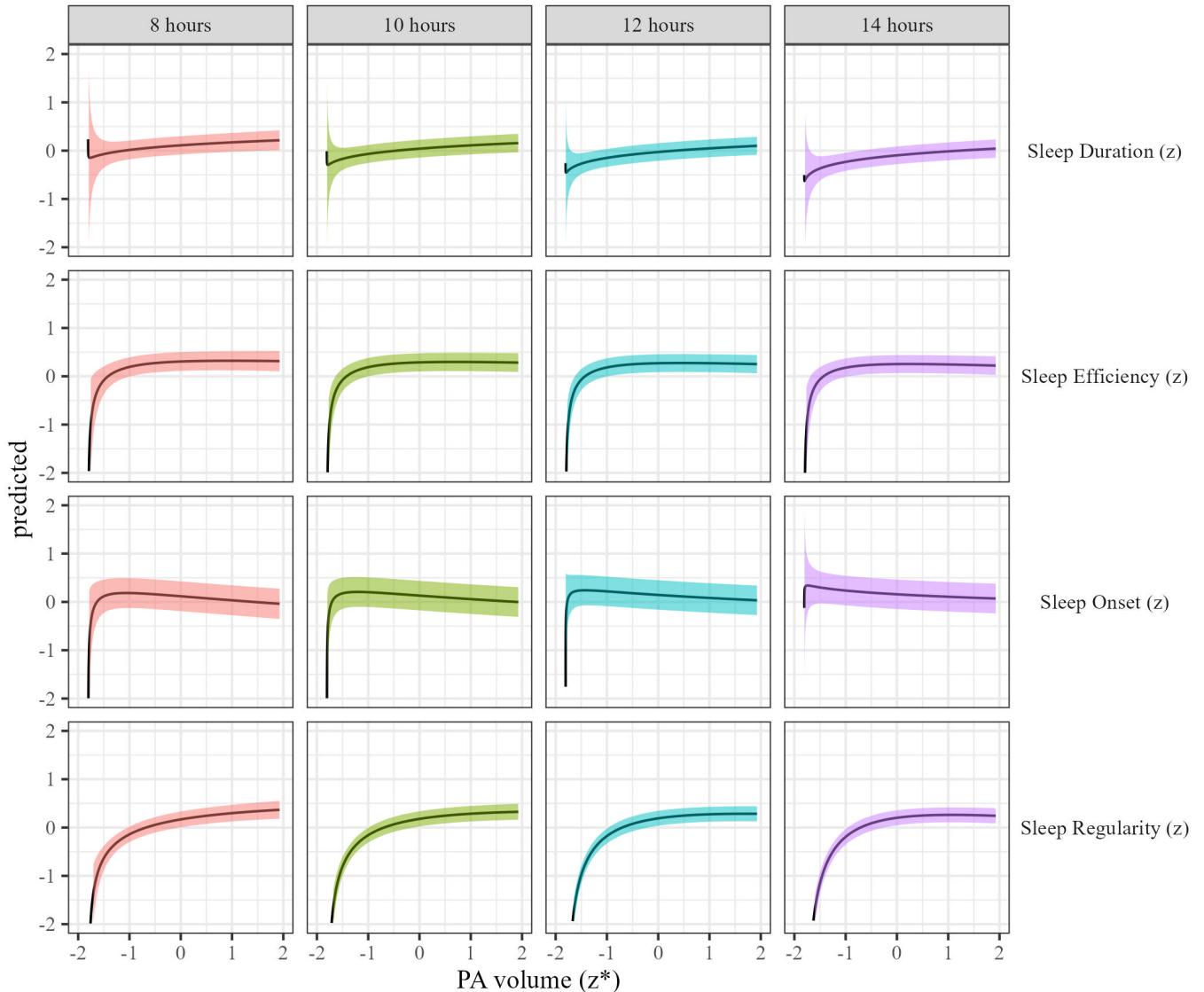


Figure 48. Sleep metrics on Physical activity volume by daylight hours

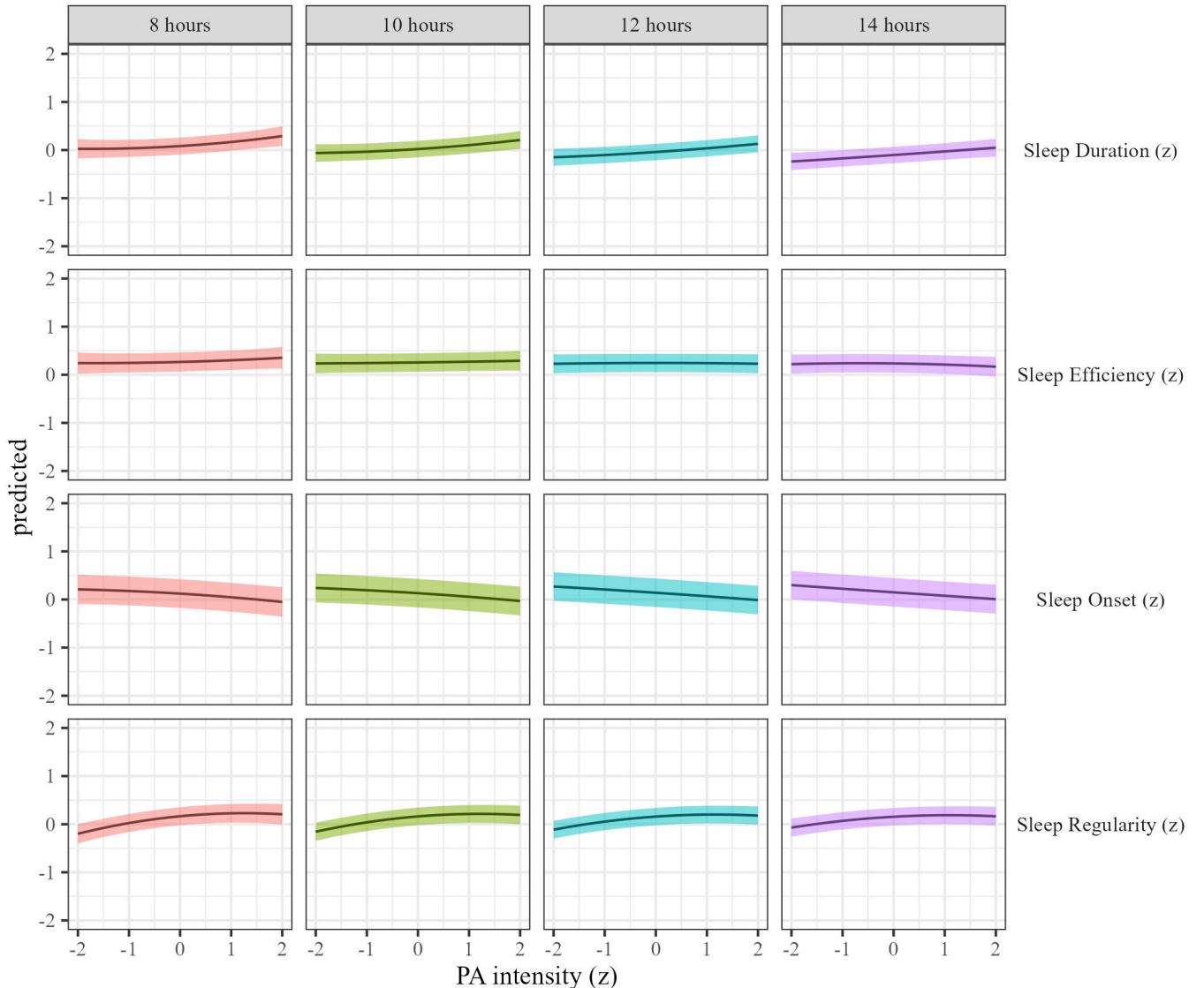
