

A cluster randomized controlled trial to reduce office workers' sitting time: effect on productivity outcomes ¹

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1. *Supplementary material*
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Supplemental Table S1: Description of Health and Work Questionnaire (HWQ) and Work Limitations Questionnaire (WLQ).

Scale		Description of Items Within Each Scale
HWQ (Items, subscales, and total score all scored 1-10)	Productivity (average of items)	Eleven items which examine the amount, quality, and efficiency of job tasks. Items within this subscale involve participants rating their own performance as well as their performance in the eyes of their supervisor and coworkers.
	Concentration/ Focus (average of items) ^a	Four items which deal with participants' feelings of restlessness, interest, difficulty concentrating, and exhaustion at the workplace. ^a
	Supervisor Relations (average of items)	Two items addressing participants' ratings of satisfaction and communication with their supervisor.
	Non-Work Satisfaction (average of items)	Three items which deal with participants communication, relationship satisfaction, and personal life outside of the workplace.
	Work Satisfaction (average of items)	Four items which examine participants' satisfaction regarding their work environment, job, and relationship with coworkers.
	Impatience / Irritability (average of items) ^a	Three items which examine participants' annoyance, impatience, and conflicts in the workplace. ^a
	Not Included in any Sub-Scale	Items examining stress ^a , job control, and ability to finish work on time ^a .
	Total Score	Average of all 30 items.
WLQ (Items scored 0-4,	Time Demands (average of items) ^a	Five items within the time demands subscale address participants' ability to work the required hours, start/ continuously work, and maintain a work routine. ^a

subscales scored 0- 100, and productivity loss score is 0-24.9)	Physical Demands (average of items) ^a	Six items which reflect participants' ability to walk, lift objects, bend/twist, maintain a position, repeat motions, and use hand-held tools (including using a keyboard).
	Mental/ Interpersonal Demands (average of items) ^a	Nine items of the mental/interpersonal demands subscale dealing with participants' ability to concentrate, think, read, speak, help others, and control their temper. The interpersonal aspects of this subscale include interactions with co-workers, supervisors, and customers. ^a
	Output Demands (average of items) ^a	Five items examining participants' ability to handle their workload, finish work, work quickly, and avoid mistakes. ^a
	Productivity Loss Score ^a	A weighted sum of the WLQ subscales

^a Indicates lower value is better.

Supplemental Table S2: Variables considered as potential confounders and adjusted for in analyses using the Health and Work Questionnaire (HWQ) and Work Limitations Questionnaire (WLQ).

Outcome	Models are adjusted for ^a
All outcomes	Baseline values of the outcome, age (years), gender (men/women) and the following if significant at $P < 0.2$ (backward elimination): Ethnicity (Caucasian/other), completed post-school education (yes/no), married/living together (yes/no), job control (high [6 to 10] / low [1 to 5]), clerical job category (yes/no), workspace satisfaction (1-5 score, continuous or hi/low split), informal interactions at work (total duration), 5+ years in current workplace (yes/no), full time equivalent (yes/no), doctor diagnosed diabetes or had a baseline fasting glucose level diagnostic of diabetes (yes/no), doctor diagnosed high cholesterol or high baseline fasting cholesterol level (yes/no), physical Quality of Life (QoL) score, mental Quality of Life (QoL) score, Health & Digestive Issues symptoms score (continuous), fatigue score (continuous), lower back problems (yes/no), upper extremity problems (yes/no), lower extremity problems (yes/no), Body Mass Index (BMI; kg/m ²), overall MVPA stepping (h/16 h), workplace sitting (h/8-h at work), currently smoke (yes/no), average TV time (h/d)
HWQ Productivity	Married/living together, full time equivalent, Health & Digestive Issues symptoms score, upper extremity problems, BMI, physical QoL score, mental QoL score, MVPA stepping, workplace sitting, currently smoke
HWQ Focus	Ethnicity, full time equivalent, diabetes, lower back problems, mental QoL score
HWQ Supervisor Relations	Married/living together, ethnicity, workspace satisfaction, job control, full time equivalent, 5+ years in current workplace, lower back problems, fatigue score, workplace sitting, currently smoke, mental QoL score
HWQ Non-Work Satisfaction	Married/living together, workspace satisfaction, doctor diagnosed high cholesterol, Health & Digestive Issues symptoms score, fatigue score, MVPA stepping, workplace sitting, currently smoke, mental QoL score
HWQ Work Satisfaction	Married/living together, workspace satisfaction, clerical job category, 5+ years in current workplace, workplace sitting
HWQ Impatience	Married/living together, ethnicity, informal interactions at work, workspace satisfaction, job control, full time equivalent, workplace sitting
HWQ Total	Married/living together, ethnicity, 5+ years in current workplace, workplace sitting, mental QoL score
HWQ Stress Item	Married/living together, ethnicity, 5+ years in current workplace, fatigue score, MVPA stepping, workplace sitting, currently smoking, mental QoL score

