

Original article. Scand J Work Environ Health. 2017;43(2)109–116. doi:10.5271/sjweh.3610

The impact of reduced worktime on sleep and perceived stress – a group randomized intervention study using diary data ¹

by Helena Schiller, BSc,² Mats Lekander PhD, Kristiina Rajaleid, PhD, Carina Hellgren, PhD, Torbjörn Åkerstedt, PhD, Peter Barck-Holst, MSc, Göran Kecklund, PhD

¹ Supplementary tables A–F

² Correspondence to: Helena Schiller, Stress Research Institute, Stockholm University, SE-10691, Stockholm, Sweden. [E-mail: helena.-schiller@su.se]

Table A. Sensitivity analysis; results of the group by time interaction from the multilevel mixed model analyses. Adjusted analysis; results of the group by time interaction from the multilevel mixed model analyses adjusted by shiftwork, educational level and level of work control at baseline. All three data collection periods are included in the model.

Variables	Sensitivity analysis			Adjusted analysis		
	Estimate	95% C. I.		Estimate	95% C. I.	
SSQ ^a work (1 – 5 good)	0.086**	0.039	0.141	0.100**	0.047	0.152
SSQ days off (1 – 5 good)	0.123**	0.052	0.195	0.104**	0.028	0.180
Sleep length work (h)	0.200**	0.130	0.269	0.196**	0.122	0.270
Sleep length days off (h)	-0.043	-0.163	0.078	-0.121	-0.251	0.010
Sleepiness work (1 – 9 very sleepy)	-0.195**	-0.287	-0.102	-0.227**	-0.327	-0.126
Sleepiness days off (1 – 9 very sleepy)	-0.215**	-0.333	-0.097	-0.223**	-0.349	-0.096
Stress work (1 – 9 very high)	-0.235**	-0.351	-0.119	-0.225**	-0.349	-0.101

Work time reduction

Stress days off (1 – 9 very high)	-0.237**	-0.353	-0.120	-0.225**	-0.347	-0.102
Worries/Stress at bedtime work (1 – 5 no worry/stress)	0.086**	0.022	0.150	0.069**	0.003	0.136
Worries/Stress at bedtime days off (1 – 5 no worry/stress)	0.113**	0.045	0.181	0.084**	0.014	0.154

** Significant at the 0.01-level

Table B. Subgroup analysis I; Gender. Mean values (m) and standard deviations (sd) divided by group (intervention and control) and subgroup. Results of the three way-interaction of Group*Time*Gender from the multilevel mixed model analyses. All three data collection periods are included in the model.

