

SUPPLEMENTAL INFORMATION

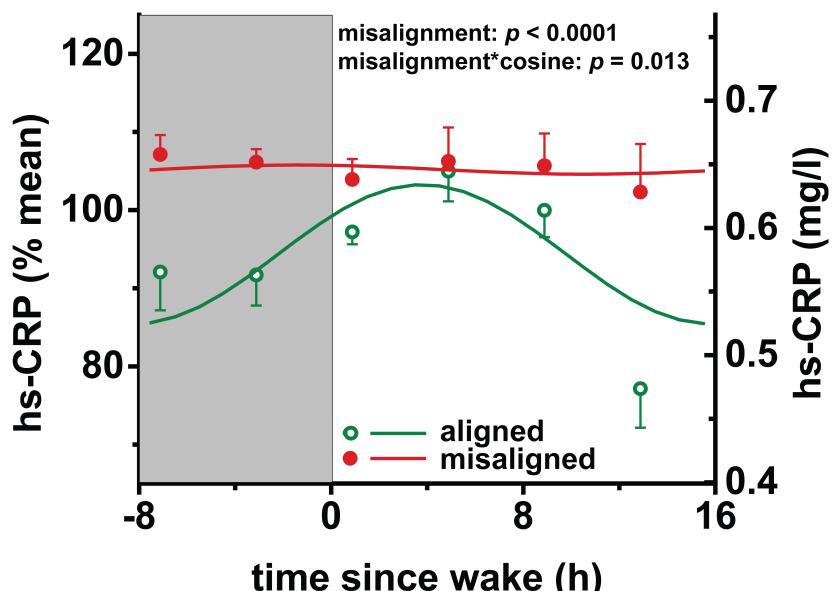
Circadian misalignment increases C-reactive protein and blood pressure in chronic shift workers

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Supplemental figure



Supplemental Figure 1. Cosine analysis of the effects of alignment condition on 24-h high-sensitivity C-reactive protein rhythms. Cosine model estimates are shown as solid lines (green, aligned condition; red, misaligned condition). Open (aligned condition) and filled (misaligned condition) symbols represent data grouped relative to time since wake (data also shown in Figure 2). hs-CRP, high-sensitivity C-reactive protein; grey bar, sleep opportunity. Data are represented as mean±SEM.

Supplemental tables

Table 1. Estimates of fixed effects for 24-h high-sensitivity C-reactive protein

Parameter	Estimate	SE	DF	t-value	P-value
Intercept	6.236	0.259	6.288	24.050	<0.0001
Alignment					
Aligned	-0.286	0.064	63.005	-4.434	<0.0001
Misaligned (reference level)					
TSW					
-7.12 h	0.059	0.061	63.002	0.964	0.339
-3.12 h	0.047	0.058	63.000	0.813	0.419
0.88 h	0.025	0.058	63.000	0.431	0.668
4.88 h	0.044	0.058	63.000	0.747	0.458
8.88 h	0.039	0.058	63.000	0.670	0.505
12.88 h (reference level)					
Alignment*TSW					
Aligned, -7.12 h	0.125	0.089	63.003	1.412	0.163
Aligned, -3.12 h	0.135	0.087	63.003	1.547	0.127
Aligned, 0.88 h	0.220	0.087	63.003	2.531	0.014
Aligned, 4.88 h	0.275	0.087	63.003	3.166	0.002
Aligned, 8.88 h	0.232	0.087	63.003	2.663	0.010

Mixed-effects model was fitted with alignment, time since wake (TSW) and their interaction (alignment*TSW) as fixed effects and subject as random effect. SE, standard error; DF, degrees of freedom.

