Multiverse analysis

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

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Abstract

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

   Keywords: keywords

   Word count: X

Multiverse analysis

Results

Multiverse

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

The effects of physical activity volume on sleep

We estimated the effects of physical activity on sleep (RQ1) using mixed-effects models We estimated the effect of physical activity volume on sleep by age, and the results are presented in Table 1 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 1 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 2 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 2 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 2 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 2 and Figure 6.

Table 1

Physical activity on sleep controlling for SES, gender and BMI

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Sleep duration								
(Intercept)	0.51 [-0.42, 1.43]	0.47	1.07	.380	0.57 [-0.24, 1.39]	0.42	1.38	.282
Physical activity	-0.10 [-0.60, 0.41]	0.26	-0.37	.746	0.09 [-0.78, 0.95]	0.44	0.19	.865
Age	0.00 [-0.01, 0.00]	0.00	-1.07	.329	0.00 [-0.01, 0.00]	0.00	-1.17	.284
Physical activity^2	0.01 [-0.05, 0.06]	0.03	0.26	.818	-0.03 [-0.23, 0.16]	0.10	-0.33	.770
Physical activity × age	0.00 [0.00, 0.01]	0.00	0.49	.671	0.00 [-0.01, 0.01]	0.01	-0.21	.855
Age × Physical activity^2	0.00 [0.00, 0.00]	0.00	-0.36	.747	0.00 [0.00, 0.00]	0.00	0.26	.820
Sleep efficency								
(Intercept)	-0.36 [-1.05, 0.34]	0.35	-1.01	.401	-0.44 [-1.09, 0.21]	0.33	-1.33	.291
Physical activity	0.08 [-0.34, 0.49]	0.21	0.35	.757	0.05 [-0.54, 0.64]	0.30	0.17	.882
Age	0.00 [-0.01, 0.01]	0.00	0.15	.888	0.00 [0.00, 0.01]	0.00	0.52	.609
Physical activity^2	-0.01 [-0.06, 0.03]	0.02	-0.59	.614	0.00 [-0.17, 0.18]	0.09	0.03	.976
Physical activity × age	0.00 [-0.01, 0.00]	0.00	-0.76	.523	0.00 [-0.01, 0.01]	0.00	-0.23	.838
Age × Physical activity^2	0.00 [0.00, 0.00]	0.00	0.84	.440	0.00 [0.00, 0.00]	0.00	-0.23	.838
Sleep onset								
(Intercept)	-0.82 [-1.37, -0.26]	0.28	-2.88	.075	-0.81 [-1.39, -0.23]	0.30	-2.72	.092
Physical activity	0.29 [-0.24, 0.83]	0.27	1.09	.393	-0.30 [-0.88, 0.28]	0.29	-1.02	.415
Age	0.00 [0.00, 0.01]	0.00	0.88	.404	0.00 [0.00, 0.00]	0.00	0.10	.921
Physical activity^2	-0.04 [-0.12, 0.04]	0.04	-1.02	.414	0.06 [-0.07, 0.19]	0.07	0.90	.460
Physical activity × age	-0.01 [-0.01, 0.00]	0.00	-1.25	.338	0.00 [-0.01, 0.01]	0.00	0.79	.511
Age × Physical activity^2	0.00 [0.00, 0.00]	0.00	1.03	.399	0.00 [0.00, 0.00]	0.00	-0.90	.445
Sleep regularity								

Table 1 continued

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
(Intercept)	0.32 [-0.01, 0.64]	0.17	1.88	.143	0.25 [-0.16, 0.67]	0.21	1.20	.318
Physical activity	0.24 [0.02, 0.45]	0.11	2.17	.158	0.05 [-0.46, 0.56]	0.26	0.19	.868
Age	0.00 [0.00, 0.01]	0.00	0.56	.586	0.00 [0.00, 0.00]	0.00	-0.33	.740
Physical activity^2	-0.03 [-0.07, 0.02]	0.02	-1.15	.361	0.01 [-0.16, 0.19]	0.09	0.15	.894
Physical activity $\times$ age	0.00 [0.00, 0.00]	0.00	-0.50	.658	0.00 [-0.01, 0.01]	0.00	-0.15	.894
Age $\times$ Physical activity^2	0.00 [0.00, 0.00]	0.00	-1.45	.250	0.00 [0.00, 0.00]	0.00	-0.41	.723

Note. Adjusted for SES, BMI, and sex.