HWQ Job Control Item	Ethnicity, completed post-school education, workspace satisfaction, clerical job category, 5+ years in current workplace, upper extremity problems, workplace sitting, currently smoking, physical QoL score, mental QoL score
HWQ Ability to Finish Work Item	Completed post-school education, informal interactions at work, workspace satisfaction, job control, diabetes, lower extremity problems, workplace sitting, mental QoL score
WLQ Physical Demands	Married/living together, workspace satisfaction, full time equivalent, clerical job category, diabetes, Health & Digestive Issues symptoms score, fatigue score, BMI, physical QoL score, mental QoL score
WLQ Mental/ Interpersonal Demands	Married/living together, completed post-school education, informal interactions at work, workspace satisfaction, job control, clerical job category, doctor diagnosed high cholesterol, Health & Digestive Issues symptoms score, upper extremity problems, MVPA stepping, average TV time, mental QoL score
WLQ Output Demands	Completed post-school education, clerical job category, diabetes, doctor diagnosed high cholesterol, upper extremity problems, workplace sitting, mental QoL score
WLQ Time Demands	Completed post-school education, workspace satisfaction, clerical job category, lower back problems, BMI, physical QoL score, mental QoL score
WLQ Score	Completed post-school education, full time equivalent, clerical job category, diabetes, physical QoL score, MVPA stepping, average TV time, mental QoL score

^a Models adjusted for baseline values of the outcome, age and gender regardless of significance and other potential confounders (all baseline values only) that were retained as significant at $P < 0.2$ in a backward elimination.

Supplemental Table S3: Odds of missing data (logistic regression) in 136 intervention and 95 control participants.^a

	OR (95% CI)	P
Intervention (Y/N)	0.77 (0.37–1.58)	0.441
Age (Years)	1.06 (0.69–1.64)	0.776
Female (Y/N)	1.38 (0.82–2.30)	0.201
BMI (kg/m ²)	1.13 (0.89–1.45)	0.287
Married (Y/N)	1.36 (0.71–2.62)	0.324
Caucasian (Y/N)	0.75 (0.35–1.63)	0.443
Smoker (Y/N)	2.97 (1.21–7.24)	0.021
Post-School Education (Y/N)	0.63 (0.29–1.38)	0.229
Job Control (High/Low)	0.93 (0.50–1.73)	0.804
Full Time (Y/N)	0.99 (0.60–1.63)	0.956
Clerical Work (Y/N)	0.99 (0.45–2.17)	0.972
5+ Years in Current Workplace (Y/N)	1.31 (0.68–2.54)	0.388
Diabetes (Y/N)	1.07 (0.51–2.23)	0.855
High Cholesterol (Y/N)	0.83 (0.30–2.27)	0.691
Lower Back Problems (Y/N)	1.15 (0.48–2.77)	0.736
Upper Extremity Problems (Y/N)	0.56 (0.23–1.34)	0.173
Lower Extremity Problems (Y/N)	0.67 (0.43–1.05)	0.079
Informal Interactions at Work (min/wk)	0.97 (0.73–1.29)	0.824
Workspace Satisfaction	1.03 (0.87–1.22)	0.726
Health and Digestive Issues symptom score	1.06 (0.63–1.79)	0.812
Fatigue score	1.19 (0.75–1.88)	0.434
Physical QoL score	0.86 (0.63–1.17)	0.300
Mental QoL score	0.96 (0.67–1.38)	0.818
MVPA (h/16h)	0.87 (0.63–1.21)	0.389
Workplace Sitting (h/8-h)	0.77 (0.56–1.06)	0.097
Average TV time (h/d)	1.07 (0.90–1.28)	0.411

