International Journal of
Environmental Research and Public Health

MDPI

Article

Participation in the Global Corporate Challenge®, a Four-Month Workplace Pedometer Program, Reduces Psychological Distress

Jessica Stone [1], S. Fiona Barker [1], Danijela Gasevic [1,2] and Rosanne Freak-Poli [1,3,*]

[1] School of Public Health and Preventive Medicine, Monash University, Melbourne, VIC 3004, Australia
[2] Centre for Global Health, Usher Institute, The University of Edinburgh, Edinburgh EH8 9AG, UK
[3] School of Clinical Sciences at Monash Health, Monash University, Melbourne, VIC 3004, Australia
* Correspondence: rosanne.freak-poli@monash.edu

Abstract: Background: Psychological distress (stress) has been linked to an increased risk of chronic diseases and is exacerbated by a range of workplace factors. Physical activity has been shown to alleviate psychological distress. Previous pedometer-based intervention evaluations have tended to focus on physical health outcomes. This study aimed to investigate the immediate and long-term changes in psychological distress in employees based in Melbourne, Australia after their participation in a four-month pedometer-based program in sedentary workplaces. Methods: At baseline, 716 adults (aged 40 ± 10 years, 40% male) employed in primarily sedentary occupations, voluntarily enrolled in the Global Corporate Challenge© (GCC©), recruited from 10 Australian workplaces to participate in the GCC® Evaluation Study, completed the Kessler 10 Psychological Distress Scale (K10). Of these, 422 completed the K10 at baseline, 4 months and 12 months. Results: Psychological distress reduced after participation in a four-month workplace pedometer-based program, which was sustained eight months after the program ended. Participants achieving the program goal of 10,000 steps per day or with higher baseline psychological distress had the greatest immediate and sustained reductions in psychological distress. Demographic predictors of immediate reduced psychological distress (n = 489) was having an associate professional occupation, younger age, and being 'widowed, separated or divorced'. Conclusions: Participation in a workplace pedometer-based program is associated with a sustained reduction in psychological distress. Low-impact physical health programs conducted in groups or teams that integrate a social component may be an avenue to improve both physical and psychological health in the workplace.

Keywords: psychological distress; stress; physical activity; prevention; health promotion; intervention; K10; pedometer; work; occupational health; sitting; sedentary; physical activity

Citation: Stone, J.; Barker, S.F.; Gasevic, D.; Freak-Poli, R. Participation in the Global Corporate Challenge®, a Four-Month Workplace Pedometer Program, Reduces Psychological Distress. *Int. J. Environ. Res. Public Health* **2023**, *20*, 4514. https://doi.org/10.3390/ijerph20054514

Academic Editors: Bronwyn K. Clark and Charlotte Brakenridge

Received: 11 January 2023
Revised: 24 February 2023
Accepted: 27 February 2023
Published: 3 March 2023

1. Introduction

Psychological distress represents a combination of nervousness, agitation and psychological fatigue, and is interchangeably referred to as stress [1,2]. Experiencing higher levels of psychological distress may indicate an underlying mental disorder, such as anxiety or depression [3], and has been linked to an increased risk of chronic diseases such as cardiovascular disease, arthritis and chronic obstructive respiratory disease [4]. However, there is a lack of comprehensive data collected on the incidence and prevalence of psychological distress, especially in comparison to physical health [5].

In Canada and Australia, around 10% of people report experiencing high levels of psychological distress, while 15–20% of workers across Europe and North America report experiencing psychological distress [6,7]. Psychological distress in the workplace is exacerbated by a range of workplace factors including high job demand and low job control, job strain, poor support, poor workplace relationships, low role clarity, poor organisational change management, poor organisational justice, poor environmental conditions, remote or isolated work and violent or traumatic events [8–10]. Work-related stress can also increase

the risk of chronic disease—a study of 1,592,491 Danish workers concluded that an average of 0.25 years in women and 0.84 years in men were lost due to chronic illness associated with high job demand and low job control [11]. This can partly be explained by findings from a study of 3090 Japanese workers reporting that workers with high job demand, low job control and job strain were more likely to have pre-existing health conditions worsen as workloads and work/family conflicts arose during their employment [10]. Work-related distress is also associated with high levels of unplanned absences, sick leave, staff turnover, withdrawal, presenteeism, poor work and poor product quality [8]. Workers experiencing psychological distress at their workplace emphasise the importance of preventing and managing levels of psychological distress in working populations and identifying interventions that target and reduce psychological distress.

Physical activity has been shown to reduce psychological distress, reduce the risk of chronic disease and increase self-esteem, overall wellbeing, and health-related quality of life [12–16]. Mechanistically, physical activity increases the production of endorphins and neurotransmitters such as serotonin and dopamine, which boost mood and reduce feelings of stress and depression [17]. The benefit of physical activity on reducing psychological distress is irrespective of age, sex, ethnicity or having a medical condition [18,19]. A longitudinal study consisting of 33,918 observations from 17,080 individuals in the Household, Income and Labour Dynamics in Australia (HILDA) Survey over 2007, 2009 and 2011 reported that frequent participation in moderate to vigorous physical activity was associated with lower psychological distress scores [20]. A review to develop new evidence-based Australian guidelines for physical activity for adults concluded that participation in moderate to vigorous physical activity (compared to being inactive or of low levels of physical activity) was associated with a reduction in feelings of psychological distress [13]. Despite these benefits, very few adults undertake the World Health Organisation's (WHO) recommendation of 150 min of moderate-intensity physical activity and at least 2 days of strength-based muscle training each week [21,22]. Moderate-intensity physical activity is defined as activity that is performed at 3.0–5.9 times the intensity of rest, while vigorous-intensity physical activity is performed at 6.0 or more times the intensity of rest for adults [22].

The increasingly sedentary nature of transport, leisure-time and workplaces contributes to an overall decrease in physical activity worldwide [23]. The WHO has recognised the workplace environment as an important area of action for health promotion and disease prevention [24]. In 2017, 39% of people employed in the European Union worked while sitting [25]. Attempts have been made by workplaces and research groups to reduce sedentary time and increase physical activity at work [20,26–30]. The Toronto Charter, reported by the International Society for Physical Activity and Health (GAPA), calls for physical activity programs that are targeted to all sections of society, including the workplace [31]. The Charter also encourages employers and academia to undertake research to provide evidence for the effectiveness of physical activity programs in work settings and to provide support for employees in workplaces to be physically active [31]. Pedometer-based interventions have been suggested as a simple method for encouraging physical activity in the general and working population [32].

Previous studies investigating the use of pedometers as a physical activity intervention have tended to focus on physical health outcomes rather than psychological health outcomes, and only assessed short term benefits. While there is considerable evidence that physical activity and pedometer interventions in the workplace are effective at improving health outcomes and psychological distress, further clarification is needed in future studies to address the following issues. As identified in the systematic review by Freak-Poli et al., many studies that assessed pedometer interventions and their impact on health outcomes were cross-sectional and only observed the short-term effects of the programs on health [33]. Additionally, although there is an association with lower psychological distress among people who undertake more physical activities and/or are less sedentary, these findings are not validated by changes during physical activity interventions [20,27].

There is also a need for physical activity interventions to assess health outcomes beyond physical health factors. Physical activity interventions primarily focus on improving physical health outcomes linked to chronic disease, but such interventions may have additional benefits. There is a need for evaluations to be expanded to include mental health outcomes as well [33]. Additionally, the Freak-Poli et al. systematic review recommends the use of longitudinal studies to follow participants over a longer period of time to demonstrate sustained long-term effects on physical and mental health outcomes after the intervention has been completed [33].

Furthermore, evidence shows that employees are motivated to engage in pedometer programs, as walking is a low-intensity but sustainable form of physical activity over long periods of time [33]. It is also important to note that the employees most likely to benefit from workplace low-impact walking programs are those in highly sedentary roles, such as office workers and administrative staff [33]. Women, full time workers and individuals that self-reported a healthy weight and high physical activity were more likely to engage and participate in pedometer programs, which indicates that other groups need to be targeted in future studies [33–35]. Such interventions may provide the opportunity to negate the negative effects associated with shift work, overtime, and high job stress, as well as improve health outcomes [36].

Our study aims to investigate whether participation in a four-month workplace pedometer program was associated with immediate changes (after the four-month program) and long-term changes (eight months post-program) in psychological distress. Secondly, if changes were observed, we aimed to explore factors associated with change in psychological distress. Based on previous evidence that lower psychological distress is associated with undertaking physical activity, we hypothesize that adults in sedentary occupations will have a reduction in psychological distress after participation in a group-based, low-intensity physical activity workplace program, compared to their baseline measure (pre-post design).

2. Materials and Methods

This study involved secondary analysis of an existing, de-identified sample of office workers from Melbourne, Australia who were in predominantly sedentary occupations and enrolled in a group-based, pedometer workplace program.

2.1. Global Corporate Challenge®

The Global Corporate Challenge® (GCC®) is an annual pedometer-based, physical activity, four-month workplace health program that is conducted by a corporate organisation. The GCC® is held world-wide through workplaces, which group employees into teams of seven people. In this study, participants were asked to wear the visible pedometers provided by the GCC® on their hip throughout the day, with the exception of swimming and showering (it was removed during sleeping). Each participant aimed to undertake the step goal of 10,000 steps per day, which has been the historical recommended step goal to achieve adequate daily activity [12,14,37–39]. Each participant entered their steps into the GCC® website, which was combined to generate a team step count. The team step count was displayed virtually as walking progress around a world map, with information on locations as they arrived. Teams could see their progress, as well as other teams within their company world-wide, providing a competitive edge to the program. For example, an international company can compete with the office on the other side of the world. Additionally, the team or group component of the GCC® provided opportunities to get to know colleagues, external encouragement to achieve the recommended step goal, and increased collegiality among colleagues. Participants were sent weekly encouragement newsletters via email including the participant's personal best daily step count, health tips from a nutritionist, stories from other participants, a "Dear GCC" section answering participants' questions, housekeeping and prizes awarded by sponsors of the program. A website was used for logging daily step counts and provided access to additional health

information such as the number of steps required to burn off a hamburger, communication among participants and comparing team progress.

2.2. Recruitment and Participation

The GCC® Evaluation Study was a prospective longitudinal observational study conducted over a 12-month period in workplaces across Melbourne (Figure 1) [12,14,37–39]. Participants were recruited from ten predominantly sedentary workplaces over eight weeks in April and May 2008, and were enrolled in the GCC® program (Appendix A). While 716 participants completed the Kessler Psychological Distress Scale 10-item (K10) [40] at baseline, this study mainly focused on the 422 participants who completed the K10 at baseline and 4- and 12-month follow-ups. Across all variables, there was minimal missing data (Appendix B).