Table 2

Sleep on physical activity controlling for SES, gender and BMI

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
Sleep duration								
(Intercept)	0.23 [-0.15, 0.62]	0.20	1.20	.282	0.71 [0.10, 1.31]	0.31	2.30	.112
Sleep duration	-0.03 [-0.09, 0.03]	0.03	-0.99	.394	0.04 [-0.08, 0.16]	0.06	0.58	.616
Age	-0.01 [-0.02, -0.01]	0.00	-5.39	.002	-0.02 [-0.02, -0.01]	0.00	-6.08	.004
Sleep duration^2	0.03 [-0.01, 0.07]	0.02	1.49	.252	-0.02 [-0.11, 0.07]	0.05	-0.50	.669
Sleep duration × age	0.00 [0.00, 0.00]	0.00	0.06	.957	0.00 [0.00, 0.00]	0.00	-0.34	.766
Age × Sleep duration^2	0.00 [0.00, 0.00]	0.00	-2.32	.094	0.00 [0.00, 0.00]	0.00	0.11	.921
Sleep efficency								
(Intercept)	0.25 [-0.12, 0.63]	0.19	1.32	.239	0.68 [0.00, 1.37]	0.35	1.96	.159
Sleep efficiency	0.01 [-0.03, 0.05]	0.02	0.36	.726	-0.03 [-0.11, 0.06]	0.05	-0.58	.612
Age	-0.02 [-0.02, -0.01]	0.00	-5.70	.002	-0.02 [-0.02, -0.01]	0.00	-6.81	.001
Sleep efficiency^2	0.01 [-0.01, 0.02]	0.01	0.91	.388	-0.01 [-0.04, 0.03]	0.02	-0.45	.692
Sleep efficiency × age	0.00 [0.00, 0.00]	0.00	0.14	.893	0.00 [0.00, 0.00]	0.00	0.71	.536
Age × Sleep efficiency^2	0.00 [0.00, 0.00]	0.00	0.11	.917	0.00 [0.00, 0.00]	0.00	0.54	.630
Sleep onset								
(Intercept)	0.27 [-0.13, 0.66]	0.20	1.33	.239	0.71 [0.05, 1.37]	0.34	2.11	.136
Sleep onset	-0.01 [-0.10, 0.07]	0.04	-0.31	.784	-0.01 [-0.06, 0.04]	0.02	-0.31	.774
Age	-0.02 [-0.02, -0.01]	0.00	-5.55	.002	-0.02 [-0.02, -0.01]	0.00	-6.72	.001
Sleep onset^2	-0.01 [-0.04, 0.02]	0.01	-0.73	.482	-0.02 [-0.07, 0.03]	0.02	-0.88	.451
Sleep onset × age	0.00 [0.00, 0.00]	0.00	0.23	.838	0.00 [0.00, 0.00]	0.00	0.39	.722
Age × Sleep onset^2	0.00 [0.00, 0.00]	0.00	-0.06	.949	0.00 [0.00, 0.00]	0.00	0.91	.412
Sleep regularity								

Table 2 continued

Term	Physical Activity Volume				Physical Activity Intensity			
	β [95% CI]	SE	t	p	β [95% CI]	SE	t	p
(Intercept)	0.25 [-0.13, 0.63]	0.19	1.28	.253	0.71 [0.06, 1.36]	0.33	2.13	.135
Sleep regularity	0.08 [0.00, 0.17]	0.04	1.99	.160	0.10 [0.05, 0.14]	0.02	4.19	.018
Age	-0.02 [-0.02, -0.01]	0.00	-5.07	.006	-0.02 [-0.02, -0.01]	0.00	-6.40	.002
Sleep regularity²	0.01 [-0.03, 0.04]	0.02	0.29	.791	-0.01 [-0.04, 0.01]	0.01	-1.00	.379
Sleep regularity × age	0.00 [0.00, 0.00]	0.00	-0.88	.413	0.00 [0.00, 0.00]	0.00	-3.68	.003
Age × Sleep regularity²	0.00 [0.00, 0.00]	0.00	-0.09	.933	0.00 [0.00, 0.00]	0.00	1.34	.196