Table presents odds ratio (OR) with 95% confidence interval (CI) and p-value from logistic regression. All yes/no (Y/N) variables compare yes versus no and high/low variables compare high versus low. All continuous variables were first divided by their standard deviation before the regression analysis.

^a Participants are considered to have missing data if data are missing for any of the outcomes at any timepoint, or for any of the covariates used in models for these outcomes.

Supplemental Table S4: Worksite clustering at baseline (n=14 clusters; n=231 participants).^a

	Outcome	3 Month ICC (95% CI)	12 Month ICC (95% CI)
HWQ	Total Score	<0.001 (<0.001– <0.001)	0.05 (0.003–0.528)
	Productivity	<0.001 (<0.001– <0.001)	<0.001 (<0.001– <0.001)
	Focus	<0.001 (<0.001– <0.001)	0.100 (0.020–0.370)
	Supervisor Relations	0.037 (0.003–0.341)	<0.001 (<0.001– <0.001)
	Non-Work Satisfaction	<0.001 (<0.001– <0.001)	0.009 (<0.001–0.985)
	Work Satisfaction	0.035 (0.001–0.574)	<0.001 (<0.001– <0.001)
	Impatience	<0.001 (<0.001– <0.001)	0.037 (0.001–0.520)
	Stress Item	0.032 (0.001–0.444)	0.086 (0.011–0.458)
	Job Control Item	<0.001 (<0.001– <0.001)	<0.001 (<0.001– <0.001)
	Finish Work Item	0.032 (0.002–0.310)	0.017 (<0.001–0.567)
WLQ	Productivity Loss Score	0.018 (<0.001–0.598)	<0.001 (<0.001– <0.001)
	Physical Demands	<0.001 (<0.001– <0.001)	0.033 (0.001–0.479)
	Mental Demands	<0.001 (<0.001– <0.001)	0.066 (0.006–0.437)
	Output Demands	0.036 (0.003–0.340)	<0.001 (<0.001– <0.001)
	Time Demands	0.004 (<0.001–1.000)	0.007 (<0.001–1.000)

^a calculated in STATA from random intercept models, REML estimation

Supplemental Table S5: Unadjusted Health and Work Questionnaire (HWQ) and Work Limitations Questionnaire standardized (outcome / baseline standard deviation) intervention improvements at 3 Months, 12 Months, and 12-3 Months.

