

Table S1: Association of physical activity, the balance between activity and sleep/rest, and variability in the timing of sleep/rest and activity with risk of COVID-19.

Variable	Unadjusted		^b Model 2		Adjusted		^b Model 2	
	^a Model 1 severe COVID-19 (UK Biobank cohort as comparator)	P-value	positive test for COVID-19 (negative test result as comparator)	P-value	^a Model 1 severe COVID-19 (UK Biobank cohort as comparator)	P-value	positive test for COVID-19 (negative test result as comparator)	P-value
Physical activity								
Overall physical activity	0.83 (0.69, 1.01)	.06	1.08 (0.94, 1.25)	.28	0.85 (0.70, 1.04)	.11	0.93 (0.79, 1.09)	.40
Moderate to vigorous PA	0.81 (0.66, 0.99)	.04	1.11 (0.96, 1.28)	.17	0.81 (0.66, 1.01)	.06	1.00 (0.84, 1.18)	.98
^cActivity and rest								
^d Activity during waking hours (16 h)	0.81 (0.66, 0.98)	.03	1.06 (0.92, 1.23)	.39	0.75 (0.61, 0.93)	.01	0.88 (0.74, 1.05)	.15
^d Movement during sleep/rest (L8 h)	1.21 (1.09, 1.34)	<.001	1.20 (1.08, 1.34)	<.001	1.26 (1.12, 1.42)	<.001	1.14 (1.00, 1.30)	.04
Balance between activity and sleep/rest	0.68 (0.60, 0.77)	<.001	0.87 (0.77, 0.98)	.02	0.71 (0.62, 0.81)	<.001	0.86 (0.75, 0.98)	.03
^{c,e}Variability in timing of activity and rest								
Variability in timing of activity	1.21 (1.10, 1.33)	.001	1.24 (1.11, 1.37)	<.001	1.18 (1.07, 1.31)	.001	1.18 (1.05, 1.32)	.006
Variability in timing of sleep/rest	1.20 (1.09, 1.32)	.002	1.27 (1.13, 1.41)	<.001	1.18 (1.06, 1.31)	.002	1.18 (1.04, 1.33)	.007
Variability in sleep/rest mid-point	1.23 (1.11, 1.36)	.001	1.25 (1.13, 1.39)	<.001	1.21 (1.08, 1.35)	.001	1.17 (1.04, 1.35)	.003

^a Adjusted analysis adjusted for: adjusted for age, sex and ethnicity

^b Adjusted analysis adjusted for: age, sex, ethnicity, Townsend Deprivation Index, number of people in household, fruit/vegetable consumption, red meat consumption, smoking status, alcohol intake, number of self-reported cancers & non-cancer illnesses, and number of treatments/medications

^c Adjusted analysis: In addition, adjusted for sleep duration

^d Adjusted analysis: In addition, mutually adjusted for each other

^e Adjusted analysis: In addition, adjusted for overall physical activity

Odds ratios expressed per standard deviation of each variable

a) Model 1 - comparator group = all non-severe COVID (includes those not tested, those testing negative, those testing positive but not classed as severe)

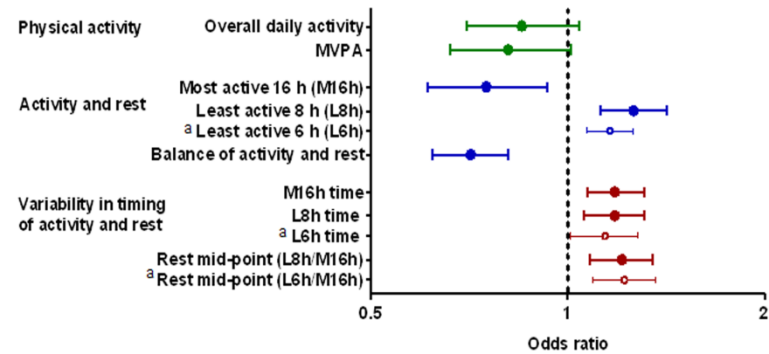
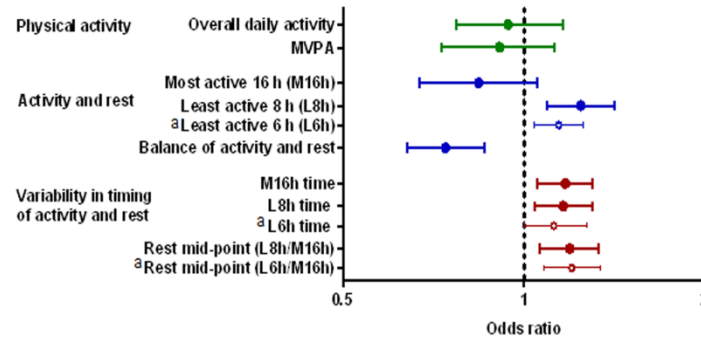


Fig S1. Association of physical activity, the balance between activity and sleep/rest, and variability in the timing of sleep/rest and activity. Risk of severe COVID-19 (UK Biobank cohort as comparator group, sensitivity analysis with positive test result in the community assumed to be non-severe and added to the comparator group); Odds ratios expressed per standard deviation of each variable. OR = odds ratio.