Table 2. Estimates of covariance parameters for 24-h high-sensitivity C-reactive protein

Parameter	Estimate	SE	Wald Z	P-value
Residual	0.012	0.002	5.613	<0.0001
Intercept (participant) variance	0.459	0.265	1.728	0.084

SE, standard error; DF, degrees of freedom

Table 3. Estimates of fixed effects for 24-h systolic blood pressure

Parameter	Estimate	SE	DF	t-value	P-value
Intercept	4.591	0.042	9.521	108.975	<0.0001
Alignment					
Aligned	-0.024	0.028	606.003	-0.852	0.394
Misaligned (reference level)					
TSW					
0.5 h	0.123	0.025	606.000	4.893	<0.0001
1.5 h	0.146	0.027	605.998	5.337	<0.0001
2.5 h	0.105	0.026	606.009	4.075	<0.0001
3.5 h	0.096	0.029	606.014	3.284	0.001
4.5 h	0.150	0.027	606.010	5.645	<0.0001
5.5 h	0.132	0.026	606.005	5.039	<0.0001
7.5 h	0.122	0.027	605.998	4.447	<0.0001
8.5 h	0.131	0.027	605.998	4.778	<0.0001
9.5 h	0.128	0.028	606.001	4.596	<0.0001
10.5 h	0.106	0.028	606.001	3.797	<0.0001
11.5 h	0.125	0.027	606.025	4.565	<0.0001
12.5 h	0.142	0.026	606.009	5.510	<0.0001
13.5 h	0.128	0.030	606.006	4.251	<0.0001
14.5 h	0.127	0.025	606.007	5.092	<0.0001
15.5 h	0.125	0.027	606.002	4.716	<0.0001
16.5 h	0.057	0.028	606.001	2.026	0.043
17.5 h	0.014	0.028	606.001	0.501	0.616
18.5 h	-0.013	0.028	606.001	-0.453	0.650
19.5 h	-0.001	0.028	606.001	-0.025	0.980
20.5 h	-0.071	0.027	605.998	-2.600	0.010
21.5 h	-0.008	0.028	606.001	-0.297	0.766
22.5 h	0.000	0.028	606.001	0.011	0.991
23.5 h (reference level)					
Alignment*TSW					
Aligned, 0.5 h	0.017	0.038	606.010	0.446	0.656
Aligned, 1.5 h	0.032	0.039	606.001	0.811	0.417
Aligned, 2.5 h	0.047	0.038	606.004	1.248	0.212
Aligned, 3.5 h	-0.009	0.042	606.026	-0.217	0.828
Aligned, 4.5 h	-0.010	0.038	606.002	-0.255	0.799
Aligned, 5.5 h	0.035	0.038	606.009	0.919	0.359

Aligned, 7.5 h	-0.011	0.039	606.004	-0.275	0.783
Aligned, 8.5 h	-0.030	0.040	606.006	-0.743	0.458
Aligned, 9.5 h	-0.011	0.040	606.007	-0.280	0.779
Aligned, 10.5 h	0.027	0.041	606.006	0.655	0.513
Aligned, 11.5 h	0.004	0.040	606.007	0.093	0.926
Aligned, 12.5 h	-0.014	0.037	606.009	-0.375	0.708
Aligned, 13.5 h	0.061	0.043	606.008	1.431	0.153
Aligned, 14.5 h	-0.003	0.036	606.005	-0.075	0.941
Aligned, 15.5 h	0.003	0.038	606.003	0.072	0.942
Aligned, 16.5 h	0.001	0.041	606.007	0.022	0.983
Aligned, 17.5 h	0.012	0.041	606.003	0.306	0.760
Aligned, 18.5 h	-0.007	0.041	606.003	-0.180	0.857
Aligned, 19.5 h	-0.021	0.040	606.001	-0.521	0.603
Aligned, 20.5 h	0.071	0.040	606.008	1.762	0.079
Aligned, 21.5 h	0.036	0.041	606.000	0.895	0.371
Aligned, 22.5 h	-0.004	0.041	606.000	-0.087	0.931

Mixed-effects model was fitted with alignment, time since wake (TSW) and their interaction (alignment*TSW) as fixed effects and subject as random effect. SE, standard error; DF, degrees of freedom.