		Baseline				9 months				18 months				Multilevel mixed model analyses		
		Women		Men		Women		Men		Women		Men				
Group		m	sd	m	sd	m	sd	m	sd	m	sd	m	sd	Estimate	95% C.I.	
SSQ ^a work (1 – 5 good)	I ^b	4.03	0.5	4.27	0.5	4.18	0.5	4.35	0.4	4.28	0.5	4.44	0.4	-0.046	-0.161	0.069
	C ^c	4.12	0.5	4.20	0.6	4.10	0.6	4.25	0.5	4.19	0.5	4.24	0.5			
SSQ days off (1 – 5 good)	I	4.21	0.8	4.47	0.5	4.37	0.7	4.49	0.6	4.46	0.6	4.50	0.6	-0.137	-0.300	0.026
	C	4.32	0.6	4.25	0.8	4.32	0.7	4.43	0.7	4.30	0.7	4.25	0.7			
Sleep length work (hh:min)	I	7:20	0:42	7:09	0:42	7:40	0:42	7:28	0:48	7:40	0:42	7:33	0:42	0.035	-0.128	0.199
	C	7:20	0:42	7:19	0:42	7:18	0:48	7:13	0:54	7:19	0:48	7:20	0:48			
Sleep length days off (hh:min)	I	8:32	1:06	8:16	1:00	8:40	1:00	8:23	1:06	8:37	1:06	8:20	1:06	-0.095	-0.381	0.189
	C	8:34	1:06	8:16	1:06	8:41	1:12	8:13	1:12	8:41	1:06	8:40	1:06			
Sleepiness work (1 – 9 very sleepy)	I	4.58	1.0	4.01	1.0	4.10	1.0	3.69	1.0	3.94	0.9	3.54	1.1	-0.118	-0.336	0.100
	C	4.60	0.9	3.95	1.3	4.41	1.0	4.03	1.2	4.25	1.0	4.19	1.1			
Sleepiness days off (1– 9 very sleepy)	I	4.04	1.2	3.84	1.3	3.82	1.2	3.36	1.2	3.67	1.1	3.26	1.3	-0.303*	-0.580	-0.026
	C	3.98	1.1	3.32	1.3	3.90	1.2	3.44	1.3	3.90	1.1	3.77	1.4			
Stress work (1 – 9 very high)	I	3.46	1.2	2.75	1.3	2.88	1.2	2.44	1.1	2.84	1.1	2.53	1.1	0.107	-0.171	0.385
	C	3.34	1.3	2.76	1.1	3.20	1.4	2.93	1.0	3.29	1.3	3.02	1.1			
Stress days off (1 – 9 very high)	I	2.42	1.2	2.21	1.3	2.15	1.2	1.85	0.9	2.06	1.0	2.00	1.1	0.174	-0.106	0.454
	C	2.24	1.2	1.87	0.9	2.23	1.3	2.01	0.8	2.39	1.3	1.91	0.8			

Work time reduction

Worries/Stress at bedtime work (1 – 5 no worry/stress)	I	4.24	0.7	4.52	0.6	4.44	0.7	4.59	0.5	4.50	0.6	4.72	0.5	-0.101	-0.246	0.045
	C	4.41	0.6	4.43	0.7	4.44	0.7	4.50	0.6	4.46	0.6	4.60	0.6			
Worries/Stress at bedtime days off (1 – 5 no worry/stress)	I	4.98	1.2	4.95	1.1	4.82	1.08	4.59	1.1	4.88	1.1	4.64	1.1	-0.069	-0.245	0.087
	C	4.88	1.1	4.66	1.0	4.97	1.1	4.64	0.8	4.83	1.0	4.54	1.0			

a) SSQ=Subjective Sleep Quality

b) I=intervention group

c) C=control group

* Significant at the 0.05-level

Table C. Subgroup analysis II; Age. Mean values (m) and standard deviations (sd) divided by group (intervention and control) and subgroup. Results of the three way-interaction Group*Time*Age (dichotomized by median split) from the multilevel mixed model analyses. All three data collection periods are included in the model.