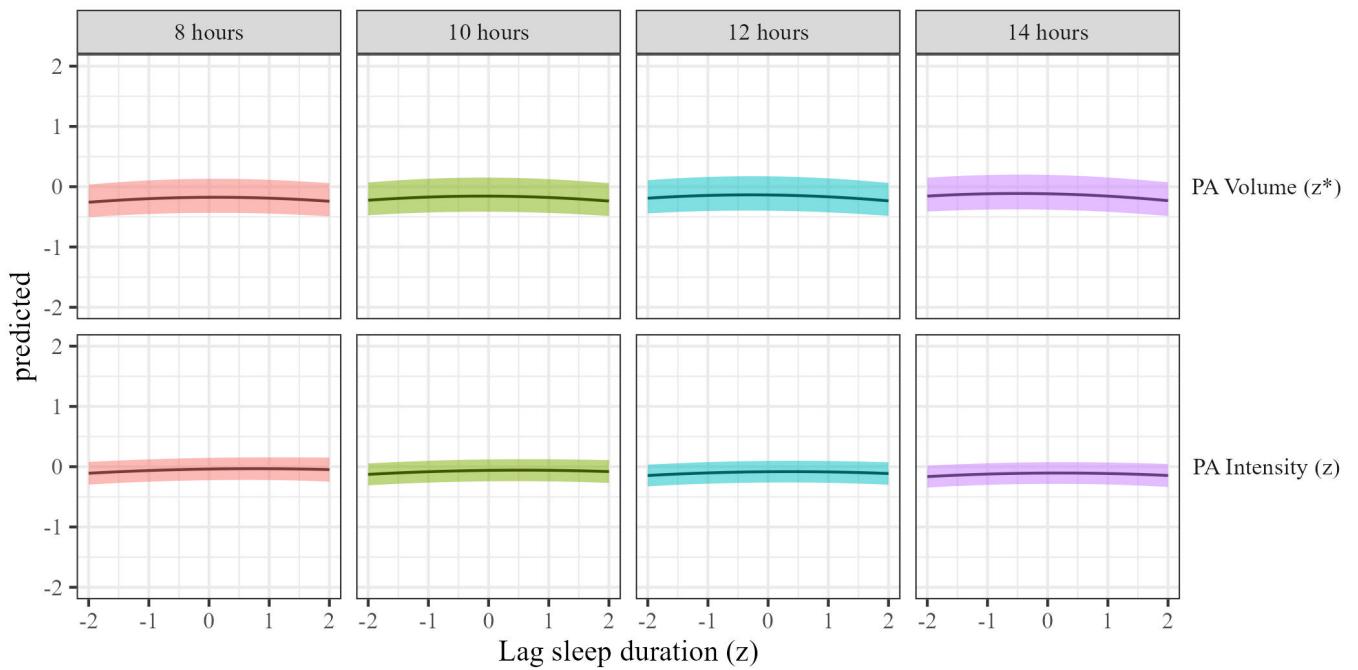
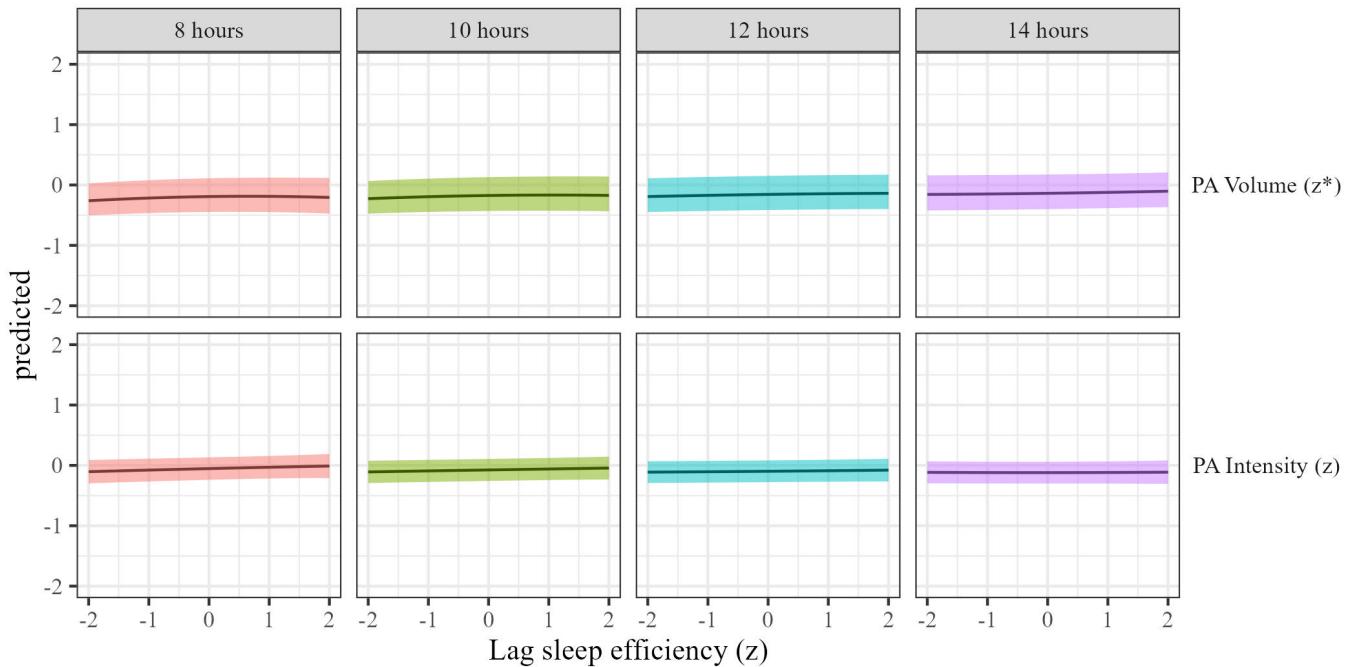


Figure 49. Sleep metrics on Physical activity intensity moderated by daylight hours