		3 Months		12 Months		12-3 Months	
		Mean Change (95%CI)	P	Mean Change (95%CI)	P	Mean Change (95%CI)	P
Outcome							
HWQ	Total Score	0.07 (-0.14–0.29)	0.506	0.15 (-0.09–0.39)	0.225	0.07 (-0.17–0.31)	0.547
	Productivity	-0.03 (-0.3–0.24)	0.827	0.19 (-0.13–0.5)	0.245	0.22 (-0.1–0.53)	0.183
	Focus ^a	-0.1 (-0.3–0.1)	0.341	-0.01 (-0.29–0.26)	0.919	0.08 (-0.2–0.36)	0.558
	Supervisor Relations	0.05 (-0.22–0.32)	0.718	0.15 (-0.15–0.44)	0.327	0.1 (-0.23–0.43)	0.564
	Non-Work Satisfaction	-0.06 (-0.33–0.21)	0.676	0.23 (-0.04–0.51)	0.097	0.29 (-0.03–0.61)	0.072
	Work Satisfaction	0.1 (-0.16–0.36)	0.45	0.21 (-0.08–0.51)	0.159	0.11 (-0.17–0.4)	0.435
	Impatience ^a	-0.08 (-0.33–0.17)	0.538	0.21 (-0.11–0.54)	0.197	0.29 (-0.09–0.68)	0.137
	Stress Item ^a	-0.1 (-0.41–0.21)	0.537	-0.2 (-0.57–0.16)	0.276	-0.1 (-0.45–0.24)	0.554
	Job Control Item	0.03 (-0.22–0.28)	0.806	-0.09 (-0.37–0.19)	0.533	-0.12 (-0.4–0.16)	0.408
	Fail to Finish Work Item ^a	-0.2 (-0.48–0.08)	0.164	0.09 (-0.24–0.43)	0.585	0.29 (-0.07–0.66)	0.115
WLQ	Productivity Loss Score ^a	-0.14 (-0.34–0.07)	0.196	-0.33 (-0.58– -0.07)	0.012 *	-0.19 (-0.44–0.06)	0.14
	Time Demands ^a	-0.00 (-0.23–0.22)	0.968	-0.34 (-0.6– -0.08)	0.01 *	-0.34 (-0.61– -0.06)	0.015 *
	Physical Demands ^a	-0.07 (-0.39–0.25)	0.658	0.28 (-0.06–0.62)	0.103	0.35 (-0.03–0.73)	0.068
	Mental/ Interpersonal Demands ^a	-0.11 (-0.32–0.1)	0.32	-0.41 (-0.71– -0.12)	0.006 *	-0.31 (-0.62–0.00)	0.053
	Output Demands ^a	-0.13 (-0.36–0.1)	0.274	-0.38 (-0.64– -0.13)	0.003 *	-0.26 (-0.5– -0.01)	0.039 *

^a Indicates lower value is better

* Significant intervention effect.

Supplemental Table S6: Adjusted mean changes from baseline in productivity outcomes within intervention and control groups.

