Associations of working conditions and chronic low-grade inflammation among employees: a systematic review and meta-analysis¹

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- 1. Supplementary Material
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Table S1

Outcome	Definition of outcome	Inflammatory biomarkers (per outcome
category	category	category)
Cells	Inflammation-related	Leukocytes
	processes on cell level as a	Eosinophils
	component of cellular	Granulocytes
	immunity	Lymphocytes
		Macrophages
		Monocytes
		Neutrophils
		Dendritic cells
Plasma	Inflammation-related	Acute-phase proteins
molecules	processes on plasma protein	C-reactive protein (CRP)
	level as a component of	Fibrinogen
	humoral immunity	Serum amyloid A
		Cytokines
		Chemokines
		Interferon-gamma (IFN-γ)
		Interleukins (IL)
		Lymphokines
		Monokines
		Tumor necrosis factor-alpha (TNF-α)
		Cell-free DNA
		Inflammasomes
		Intercellular adhesion molecule-1
Intracellular	Inflammation-related	Transcription factors
processes	processes on intracellular	AP-1
	level	NF-IL6
		NF-kappa B
		Gene expression
		Transcripts for proteins associated with
		inflammatory processes
		Transcriptomics focusing on or revealing
		inflammatory processes

Outcome Category, Definition, and Included Inflammatory Biomarkers per Category.

Table S2 Extracted Data and Risk of Bias Assessment per Study available at: https://osf.io/u2s9p/

Table S3

Results of the Risk of Bias Assessment (for Randomized Controlled Trials and Non-Randomized Studies of Interventions) and Quality of Reporting Assessment (for Observational Studies)

Study (type)	Risk of bias d	lomains						Overall risk of bias
RCT	Randomizatio	on process		Deviations from intended interventions	Missing outcome data	Measurement of the outcome	Selection of the reported result	
Dunne et al	+			+	±	+	±	±
(65) Hasson et al	+			+	+	+	±	±
(66) Hewitt et al	+			+	+	+	±	±
(67)								
Korshøj et al	±			+	<u>+</u>	+	+	±
Lebares et al	+			+	+	+	±	±
Murphy et al	+			+	<u>+</u>	+	±	±
(70) Shete et al (71)	+			+	±	+	±	±
Wachi et al (72)	<u>+</u>			+	+	+	<u>+</u>	±
NRSI	Confounding	Selection of participants into the study	Classification of interventions	Deviations from intended interventions	Missing data	Measurement of outcomes	Selection of the reported result	Overall risk of bias
Controlled:								
Carlsson et al (73)	±	+	+	+	_	+	+	_
Filaire et al (74)	_	<u>+</u>	+	+	n.i.	+	+	_
Geus et al (75)	_	+	+	<u>+</u>	n.i.	+	+	_

Tuble 35 Commu	eu							
Study (type)	Risk of bias d	lomains						Overall risk of bias
NRSI	Confounding	Selection of participants into the study	Classification of interventions	Deviations from intended interventions	Missing data	Measurement of outcomes	Selection of the reported result	
Netterstrøm & Hansen (76) <i>Uncontrolled:</i>	_	+	+	+		+	+	
Meyer et al (77)		+	n.a.	+	+	+	+	
Ramey et al (78)		±	+	+	±	+	+	
Skogstad et al (79)	_	±	+	+	±	+	+	_
Wultsch et al (80)		+	+	+	n.i.	+	+	
Observational			Quality of report	rting				Summary
			Number of criter	ia reported	Number of	f relevant criteria		score
Christian & Nuss	baum (81)		13		32			0.41
Dich et al (82)		23		33			0.70	
Eguchi et al (83)			22		33			0.67
Elovainio et al (84)		23		33		0.70		
Lee et al (85)		18		33			0.55	
Magnusson Hanson et al (86)		21		33			0.64	
Shirom et al (87)			22		33			0.67

Table S3 continued

Note. RCT = randomized controlled trial; NRSI = non-randomized study of intervention.

RCT: '+' = low risk of bias; ' \pm ' = some concerns; '-' = high risk of bias

NRSI: '+' = low risk of bias; ' \pm ' = moderate risk of bias; '-' = serious risk of bias; '-' = critical risk of bias; 'n.i.' = no information; 'n.a.' = not applicable

Observational: summary score = number of criteria reported divided by number of relevant criteria; scale range: 0-1 (higher scores indicate better quality)