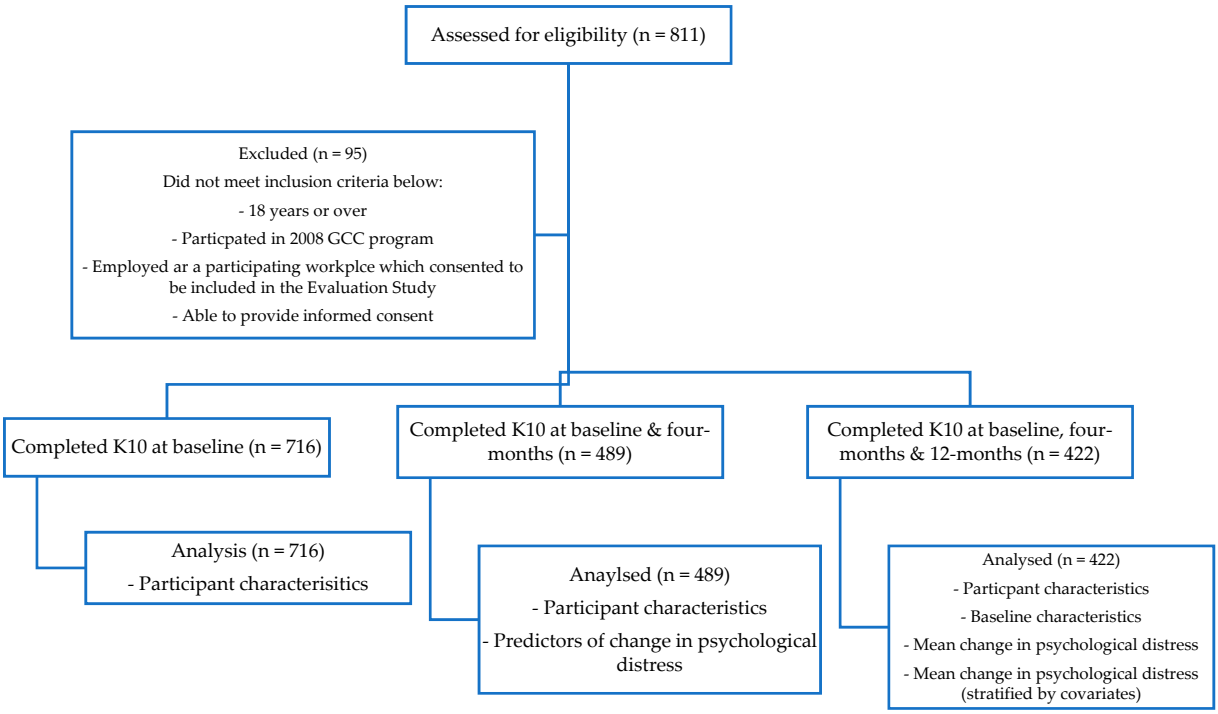

Figure 1. Participant recruitment.

The GCC® Evaluation Study was conducted in accordance with Monash University Human Research Ethics Approval, specifically the Standing Committee on Ethics in Research involving Humans (SCERH); Low Impact Research Project Involving Humans, project number CF08/0217-2008000125.

2.3. Psychological Distress

Psychological distress was measured using the 10-item Kessler Psychological Distress Scale (K10) [40]. The K10 scale is a short dimensional measure of non-specific psychological distress in the anxiety-depression spectrum [1,41]. Responses to each one of the 10 scale items were scored between 1 and 5. The final scores ranged between 10 and 50, and these were categorised as low (10–15), moderate (16–21), high (22–29) and very high (30–50) psychological distress [1,42] (further detail in Appendix C). There is significant evidence establishing the reliability and validity of the K10 across a number of diverse settings, including both international and Australian contexts, across a range of populations (Cronbach's alpha coefficient ranges between 0.84–0.94, sensitivity 0.67–0.9 and specificity 0.74–0.81 for cut-offs below 28 [43–51]). K10 scores were collected at baseline, 4-months and 12-months via an online self-report survey.

2.4. Measures

Daily step count was used as the exposure in this study. Daily step counts were collected using pedometers (GCC® brand) worn on the hip. The pedometer was manufactured by GCC® and internally validated. The 10,000 daily step goal was based on previous evidence from Tudor-Locke that suggested 10,000 daily steps as indicative of active individuals [52]. Alongside the 10,000 daily step goal, we also tested the potentially new threshold of 7500 steps per day [52].

Covariates were assessed alongside psychological distress and step count to assess the health and psychological characteristics of participants in each psychological distress category. Potential confounders were selected a priori [53] (Clayton & Hill,1993) based on their relation with physical activity, aligned with previous papers reporting on the GCC® [12,14,37–39]. Demographic information (age, sex, tertiary education, partner status, socio-economic status, occupation), prior participation in the GCC®, motivation for participation (health, to look my best, fitness, colleagues or friends and family) and behavioural measures (fruit and vegetable intake, alcohol intake, smoking status, physical activity, sitting time and takeaway dinner consumption), were collected using the core and expanded options of the WHO STEPwise approach [54] and the WHO mini-STEP [55]. Psychosocial measures of wellbeing were collected using the WHO-5 questionnaire and health-related quality of life was measured using the SF-12 [12]. Locus of control was assessed using the Duttweiler Internal Control Index [56].

Anthropometric measures including blood pressure, heart rate, weight, body mass index (BMI), and waist circumference were measured at baseline, 4 and 12 months. Measurements were conducted by trained staff in the morning at the employees' workplaces using the following equipment: blood pressure (Omron IA1B Automatic blood pressure intellisense machine), height (stadiometer portable height scale code PE087and step ladder), weight (Salter electronic bathroom scales model 913 WH3R 3007 during baseline and four-month data collection and Seca digital scales model Robusta 813 during twelve-month data collection) and waist and hip measurements (Figure Finder Tape Measure Novel Products Inc. 2005 code PE024 and a mirror) [14].

2.5. Data Analysis

The normality of K10 was assessed, with transformation undertaken if required. Baseline characteristics of study participants were stratified by categories of psychological distress and presented as mean (SD) if continuous and counts or percentages if categorical. The mean change in psychological distress in the total sample of participants that completed the K10 at all timepoints and in each psychological distress category (n = 422) was calculated using linear regression to compare changes from baseline to 4 months and baseline to 12 months. Linear regression exploratory analysis was used to investigate if other subgroups within the study had changes in psychological distress after the program. The mean change in psychological distress in participants that completed the K10 at all timepoints (n = 422) was stratified by age, sex, education, partner status, socio-economic status, occupation, motivation for participation, locus of control and step data using linear regression. Finally, linear regression analysis was used to determine predictors of immediate change in psychological distress among participants that completed the K10 at baseline and 4 months (n = 489). Factors associated with change in psychological distress were determined using univariable and multivariable (factors mutually adjusted) linear regression models. The statistical significance level was set at $p \leq 0.05$. Data analysis was performed using Stata 16, StataCorp. 2019. Stata Statistical Software: Release 16. College Station, TX, USA: StataCorp LLC.

3. Results

Of the 716 participants who completed the K10 at baseline, 489 completed the K10 at baseline and 4 months, and 422 completed the K10 at baseline, four and 12 months. The K10 was slightly right-skewed, which was to be expected, as that indicated higher psycho-

logical distress (Appendix D). Hence, transformation was not required and assists with the interpretation of the findings as the K10 has prespecified categories. The smoothness of the normality of the data became disjointed with less data points at intervention completion (4 months) and long-term follow-up (12 months). Participants who only completed the K10 at baseline (n = 716) had a mean age of 40 years, 39.7% were male, and 79.9% had completed tertiary education. Participants that completed the K10 at baseline and 4 months only (n = 489) had a mean age of 41 years, 40.9% were male, and 80.6% had completed tertiary education. Of the 422 participants that completed K10 at all timepoints, had a mean age of 41, 42% were male, and 81% had completed tertiary education. Participants who remained in the study at four and 12 months (n = 422) were more likely to eat the recommended daily serving of fruits and vegetables, were more physically active and less sedentary (Appendix E).

Among the 422 participants who completed the K10 at baseline, 4 and 12 months, participants with lower baseline psychological distress (compared to higher baseline psychological distress) were older, had lower health related motivation for participation in the program, met the recommended physical activity guidelines, consumed takeaway dinner less regularly, and had higher scores for wellbeing, the SF-12 mental health component (MCS) and internal locus of control (Table 1).

Table 1. Baseline characteristics of participants with low, moderate, high and very high levels of psychological distress (K10 scores), n = 422 [a].

	Psychological Distress				
N = 422	**Low Mean ± SD or n (%)**	**Moderate Mean ± SD or n (%)**	**High Mean ± SD or n (%)**	**Very High Mean ± SD or n (%)**	***p*-Value [b]**
n	117	215	71	19	
DEMOGRAPHICS					
Age (year)	42.6 ± 10	41.7 ± 10	39.4 ± 10.7	37.8 ± 8.8	**<0.001**
Male	46 (39.3%)	96 (44.7%)	29 (40.9%)	7 (36.8%)	0.366
Completed tertiary education [c]	97 (82.9%)	169 (78.6%)	56 (78.9%)	18 (94.7%)	0.778
Partner status					
Married or de facto	86 (73.5%)	162 (75.4%)	41 (57.8%)	11 (57.9%)	0.164
Widowed, separated or divorced	9 (7.7%)	18 (8.4%)	11 (15.5%)	4 (21.1%)	
Never married	22 (18.8%)	35 (16.3%)	19 (26.8%)	4 (21.1%)	
Socio Economic Status by residential postcode (SEIFA) [d]					
Most Advantaged	32 (27.4%)	49 (22.9%)	15 (21.1%)	5 (26.3%)	0.363
Advantaged	28 (23.9%)	63 (29.4%)	16 (22.5%)	3 (15.8%)	
Disadvantaged	32 (27.4%)	49 (22.9%)	18 (25.4%)	9 (47.4%)	
Most Disadvantaged	25 (21.4%)	53 (24.8%)	22 (31%)	2 (10.5%)	
Occupation					
Professional	49 (45%)	97 (48.3%)	29 (43.3%)	11 (64.7%)	0.768
Associate professional	24 (22%)	36 (17.9%)	16 (23.9%)	2 (11.8%)	
Manager	19 (17.4%)	42 (20.9%)	13 (19.4%)	2 (11.8%)	
Clerical or Service	17 (15.6%)	26 (12.9%)	9 (13.4%)	2 (11.8%)	
BASELINE MEASURES					
Prior GCC® Participation [c]	32 (27.4%)	49 (22.8%)	13 (18.3%)	3 (15.8%)	0.314
Motivation for participation					
Health [c]	73 (62.4%)	146 (67.9%)	57 (80.3%)	13 (68.4%)	**0.006**
To look my best [c]	67 (57.3%)	132 (61.4%)	47 (66.2%)	13 (68.4%)	0.066
Fitness [c]	76 (65%)	144 (67%)	50 (70.4%)	14 (73.7%)	0.103
Colleagues [c]	117 (100%)	209 (97.2%)	69 (97.2%)	18 (94.7%)	0.336
Friends or family [c]	13 (11.1%)	23 (10.7%)	10 (14.1%)	4 (21.1%)	0.351

Table 1. *Cont.*

		Psychological Distress			
BEHAVIOURAL MEASURES					
Fruit intake (meeting guidelines) [c]	36 (30.8%)	73 (34%)	27 (38%)	4 (21.1%)	0.274
Vegetable intake (meeting guidelines) [c]	16 (13.7%)	38 (17.7%)	11 (15.5%)	2 (10.5%)	0.91
Alcohol (meeting guidelines) [c]	57 (48.7%)	90 (41.9%)	22 (31%)	10 (52.6%)	0.676
Non smoker [c]	109 (93.2%)	198 (92.1%)	68 (95.8%)	14 (73.7%)	0.284
Physical activity (meeting guidelines) [c]	48 (41%)	95 (44.2%)	27 (38%)	6 (31.6%)	**0.003**
Sitting time (hours per day)					
Weekday	8.6 ± 3.5	8 ± 3.5	8.5 ± 3.9	8.6 ± 4.4	0.991
Weekend	5.7 ± 3	5.3 ± 2.9	4.7 ± 2.2	5.8 ± 3.8	0.437
Takeaway Dinner					
Once or less per month	57 (48.7%)	98 (45.6%)	32 (45.1%)	8 (42.1%)	**0.026**
About once a week	46 (39.3%)	95 (44.2%)	25 (35.2%)	10 (52.6%)	
More than once a week	14 (12%)	22 (10.2%)	14 (19.7%)	1 (5.3%)	
PSYCHOSOCIAL MEASURES					
Well-being	69.2 ± 12	63.3 ± 15.3	44.1 ± 20.2	27.8 ± 17.4	**<0.001**
Well-being [c] **(positive category)**	108 (92.3%)	175 (81.4%)	31 (43.7%)	3 (15.8%)	**<0.001**
Health related quality of life (SF-12)					
Mental health component	54.8 ± 3.6	51.4 ± 7.2	39.2 ± 11.2	31.1 ± 10.8	**<0.001**
Physical health component	50.7 ± 6.9	51 ± 7.2	51 ± 8.9	52.4 ± 7.8	0.676
Duttweiler Internal Control Index score	110.5 ± 10.7	106.4 ± 10.2	100.6 ± 11	97.3 ± 13.5	**<0.001**
ANTHROPOMETRIC MEASURES					
Systolic blood pressure (mmHg)	120.1 ± 12.9	117.9 ± 14.6	120.6 ± 14.9	115.5 ± 14.3	**0.053**
Diastolic blood pressure (mmHg)	82.1 ± 9.8	(203) 79.1 ± 10.4	(66) 79.6 ± 9.3	78 ± 10.8	**0.011**
Heart rate (beats per minute)	70.2 ± 11.3	(203) 68.1 ± 10.1	(66) 67.9 ± 8.5	68.1 ± 9.7	0.868
Weight (kg)	77.1 ± 15.5	(209) 77.6 ± 16	(68) 76.8 ± 16	(18) 81 ± 16.3	0.811
Body mass index (kg/m^2)	(115) 26.8 ± 5	(209) 26.8 ± 4.6	(68) 26.7 ± 5	(18) 28 ± 5.8	0.524
Waist circumference	(115) 88.1 ± 12.3	(209) 88.6 ± 12.7	(68) 87.4 ± 13.1	(18) 91.9 ± 11.6	0.973
PROCESS MEASURES					
STEP DATA					
Steps average (per day)	11,718.5 ± 4318.3	11,839.6 ± 3368.2	(70) 11,975.9 ± 4154.3 [e]	10,722 ± 2555.2	0.135
Meeting 10,000 on average (per day)					
Yes	77 (65.8%)	154 (71.6%)	46 (65.7%)	12 (63.2%)	0.168
No	40 (34.2%)	61 (28.4%)	24 (34.3%)	7 (36.8%)	
Meeting 7500 on average (per day)					
Yes	159 (88.3%)	141 (92.8%)	62 (88.6%)	16 (84.2%)	0.909
No	21 (11.7%)	11 (7.2%)	8 (11.4%)	3 (15.8%)	