		3 Months				12 Months			12-3 Months	
Outcome	Group	<i>n</i>	Mean Change (95%CI)	<i>P</i>	<i>n</i>	Mean Change (95%CI)	<i>P</i>	Mean Change (95%CI)	<i>P</i>	
HWQ	Total Score	Control	76	0.04 (-0.13–0.2)	0.645	60	-0.05 (-0.23–0.13)	0.603	-0.09 (-0.27–0.1)	0.364
		Intervention	112	0.11 (-0.02–0.25)	0.096	93	0.1 (-0.05–0.24)	0.192	-0.02 (-0.17–0.13)	0.809
	Productivity	Control	76	0.01 (-0.18–0.21)	0.898	60	-0.12 (-0.36–0.12)	0.331	-0.13 (-0.38–0.12)	0.301
		Intervention	112	-0.07 (-0.23–0.1)	0.424	93	0.02 (-0.17–0.21)	0.808	0.09 (-0.11–0.29)	0.378
	Focus ^a	Control	76	-0.14 (-0.29–0.02)	0.082	60	-0.14 (-0.36–0.07)	0.189	-0.01 (-0.23–0.21)	0.94
		Intervention	113	-0.26 (-0.38– -0.14)	<0.001 *	93	-0.18 (-0.35– -0.00)	0.044	0.08 (-0.09–0.26)	0.355
	Supervisor Relations	Control	76	-0.08 (-0.29–0.13)	0.437	60	-0.18 (-0.41–0.04)	0.109	-0.1 (-0.36–0.16)	0.444
		Intervention	112	-0.00 (-0.17–0.17)	0.981	93	0.02 (-0.16–0.2)	0.849	0.02 (-0.19–0.23)	0.855
	Non-Work Satisfaction	Control	76	0.08 (-0.13–0.28)	0.461	60	-0.15 (-0.36–0.05)	0.14	-0.23 (-0.48–0.02)	0.067
		Intervention	112	0.11 (-0.06–0.28)	0.201	93	0.19 (0.03–0.35)	0.019	0.08 (-0.12–0.28)	0.42
	Work Satisfaction	Control	76	-0.05 (-0.26–0.15)	0.613	60	-0.15 (-0.37–0.08)	0.21	-0.09 (-0.31–0.13)	0.41
		Intervention	112	0.1 (-0.08–0.27)	0.274	93	0.13 (-0.06–0.31)	0.185	0.03 (-0.15–0.21)	0.736
	Impatience ^a	Control	76	-0.11 (-0.31–0.08)	0.265	60	-0.18 (-0.43–0.06)	0.14	-0.07 (-0.37–0.23)	0.635
		Intervention	112	-0.11 (-0.27–0.05)	0.185	93	0.09 (-0.1–0.29)	0.347	0.2 (-0.04–0.45)	0.103
	Stress Item ^a	Control	76	0.00 (-0.17–0.18)	0.969	60	0.01 (-0.22–0.24)	0.924	0.01 (-0.26–0.28)	0.954
		Intervention	112	-0.19 (-0.34– -0.05)	0.007 *	93	-0.25 (-0.44– -0.06)	0.008	-0.06 (-0.28–0.16)	0.608
	Job Control Item	Control	76	0.02 (-0.17–0.21)	0.87	60	-0.03 (-0.23–0.18)	0.78	-0.05 (-0.27–0.18)	0.689
		Intervention	112	0.18 (0.02–0.33)	0.026 *	93	0.00 (-0.16–0.16)	0.994	-0.17 (-0.35–0.00)	0.054
Fail to Finish Work Item ^a	Control	76	-0.04 (-0.25–0.18)	0.731	60	-0.15 (-0.4–0.1)	0.246	-0.11 (-0.39–0.17)	0.435	
	Intervention	112	-0.16 (-0.34–0.02)	0.083	93	0.04 (-0.17–0.24)	0.729	0.19 (-0.03–0.42)	0.095	
WLQ	Productivity Loss Score ^a	Control	74	-0.13 (-0.28–0.02)	0.083	58	0.03 (-0.18–0.23)	0.784	0.16 (-0.04–0.36)	0.111
		Intervention	110	-0.28 (-0.4– -0.16)	<0.001 *	92	-0.28 (-0.44– -0.12)	0.001	0 (-0.16–0.15)	0.968
	Time Demands ^a	Control	76	-0.18 (-0.35– -0.02)	0.032 *	58	0.04 (-0.18–0.25)	0.732	0.22 (0.01–0.43)	0.041 *
		Intervention	114	-0.29 (-0.43– -0.16)	<0.001 *	94	-0.38 (-0.55– -0.21)	<0.001 *	-0.09 (-0.25–0.08)	0.319
	Physical Demands ^a	Control	77	0.06 (-0.18–0.29)	0.652	60	-0.14 (-0.39–0.11)	0.272	-0.2 (-0.49–0.1)	0.192
		Intervention	112	-0.00 (-0.2–0.19)	0.97	92	0.19 (-0.01–0.39)	0.068	0.19 (-0.05–0.43)	0.113