Note. Adjusted for SES, BMI, and sex.
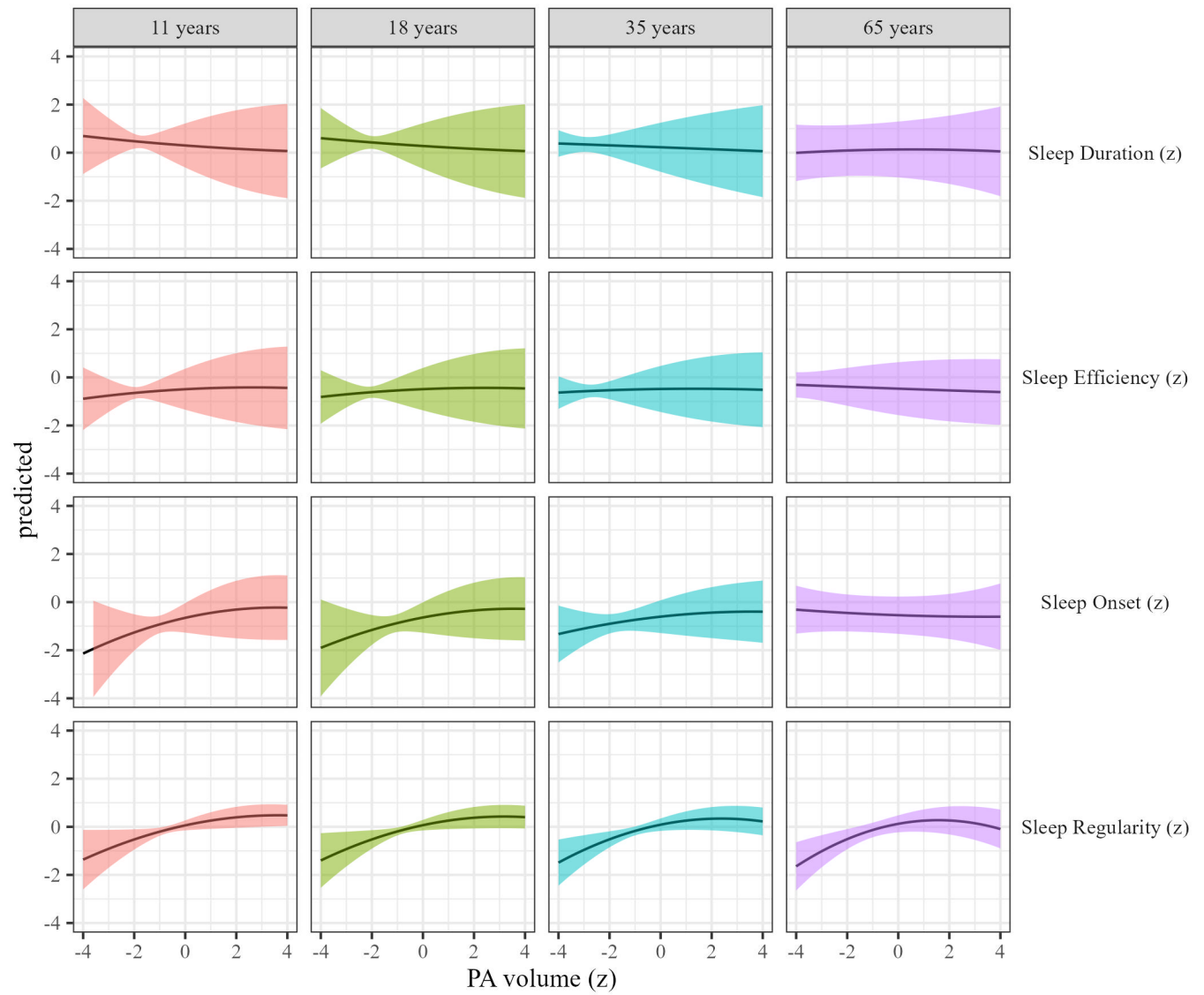