[a] Restricted to participants who attended and completed the K10 scale at baseline, 4-month and 12-month data collection (n = 422). [b] Bold highlights statistically significant results. [c] The reference group for this binary variable is 'no'. The reference group data is not shown. [d] Socio-Economic Indexes for Areas (SEIFA) [e] Only 421 people who had step data that completed the K10 at all 3 timepoints. Note: percentages for some measures total greater than 100 per cent. For these measures, participants were able to select multiple responses.

3.1. Immediate and Long-Term Changes in Psychological Distress

Psychological distress decreased by half a unit between baseline and 4 months, which was retained at the 12-month timepoint (n = 422) (Figure 2 and Appendix F). Participants with higher baseline psychological distress scores had greater reductions in psychological distress after participation in the program, while participants with low baseline psychological distress scores reported increases in psychological distress. Immediate and sustained long term reductions in K10 scores (n = 422) were observed among those who were aged 30–40, females, had completed tertiary education, were widowed, separated or divorced, associate professionals, reported that they were motivated to participate in the program due to health, to look their best, improve their fitness, or encouragement from colleagues and were more likely to meet the 10,000 daily step goal (Appendix G).

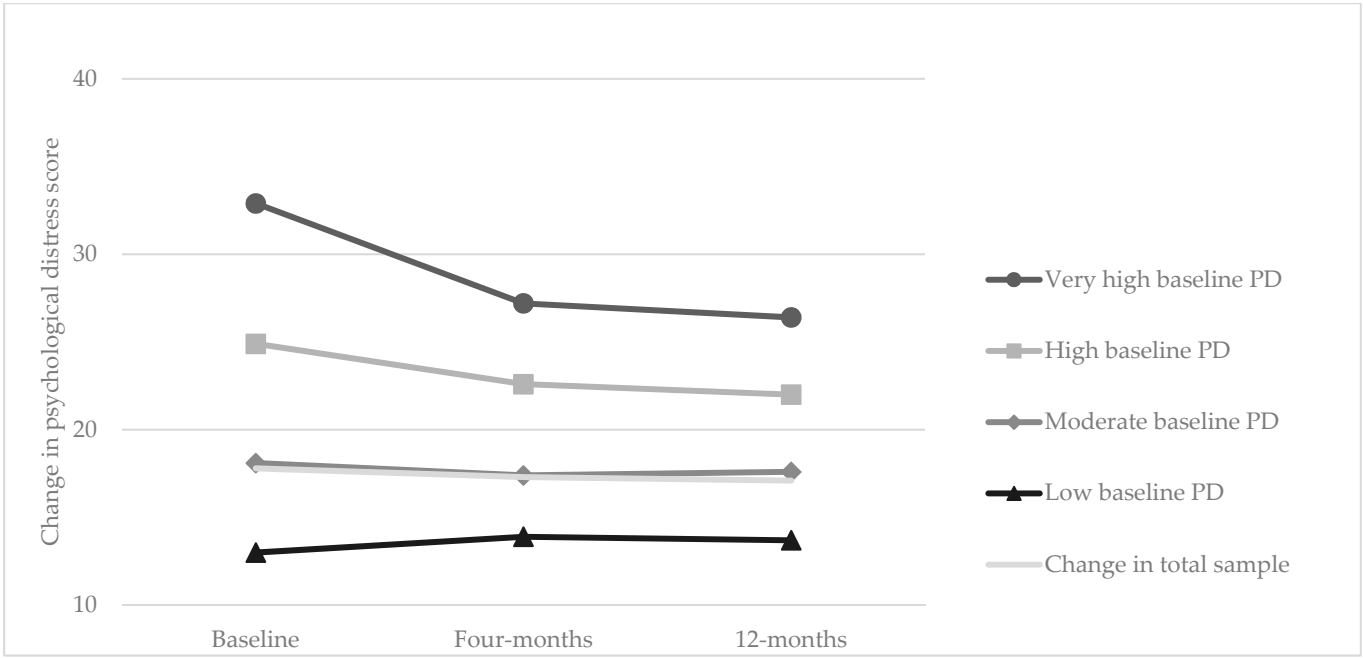

Figure 2. Change in psychological distress (PD) K10 score at baseline, 4 months and 12 months (n = 422) [a]. (a K10 completed at all three timepoints).

3.2. Predictors of a Reduction in Psychological Distress

Univariable analysis of the 489 participants that completed the K10 at baseline and 4 months only were more likely to be younger age, being 'widowed, separated or divorced', being an associate professional, and achieving the goal of the program (steps average per day and meeting 10,000 steps average per day) were predictors of reductions in psychological distress after participation in the pedometer program (Table 2). The results of the multivariable analysis, when mutually adjusting for possible predictors of reduction in psychological distress, found that being employed in an associate professional occupation was the predictor with the greatest magnitude of reducing psychological distress from participation in the program (n = 453, included participants that had data for age, sex, tertiary education, socio-economic status, occupation, partner status and meeting the 10,000 steps daily goal). The associate professional occupation category, compared to the reference category of professional occupation, had the greatest magnitude of reduction in psychological distress. The immediate (4-month) and sustained (12-month) changes in psychological distress within each of these stratum are presented in Appendix H.

Table 2. Predictors of change in psychological distress (K10 score) at 4-months, n = 489 [a].

			Univariable Model		Multivariable Model [b]	
Predictor Variable	**n**	**Crude Psychological Distress Change (Units)**	**Psychological Distress Change B (95% CI)**	***p*-Value**	**Psychological Distress Change B (95% CI)**	***p*-Value**
Age (years)	489	−1.4	−0.1 (−0.1, −0.01)	**0.024**	−0.02 (−0.1, 0.05)	0.549
Sex						
Female	200	−1.4	REFERENCE		REFERENCE	
Male	289	−1.5	0.4 (−0.7, 1.6)	0.428	−0.5 (−2.1, 1.1)	0.477
Tertiary education						
Not completed	95	−1.1	REFERENCE		REFERENCE	
Completed	394	−1.5	−0.4 (−2.0, 1.1)	0.539	−0.7 (−2.4, 1.0)	0.367
Partner Status						
Married/de facto	351	−1.4	REFERENCE		REFERENCE	
Widowed, separated or divorced	47	−3.1	−2.2 (−3.8, −0.6)	**0.012**	−2.0 (−4.3, 0.3)	0.081
Never married	91	−0.6	0.8 (−0.2, 1.7)	0.105	0.7 (−0.3, 1.7)	0.162
Socio Economic Status by residential postcode (SEIFA)						
Most Advantaged	29	−1.6	−0.9 (−2.0, 0.1)	0.078	−0.3 (−2.0, 1.4)	0.671
Advantaged	213	−2.2	−0.4 (−2.6, 1.7)	0.659	0.1 (−1.2, 1.4)	0.884
Disadvantaged	80	−0.9	0.2(−1.5, 1.9)	0.807	0.3 (−1.0, 1.7)	0.585
Most Disadvantaged	29	−1.0	REFERENCE		REFERENCE	
Occupation						
Professional	213	−1.4	REFERENCE		REFERENCE	
Associate professional	90	−2.0	−0.7 (−1.0, −0.3)	**0.004**	−1.1 (−1.8, −0.4)	**0.005**
Manager	88	−1.7	−0.7 (−1.8, 0.5)	0.226	−0.7 (−1.7, 0.3)	0.142
Clerical or Service	64	−0.3	1.1 (−0.5, 2.8)	0.162	0.7 (−0.2, 1.7)	0.123
Steps average per day (per 10,000 steps)	488	−1.4	−0.0001 (−0.0003, −0.00001)	**0.032**	*	
Meeting 10,000 daily step goal						
Yes	329	−1.8	−1.1 (−2.0, −0.2)	**0.024**	−0.6 (−1.6, 0.5)	0.272
No	159	−0.7	REFERENCE		REFERENCE	
Meeting 7500 steps (on average) [c]						
Yes	440	−0.6	−1.0 (−2.6, 0.6)	0.200	−0.9 (−2.5, 0.7)	0.228
No	48	0.4	REFERENCE		REFERENCE	

[a] Completed baseline and four-month K10. [b] Multivariable model (n = 453) mutually adjusted for age, sex, tertiary education, socio-economic status, occupation, partner status and meeting 10,000 steps daily goal. [c] Multivariable model (meeting 7500 step goal) mutually adjusted for age, sex, tertiary education, socio-economic status, occupation, partner status and meeting 7500 steps daily goal. Excluded those with data missing for age, sex, tertiary education, socio-economic status, occupation, partner status and meeting 10,000 steps daily goal variables. * Steps average per day excluded from multivariable model.

4. Discussion

Psychological distress among Australian employees in mostly sedentary workplaces was reduced after participation in the four-month workplace pedometer program, which was sustained eight months after the program ended. The reduction in psychological distress was greatest for those experiencing higher levels of stress before participating in the program. Participants achieving the goal of the program of meeting 10,000 steps average per day or with higher baseline psychological distress had the greatest immediate and sustained reductions in psychological distress. At baseline, higher psychological distress was associated with younger age, higher health related motivation for participation in the program, did not meet the recommended physical activity guidelines, consumed takeaway dinner regularly, and had lower scores for wellbeing, the SF-12 mental health component (MCS) and internal locus of control. Demographic predictors of reduced psychological distress were being an associate professional, younger age, and being 'widowed, separated or divorced'.