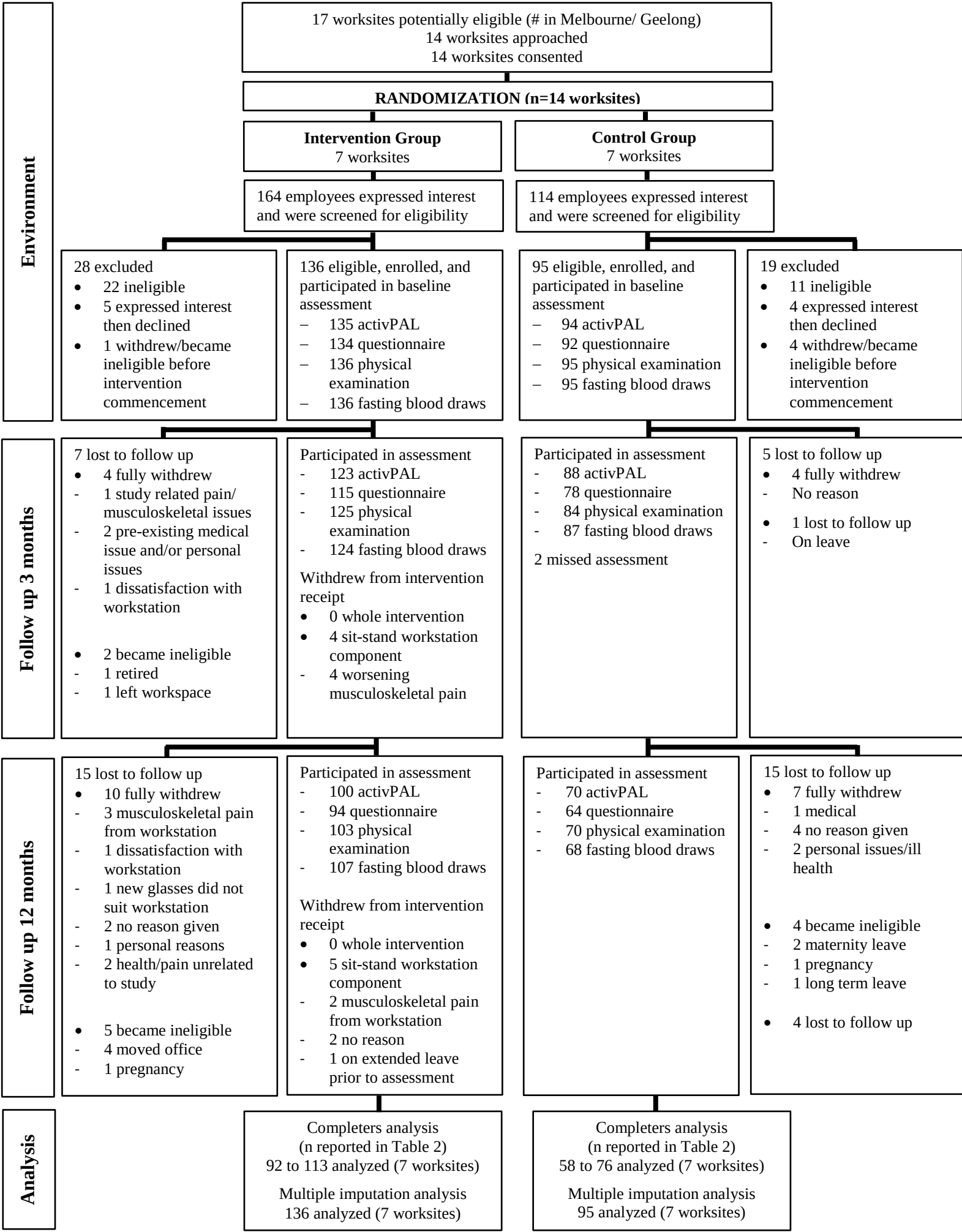
Mental/ Interpersonal Demands^a	Control	75	-0.05 (-0.2–0.1)	0.522	60	0.18 (-0.05–0.42)	0.13	0.23 (-0.01–0.47)	0.065
	Intervention	111	-0.26 (-0.38– -0.13)	<0.001 *	92	-0.32 (-0.51– -0.13)	0.001 *	-0.06 (-0.26–0.14)	0.542
Output Demands^a	Control	76	-0.14 (-0.3–0.03)	0.114	60	0.04 (-0.16–0.23)	0.695	0.17 (-0.01–0.36)	0.067
	Intervention	110	-0.25 (-0.39– -0.11)	<0.001 *	92	-0.32 (-0.48– -0.16)	<0.001 *	-0.07 (-0.22–0.08)	0.364

Table presents adjusted mean changes in the Health and Work Questionnaire (HWQ) and Work Limitations Questionnaire (WLQ) outcomes, standardized (divided by baseline SD), and adjusted for baseline values and potential confounders.