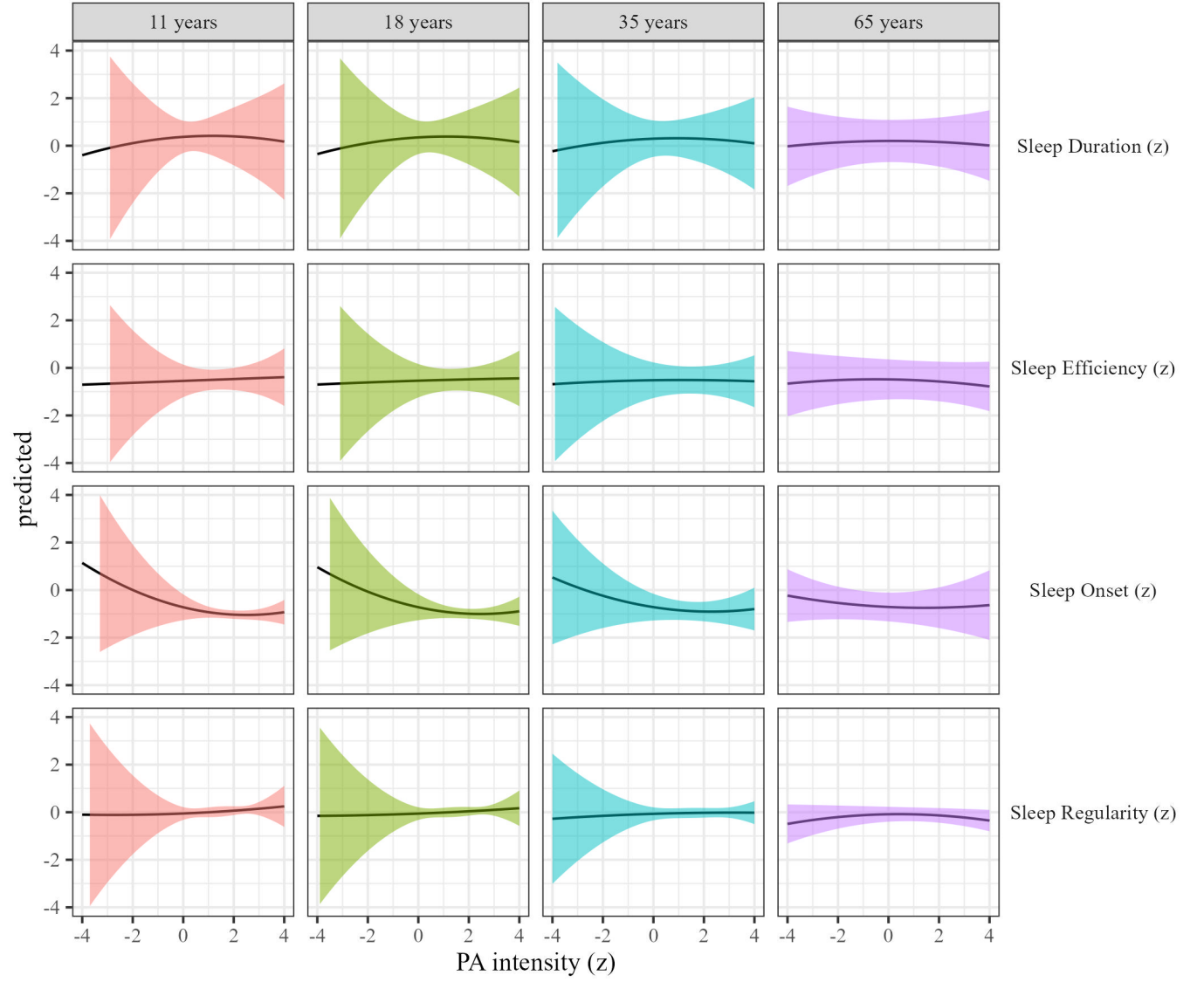*Figure 1*. Sleep metrics on Physical activity volume