4.1. Immediate and Long-Term Changes in Psychological Distress

While the importance of physical activity as a factor for reducing psychological distress has been studied many times [12–17,20], there is limited evidence for this relationship during participation in a workplace pedometer program. To our knowledge, we are the second study to have assessed long term physical activity interventions that utilise pedometers in terms of psychological distress. Our findings support evidence from a prior study of 1963 Indian and Australian workplaces enrolled in the Stepathlon corporate challenge reporting a benefit in psychological distress of 0.49 (mean change) over the 100-day program period. Interestingly, both our study and the Stepathlon study are opposed to the majority of prior evidence evaluating the effectiveness of workplace physical activity interventions on psychological distress [57–59]. This is likely because both our study and the Stepathlon were longer programs, where the interventions were able to form a habit in the participants—a study by Lally et al., 2010 found that it takes on average two months to develop a consistent behaviour [60]. A 2019 systematic review assessing job stress during workplace exercise interventions reported that only two of eight workplace physical activity programs observed a statistically significant reduction in job stress. Another 2018 systematic review concluded that studies assessing workplace physical activity programs were of low quality due to the lack of a control group [61]. In the study by Jindo et al., the participant characteristics were similar to our study and included a lower proportion of male participants to female participants, the mean age was older (around 50 years), and participants were also mainly tertiary educated [62]. The study collected data over six months but did not find improvements in psychological distress with increased compliance in the workplace exercise program. Conversely, participants with low psychological distress at baseline had an increase in psychological distress score during and after the program. Regression to the mean [63] is expected in longitudinal studies, particularly due to the ceiling effects encountered due to the healthy cohort effect [38]. To put this into context, among the healthiest participants (the least psychologically distressed), we observed a slight increase in psychological distress. However, the magnitude of this increase would not impact psychological distress categorization greatly as small increases would shift in an individual's score to the lower end of the moderate category or remain in the low category. Nonetheless, a bi-directional relationship between physical activity and psychological distress has been observed, where pre-existing higher levels of psychological distress are associated with decreases in physical activity [64]. Further, increases in psychological distress during participation in workplace health programs may be explained by work stressors impacting these participants during the program [10].

Despite the opposing evidence in the above-mentioned systematic reviews, broader literature has shown that physical activity has benefits to psychological distress. Our findings support other prior literature, such as a study by Thogersen-Ntoumani et al., which demonstrated an estimated effect size of −0.31 in enthusiasm, −0.02 in relaxation and 0.05 in nervousness, in stress-related symptoms amongst sedentary British University employees four months post-intervention (note these findings were not statistically significant) [65]. Furthermore, a study by Perales et al. assessing self-reported physical activity data from 2007, 2009 and 2011, showed estimated effects of −0.41 units on the K10 when engaging in moderate to vigorous physical activity less than once a week compared to not at all, −0.83 units for being active once or twice a week, −1.14 units for being active 3 times a week, −1.42 units for being active more than 3 times a week, and −1.79 units for being active every day [20]. This demonstrates that as individuals engaged in frequent physical activity, their psychological distress scores reduced—which aligns with the finding of our study that higher step counts were associated with higher reductions in psychological distress.

4.2. Predictors of a Reduction in Psychological Distress

Our study demonstrated that people with a higher step count, higher levels of psychological distress, associate professional occupations, younger age, and being 'widowed,

separated, or divorced' had the greatest reductions in psychological distress. Our observation that achieving 10,000 steps on average per day was associated with greater reductions of psychological distress supports the prior the Stepathlon corporate challenge study. However, the Stepathlon study also reported a benefit for participants that did not meet the 10,000 step-goal of 5.4% improvement in stress, compared to a 10.1% improvement for those meeting the goal [57]. Our magnitude of benefit was comparatively low, equating to 1.8% improvement in psychological distress among all participants and 4.5% improvement among those meeting the goal. Both our study and the Stepathlon study suggest that greater physical activity has additional benefits for psychological distress. Previous evidence also shows reductions in anxiety and depressive symptoms after moderate to intense physical activity [13]. Furthermore, recent evidence suggests a threshold of 7500 steps reduces mortality risk (hazard ratio [HR] = 0.57, [95% CI] = 0.38, 0.83), with an 8.5% mean risk reduction for every additional 1000 steps/day [58]. Findings suggest that step counts greater than 7500 daily steps only marginally reduce the magnitude of the risk (2% mean risk reduction per 1000 steps/day) [58]. However, we did not observe an association between meeting a daily step goal of 7500 steps and a reduction in psychological distress.

Our study supports prior research that identified that people with the higher levels of psychological distress received the most beneficial changes from a walking intervention [66,67]. A review of the literature has concluded that while some studies have shown higher levels of stress decreased participation in exercise and physical activity in employee populations [67], another study reported that individuals experiencing higher levels of stress engaged in higher levels of physical activity [68]. This tends to be the case for those who already engage in physical activity regularly [69] but could also be a result of life events such as new relationships, retirement, changing work conditions, income changes and personal achievements [70].

Being an associate professional was the strongest demographic predictor of benefiting in psychological distress from participation in the program. Job position and having increased autonomy over work has been linked to lower stress [71], however, a study in Japan has reported that professionals and managers have a higher risk of poor health compared to clerks and manual laborers [72]. At baseline, associate professionals were no more likely to be stressed than other occupations in our study, hence, physical activity interventions along with increased job autonomy could greatly benefit this group.

The subgroups of younger age and being 'widowed, separated or divorced', could be targeted for low-intensity physical activity interventions to reduce stress. Among 7485 participants aged 20–64 years, higher levels of psychological distress have been observed in younger people that reported work-related stressors [71]. While we also observed a mean difference by age in psychological distress at baseline, there was only a 4-year mean difference between low and very high stress categories among participants aged 37–40 years. In our study, employees who were 'widowed, separated or divorced' had greater reductions in psychological distress. Evidence has shown that marriage may benefit mental health by lessening negative effects of chronic stressors, but also suggests that the changing nature of partner status can limit these effects [73]. However, we did not observe any difference in stress by partner status at baseline. Low physical activity interventions, therefore, are effective regardless of partner status, but could be a consideration in accounting for the stressors participants may have in their lives.

There are several possible mechanisms explaining how physical activity could benefit psychological distress. Participation in a physical activity intervention over four months is likely to promote the release of endorphins and be beneficial to psychological distress [17]. We note that a bi-directional relationship may exist with pre-existing higher levels of psychological distress associated with decreases in physical activity [64].

4.3. Strengths and Limitations

The main limitation of this study is the lack of a control group, meaning a cause-and-effect relationship could not be established. This study was also undertaken during colder

winter months when people are known to be less active [74]. Further, winter has also been shown to have a negative impact on psychological distress [75]. Therefore, participants could have demonstrated greater program benefits if the evaluation was repeated in the warmer months.

Secondly, interventions and research studies typically attract participants who have positive health behaviours and therefore may perform better, known as the healthy cohort effect [38]. This may have been mitigated slightly as the GCC® was available for multiple years in a row. Initial years likely recruited a healthy cohort, but over time, as more and more employees were encouraged to participate, the healthy cohort effect would reduce. Of note, psychological distress at baseline in prior participating GCC® participants was no higher compared to new enrollees, however, a higher proportion of prior GCC® participants completed the K10 at baseline, 4 months and 12 months (data not reported).

Thirdly, the use of pedometers may be outdated and the pedometers are not externally validated [76]. The effect of lack of external validity is likely to be misclassification, and therefore our observed interaction between change in psychological distress and daily step count is likely to be an attenuation of any true effect. Pedometers have generally been found to be correlated with accelerometers, to have concordance with self-reported physical activity, and to have an inverse relationship with time spent sitting [52]. While we could suggest further research be undertaken utilising validated pedometers, this methodology is likely outdated. Pedometers were the device of choice for fitness programs and interventions in the early to mid-2000s. With advancements in technology, there has been a movement towards the use of accelerometers and electronic monitoring [33]. However, our findings of benefits in psychological distress are likely generalisable to studies using other technologies to monitor physical activity. Therefore, our main finding can be more generalisable to indicate that participation in a group-based, low-intensity, physical activity, walking program conducted through the workplace reduced psychological distress. Of note is our generalisation to low-intensity physical activity, as physical activity intensity can have a u-shaped association with mental health [77].

Fourthly, it is possible that participation in this program could have adverse consequences on psychological distress [78]. The competitive component could be experienced as encouragement or psychological distress, likely relating to the individual's physical activity level, readiness to change, personality, and workplace politics [79]. For example, if a participant has the lowest step count in the team, they may feel pressured or shamed (rather than encouraged) to increase their daily step count.

Further, the workplace has a number of stressors [8–10] and participation in a workplace health program could add to these. Despite the program being voluntary, and requiring partial payment by some employees, an employee may find participation in the program overwhelming in terms of the physical activity required or the time commitment. Therefore, the workplace health program may present another competing "job" demand. One way of coping with additional stress is psychological detachment from work, which can have positive or negative outcomes [78]. Potentially a participant may choose to increase their participation in the program as part of psychological detachment from work, thus reducing their psychological distress. Our findings demonstrate that employees with higher psychological distress received the most beneficial effects from participation in the program. Additionally, the workplace environment may provide access to people with high stressors that may not be present in other settings and therefore the effectiveness of the program might be partly attributable to the workplace setting.

Finally, the data were collected in 2008–2009 but have been analysed through a present-day lens. In 2007–2008, around 62% of adults did not meet the recommended physical activity guidelines compared to 55% in 2017–2018 [80]. Despite the increase in meeting physical activity guidelines over time, there has been an overall decrease in manual labour occupations [81] and an increase in digital entertainment during leisure time which means that individuals are continuing to participate in highly sedentary behaviours [23]. We believe that workplaces have not changed significantly over this time and our study

findings of an improvement in psychological distress from a low-impact physical activity intervention remains relevant.

The strengths of the study include the large sample size and the use of the K10, which is used by Australian general practitioners to assess stress. Our findings are generalisable to tertiary-educated adults employed in sedentary occupations. Our findings, along with prior outcomes from the GCC® Evaluation Study, fills a gap in the literature exploring pedometer-based programs and health outcomes.

5. Conclusions

Among 422 predominantly sedentary employees, participation in a group-based, low-intensity, physical activity, walking program conducted in the workplace reduced psychological distress and was particularly beneficial to those with higher levels of psychological distress. Older participants that had a higher daily step count, those in associate professional occupations, and those that were 'widowed, separated, or divorced' had the greatest reductions in psychological distress.

A better understanding of the relationship between physical activity and psychological distress can inform health policy. Health promotion programs can be tailored to focus interventions on overall psychological wellbeing (in addition to other health outcomes). It can be difficult to convince workplaces and employees of the value of participation in a workplace-based physical activity program; therefore, workplace policy development should reflect the need to consider the individual characteristics that affect positive health within a workplace, in order to identify and implement an appropriate intervention [82]. While improvements to workplace conditions are much needed, physical activity programs can be a complementary part of longer-term sustainable improvements in employee wellbeing. Policies concerning employee health and stress management should avoid a one-size-fits-all approach, and should focus on creating psychologically safe work environments and strengthening workplace conditions which are shown to be a major driver of employee stress. The opportunity for employees to participate in workplace group based programs that promote small positive health changes, such as the low-intensity walking program evaluated here, can be incorporated into these policies. The COVID-19 pandemic has added another dimension to workplace stress. High job demand, low job control and job strain have been shown to worsen pre-existing health conditions as workloads and work/family conflicts arose during COVID-19 lockdown and stay-at-home orders [83,84]. Low-impact physical activity interventions, such as the one evaluated in this study, can provide a solution to better physical health [38], mental wellbeing [14], and stress.

Author Contributions: Conceptualization, S.F.B., D.G. and R.F.-P.; Methodology, J.S., S.F.B., D.G. and R.F.-P.; Formal analysis, J.S.; Investigation, J.S. and R.F.-P.; Resources, R.F.-P.; Writing—original draft, J.S.; Writing—review & editing, J.S., S.F.B., D.G. and R.F.-P.; Supervision, S.F.B., D.G. and R.F.-P.; Project administration, R.F.-P. All authors have read and agreed to the published version of the manuscript.

Funding: The authors acknowledge the Australian Research Council (ARC) and the Foundation for Chronic Disease Prevention™ in the Workplace, which is associated with the Global Corporate Challenge®, partially funded the GCC®Evaluation Study. None of the funding organizations or sponsors were involved in the design, analysis, and interpretation of the data; and preparation, review, or approval of the manuscript.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Monash University Human Research Ethics through the Standing Committee on Ethics in Research involving Humans (SCERH) (project number CF08/0271–2008000125 in 2008). The study was deemed as a Low Impact Research Project Involving Humans.