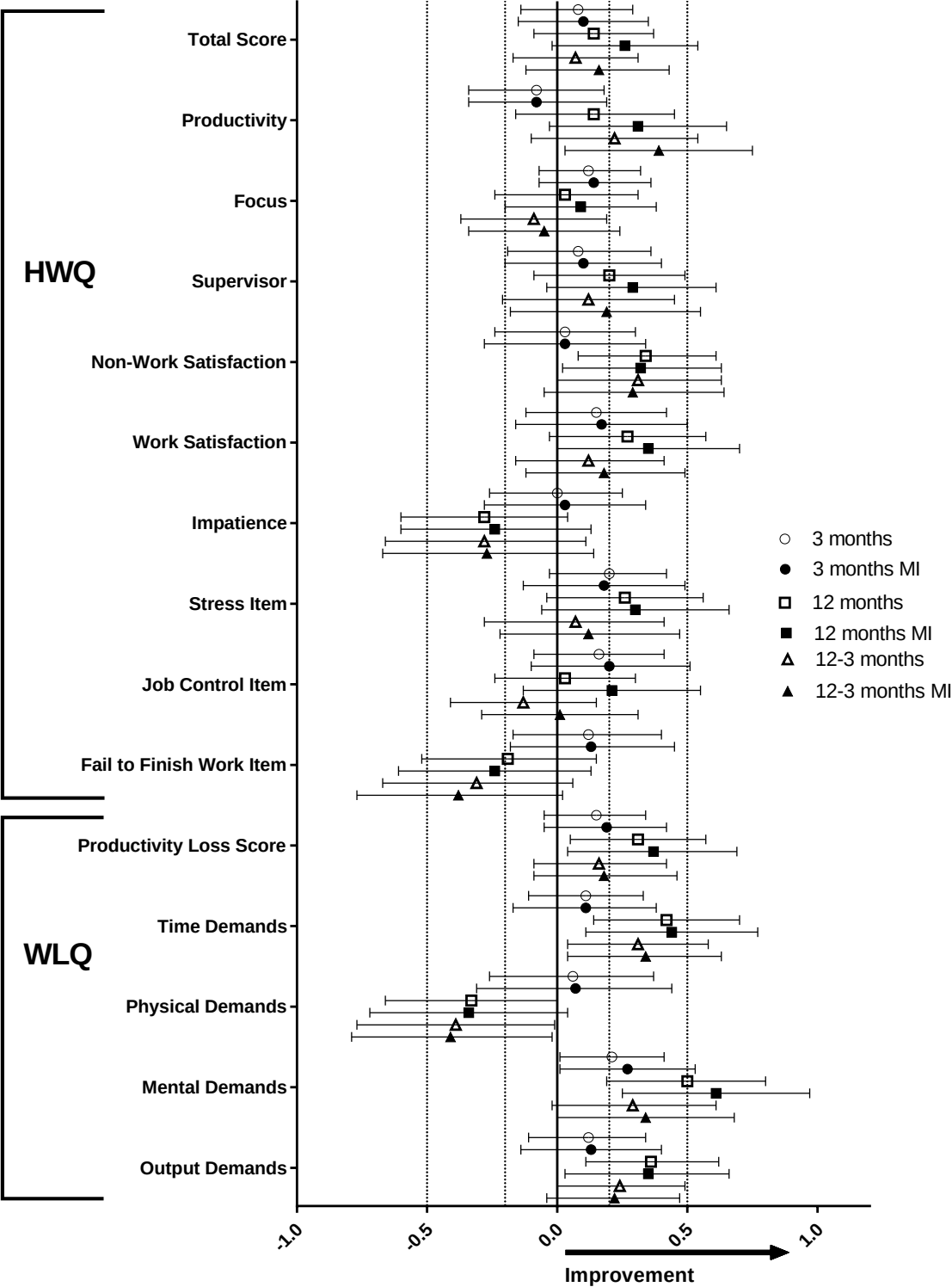
* Significantly different to baseline $P < .05$.