Table 4. Estimates of covariance parameters for 24-h systolic blood pressure

Parameter	Estimate	SE	Wald Z	P-value
Residual	0.005	0.000	17.407	<0.0001
Intercept (participant) variance	0.010	0.006	1.722	0.085

SE, standard error; DF, degrees of freedom

Table 5. Estimates of fixed effects for 24-h diastolic blood pressure

Parameter	Estimate	SE	DF	t-value	P-value
Intercept	4.135	0.041	13.192	99.956	<0.0001
Alignment					
Aligned	-0.048	0.035	606.008	-1.355	0.176
Misaligned (reference level)					
TSW					
0.5 h	0.181	0.031	606.001	5.817	<0.0001
1.5 h	0.112	0.034	605.998	3.317	0.001
2.5 h	0.066	0.032	606.018	2.083	0.038
3.5 h	0.064	0.036	606.027	1.783	0.075
4.5 h	0.137	0.033	606.021	4.185	<0.0001
5.5 h	0.111	0.032	606.011	3.434	0.001
7.5 h	0.132	0.034	605.998	3.921	<0.0001
8.5 h	0.169	0.034	605.998	5.013	<0.0001
9.5 h	0.137	0.034	606.003	3.985	<0.0001
10.5 h	0.171	0.034	606.003	4.956	<0.0001
11.5 h	0.156	0.034	606.049	4.604	<0.0001
12.5 h	0.168	0.032	606.018	5.269	<0.0001
13.5 h	0.097	0.037	606.012	2.630	0.009
14.5 h	0.086	0.031	606.015	2.770	0.006
15.5 h	0.082	0.033	606.004	2.491	0.013
16.5 h	-0.024	0.034	606.004	-0.705	0.481
17.5 h	-0.091	0.034	606.004	-2.629	0.009
18.5 h	-0.054	0.034	606.004	-1.553	0.121
19.5 h	-0.034	0.034	606.004	-0.987	0.324
20.5 h	-0.078	0.034	605.998	-2.309	0.021
21.5 h	-0.024	0.034	606.004	-0.683	0.495
22.5 h	-0.067	0.034	606.004	-1.945	0.052
23.5 h (reference level)					
Alignment*TSW					
Aligned, 0.5 h	-0.016	0.047	606.021	-0.344	0.731
Aligned, 1.5 h	0.073	0.048	606.003	1.507	0.132
Aligned, 2.5 h	0.064	0.047	606.008	1.367	0.172
Aligned, 3.5 h	0.063	0.052	606.050	1.214	0.225
Aligned, 4.5 h	0.038	0.047	606.004	0.819	0.413
Aligned, 5.5 h	0.065	0.046	606.019	1.390	0.165

Aligned, 7.5 h	0.036	0.048	606.008	0.737	0.461
Aligned, 8.5 h	0.036	0.050	606.012	0.726	0.468
Aligned, 9.5 h	0.064	0.050	606.015	1.280	0.201
Aligned, 10.5 h	0.042	0.050	606.012	0.827	0.408
Aligned, 11.5 h	0.074	0.050	606.014	1.486	0.138
Aligned, 12.5 h	0.039	0.046	606.018	0.847	0.397
Aligned, 13.5 h	0.098	0.053	606.017	1.857	0.064
Aligned, 14.5 h	0.031	0.045	606.011	0.684	0.494
Aligned, 15.5 h	0.004	0.047	606.008	0.078	0.938
Aligned, 16.5 h	0.005	0.050	606.014	0.102	0.919
Aligned, 17.5 h	0.003	0.050	606.008	0.069	0.945
Aligned, 18.5 h	0.003	0.050	606.007	0.054	0.957
Aligned, 19.5 h	-0.063	0.049	606.004	-1.286	0.199
Aligned, 20.5 h	0.017	0.050	606.017	0.333	0.740
Aligned, 21.5 h	0.020	0.050	606.001	0.393	0.694
Aligned, 22.5 h	0.065	0.050	606.001	1.291	0.197

Mixed-effects model was fitted with alignment, time since wake (TSW) and their interaction (alignment*TSW) as fixed effects and subject as random effect. SE, standard error; DF, degrees of freedom.

Table 6. Estimates of covariance parameters for 24-h diastolic blood pressure

Parameter	Estimate	SE	Wald Z	P-value
Residual	0.008	0.000	17.407	<0.0001
Intercept (participant) variance	0.008	0.005	1.713	0.087

SE, standard error; DF, degrees of freedom