*Figure 50.* Physical activity by sleep duration moderated by daylight hours



*Figure 51.* Physical activity by sleep efficiency moderated by daylight hours

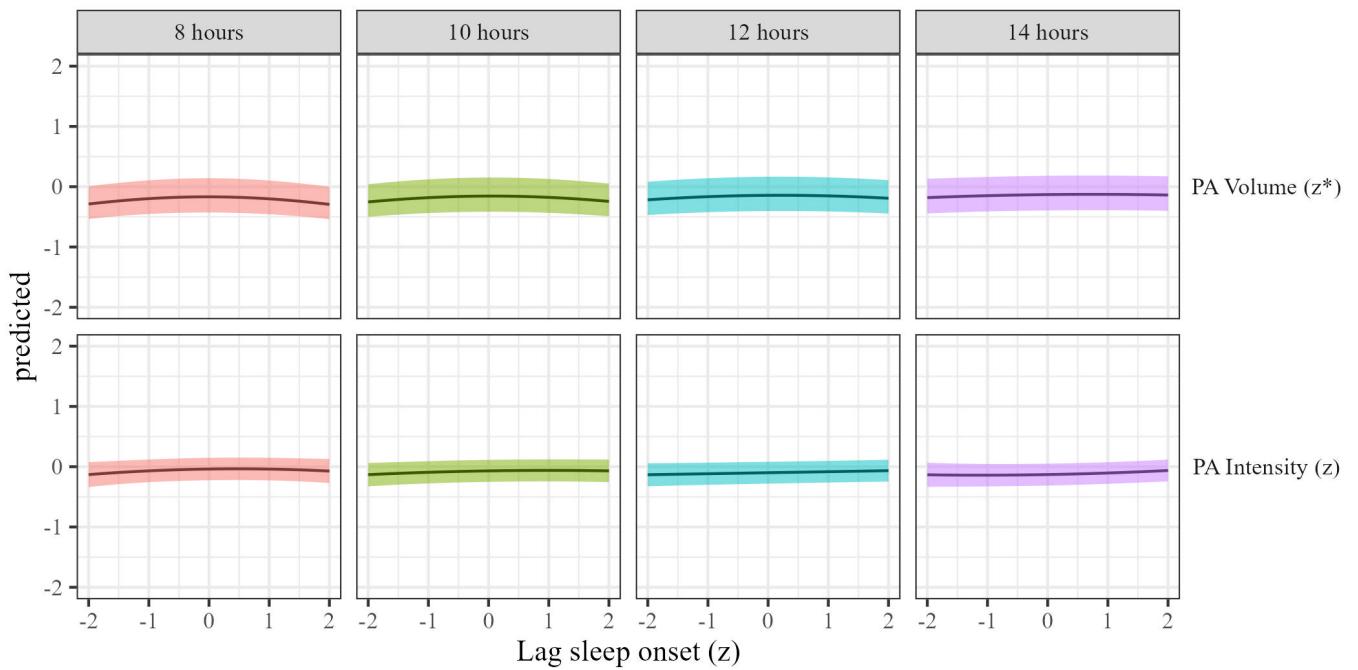


Figure 52. Physical activity by sleep onset moderated by daylight hours

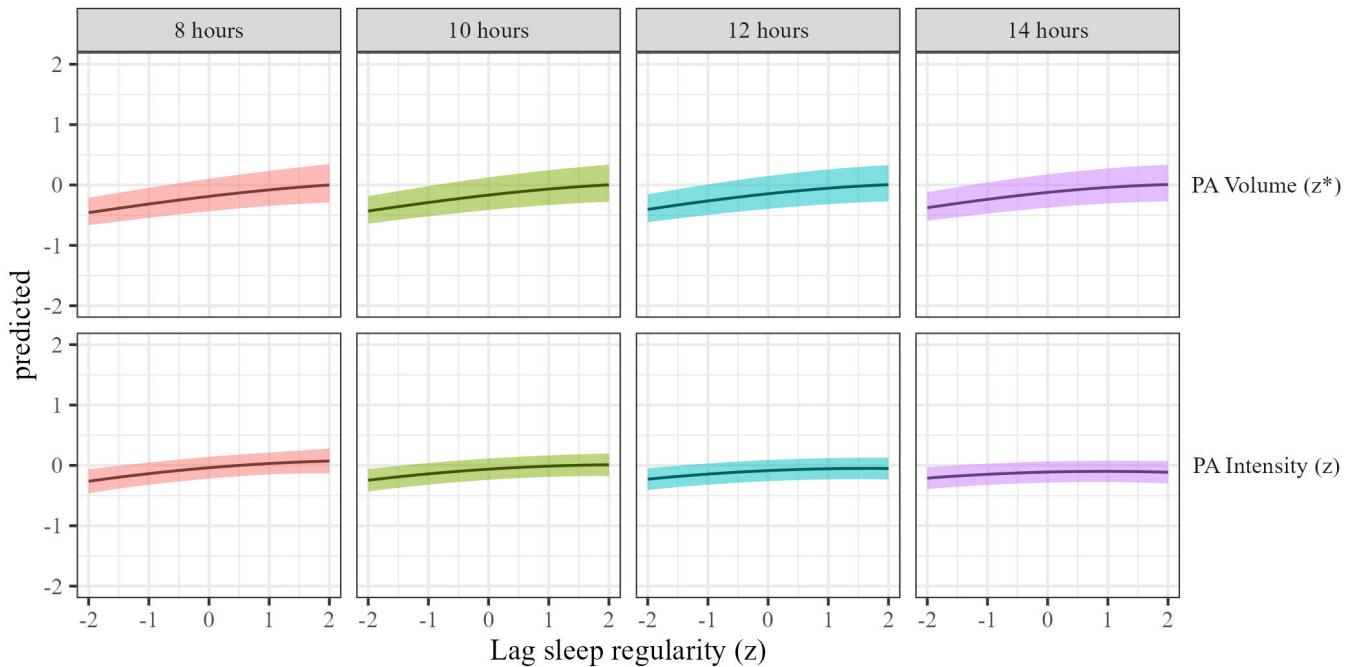