^a Indicates lower value is better

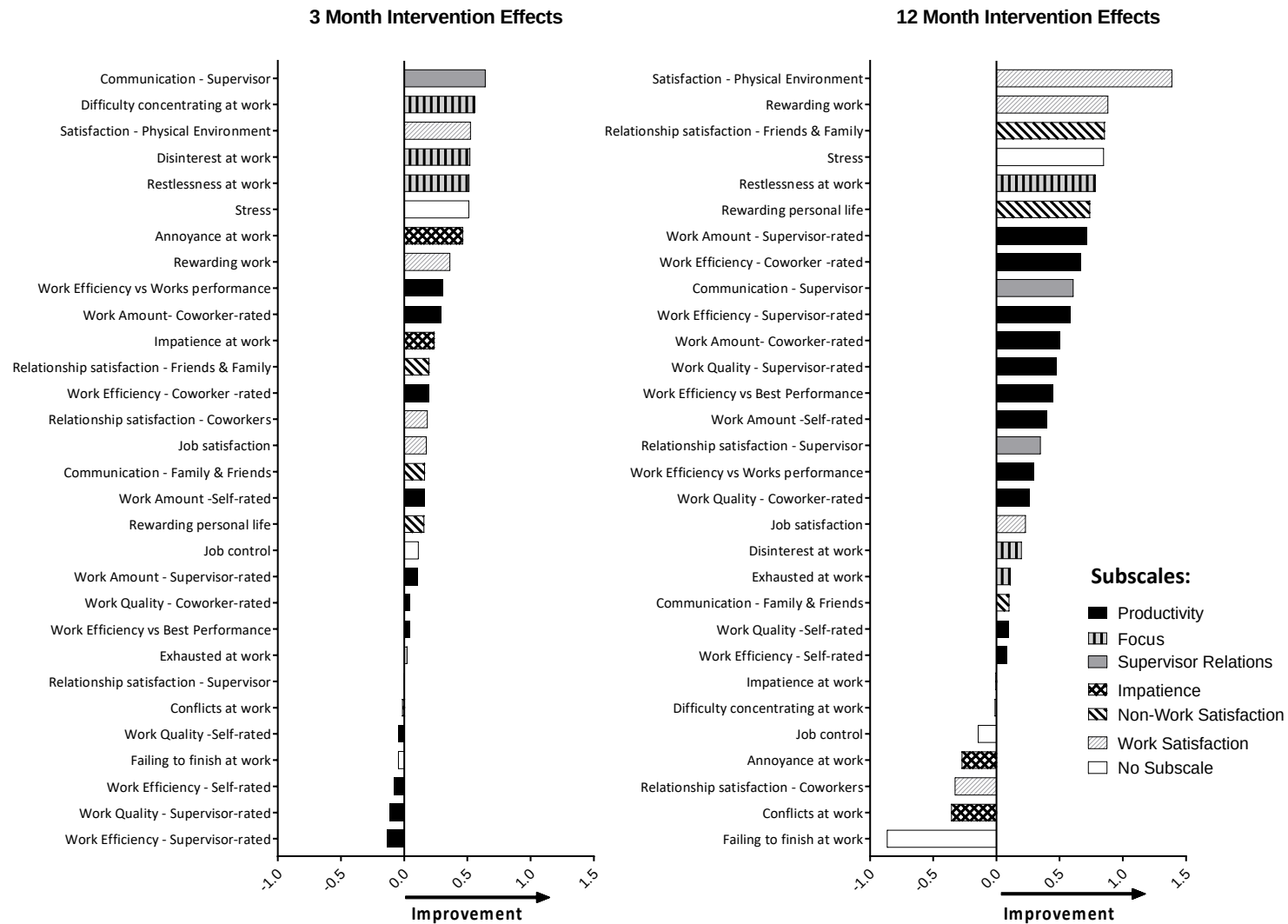
Supplemental Figure S1: Flow diagram of enrolment, participation, and analysis.



Supplemental Figure S2: Comparison of intervention effects on Health and Work Questionnaire (HWQ) and Work Limitations Questionnaire (WLQ) outcomes at 3 months and 12 months when estimated by evaluable-case and multiple imputation (MI) analyses.



Supplemental Figure S3: Description of mean improvements in individual Health and Work Questionnaire (HWQ) items in the intervention group net of control, ranked by degree of improvement.



Supplemental Figure S4: Description of mean improvements in individual Work Limitations Questionnaire (WLQ) items in the intervention group net of control, ranked by degree of improvement