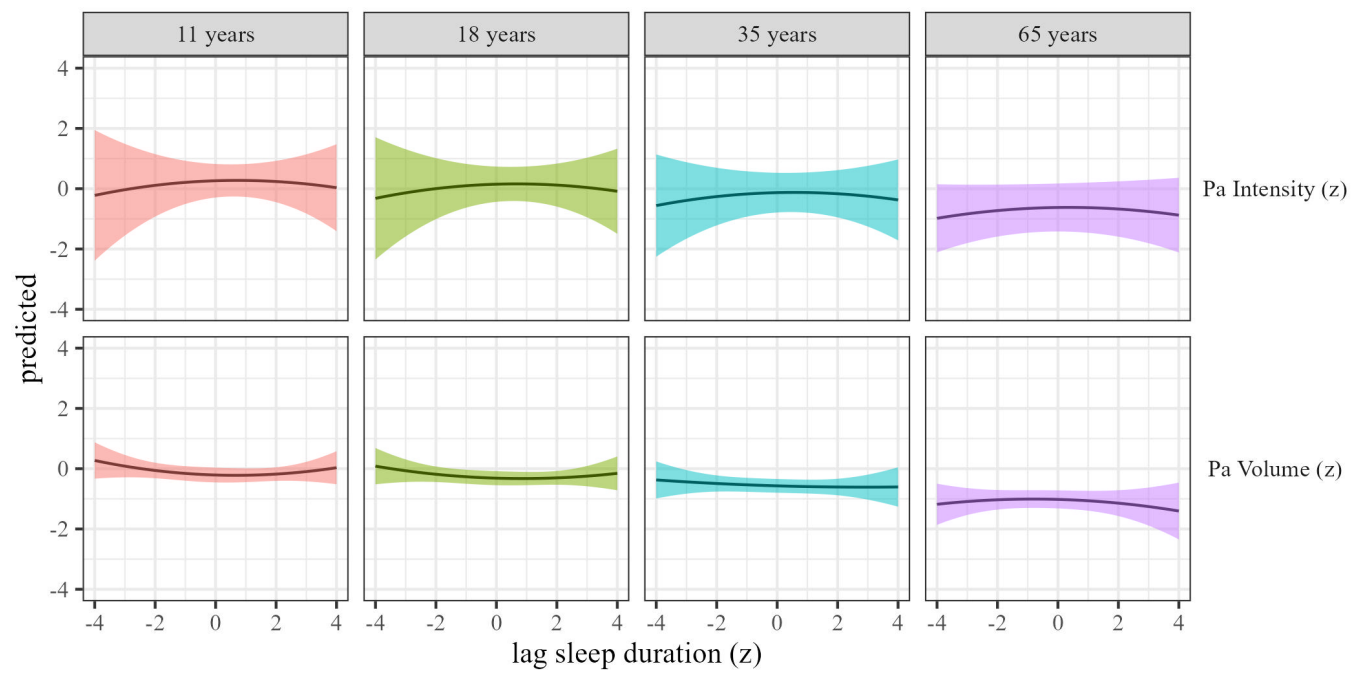*Figure 2*. Sleep metrics on Physical activity intensity