Informed Consent Statement: Written informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available due to the original consent form not having a proviso for publicly available data distribution.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

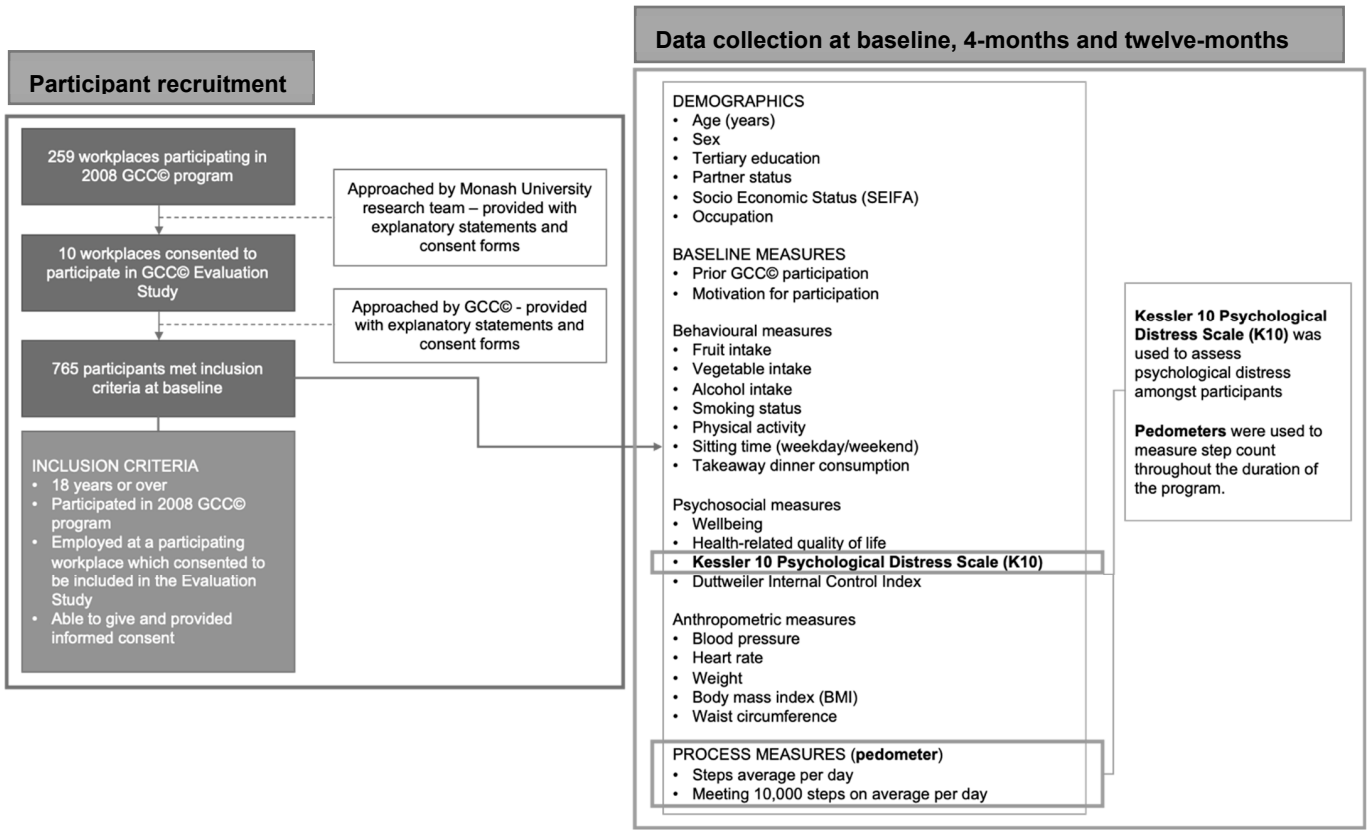

Figure A1. Participant recruitment and data collection at baseline, 4-months and 12-months for the GCC© Evaluation Study. Process measures were only collected at 4-months.

Appendix B

Table A1. Missingness. Blank indicates none missing.

	Psychological Distress			
N = 422	**Low Mean ± SD or n (%)**	**Moderate Mean ± SD or n (%)**	**High Mean ± SD or n (%)**	**Very High Mean ± SD or n (%)**
n	117	215	71	19
DEMOGRAPHICS				
Age (year)				
Male				
Completed teritary education [c]				
Partner status				
Married or de facto				
Widowed, separated or divorced				
Never married				
Socio Economic Status (by SEIFA) [d]		1 (<1%)		
Occupation	8 (6.8%)	14 (6.5%)	4 (5.6%)	2 (10.5%)

Table A1. *Cont.*

			Psychological Distress	
BASELINE MEASURES				
Prior GCC® Participation [c]				
Motivation for participation				
Health [c]				
To look my best [c]				
Fitness [c]				
Colleagues [c]				
Friends or family [c]				
BEHAVIOURAL MEASURES				
Fruit intake [c]				
Vegetable intake [c]				
Alcohol [c]				
Non smoker [c]				
Physical activity [c]				
Sitting time				
Weekday				
Weekend				
Takeaway Dinner				
Once or less per month				
About once a week				
More than once a week				
PSYCHOSOCIAL MEASURES				
Well-being				
Well-being [c] (positive category)				
Health related quality of life (SF-12)				
Mental health component	1 (<1%)	1 (<1%)		
Physical health component				
Duttweiler Internal Control Index score				
ANTHROPOMETRIC MEASURES				
Systolic blood pressure (mmHg)				
Diastolic blood pressure (mmHg)		12 (5.6%)	5 (7%)	
Heart rate (beats per minute)		12 (5.6%)	5 (7%)	
Weight (kg)		6 (2.8%)	3 (4.2%)	1 (5.3%)
Body mass index (kg/m^2)	2 (1.7%)	6 (2.8%)	3 (4.2%)	1 (5.3%)
Waist circumference	2 (1.7%)	6 (2.8%)	3 (4.2%)	1 (5.3%)
PROCESS MEASURES				
STEP DATA				
Steps average (per day)			1 (1.4%)	
Meeting 10,000 on average (per day)			1 (1.4%)	
Meeting 7500 on average (per day)	63 (153.8%)	63 (29.3%)	1 (1.4%)	

[c] The reference group for this binary variable is 'no'. The reference group data is not shown. [d] Socio-Economic Indexes for Areas (SEIFA)

Appendix C. The Kessler 10 Psychological Distress Scale (K10) [40]

Answer Scale

All of the time, Most of the time, Some of the time, A little of the time, None of the time

Scoring

All of the time = 1 point
Most of the time = 2 points
Some of the time = 3 points

A little of the time = 4 points
None of the time = 5 points

The following questions are about your feelings in the past 4 weeks.

1. In the past 4 weeks, about how often did you feel tired out for no good reason?
2. (In the past 4 weeks,) about how often did you feel nervous?
3. (In the past 4 weeks,) about how often did you feel so nervous that nothing could calm you down?
4. (In the past 4 weeks,) about how often did you feel hopeless?
5. (In the past 4 weeks,) about how often did you feel restless or fidgety?
6. (In the past 4 weeks,) about how often did you feel so restless you could not sit still?
7. (In the past 4 weeks,) about how often did you feel depressed?
8. (In the past 4 weeks,) about how often did you feel that everything was an effort?
9. (In the past 4 weeks,) about how often did you feel so sad that nothing could cheer you up?
10. (In the past 4 weeks,) about how often did you feel worthless?

Appendix D

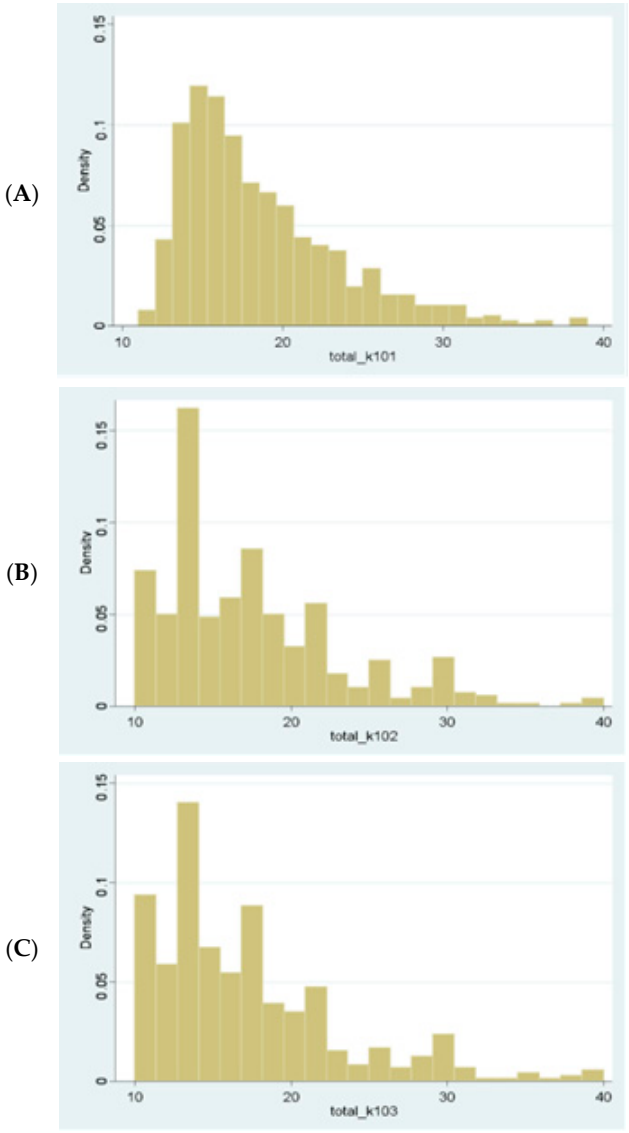

Figure A2. Distribution of the Kessler 10 Psychological Distress Scale (K10). (**A**) K10 at baseline; (**B**) K10 at 4-months (end of the program); (**C**) K10 at 12-months (8-months after program completion).

Appendix E

Table A2. Comparison of baseline participant characteristics between participants who did and did not attend the 4-month and 12-month follow-up visits.

	Baseline Only Mean + SD or n (%)	**Baseline and 4-Months Mean + SD or n (%)**	**Baseline, 4-Months and 12-Months Mean + SD or n (%)**	***p*-Value**
n	716	489	422	
DEMOGRAPHICS				
Age (year)	40 ± 10	41 ± 10	41 ± 10	<0.001
Male	284 (39.7%)	200 (40.9%)	178 (42.2%)	<0.001
Completed tertiary education [a]	572 (79.9%)	394 (80.6%)	394 (80.6%)	<0.001
Partner status				
Married or de facto	501 (70%)	351 (71.8%)	300 (71.1%)	<0.001
Widowed, separated or divorced	63 (8.8%)	47 (9.6%)	42 (10%)	
Never married	152 (21.2%)	91 (18.6%)	80 (19%)	
Socio Economic Status (by SEIFA) [b]				
Most Advantaged	176 (24.6%)	119 (24.4%)	101 (24%)	<0.001
Advantaged	165 (23.1%)	126 (25.8%)	110 (26.1%)	
Disadvantaged	195 (27.3%)	125 (25.6%)	108 (25.7%)	
Most Disadvantaged	179 (25%)	118 (24.2%)	102 (24.2%)	
Occupation				
Professional	294 (44%)	213 (46.8%)	186 (47.2%)	<0.001
Associate professional	122 (18.2%)	90 (19.8%)	78 (19.8%)	
Manager	147 (22%)	88 (19.3%)	76 (19.3%)	
Clerical or Service	106 (15.8%)	64 (14.1%)	54 (13.7%)	
BASELINE MEASURES				
Prior GCC® Participation [a]	157 (21.9%)	106 (21.7%)	97 (23%)	<0.001
Motivation for participation				
Health [a]	484 (67.7%)	337 (68.9%)	289 (68.5%)	<0.001
To look my best [a]	418 (58.5%)	289 (59.1%)	259 (61.4%)	<0.001
Fitness [a]	475 (66.4%)	324 (66.3%)	284 (67.3%)	<0.001
Colleagues [a]	700 (97.8%)	478 (97.8%)	413 (97.9%)	<0.001
Friends or family [a]	95 (13.3%)	66 (13.5%)	50 (11.9%)	<0.001
BEHAVIOURAL MEASURES				
Fruit intake (meeting guidelines) [a]	216 (30.2%)	181 (37%)	155 (37.6%)	<0.001
Vegetable intake (meeting guidelines) [a]	103 (14.4%)	90 (18.4%)	82 (19.4%)	<0.001
Alcohol (meeting guidelines)[a]	311 (43.4%)	209 (42.7%)	215 (51%)	<0.001
Non smoker [a]	642 (89.7%)	452 (92.4%)	401 (95%)	<0.001
Physical activity (meeting guidelines) [a]	274 (38.3%)	230 (47%)	193 (45.7%)	<0.001
Sitting time (hours per day)				
Weekday	8.1 ± 3.6	7.6 ± 3.6	7.4 ± 3.7	<0.001
Weekend	(715) 5.3 ± 3.0	4.8 ± 3.0	4.9 ± 2.8	<0.001
Takeaway Dinner				
Once or less per month	321 (44.8%)	236 (48.3%)	210 (49.8%)	<0.001
About once a week	298 (41.6%)	209 (42.7%)	177 (41.9%)	
More than once a week	97 (13.6%)	44 (9%)	35 (8.3%)	