		Baseline				9 months				18 months				<u>Multilevel mixed model analyses</u>		
		<u>Age <=45 years</u>		<u>Age>45 years</u>		<u>Age <=45 years</u>		<u>Age>45 years</u>		<u>Age <=45 years</u>		<u>Age>45 years</u>		Estimate	95% C.I.	
	Group	m	sd	m	sd	m	sd	m	sd	m	sd	m	sd			
SSQ^a work (1 – 5 good)	I ^b	4.12	0.5	4.04	0.5	4.31	0.4	4.14	0.6	4.40	0.4	4.24	0.6	0.090	-0.009	0.188
	C ^c	4.15	0.5	4.14	0.6	4.12	0.6	4.16	0.6	4.19	0.5	4.22	0.5			
SSQ days off (1 – 5 good)	I	4.29	0.7	4.25	0.7	4.37	0.7	4.42	0.6	4.52	0.6	4.43	0.6	0.088	-0.051	0.226
	C	4.27	0.6	4.32	0.7	4.32	0.7	4.37	0.7	4.21	0.7	4.36	0.6			
Sleep length work (hh:min)	I	7:19	0:42	7:15	0:40	7:38	0:47	7:35	0:43	7:40	0:47	7:37	0:38	0.018	-0.116	0.152
	C	7:25	0:44	7:15	0:44	7:22	0:46	7:11	0:51	7:20	0:43	7:18	0:49			
Sleep length days off (hh:min)	I	8:34	1:11	8:23	1:00	8:40	1:11	8:32	0:54	8:38	1:07	8:28	1:00	0.066	-0.167	0.298
	C	8:35	1:07	8:26	1:00	8:41	1:14	8:30	1:10	8:43	1:16	8:40	1:04			
Sleepiness work (1 – 9 very sleepy)	I	4.70	1.0	4.29	1.1	4.16	1.0	4.16	1.1	3.95	1.0	4.29	1.0	-0.058	-0.236	0.119
	C	4.57	1.1	3.95	1.3	4.50	1.1	4.03	1.2	4.18	1.1	4.19	1.1			
Sleepiness days off (1 – 9 very sleepy)	I	4.16	1.2	3.82	1.2	3.88	1.3	3.54	1.2	3.65	1.2	3.51	1.2	-0.176	-0.401	0.049
	C	3.87	1.2	3.79	1.2	3.99	1.2	3.61	1.3	3.87	1.2	3.88	1.2			
Stress work (1 – 9 very high)	I	3.49	1.3	3.10	1.2	2.84	1.2	2.69	1.1	2.87	1.2	2.67	1.1	0.016	-0.210	0.241
	C	3.29	1.3	3.13	1.3	3.22	1.3	3.07	1.4	3.15	1.2	3.32	1.2			
Stress days off (1 – 9 very high)	I	2.51	1.3	2.21	1.2	2.11	1.1	2.05	1.1	2.12	1.1	1.98	1.0	-0.106	-0.333	0.121
	C	2.23	1.2	2.09	1.3	2.35	1.3	2.02	1.3	2.31	1.3	2.29	1.2			
	I	4.21	0.7	4.39	0.7	4.43	0.7	4.51	0.6	4.55	0.6	4.54	0.6			

Work time reduction

Worries/Stress at bedtime work (1 – 5 no worry/stress)	C	4.31	0.7	4.53	0.5	4.31	0.7	4.53	0.6	4.40	0.7	4.57	0.5	0.100	-0.024	0.245
Worries/Stress at bedtime days off (1 – 5 no worry/stress)	I	4.59	0.7	4.60	0.7	4.65	0.6	4.73	0.6	4.78	0.5	4.78	0.5	0.060	-0.071	0.192
	C	4.61	0.8	4.73	0.5	4.58	0.7	4.81	0.4	4.57	0.7	4.76	0.5			

a) SSQ=Subjective Sleep Quality

b) I=intervention group

c) C=control group

Table d. Subgroup analysis III; Children. Mean values (m) and standard deviations (sd) divided by group (intervention and control) and subgroup. Results of the three way-interaction of Group*Time*Having children living at home from the multilevel mixed model analyses. All three data collection periods are included in the model.