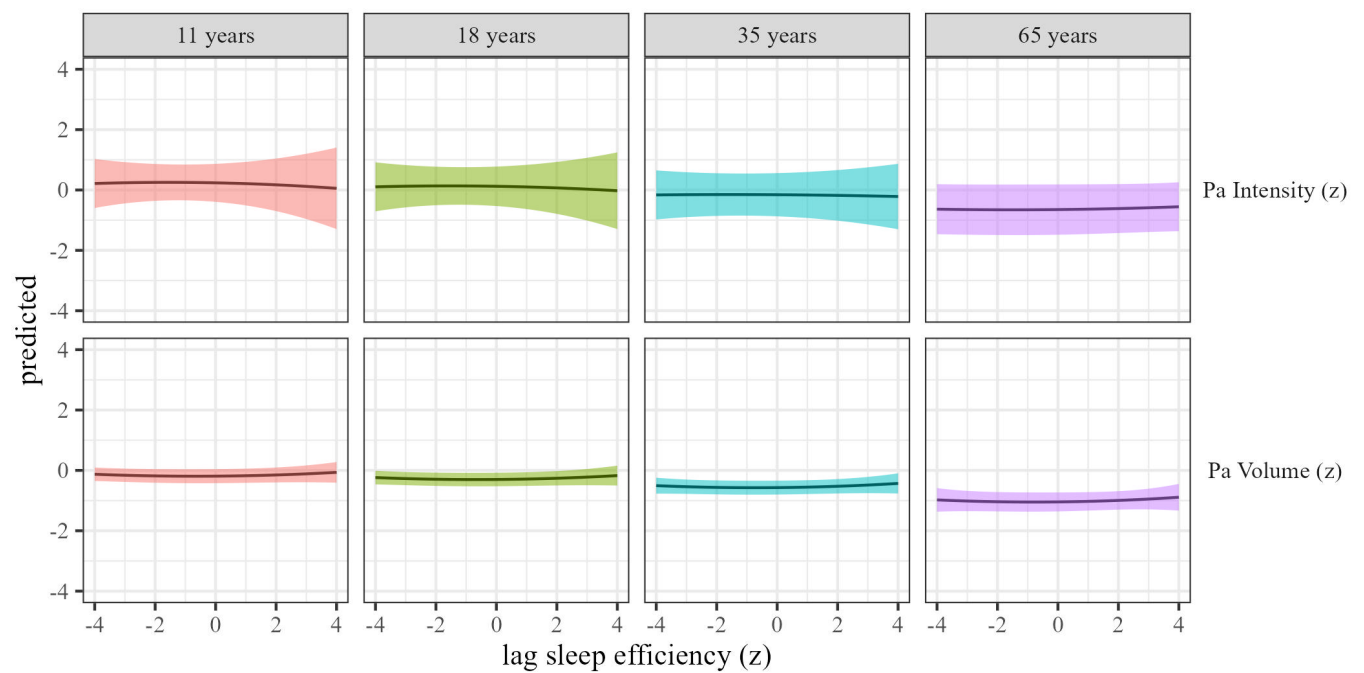*Figure 3*. Physical activty by sleep duration