Table A2. *Cont.*

	Baseline Only Mean + SD or n (%)	Baseline and 4-Months Mean + SD or n (%)	Baseline, 4-Months and 12-Months Mean + SD or n (%)	*p*-Value
PSYCHOSOCIAL MEASURES				
Well-being	60 ± 19.1	63.5 ± 18.8	63.6 ± 18.7	<0.001
Well-being (positive category) [a]	521 (72.77%)	395 (80.78%)	327 (77.5%)	<0.001
Health related quality of life (SF-12)				
Mental health component	(713) 49.4 ± 10	50.5 ± 9.1	(421) 43.1 ± 5.3	<0.001
Physical health component	(713) 50.5 ± 7.3	50.5 ± 7.8	(421) 48.5 ± 4.9	<0.001
K10 Scores				
Low	209 (29.2%)	224 (45.8%)	205 (48.6%)	<0.001
Moderate	347 (48.5%)	173 (35.4%)	143 (33.9%)	
High	129 (18%)	61 (12.5%)	49 (11.6%)	
Very high	31 (4.3%)	31 (6.3%)	25 (5.9%)	
Duttweiler Internal Control Index score	106 ± 11.1	105 ± 11.9	105 ± 12.4	<0.001
ANTHROPOMETRIC MEASURES				
Systolic blood pressure (mmHg)	(646) 118.6 ± 15	(457) 116.9 ± 13.7	(386) 115.6 ± 13.2	<0.001
Diastolic blood pressure (mmHg)	(646) 79.7 ± 10.4	(457) 78 ± 9.8	(386) 78.2 ± 9.9	<0.001
Heart rate (beats per minute)	(646) 68.6 ± 10	(457) 68.8 ± 10.8	(377) 68.3 ± 10.8	<0.001
Weight (kg)	(657) 76.8 ± 16.2	(458) 76.8 ± 15.5	(387) 77.6 ± 15.8	<0.001
Body mass index (kg/m^2)	(657) 26.7 ± 4.8	(446) 26.6 ± 4.6	(387) 26.9 ± 4.8	<0.001
Waist circumference	(656) 87.8 ± 12.6	(458) 86.1 ± 12.1	(387) 88 ± 12.6	<0.001
PROCESS MEASURES				
STEP DATA				
Steps average (per day)	(706) 11,481.1 ± 3720.8	(488) 11,691.5 ± 3700.1	(421) 11,778.2 ± 3755.7	<0.001
Meeting 10,000 on average (per day) [a]				
Yes	450 (63.7%)	329 (67.4%)	289 (68.7%)	<0.001
No	256 (36.3%)	159 (32.6%)	132 (31.4%)	

[a] The reference group for this binary variable is 'no'. The reference group data is not shown. [b] Socio-Economic Indexes for Areas (SEIFA).

Appendix F

Table A3. Immediate and sustained change in psychological distress (K10 score) associated with participation in a physical activity workplace program (n = 422).

					Baseline to 4-Months		Baseline to 12-Months	
	n	Baseline	4-Months	12-Months	Mean Change B (95% CI)	*p*-Value	Mean Change B (95% CI)	*p*-Value
Change in K10 score in total sample	422	17.8 ± 5.6	17.3 ± 5.6	17.1 ± 5.8	−0.5 (−0.9, −0.04)	0.035	−0.7 (−1.1, −0.3)	0.005
Low baseline K10 score	180	13.0 ± 1.5	13.9 ± 3.4	13.7 ± 3.2	0.9 (0.3, 1.0)	0.007	0.6 (0.2, 1.0)	0.015
Moderate baseline K10 score	152	18.1 ± 1.7	17.4 ± 4.1	17.6 ± 4.4	−0.7 (−1.4, 0.01)	0.052	−0.5 (−1.1, 0.1)	0.097
High baseline K10 score	71	24.9 ± 2.2	22.6 ± 5.3	22.0 ± 6.3	−2.3 (−4.8, 0.3)	0.074	−2.9 (−4.5, −1.2)	0.003
Very high baseline K10 score	19	32.9 ± 3.3	27.2 ± 6.9	26.4 ± 7.1	−5.7 (−9.5, −1.0)	0.01	−6.5 (−12.8, −0.4)	0.041

K10 scores reported as mean ± SD. K10 completed at all three timepoints.

Appendix G

Table A4. Immediate and long-term change in psychological distress (K10 scores) associated with participation in a physical activity workplace program, stratified by demographic, baseline, psychosocial and process measures (measures taken at baseline).

						Baseline to 4-Months				Baseline to 12-Months			
		n	**Baseline**	**4-Months**	**12-Months**	**Mean Change**	**(95% CI) Min**	**(95% CI) Max**	***p*-Value**	**Mean Change**	**(95% CI) Min**	**(95% CI) Max**	***p*-Value**
Total sample		422	17.8 ± 5.6	17.3 ± 5.6	17.1 ± 5.8	−0.5	−0.9	−0.04	0.035	−0.7	−1.1	−0.3	0.005
DEMOGRAPHICS													
Age	20–30	65	20 ± 5.1	20.1 ± 6.7	19.7 ± 6.8	0.5	−1.2	2.3	0.508	0.2	−1.9	2.3	0.83
	30–40	130	19.4 ± 5.3	17.8 ± 5.6	17 ± 5.1	−0.9	−1.8	−0.1	0.039	−1.8	−2.9	−0.6	0.008
	40–50	135	18 ± 4	16.2 ± 5.1	16.6 ± 6.1	−0.6	−1.1	−0.1	0.022	−0.2	−0.8	0.5	0.541
	50–60	80	17.9 ± 4.6	16.4 ± 4.7	16.1 ± 4.4	−0.3	−1.0	0.4	0.421	−0.6	−1.1	−0.1	0.017
	60–70	12	17.3 ± 3.2	14.7 ± 3.8	16.3 ± 6.6	−1.4	−2.7	−0.1	0.037	0.2	−1.3	1.7	0.774
Sex	Females	244	18.9 ± 5.1	17.5 ± 5.8	17.4 ± 5.6	−0.6	−1.0	−0.3	0.003	−0.8	−1.5	−0.1	0.026
	Males	178	18.4 ± 4.3	16.9 ± 5.4	16.7 ± 5.9	−0.3	−1.4	0.8	0.559	−0.5	−1.3	0.3	0.214
Tertiary education	Completed tertiary education	340	18.7 ± 4.9	17.2 ± 5.6	17.2 ± 5.8	−0.6	−1.0	−0.2	0.005	−0.6	−1.1	−0.2	0.008
	Did not complete tertiary education	82	17.6 ± 5	17.5 ± 5.5	16.8 ± 5.4	−0.05	−1.9	1.8	0.952	−0.8	−2.2	0.5	0.206
Partner status	Married or de facto	300	18.2 ± 4.3	16.8 ± 5.3	16.9 ± 5.8	−0.5	−0.8	−0.1	0.025	−0.3	−0.8	0.1	0.125
	Widowed, separated or divorced	42	20.9 ± 5.7	17.7 ± 5.2	17.3 ± 5	−2.0	−4.2	0.1	0.057	−2.5	−4.3	−0.7	0.012
	Never married	80	19.5 ± 5.5	18.9 ± 6.7	17.7 ± 5.9	0.2	−1.0	1.3	0.771	−1.0	−1.6	−0.4	0.005
Socio Economic Status (by SEIFA)	Most Advantaged	101	18.6 ± 4.9	17 ± 5.8	16.9 ± 5.4	−0.7	−2.4	1.0	0.358	−0.9	−1.6	−0.2	0.017
	Advantaged	110	18.3 ± 4.5	16.1 ± 4.7	16.1 ± 4.7	−0.9	−1.5	−0.3	0.007	−0.9	−2.2	0.4	0.149
	Disadvantaged	108	19.1 ± 5.3	18.2 ± 5.8	17.8 ± 6.4	−0.1	−0.9	0.7	0.776	−0.5	−1.0	−0.04	0.038
	Most Disadvantaged	102	18.9 ± 4.3	17.8 ± 5.9	17.6 ± 6.4	−0.2	−1.0	0.6	0.564	−0.4	−1.4	0.5	0.346
Occupation	Professional	186	18.8 ± 4.9	17.4 ± 6.1	17.2 ± 5.9	−0.3	−1.1	0.5	0.384	−0.5	−1.1	0.1	0.090
	Associate professional	78	18.7 ± 4.6	16.7 ± 4.7	16.7 ± 5.5	−1.2	−1.7	−0.6	0.002	−1.2	−2.2	−0.2	0.023
	Manager	76	18.6 ± 4.5	17 ± 4.5	17.2 ± 5.8	−0.9	−1.7	−0.1	0.029	−0.7	−1.7	0.4	0.178
	Clerical or Service	54	18.4 ± 4.2	18.1 ± 5.9	17 ± 5.5	0.5	−0.8	1.8	0.387	−0.6	−2.3	1.0	0.403
BASELINE MEASURES													
Motivation for participation	Health (yes)	289	19 ± 4.9	17.6 ± 5.8	17.1 ± 5.6	−0.6	−1.1	−0.03	0.040	−1.1	−1.5	−0.6	<0.001
	To look my best (yes)	259	18.9 ± 4.9	17.6 ± 5.9	17.5 ± 5.8	−0.5	−1.0	−0.1	0.026	−0.7	−1.2	−0.1	0.024
	Fitness (yes)	284	18.9 ± 4.8	17.3 ± 5.8	17.3 ± 5.8	−0.7	−1.3	−0.2	0.016	−0.9	−1.5	−0.3	0.009
	Colleagues (yes)	413	18.6 ± 4.7	17.3 ± 5.6	17 ± 5.8	−0.5	−0.9	−0.04	0.034	−0.7	−1.1	−0.3	0.005
	Friends or family (yes)	50	19.8 ± 5.6	18.3 ± 6.8	18.7 ± 7.4	−0.6	−2.0	0.8	0.386	−0.2	−1.2	0.8	0.630
PSYCHOSOCIAL MEASURES													
	Duttweiler	422	18.7 ± 4.8	17.3 ± 5.6	17.1 ± 5.8	0.2	−4.8	5.1	0.933	−4.8	−9.8	0.2	0.059
PROCESS MEASURES													
	Steps average per day (per 10,000 steps)	422	17.8 ± 5.6	17.3 ± 5.6	17.1 ± 5.8	0.3	−0.8	1.3	0.565	−0.4	−2.1	1.2	0.574
	Program compliance												
	Yes	289	17.5 ± 5.4	16.8 ± 5.2	16.6 ± 5.4	−0.7	−1.3	−0.02	**b**	−0.9	−1.4	−0.3	**0.009**
	No	132	18.4 ± 6	18.3 ± 6.4	18.1 ± 6.4	−0.1	−0.9	0.7	0.83	−0.2	−0.9	0.5	0.466