		Baseline				9 months				18 months				<u>Multilevel mixed model analyses</u>		
		<u>Having children</u>		<u>No children</u>		<u>Having children</u>		<u>No children</u>		<u>Having children</u>		<u>No children</u>		Estimate	95% C.I.	
	Group	m	sd	m	sd	m	sd	m	sd	m	sd	m	sd			
SSQ^a work (1 – 5 good)	I ^b	4.13	0.5	4.03	0.5	4.24	0.5	4.21	0.5	4.34	0.5	4.32	0.5	-0.026	-0.132	0.080
	C ^c	4.21	0.5	4.11	0.6	4.19	0.6	4.15	0.6	4.29	0.5	4.16	0.5			
SSQ days off (1 – 5 good)	I	4.32	0.7	4.26	0.7	4.41	0.6	4.44	0.6	4.46	0.5	4.47	0.6	-0.004	-0.180	0.108
	C	4.34	0.6	4.35	0.7	4.38	0.7	4.35	0.7	4.32	0.7	4.36	0.7			
Sleep length work (hh:min)	I	7:14	0:36	7:17	0:41	7:33	0:48	7:37	0:41	7:34	0:42	7:40	0:45	0.049	-0.091	0.189
	C	7:23	0:46	7:16	0:43	7:16	0:47	7:18	0:50	7:22	0:52	7:26	0:41			
Sleep length days off (hh:min)	I	8:22	1:03	8:32	1:01	8:36	1:03	8:31	1:01	8:36	1:04	8:24	1:09	0.195	-0.049	0.439
	C	8:28	1:05	8:36	0:59	8:29	1:20	8:46	1:00	8:38	1:04	8:52	1:06			
Sleepiness work (1 – 9 very sleepy)	I	4.52	1.0	4.30	1.0	4.08	1.1	4.86	1.0	3.96	1.3	3.64	1.0	0.129	-0.159	0.318
	C	4.54	1.0	4.25	1.2	4.47	1.0	4.13	1.1	4.20	1.0	4.26	1.1			
Sleepiness days off (1 – 9 very sleepy)	I	4.11	1.1	3.84	1.2	3.80	1.3	3.51	1.2	3.71	1.2	3.37	1.2	0.132	-0.114	0.379
	C	3.85	1.1	3.71	1.3	3.91	1.3	3.67	1.2	3.84	1.1	3.94	1.2			
Stress work (1 – 9 very high)	I	3.31	1.3	3.24	1.3	2.84	1.2	2.66	1.2	2.90	1.1	2.57	1.2	0.324	0.087**	0.561
	C	3.44	1.2	3.03	1.4	3.25	1.4	3.00	1.3	3.22	1.2	3.31	1.3			
Stress days off (1 – 9 very high)	I	2.47	1.3	2.21	1.2	2.14	1.2	2.01	1.1	2.20	1.0	1.88	1.1	0.132	-0.103	0.368
	C	2.30	1.3	2.05	1.2	2.35	1.3	1.91	1.1	2.32	1.2	2.30	1.2			

Work time reduction

Worries/Stress at bedtime work (1 – 5 no worry/stress)	I	4.34	0.7	4.31	0.7	4.40	0.7	4.59	0.6	4.53	0.6	4.59	0.5	-0.068	-0.201	0.064
	C	4.37	0.7	4.46	0.6	4.39	0.7	4.50	0.6	4.51	0.7	4.53	0.6			
Worries/Stress at bedtime days off (1 – 5 no worry/stress)	I	4.56	0.7	4.65	0.6	4.70	0.6	4.72	0.6	4.77	0.5	4.80	0.4	0.034	-0.103	0.171
	C	4.65	0.7	4.73	0.6	4.72	0.7	4.74	0.4	4.66	0.7	4.77	0.5			

** Significant at the 0.01-level
a) SSQ=Subjective Sleep Quality
b) I=intervention group
c) C=control group

Table E. Subgroup analysis IV; Subjective Sleep Quality (SSQ). Mean values (m) and standard deviations (sd) divided by group (intervention and control) and subgroup. Results of the three way-interaction of Group*Time*SSQ at baseline (weekly mean dichotomized by median split) from the multilevel mixed model analyses. All three data collection periods are included in the model.