Figure 53. Physical activity by sleep regularity moderated by daylight hours

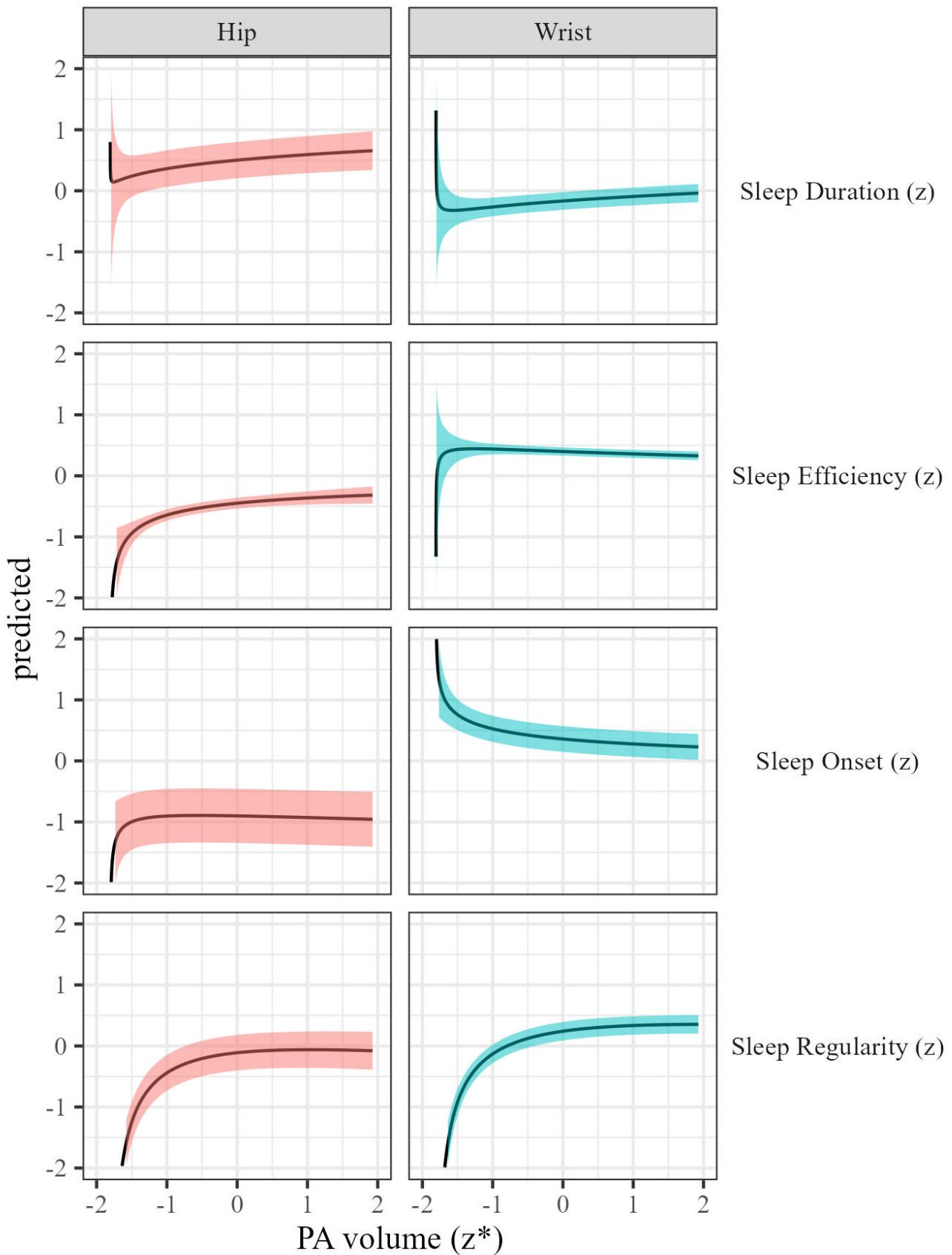


Figure 54. Sleep metrics on Physical activity volume by wear location

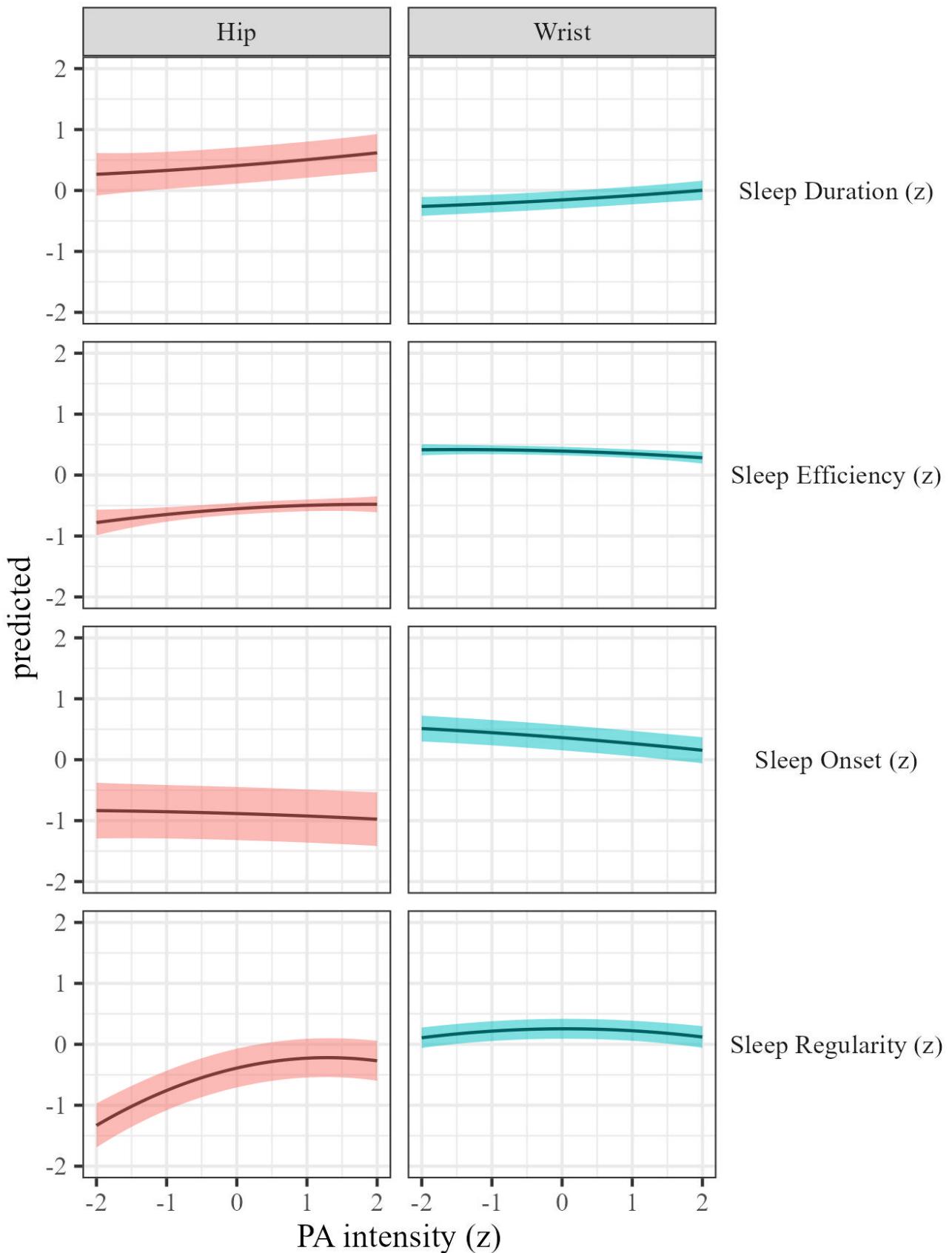


Figure 55. Sleep metrics on Physical activity intensity moderated by wear location