Appendix H

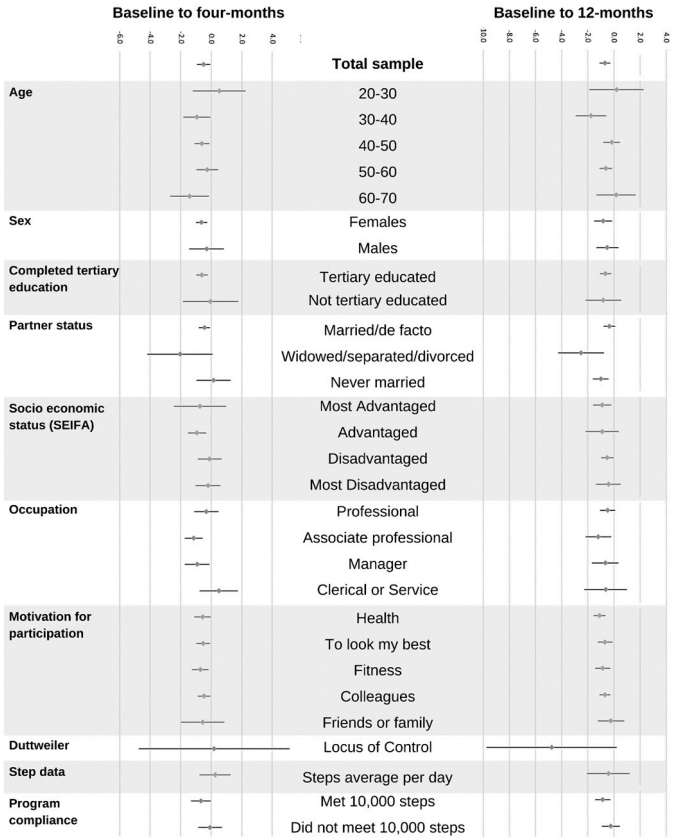

Figure A3. Immediate and sustained change in psychological distress (K10 score) associated with participation in a physical activity workplace program, stratified by demographic, psychosocial and process measures. K10 completed at all three timepoints. Corresponding table Appendix D. Note: vertical line represents no (0) change. Horizontal lines indicate 95% confidence interval minimum to maximum, with the marker indicating mean change in K10 score.

References

1. Kessler, R.C.; Demler, O.; Frank, R.G.; Olfson, M.; Pincus, H.A.; Walters, E.E.; Wang, P.; Wells, K.B.; Zaslavsky, A.M. Prevalence and Treatment of Mental Disorders, 1990 to 2003. *N. Engl. J. Med.* **2005**, *352*, 2515–2523. [CrossRef] [PubMed]
2. McKenzie, S.H.; Harris, M. Understanding the relationship between stress, distress and healthy lifestyle behaviour: A qualitative study of patients and general practitioners. *BMC Fam. Pract.* **2013**, *14*, 166. [CrossRef] [PubMed]
3. Viertiö, S.; Kiviruusu, O.; Piirtola, M.; Kaprio, J.; Korhonen, T.; Marttunen, M.; Suvisaari, J. Factors contributing to psychological distress in the working population, with a special reference to gender difference. *BMC Public Health* **2021**, *21*, 611. [CrossRef]
4. McLachlan, K.J.J.; Gale, C. The effects of psychological distress and its interaction with socioeconomic position on risk of developing four chronic diseases. *J. Psychosom. Res.* **2018**, *109*, 79–85. [CrossRef]
5. Vigo, D.; Thornicroft, G.; Atun, R. Estimating the true global burden of mental illness. *Lancet Psychiatry* **2016**, *3*, 171–178. [CrossRef]
6. Enticott, J.C.; Lin, E.; Shawyer, F.; Russell, G.; Inder, B.; Patten, S.; Meadows, G. Prevalence of psychological distress: How do Australia and Canada compare? *Aust. N. Z. J. Psychiatry* **2018**, *52*, 227–238. [CrossRef]
7. Drapeau, A.; Marchand, A.; Beaulieu-Prévost, D. Epidemiology of Psychological Distress. In *Mental Illnesses: Understanding, Prediction and Control*; InTech Open: London, UK, 2012.
8. Mental Health. Available online: https://www.safeworkaustralia.gov.au/topic/mental-health (accessed on 12 May 2021).
9. Available online: https://osha.europa.eu/en/themes/psychosocial-risks-and-stress (accessed on 12 May 2021).
10. He, Y.; Yatsuya, H.; Chiang, C.; Ota, A.; Okubo, R.; Ishimaru, T.; Tabuchi, T. 1503 The association of work-related stress with aggravation of pre-existing disease during COVID-19 emergency in Japan. *Int. J. Epidemiol.* **2021**, *50* (Suppl. S1), dyab168.273. [CrossRef]
11. Sørensen, J.K.; Framke, E.; Pedersen, J.; Alexanderson, K.; Bonde, J.P.; Farrants, K.; Flachs, E.M.; Magnusson Hanson, L.L.; Nyborg, S.T.; Kivimäki, M.; et al. 1175 Work stress and loss of years lived without chronic disease; an 18-year prospective cohort study. *Int. J. Epidemiol.* **2021**, *50*, dyab168.624. [CrossRef]

12. Harding, J.; Freak-Poli, R.L.; Backholer, K.; Peeters, A. Change in Health-Related Quality of Life Amongst Participants in a 4-Month Pedometer-Based Workplace Health Program. *J. Phys. Act. Health* **2013**, *10*, 533–543. [CrossRef]
13. Brown, W.J.; Bauman, A.E.; Bull, F.; Burton, N.W. *Development of Evidence-Based Physical Activity Recommendations for Adults (18–64 Years)*; Australian Government Department of Health: Woden Town Centre, Austraila, 2012.
14. Freak-Poli, R.L.; Wolfe, R.; Wong, E.; Peeters, A. Change in well-being amongst participants in a four-month pedometer-based workplace health program. *BMC Public Health* **2014**, *14*, 953. [CrossRef]
15. Warburton, D.; Nicol, C.W.; Bredin, S. Health benefits of physical activity: The evidence. *Can. Med. Assoc. J.* **2006**, *174*, 801–809. [CrossRef] [PubMed]
16. WHO. Physical Acitvity. World Health Organisation. 23 February 2018. Available online: https://www.who.int/news-room/fact-sheets/detail/physical-activity (accessed on 27 October 2020).
17. Mikkelsen, K.; Stojanovska, L.; Polenakovic, M.; Bosevski, M.; Apostolopoulos, V. Exercise and mental health. *Maturitas* **2017**, *106*, 48–56. [CrossRef] [PubMed]
18. US Department of Health and Human Services. *Physical Activity Guidelines Advisory Committee Report Part G. Section 8: Mental Health*; US Department of Health and Human Services: Washington, DC, USA, 2008.
19. Teychenne, M.; Costigan, S.A.; Parker, K. The association between sedentary behaviour and risk of anxiety: A systematic review. *BMC Public Health* **2015**, *15*, 513. [CrossRef] [PubMed]
20. Perales, F.; Pozo-Cruz, J.D.; Pozo-Cruz, B.D. Impact of physical activity on psychological distress: A prospective analysis of an Australian national sample. *Am. J. Public Health* **2014**, *104*, e91. [CrossRef] [PubMed]
21. Australian Bureau of Statistics (ABS). *4364.0.55.001—National Health Survey: First Results, 2017–2018 in Physical activity*; Australian Bureau of Statistics: Canberra, Australia, 2018.
22. WHO. *Global Recommendations on Physical Activity for Health*; World Health Organization: Geneva, Switzerland, 2010.
23. Guthold, R.; Stevens, G.A.; Riley, L.M.; Bull, F.C. Worldwide trends in insufficient physical activity from 2001 to 2016: A pooled analysis of 358 population-based surveys with 1·9 million participants. *Lancet Glob. Health* **2018**, *6*, e1077–e1086. [CrossRef]
24. WHO. *Preventing Noncommunicable Diseases in the Workplace through Diet and Physical Activity: WHO/World Economic Forum Report of a Joint Event*; World Health Organization/World Economic Forum: Geneva, Switzerland, 2008; pp. 1–52.
25. Eurostat. *Sit at Work? You Are One of 39%*; Eurostat: Luxembourg, 2019.
26. Gilson, N.D.; Suppini, A.; Ryde, G.C.; Brown, H.E.; Brown, W.J. Does the use of standing 'hot' desks change sedentary work time in an open plan office? *Prev. Med.* **2012**, *54*, 65–67. [CrossRef] [PubMed]
27. Kilpatrick, M.; Sanderson, K.; Blizzard, L.; Teale, B.; Venn, A. Cross-sectional associations between sitting at work and psychological distress: Reducing sitting time may benefit mental health. *Ment. Health Phys. Act.* **2013**, *6*, 103–109. [CrossRef]
28. Parry, S.; Straker, L.; Gilson, N.D.; Smith, A.J. Participatory workplace interventions can reduce sedentary time for office workers—A randomised controlled trial. *PloS ONE* **2013**, *8*, e78957. [CrossRef]
29. Tew, G.A.; Posso, M.C.; Arundel, C.E.; McDaid, C.M. Systematic review: Height-adjustable workstations to reduce sedentary behaviour in office-based workers. *Occup. Med.* **2015**, *65*, 357–366. [CrossRef]
30. Torbeyns, T.; Bailey, S.; Bos, I.; Meeusen, R. Active Workstations to Fight Sedentary Behaviour. *Sport. Med.* **2014**, *44*, 1261–1273. [CrossRef]
31. Kohl, H.W.; Craig, C.L.; Lambert, E.V.; Inoue, S.; Alkandari, J.R.; Leetongin, G.; Kahlmeier, S. The pandemic of physical inactivity: Global action for public health. *Lancet* **2012**, *380*, 294–305. [CrossRef] [PubMed]
32. Croteau, K.A. Using Pedometers to Increase the Non-Workday Steps of Hospital Nursing and Support Staff: A Pilot Study. *Workplace Health Saf.* **2017**, *65*, 452–456. [CrossRef] [PubMed]
33. Freak-Poli, R.L.; Cumpston, M.; Albarqouni, L.; Clemes, S.A.; Peeters, A. Workplace pedometer interventions for increasing physical activity. *Cochrane Database Syst. Rev.* **2020**, *7*, CD009209. [PubMed]
34. Blake, H.; Batt, M.E. Employee perceptions of a pedometer walking intervention in a hospital workplace. *Int. J. Health Promot. Educ.* **2015**, *53*, 257–270. [CrossRef]
35. Caperchione, C.M.; Vandelanotte, C.; Corry, K.; Power, D.; Gill, N.; Duncan, M.J. Qualitative Exploration of the Feasibility and Acceptability of Workplace-Based Microgrants to Improve Physical Activity: The 10,000 Steps Pedometer Microgrant Scheme. *J. Occup. Environ. Med.* **2018**, *60*, e406–e411. [CrossRef]
36. Macniven, R.; Engelen, L.; Kacen, M.J.; Bauman, A. Does a corporate worksite physical activity program reach those who are inactive? Findings from an evaluation of the Global Corporate Challenge. *Health Promot. J. Aust.* **2015**, *26*, 142–145. [CrossRef]
37. Freak-Poli, R.; Wolfe, R.; Backholer, K.; De Courten, M.; Peeters, A. Impact of a pedometer-based workplace health program on cardiovascular and diabetes risk profile. *Prev. Med.* **2011**, *53*, 162–171. [CrossRef]
38. Freak-Poli, R.; Wolfe, R.; Brand, M.; de Courten, M.; Peeters, A. Eight-month postprogram completion: Change in risk factors for chronic disease amongst participants in a 4-month pedometer-based workplace health program. *Obesity* **2013**, *21*, E360–E368. [CrossRef]
39. Freak-Poli, R.L.; Wolfe, R.; Walls, H.; Backholer, K.; Peeters, A. Participant characteristics associated with greater reductions in waist circumference during a four-month, pedometer-based, workplace health program. *BMC Public Health* **2011**, *11*, 824. [CrossRef]