Adjusted for age, sex and ethnicity. Activity during waking hours and movement during sleep/rest mutually adjusted. 'Activity & sleep/rest' and 'Variability in timing of activity and sleep/rest' variables additionally adjusted for sleep duration. 'Variability in timing of activity and sleep/rest' additionally adjusted for overall physical activity.

^a Sensitivity analyses using the least active 6 hours rather than 8 hours (open circles).

a) Model 1 - further adjusted for BMI and number of cancer and non-cancer illnesses



b) Model 2 - further adjusted for BMI

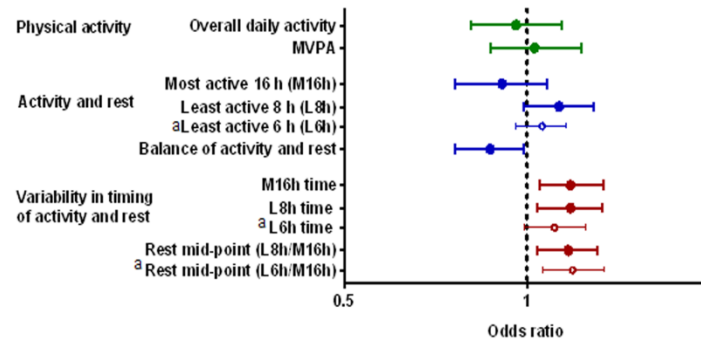
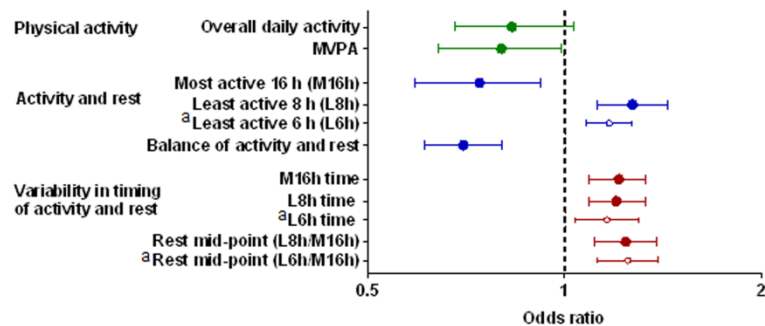


Fig S2. Association of physical activity, the balance between activity and sleep/rest, and variability in the timing of sleep/rest and activity further adjusted for BMI and underlying health conditions (model 1) and BMI (model 2): a) Model 1. Severe COVID-19 (UK Biobank cohort as comparator); and b) Model 2. Positive test for COVID-19 (negative test result as comparator). Odds ratios expressed per SD of each variable. OR = odds ratio; SD = standard deviation.

Model 2 adjusted for age, sex, ethnicity, BMI, Townsend Deprivation Index, number of people in household, fruit/vegetable consumption, red meat consumption, smoking status, alcohol intake, number of self-reported cancers & non-cancer illnesses, and number of treatments/medications. Model 1 adjusted for age, sex, ethnicity, BMI, number of cancer and non-cancer illnesses. Activity during waking hours and movement during sleep/rest mutually adjusted. 'Activity & sleep/rest' and 'Variability in timing of activity and sleep/rest' variables additionally adjusted for sleep duration. 'Variability in timing of activity and sleep/rest' additionally adjusted for overall physical activity. BMI = body mass index.

^a Sensitivity analyses using the least active 6 hours rather than 8 hours (open circles).

a) Model 1 - excluding health-workers



b) Model 2 - excluding health-workers

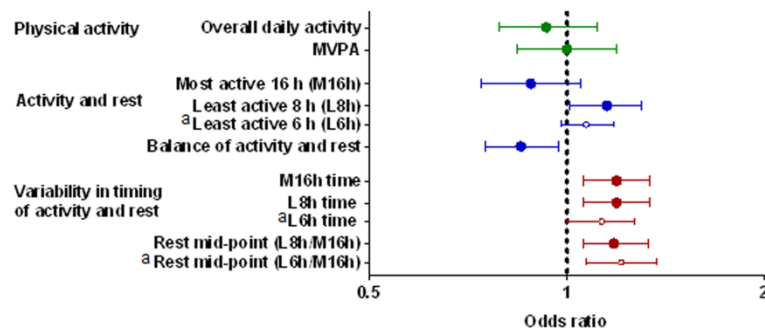


Fig S3. Association of physical activity, the balance between activity and sleep/rest, and variability in the timing of sleep/rest and activity excluding healthcare workers: a) Model 1. Severe COVID-19 (UK Biobank cohort as comparator); and b) Model 2. Positive test for COVID-19 (negative test result as comparator). Odds ratios expressed per SD of each variable. OR = odds ratio; SD = standard deviation.

Model 2 adjusted for age, sex, ethnicity, Townsend Deprivation Index, number of people in household, fruit/vegetable consumption, red meat consumption, smoking status, alcohol intake, number of self-reported cancers & non-cancer illnesses, and number of treatments/medications. Model 1 adjusted for age, sex and ethnicity. Activity during waking hours and movement during sleep/rest mutually adjusted. 'Activity & sleep/rest' and 'Variability in timing of activity and sleep/rest' variables additionally adjusted for sleep duration. 'Variability in timing of activity and sleep/rest' additionally adjusted for overall physical activity. BMI = body mass index.

^a Sensitivity analyses using the least active 6 hours rather than 8 hours (open circles).