		Baseline				9 months				18 months				<u>Multilevel mixed model analyses</u>		
		<u>SSQbl<=4.28</u>		<u>SSQbl>4.28</u>		<u>SSQbl<=4.28</u>		<u>SSQbl>4.28</u>		<u>SSQbl<=4.28</u>		<u>SSQbl>4.28</u>		Estimate	95% C.I.	
Group		m	sd	m	sd	m	sd	m	sd	m	sd	m	sd			
SSQ^a work (1 – 5 good)	I ^b	3.72	0.4	4.46	0.3	4.00	0.5	4.47	0.4	4.10	0.5	4.53	0.4	0.025	-0.073	0.124
	C ^c	3.78	0.5	4.49	0.3	3.83	0.6	4.41	0.4	3.97	0.5	4.42	0.4			
SSQ days off (1 – 5 good)	I	3.78	0.7	4.76	0.3	4.24	0.7	4.56	0.6	4.29	0.7	4.67	0.4	0.097	-0.042	0.235
	C	3.79	0.8	4.56	0.2	4.05	0.7	4.60	0.5	4.04	0.7	4.52	0.5			
Sleep length work (hh:min)	I	7:19	0:42	7:16	0:42	7:38	0:42	7:35	0:42	7:40	0:42	7:38	0:42	0.034	-0.100	0.167
	C	7:25	0:48	7:16	0:42	7:19	0:48	7:16	0:48	7:19	0:42	7:20	0:48			
Sleep length days off (hh:min)	I	8:25	1:00	8:32	1:06	8:47	1:06	8:37	1:06	8:32	1:00	8:36	1:06	0.167	-0.066	0.399
	C	8:35	1:00	8:26	1:06	8:18	1:18	8:42	1:06	8:35	1:12	8:47	1:06			
Sleepiness work (1 – 9 very sleepy)	I	4.60	0.9	4.20	1.1	4.18	0.9	3.79	1.2	4.02	0.9	3.67	1.0	0.138	-0.040	0.316
	C	4.77	0.9	4.15	1.2	4.68	1.0	4.05	1.1	4.43	1.0	4.07	1.1			
Sleepiness days off (1 – 9 very sleepy)	I	4.34	1.1	3.64	1.2	3.86	1.2	3.55	1.3	3.70	1.2	3.44	1.1	0.086	-0.140	0.313
	C	4.32	1.0	3.39	1.2	4.25	1.1	3.44	1.3	4.18	1.2	3.60	1.2			
Stress work (1 – 9 very high)	I	3.62	1.2	2.97	1.2	2.92	1.0	2.60	1.3	2.97	1.1	2.58	1.1	0.126	-0.104	0.347
	C	3.58	1.3	2.90	1.1	3.56	1.4	2.80	1.2	3.42	1.2	3.07	1.3			
Stress days off	I	2.61	1.2	2.12	1.3	2.18	1.1	1.99	1.2	2.15	1.0	1.96	1.0			

Work time reduction

(1 – 9 very high)	C	2.52	1.2	1.84	1.0	2.55	1.4	1.90	1.0	2.49	1.3	2.13	1.1	0.031	-0.196	0.259
Worries/Stress at bedtime work (1 – 5 no worry/stress)	I	4.06	0.7	4.54	0.6	4.36	0.6	4.60	0.5	4.39	0.7	4.70	0.4	0.012	-0.113	0.137
	C	4.21	0.7	4.61	0.5	4.22	0.8	4.60	0.5	4.29	0.7	4.68	0.5			
Worries/Stress at bedtime days off (1 – 5 no worry/stress)	I	4.37	0.8	4.83	0.4	4.67	0.6	4.72	0.7	4.73	0.6	4.84	0.4	0.153*	0.022	0.284
	C	4.49	0.8	4.84	0.4	4.57	0.8	4.80	0.4	4.47	0.8	4.85	0.4			

* Significant at the 0.05-level
This analysis was requested during the review process.

Table F. Subgroup analysis V; Worries and Stress at Bedtime. Mean values (m) and standard deviations (sd) divided by group (intervention and control) and subgroup. Results of the three way-interaction of Group*Time*Worries/Stress at bedtime at baseline (weekly mean value dichotomized by median split) from the multilevel mixed model analyses. All three data collection periods are included in the model.