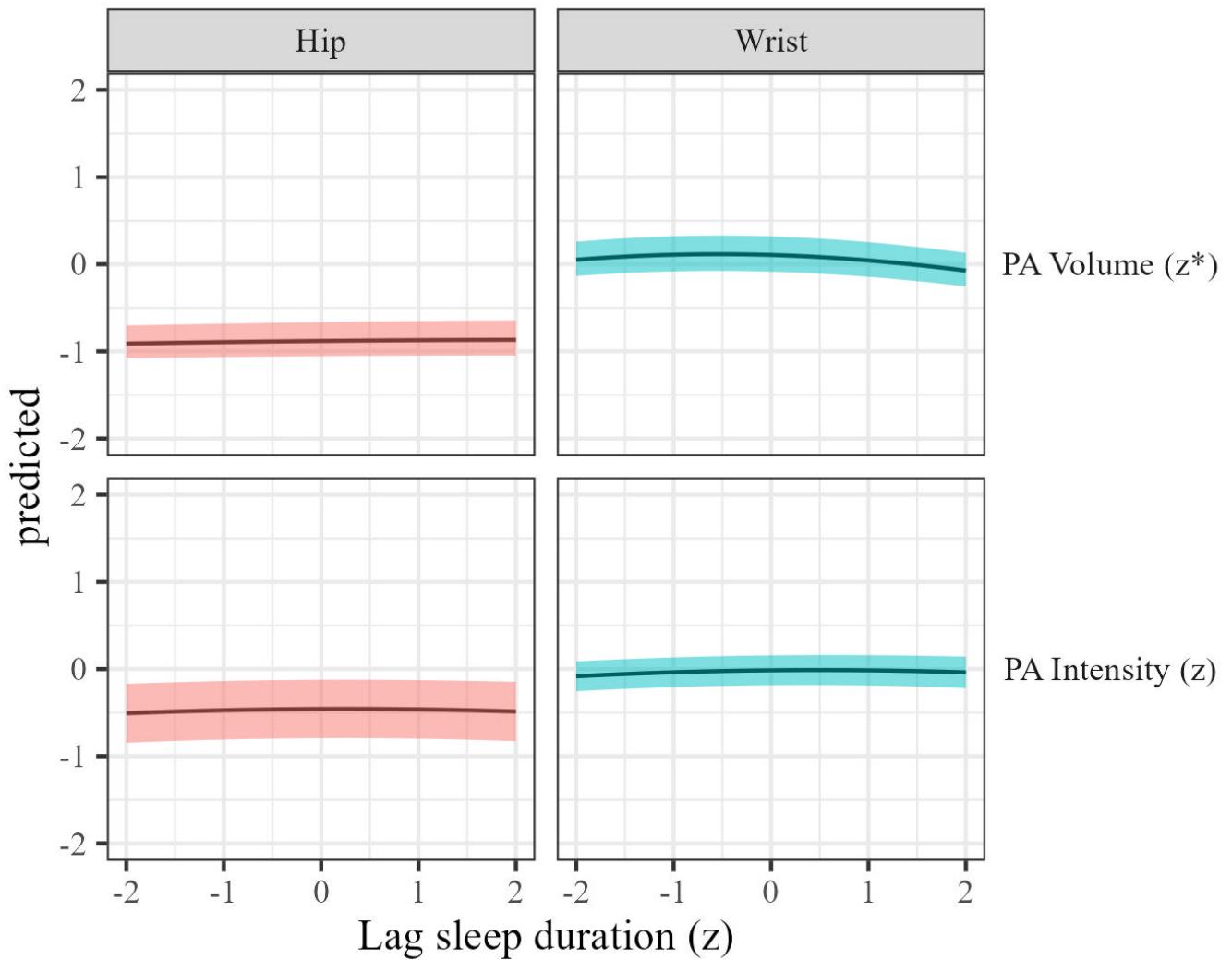


Figure 56. Physical activity by sleep duration moderated by wear location

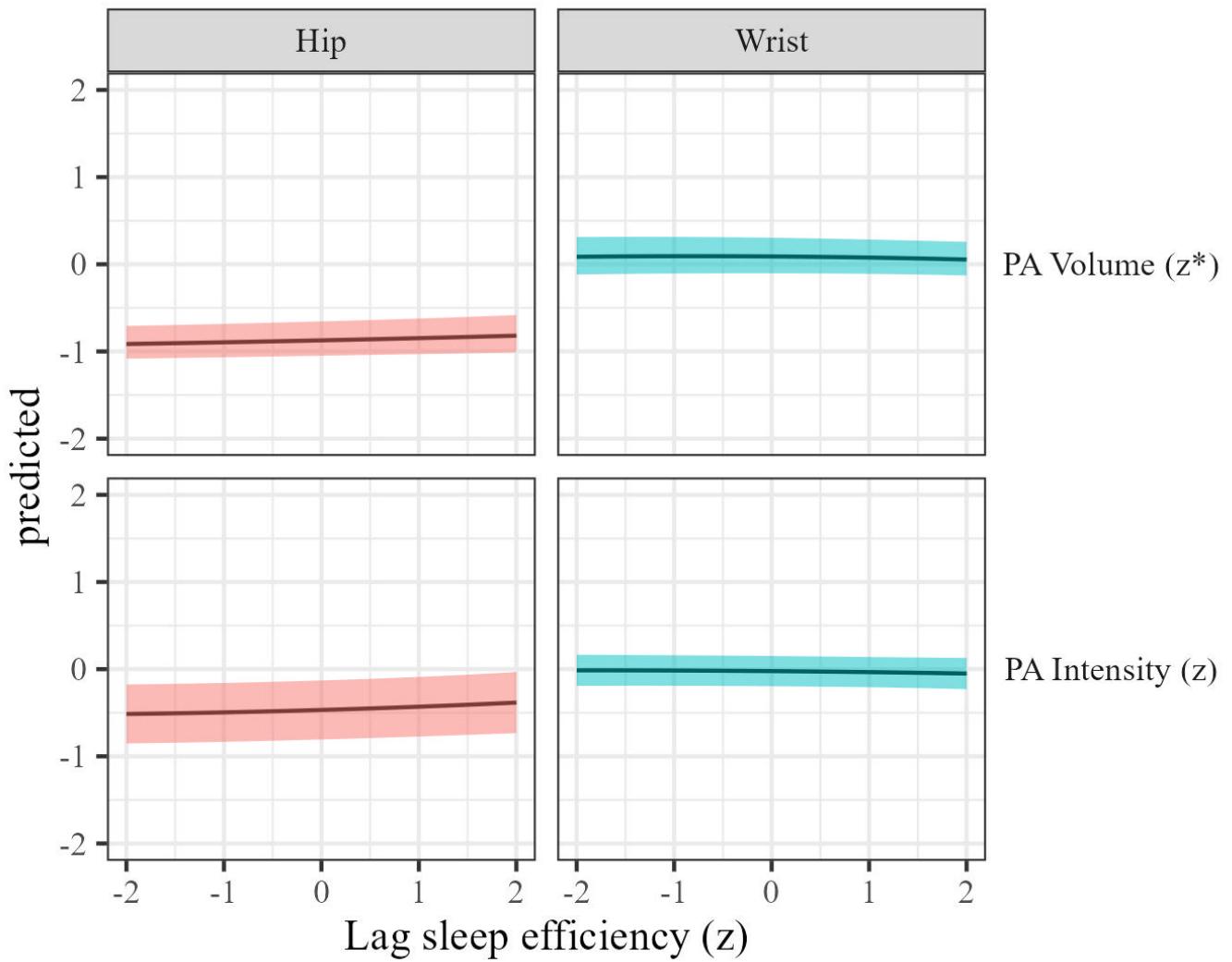


Figure 57. Physical activity by sleep efficiency moderated by wear location