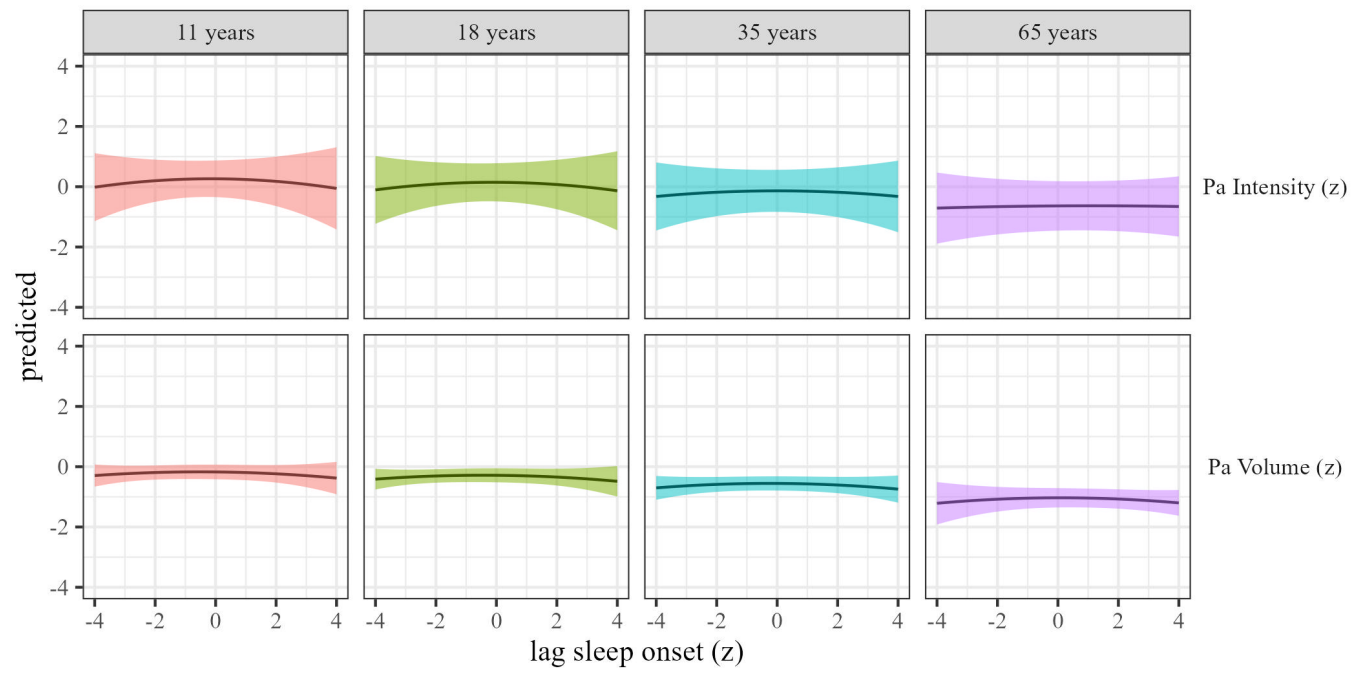*Figure 4*. Physical activty by sleep efficiency
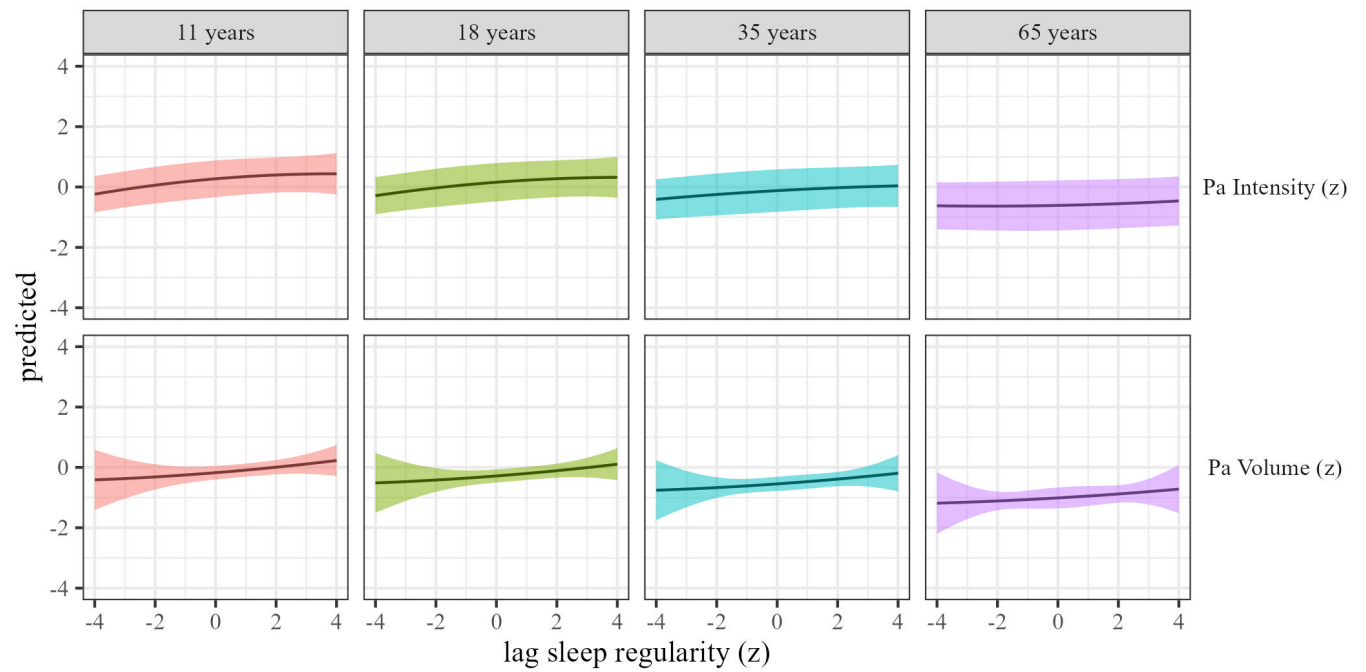
Figure 5. Physical activty by sleep onset

Figure 6. Physical activty by sleep regularity