		Baseline				9 months				18 months				<u>Multilevel mixed model analyses</u>		
		<u>Worriesbl<=4.7</u>		<u>Worriesbl>4.7</u>		<u>Worriesbl<=4.7</u>		<u>Worriesbl>4.7</u>		<u>Worriesbl<=4.7</u>		<u>Worriesbl>4.7</u>		Estimate	95% C.I.	
	Group	m	sd	m	sd	m	sd	m	sd	m	sd	m	sd			
SSQ^a work (1 – 5 good)	I ^b	3.90	0.5	4.33	0.5	4.09	0.5	4.40	0.4	4.22	0.5	4.44	0.5	0.084	-0.091	0.108
	C ^c	3.96	0.6	4.35	0.5	4.01	0.6	4.27	0.5	4.09	0.5	4.29	0.5			
SSQ days off (1 – 5 good)	I	4.09	0.8	4.49	0.5	4.29	0.7	4.53	0.6	4.41	0.8	4.56	0.6	0.011	-0.128	0.150
	C	4.15	0.8	4.45	0.6	4.22	0.7	4.48	0.7	4.16	0.8	4.41	0.6			
Sleep length work (hh:min)	I	7:19	0:41	7:14	0:41	7:36	0:45	7:38	0:43	7:32	0:44	7:41	0:42	0.038	-0.096	0.172
	C	7:23	0:43	7:17	0:46	7:16	0:50	7:18	0:47	7:22	0:51	7:17	0:47			
Sleep length days off (hh:min)	I	8:25	1:07	8:32	1:00	8:34	1:07	8:38	0:59	8:32	1:10	8:36	1:02	0.459	-0.279	0.187
	C	8:34	1:08	8:28	0:58	8:34	1:13	8:40	1:11	8:41	1:20	8:42	0:59			
Sleepiness work (1 – 9 very sleepy)	I	4.75	0.8	4.05	1.1	4.24	0.9	3.67	1.1	4.01	0.9	3.64	1.0	-0.004	-0.184	0.176
	C	4.68	1.1	4.19	0.9	4.66	1.0	4.03	1.1	4.49	0.9	4.05	1.1			
Sleepiness days off (1 – 9 very sleepy)	I	4.23	1.2	3.70	1.2	3.91	1.2	3.45	1.3	3.75	1.1	3.36	1.2	-0.091	-0.319	0.135
	C	4.12	1.2	3.56	1.2	4.17	1.2	3.44	1.2	4.29	1.2	3.53	1.1			
Stress work (1 – 9 very high)	I	3.74	1.2	2.72	1.2	3.09	1.1	2.36	1.1	3.03	1.1	2.45	1.1	0.001	-0.226	0.228
	C	3.56	1.3	2.84	1.2	3.58	1.4	2.74	1.1	3.67	1.1	2.90	1.2			
Stress days off	I	2.75	1.3	1.88	1.1	2.31	1.2	1.79	0.9	2.22	1.0	1.85	1.0			

Work time reduction

(1 – 9 very high)	C	2.45	1.3	1.87	1.0	2.50	1.3	1.89	1.0	2.67	1.3	1.99	1.0	-0.154	-0.383	0.074
Worries/Stress at bedtime work (1 – 5 no worry/stress)	I	3.87	0.6	4.88	0.2	4.24	0.7	4.78	0.4	4.36	0.6	4.79	0.4	0.075	-0.051	0.200
	C	3.98	0.6	4.87	0.2	4.16	0.8	4.69	0.4	4.15	0.7	4.78	0.4			
Worries/Stress at bedtime days off (1 – 5 no worry/stress)	I	4.30	0.8	4.98	0.1	4.56	0.7	4.87	0.3	4.69	0.6	4.90	0.3	0.126	-0.006	0.258
	C	4.37	0.8	4.98	0.1	4.54	0.8	4.85	0.4	4.44	0.8	4.88	0.4			

This analysis was requested during the review process.