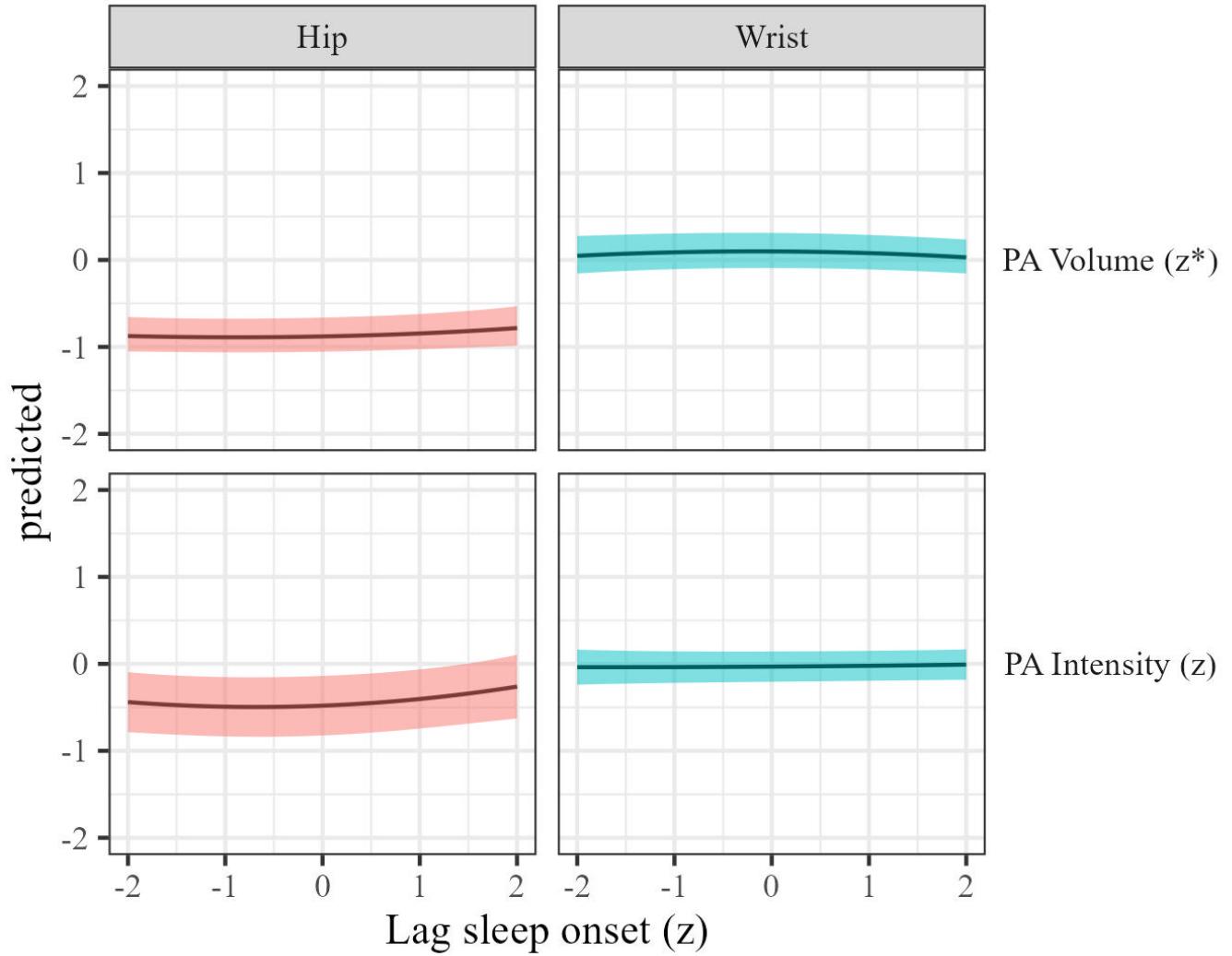


Figure 58. Physical activity by sleep onset moderated by wear location

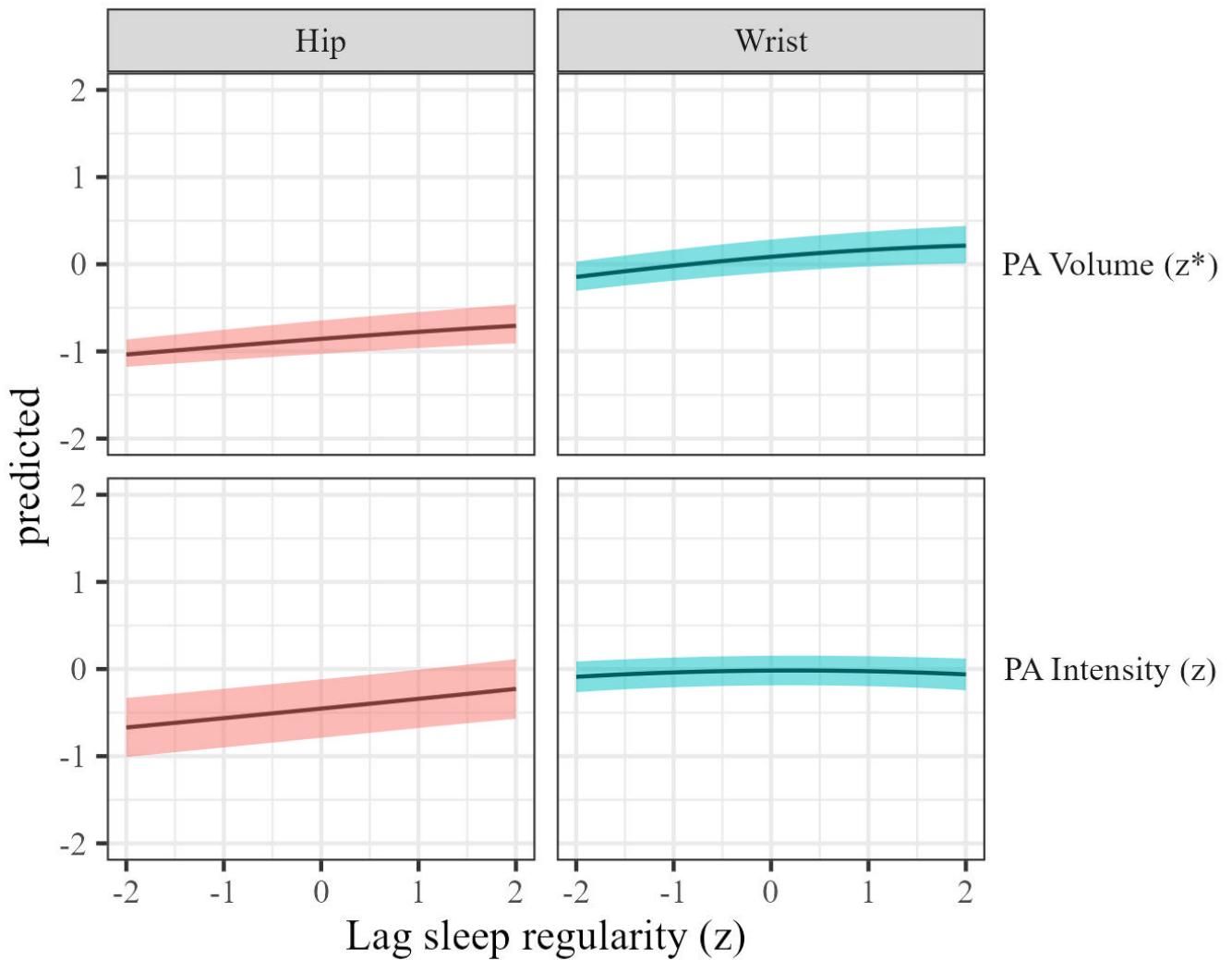


Figure 59. Physical activity by sleep regularity moderated by wear location