Table S4

Marker	Study	Type of mental intervention (duration, frequency)	Follow-up: period/number	Key findings	Direction of effect
CRP	Ramey et al (78) ^b	Resilience training (~ 14-15 weeks; one educational class, one telementor session, 3 months practice in the field)	6 months/1	No significant change following intervention	
TNF-α	Hasson et al (66) ^a	Web-based stress management and health promotion tool (6 months, daily/ regular usage)	6 months/1	Significant decrease in reference group compared to IG	$\downarrow\downarrow$ *
Gene expression	•				
TNF-α mRNA	Dunne et al (65) ^a	Attention-based training program (7 weeks, 4 sessions à 4 hours)	9 weeks/1	IG: significant increase CG: no significant change	$\uparrow \uparrow$
IL-6 mRNA				No significant changes (both groups)	
	Wachi et al (72) ^a	Recreational music making (1 hour)	3 hours/1	IG: no significant change CG: no significant change Between groups: no significant differences	
IL-2 mRNA				IG: no significant change CG: no significant change Between groups: no significant differences	
IL-10 mRNA				IG: significant decrease CG: no significant change Between groups: significant differences	$\downarrow\downarrow$
IFN-γ mRNA				IG: no significant change (phases 1 & 2) CG: no significant change (phase 1); significant increase (phase 2) Between groups: no significant differences (phase 1); significant difference (phase 2)	Ļ

Workplace Mental Interventions and Inflammatory Biomarkers

Marker	Study	Type of mental intervention (duration, frequency)	Follow-up: period/number	Key findings	Direction of effect
Transcription fac	ctors:		2		
AP-1	Lebares et	Enhanced Stress Resilience Training (ESRT;	6-8 weeks/1	IG: significant reduction	$\downarrow\downarrow$
NF-kappaB	al (69)"	aggregated data of two trials: ESRT-1: 8		IG: significant reduction	11
i i imppuz		weeks, 120 minutes/ week; ESRT-2: 6 weeks,		CG: no significant change	**
		90 minutes/ week)			
Leukocyte	Wachi et al	Recreational music making (1 hour)	3 hours/1	IG: significant increase (phase 1); no	↑↑ (phase
count	(72) ^a			significant change (phase 2)	1)
				CG: no significant change (phase 1);	↑↑*
				significant increase (phase 2)	(phase 2)
				Between groups: no significant	-
				differences (phase 1); significant	
				difference (phase 2)	

Table S4 continued

Note. CG = control group; CRP = C-reactive protein; IL = interleukin; IG = intervention group; TNF- α = tumor-necrosis-factor-alpha.

^a Randomized controlled trial

^b Non-randomized study of intervention, uncontrolled

↑↑ Significant increase in inflammatory biomarker following intervention (and no significant change/ decrease in control)

↑ Tendency for increase in inflammatory biomarker, non-significant

— No significant difference(s) in inflammatory biomarker (between groups/ within group)

↓ Tendency for decrease in inflammatory biomarker, non-significant

↓↓ Significant decrease in inflammatory biomarker following intervention (and no significant change/ increase in control)

↑↑* Significant increase in inflammatory biomarker in control group (and no significant change in intervention group)

↓↓* Significant decrease in inflammatory biomarker in control group (and no significant change in intervention group)

Table S5

Marker	Study	Type of mental intervention and characteristics	Follow-up: period/number	Key findings	Direction of effect
CRP	Carlsson et al (73) ^a)^a Workplace reorganization (merger, 2 years/1 New job) Merger: significant increase New job: no significant change (compared with CG, respectively) 		↑↑ (merger) ↑ (new job)	
	Wultsch et al (80) ^b	Extended working periods (from 8 to 12 hours/day, 3 months)	3 months/1	No significant change (total sample) Significant increase in younger participants (21-30 years)	— (total sample) ↑↑ (young participants
Fibrinogen	Carlsson et al (73) ^a	Workplace reorganization (merger, new job, control)	2 years/1	Merger: no significant change New job: no significant change (compared with CG, respectively)	
	Netterstrøm & Hansen (76) ^{a*}	Outsourcing	13 months/2	No significant changes after intervention	
IL-6	Carlsson et al (73) ^a	Workplace reorganization (merger, new job, control)	2 years/1	Merger: significant increase New job: significant increase (compared with CG, respectively)	<pre> ^↑ (merger) ^↑ (new job) </pre>
	Wultsch et al (80) ^b	Extended working periods (from 8 to 12 hours/day, 3 months)	3 months/1	No significant change	
IL-2	Filaire et al (74) ^{a**}	Lecture to 200 students (compared to a working day without lecture)	2 working days/3	Significant increase after lecture	$\uparrow\uparrow$
IL-4				Significant increase after lecture	$\uparrow\uparrow$
IL-10				No significant effects	
TNF-α				Significant increase after	$\uparrow \uparrow$

Organizational/ Structural Interventions and Inflammatory Biomarkers

Note. CG = control group; CRP = C-reactive protein; $IL = interleukin; TNF-\alpha = tumor-necrosis-factor-alpha.$

^a Non-randomized study of intervention, controlled

- ^b Non-randomized study of intervention, uncontrolled
- * Controlled for baseline only
- ** Within-subject design
- $\uparrow\uparrow$ Significant increase in inflammatory biomarker following intervention
- \uparrow Tendency for increase in inflammatory biomarker, non-significant
- No significant change in inflammatory biomarker
- \downarrow Tendency for decrease in inflammatory biomarker, non-significant
- $\downarrow \downarrow$ Significant decrease in inflammatory biomarker following intervention

Figure S1



Funnel Plot for Studies on Workplace Physical Interventions and C-reactive Protein