40. Kessler, R.C.; Andrews, G.; Colpe, L.J.; Hiripi, E.; Mroczek, D.K.; Normand, S.L.; Walters, E.E.; Zaslavsky, A.M. Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychol Med.* **2002**, *32*, 959–976. [CrossRef]
41. Australian Bureau of Statistics (ABS). *4364.0.55.001—National Health Survey: First Results, 2017–2018, in Psychological Distress*; Australian Bureau of Statistics: Canberra, Australia, 2018.
42. Coombs, T. *Australian Mental Health Outcomes and Classification Network. Kessler-10 Training Manual*; NSW Insititute of Psychiatry: Sydney, Australia, 2005.
43. Slade, T.; Grove, R.; Burgess, P. Kessler Psychological Distress Scale: Normative Data from the 2007 Australian National Survey of Mental Health and Wellbeing. *Aust. N. Z. J. Psychiatry* **2011**, *45*, 308–316. [CrossRef] [PubMed]
44. Hides, L.; Lubman, D.I.; Devlin, H.; Cotton, S.; Aitken, C.; Gibbie, T.; Hellard, M. Reliability and validity of the Kessler 10 and Patient Health Questionnaire among injecting drug users. *Aust. N. Z. J. Psychiatry* **2007**, *41*, 166–168. [CrossRef] [PubMed]
45. Spies, G.; Kader, K.; Kidd, M.; Smit, J.; Myer, L.; Stein, D.J.; Seedat, S. Validity of the K-10 in detecting DSM-IV-defined depression and anxiety disorders among HIV-infected individuals. *AIDS Care* **2009**, *21*, 1163–1168. [CrossRef]
46. Donker, T.; Comijs, H.; Cuijpers, P.; Terluin, B.; Nolen, W.; Zitman, F.; Penninx, B. The validity of the Dutch K10 and extended K10 screening scales for depressive and anxiety disorders. *Psychiatry Res.* **2009**, *176*, 45–50. [CrossRef]
47. Furukawa, T.A.; Kawakami, N.; Saitoh, M.; Ono, Y.; Nakane, Y.; Nakamura, Y.; Tachimori, H.; Iwata, N.; Uda, H.; Nakane, H.; et al. The performance of the Japanese version of the K6 and K10 in the World Mental Health Survey Japan. *Int. J. Methods Psychiatr. Res.* **2008**, *17*, 152–158. [CrossRef] [PubMed]
48. Baillie, A.J. Predictive gender and education bias in Kessler's psychological distress Scale (K10). *Soc. Psychiatry Psychiatr. Epidemiol.* **2005**, *40*, 743–748. [CrossRef]
49. Spies, G.; Stein, D.J.; Roos, A.; Faure, S.C.; Mostert, J.; Seedat, S.; Vythilingum, B. Validity of the Kessler 10 (K-10) in detecting DSM-IV defined mood and anxiety disorders among pregnant women. *Arch. Women's Ment. Health* **2009**, *12*, 69–74. [CrossRef]
50. Arnaud, B.; Malet, L.; Teissedre, F.; Izaute, M.; Moustafa, F.; Geneste, J.; Schmidt, J.; Llorca, P.M.; Brousse, G. Validity study of Kessler's Psychological Distress Scales conducted among patients admitted to French emergency departments for alcohol consumption-related disorders. *Alcohol Clin. Exp. Res.* **2010**, *34*, 1235–1245. [CrossRef]
51. Wittchen, H.-U. Screening for serious mental illness: Methodological studies of the K6 screening scale. *Int. J. Methods Psychiatr. Res.* **2010**, *19* (Suppl. S1), 1–3. [CrossRef]
52. Tudor-Locke, C.; Bassett, D.R., Jr. How many steps/day are enough? Preliminary pedometer indices for public health. *Sports Med.* **2004**, *34*, 1–8. [CrossRef]
53. Clayton, D.; Hill, M. *Statistical Models in Epidemiology*; Oxford University Press: New York, NY, USA, 1993; p. 273.
54. WHO. *The WHO STEPwise Approach. Surveillence of Risk Factors for Noncommunicable Diseases: Step 1, 2 & 3*; World Health Organization (WHO): Geneva, Switzerland, 2002.
55. WHO. *The WHO Mini-STEP Questionnaire*; World Health Organization: Geneva, Switzerland, 2002.
56. Duttweiler, P.C. The Internal Control Index: A Newly Developed Measure of Locus of Control. *Educ. Psychol. Meas.* **1984**, *44*, 209–221. [CrossRef]
57. Hallam, K.T.; Bilsborough, S.; de Courten, M. "Happy feet": Evaluating the benefits of a 100-day 10,000 step challenge on mental health and wellbeing. *BMC Psychiatry* **2018**, *18*, 19. [CrossRef]
58. del Pozo Cruz, B.; Gallardo-Gomez, D.; del Pozo-Cruz, J.; Ding, D. How many steps a day to reduce the risk of all-cause mortality? A dose–response meta-analysis. *J. Intern. Med.* **2022**, *291*, 519–521. [CrossRef] [PubMed]
59. White, R.L.; Bennie, J.; Abbott, G.; Teychenne, M. Work-related physical activity and psychological distress among women in different occupations: A cross-sectional study. *BMC Public Health* **2020**, *20*, 1007. [CrossRef] [PubMed]
60. Lally, P.; Van Jaarsveld, C.H.; Potts, H.W.; Wardle, J. How are habits formed: Modelling habit formation in the real world. *Eur. J. Soc. Psychol* **2010**, *40*, 998–1009. [CrossRef]
61. Abdin, S.; Welch, R.K.; Byron-Daniel, J.; Meyrick, J. The effectiveness of physical activity interventions in improving well-being across office-based workplace settings: A systematic review. *Public Health* **2018**, *160*, 70–76. [CrossRef]
62. Jindo, T.; Kai, Y.; Kitano, N.; Tsunoda, K.; Nagamatsu, T.; Arao, T. Relationship of workplace exercise with work engagement and psychological distress in employees: A cross-sectional study from the MYLS study. *Prev. Med. Rep.* **2020**, *17*, 101030. [CrossRef]
63. Linden, A. Estimating the effect of regression to the mean in health management programs. *Dis. Manag. Health Outcomes* **2007**, *15*, 7–12. [CrossRef]
64. Gucciardi, D.F.; Law, K.H.; Guerrero, M.D.; Quested, E.; Thøgersen-Ntoumani, C.; Ntoumanis, N.; Jackson, B. Longitudinal relations between psychological distress and moderate-to-vigorous physical activity: A latent change score approach. *Psychol. Sport Exerc.* **2020**, *47*, 101490. [CrossRef]
65. Thøgersen-Ntoumani, C.; Loughren, E.A.; Taylor, I.M.; Duda, J.L.; Fox, K.R. A step in the right direction? Change in mental well-being and self-reported work performance among physically inactive university employees during a walking intervention. *Ment. Health Phys. Act.* **2014**, *7*, 89–94. [CrossRef]
66. Groeneveld, I.F.; Proper, K.I.; van der Beek, A.J.; Hildebrandt, V.H.; van Mechelen, W. Factors associated with non-participation and drop-out in a lifestyle intervention for workers with an elevated risk of cardiovascular disease. *Int. J. Behav. Nutr. Phys. Act.* **2009**, *6*, 80. [CrossRef] [PubMed]

67. Stults-Kolehmainen, M.A.; Sinha, R. The Effects of Stress on Physical Activity and Exercise. *Sport. Med.* **2013**, *44*, 81–121. [CrossRef] [PubMed]
68. Johnson-Kozlow, M.F.; Sallis, J.F.; Calfas, K.J. Does life stress moderate the effects of a physical activity intervention? *Psychol. Health* **2004**, *19*, 479–489. [CrossRef]
69. Lutz, R.S.; Stults-Kolehmainen, M.A.; Bartholomew, J.B. Exercise caution when stressed: Stages of change and the stress–exercise participation relationship. *Psychol. Sport Exerc.* **2010**, *11*, 560–567. [CrossRef]
70. Brown, W.J.; Heesch, K.C.; Miller, Y.D. Life Events and Changing Physical Activity Patterns in Women at Different Life Stages. *Ann. Behav. Med.* **2009**, *37*, 294–305. [CrossRef]
71. Jorm, A.F.; Windsor, T.D.; Dear, K.B.; Anstey, K.J.; Christensen, H.; Rodgers, B. Age group differences in psychological distress: The role of psychosocial risk factors that vary with age. *Psychol. Med.* **2005**, *35*, 1253–1263. [CrossRef]
72. Kobayashi, Y.; Kondo, N. Organizational justice, psychological distress, and stress-related behaviors by occupational class in female Japanese employees. *PLoS ONE* **2019**, *14*, e0214393. [CrossRef]
73. Bierman, A. Functional Limitations and Psychological Distress: Marital Status as Moderator. *Soc. Ment. Health* **2012**, *2*, 35–52. [CrossRef]
74. Wagner, A.L.; Keusch, F.; Yan, T.; Clarke, P.J. The impact of weather on summer and winter exercise behaviors. *J. Sport Health Sci.* **2019**, *8*, 39–45. [CrossRef]
75. Johnsen, M.T.; Wynn, R.; Bratlid, T. Is there a negative impact of winter on mental distress and sleeping problems in the subarctic: The Tromsø Study. *BMC Psychiatry* **2012**, *12*, 225. [CrossRef]
76. Tudor-Locke, C.; Williams, J.E.; Reis, J.P.; Pluto, D. Utility of pedometers for assessing physical activity: Convergent validity. *Sports Med.* **2002**, *32*, 795–808. [CrossRef] [PubMed]
77. Shimura, A.; Masuya, J.; Yokoi, K.; Morishita, C.; Kikkawa, M.; Nakajima, K.; Chen, C.; Nakagawa, S.; Inoue, T. Too much is too little: Estimating the optimal physical activity level for a healthy mental state. *Front. Psychol.* **2023**, *13*, 1044988. [CrossRef] [PubMed]
78. Sandoval-Reyes, J.; Restrepo-Castro, J.C.; Duque-Oliva, J. Work Intensification and Psychological Detachment: The Mediating Role of Job Resources in Health Service Workers. *Int. J. Environ. Res. Public Health.* **2021**, *18*, 12228. [CrossRef] [PubMed]
79. Lewis, A. End 'Fat-Shaming' Employee Wellness Programs. *HuffPost*, 11 December 2015. Available online: https://www.huffpost.com/entry/end-fat-shaming-employee-wellness-programs_b_8738540(accessed on 12 February 2023).
80. Australian Institute of Health and Welfare. *Insufficient Physical Activity*; AIHW: Canberra, Australia, 2020.
81. Heath, A. *Skills, Technology and the Future of Work*; Reserve Bank of Australia: Sydney, Australia, 2020.
82. Barankay, I. Why Employee Wellness Programs Don't Work. Knowledge at Wharton Podcast. 7 March 2022. Available online: https://knowledge.wharton.upenn.edu/podcast/knowledge-at-wharton-podcast/why-employee-wellness-programs-dont-work/ (accessed on 12 February 2023).
83. Platts, K.; Breckon, J.; Marshall, E. Enforced home-working under lockdown and its impact on employee wellbeing: A cross-sectional study. *BMC Public Health* **2022**, *22*, 199. [CrossRef] [PubMed]
84. Peters, S.E.; Dennerlein, J.T.; Wagner, G.R.; Sorensen, G. Work and worker health in the post-pandemic world: A public health perspective. *Lancet Public Health* **2022**, *7*, e188–e194. [CrossRef]