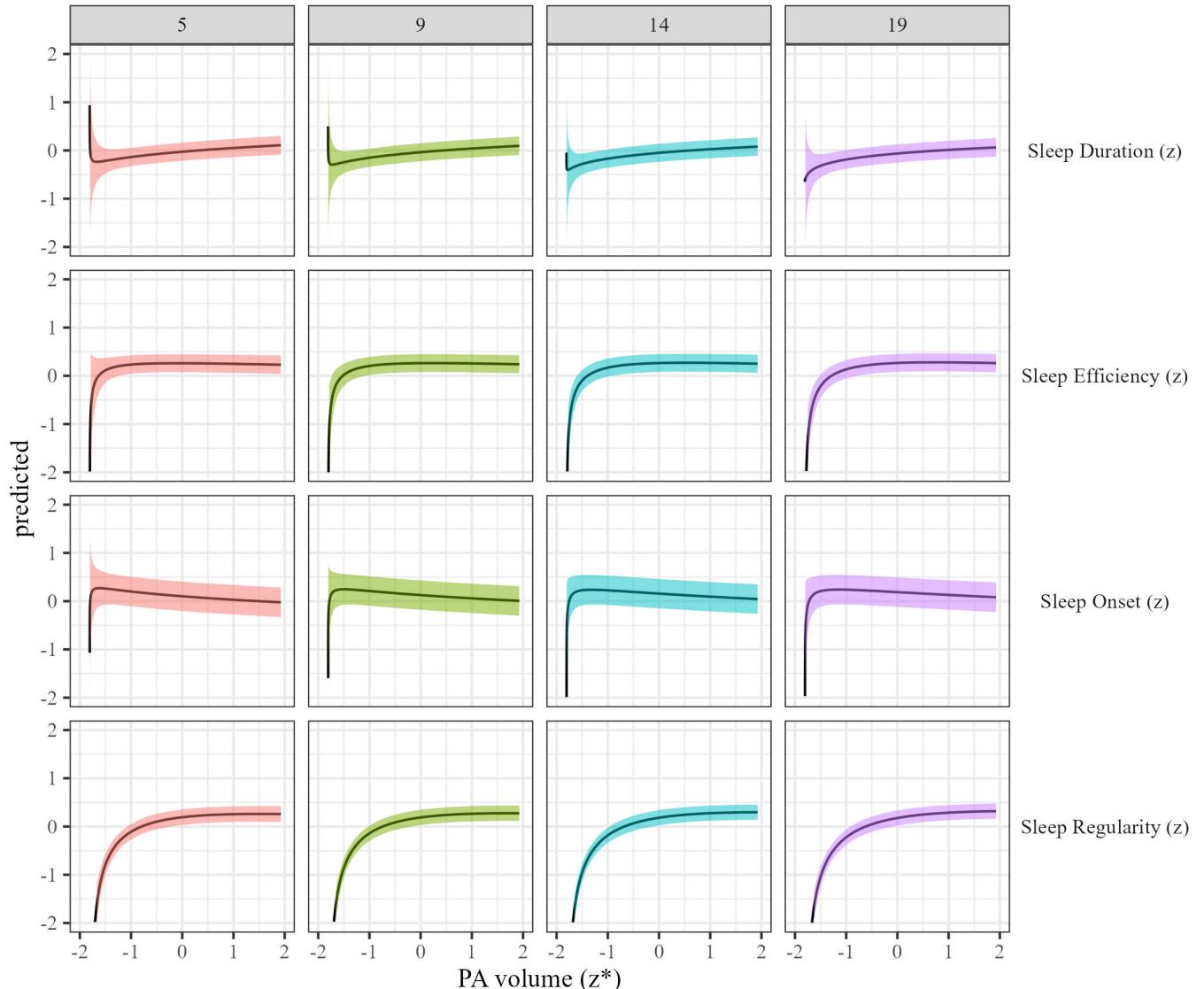


Figure 60. Sleep metrics on Physical activity volume by most active hour

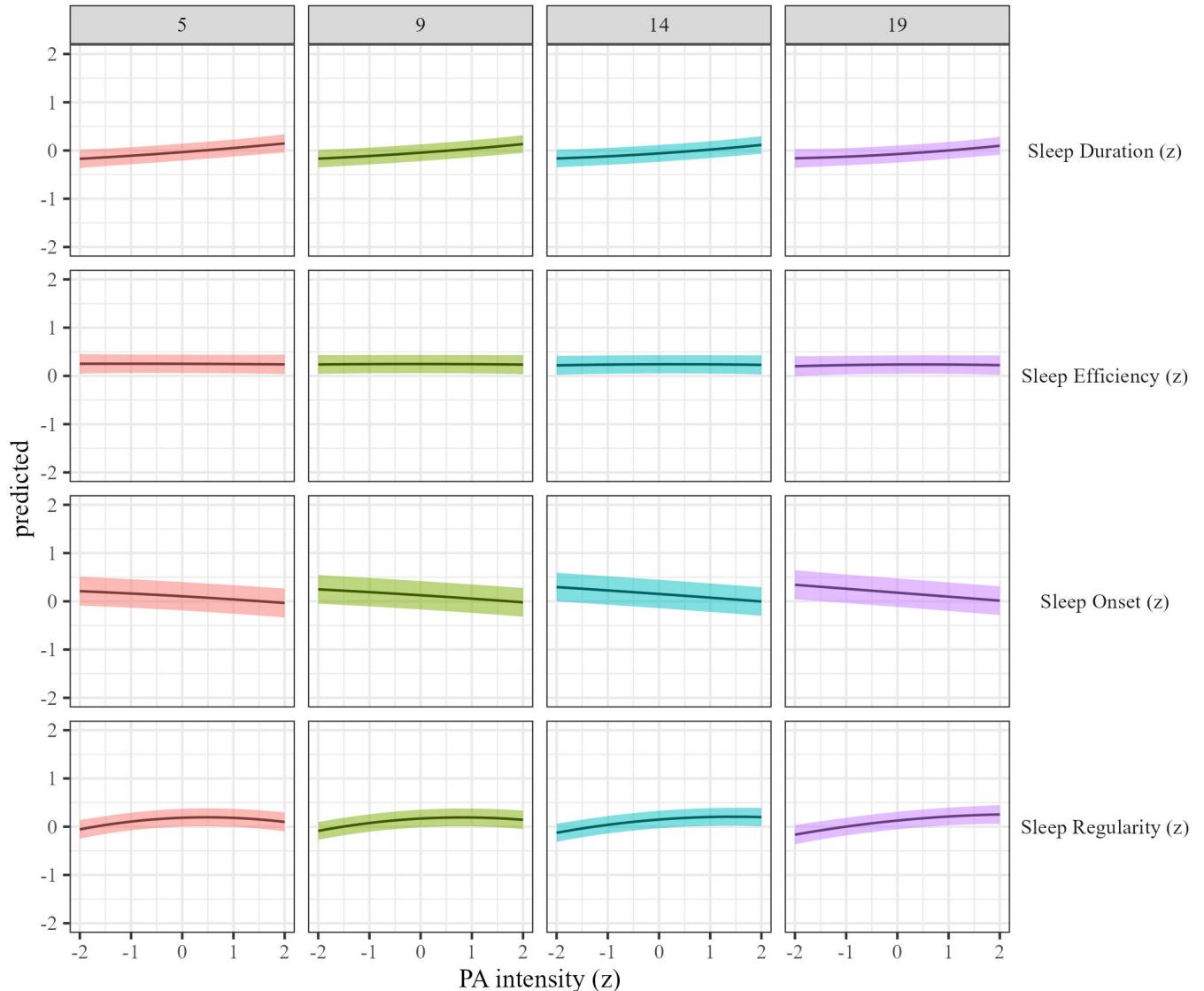


Figure 61. Sleep metrics on Physical activity intensity moderated by most active hour

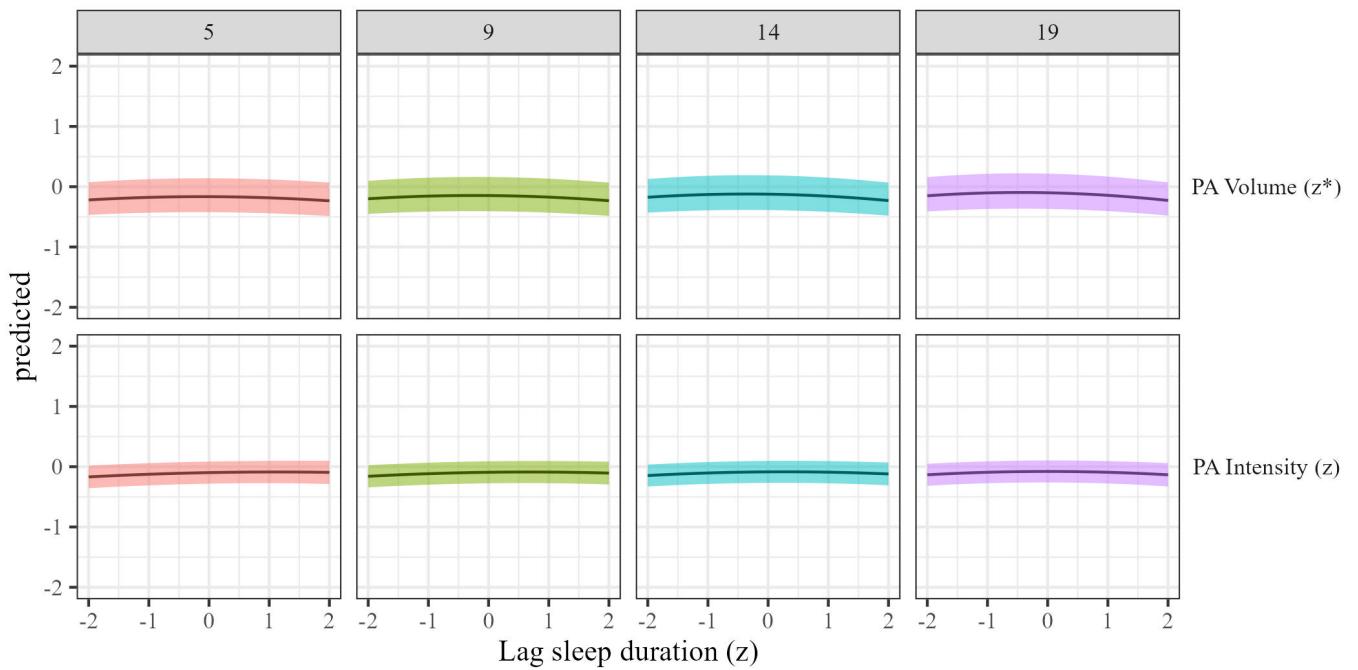


Figure 62. Physical activity by sleep duration moderated by most active hour

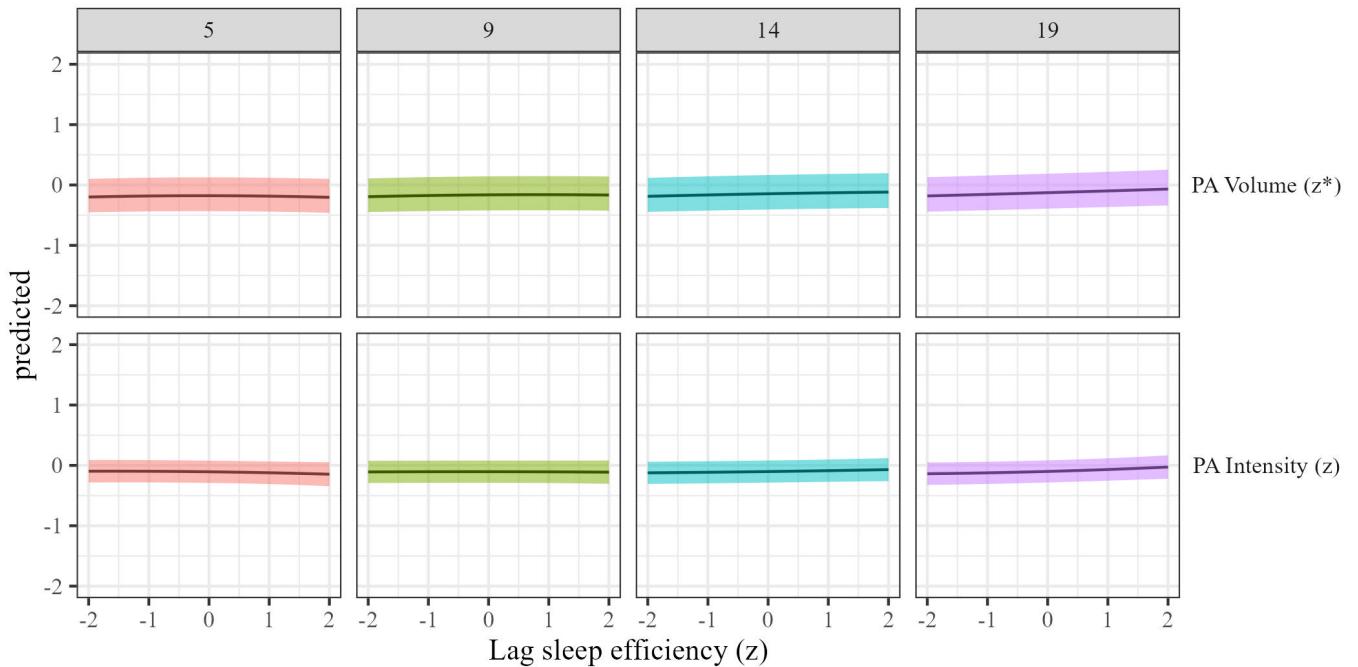


Figure 63. Physical activity by sleep efficiency moderated by most active hour

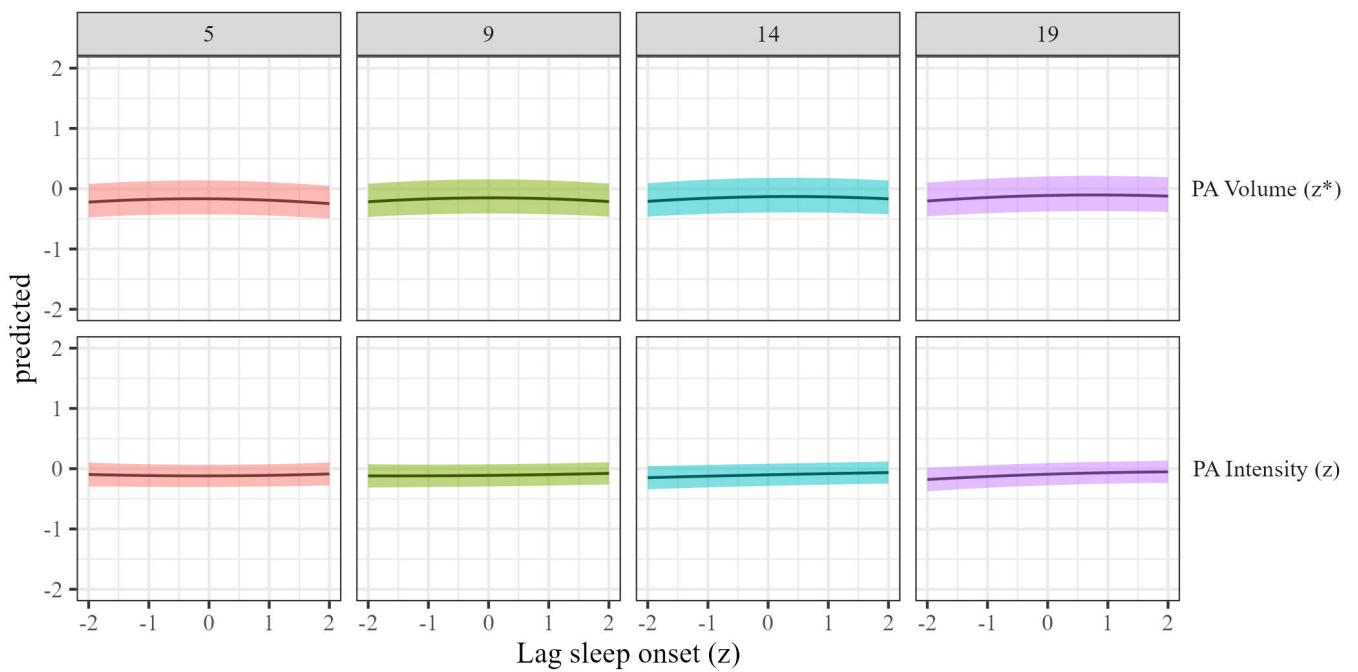


Figure 64. Physical activity by sleep onset moderated by most active hour

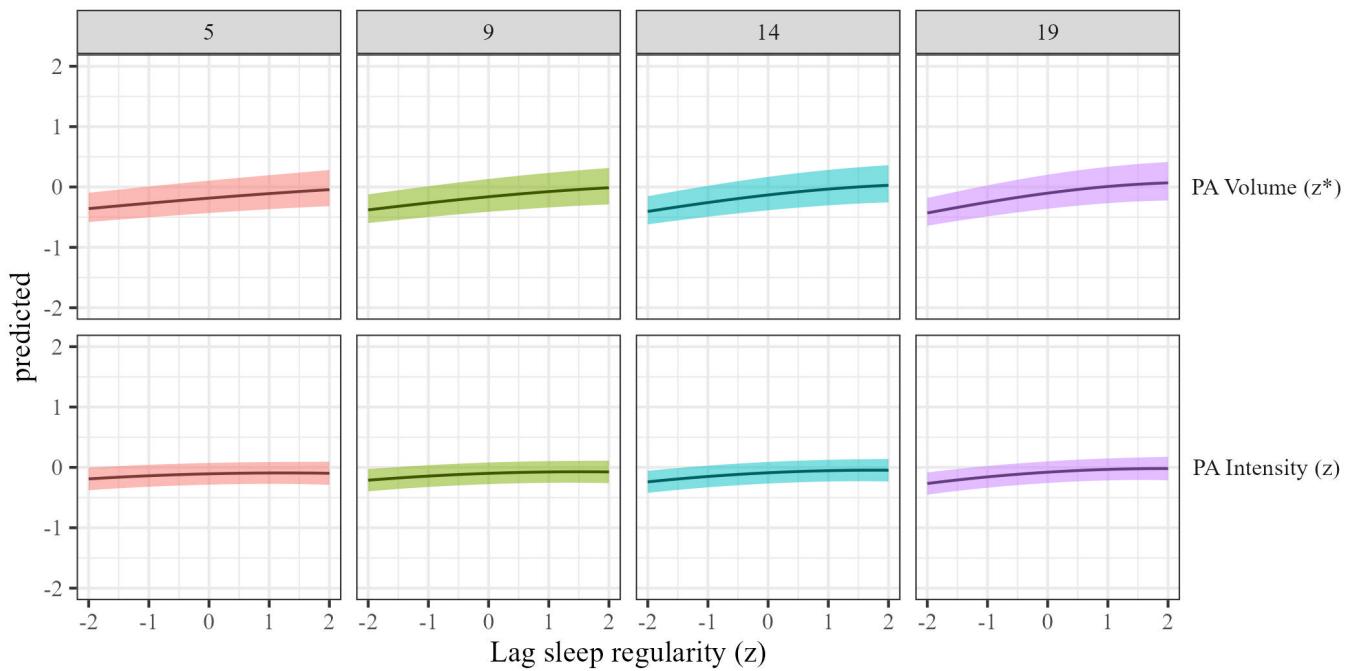


Figure 65. Physical activity by sleep regularity moderated by most active hour