INTRODUCTION

Diet and physical activity are important lifestyle behaviors to decrease the risk of chronic diseases such as diabetes and heart disease, which are currently leading causes of death worldwide.[1,2] These behaviors depend on individuals' choices and can be influenced by environmental factors including the work-related stress and job characteristics.[3,4] For example, nursing is a stressful job that involves working long hours (≥9-10 hours/day) and has been associated with poor diet and physical inactivity.[5-7] Fatigue and lack of time have been identified as the main barriers to physical activity, while long shifts and lack of breaks at work contribute to poor dietary choices.[8] A recent study of 4000 nurses reported 8.5% had a healthy lifestyle, defined as a combination of factors such as meeting physical activity guidelines and having a high diet quality score.[9]

Despite potential benefits of physical activity and diet interventions, few studies have evaluated the effects of such interventions targeting nurses.[10,11] A recent review showed limited changes in diet and physical activity outcomes after a variety of differing workplace interventions, making it hard to conclude whether such interventions could be effective in this group.[10] Therefore, further research is needed on the feasibility and efficacy of diet and physical activity workplace interventions for nurses. The American Nurses Association has acknowledged the need for this population to be healthy by declaring 2017 as the Year of the Healthy Nurse.[12]

Qualitative researchers have reported the complexity of nurses' working environment, which could explain the limited number of workplace health promotion programs targeting them.[7,8] The Medical Research Council (MRC) framework considers a complex context like this a crucial factor for intervention implementation.[13] The MRC framework calls for a systematic approach both in designing and piloting the feasibility of a complex intervention before being fully scaled-up. This

approach allows researchers to conduct a process evaluation to identify and understand key factors related to an intervention's implementation, mechanism, and context where the intervention is delivered.[13] Process evaluation is a necessary step since many effective interventions often fail when scaled-up or translated in real-world settings, because of barriers at patient/participant, staff and organizational levels.[14] For example, a process evaluation of an effective weight-loss intervention identified potential barriers for this program to be maintained in clinical settings, which included facilities' self-reported program staffing and space/equipment availability.[15]

Frameworks like "RE-AIM" have been used increasingly to evaluate interventions targeting behavior change and obesity.[14] RE-AIM follows a logical evaluation sequence in different intervention aspects, including its Reach, Effectiveness, Adoption, Implementation, and Maintenance.[16] This framework enables researchers to identify barriers to successful intervention implementation, which can inform program changes for scalability, improve effectiveness, or design studies of future interventions. This study's aim was to evaluate and understand key factors related to implementation and mechanism of a diet and physical activity workplace intervention for nurses delivered in a hospital context, using the RE-AIM framework to report on these factors.

METHODS

Study Design And Setting

A 3-month workplace pilot intervention with a pre-post test was designed to promote healthy diet and physical activity. As commonly used in behavior change interventions,[17] these researchers used a combination of theoretical constructs from Social-Cognitive Theory (social-support),[18] Goal-Setting Theory,[19] and Control Theory (self-monitoring).[20] This selection was informed by formative

work in this group.[8] Intervention setting and participants included nurses working at public and private hospitals in the Brisbane, Australia, metropolitan. Intervention materials included pedometers, a smartphone app for goal-setting, and a private Facebook group for social support. The intervention was developed using components of the Intervention Mapping (IM) framework, which is a systematic process to guide the development of evidence-based health promotion interventions.[21,22] Briefly, a needs assessment was conducted to inform intervention development by assessing the target group's need for and interest in a workplace intervention.[8] This and the literature review helped identify evidence-based intervention strategies, which included self-monitoring, social-support and goal-setting.[10] The intervention components and implementation plan of this 3-month pilot workplace intervention is described in Table 1. Ethical approval was obtained from both the researchers' institution and the hospitals where the intervention was delivered (Ref nr 2014001685 and HREC/14/MHS/190, respectively).

Participants attended an information session with the researcher, where all anthropometrical measures were conducted and the surveys administered. Participants were asked to complete questionnaires about demographic data, self-rated health, self-efficacy and social support. Finally, each participant was given a Food Frequency Questionnaire (FFQ) and an accelerometer. They were requested to wear the accelerometer for 7 consecutive days and to return it when they attended the second meeting with the researcher (*see* Figure 1). Participants were shown how to use the intervention materials (pedometer, app, and intervention's Facebook group) and granted access to the social media group during this meeting. The researcher also explained how to use the app and set goals. Participants were encouraged to set realistic goals, focusing on small and sustainable changes in their diet and physical activity. The app [23] offered prompts and support for the participant to pre-set dietary and physical activity goals, if preferred. Finally, participants were given a pedometer both as an appreciation gift for their enrollment, and as an intervention strategy to encourage daily steps.

The process evaluation was performed using the RE-AIM framework to evaluate the intervention components.[16] The key aspects were the effectiveness and adoption of intervention materials and frequency of use, as per study aims. The intervention program was evaluated in each dimension of the RE-AIM framework: Reach, Effectiveness, Adoption, Implementation and Maintenance.

Recruitment And Study Population

Participants (nurses >18 years old) were recruited from 2 metropolitan hospitals using emails, posters and word-of-mouth. Researchers contacted Nursing Managers (n=2) from these hospitals to inform them of the intervention and have their support. They invited the researchers to present at a total of 4 staff meetings, of which 3 were with 10 nurses unit managers (NUMs), and 1 was with the nursing education team (n=8 nurse educators). Nursing Managers and NUMs attending the staff meetings sent emails to their staff, totaling at least ~500 nurses across 20 different wards. Four nurses encouraged at least 1 other colleague to participate in the intervention. A total of 65 nurses expressed an interest in the study and arranged a time to meet with researchers for their baseline assessment. Nurses working in either full-time or part-time basis were eligible for participation. Participants were excluded if they had uncontrolled hypertension and diabetes, unstable angina, orthopedic or neurological limitations. Other exclusion criteria included pregnancy or planned surgery during the research period. *Reach* was measured at the beginning of the intervention, based on the response rate (number of participants invited / participants who expressed interest and met the inclusion criteria). The different recruitment channels and strategies also were considered in this dimension, which included posters, staff emails, presentations at staff meetings, and snowball methods from participants and nursing unit managers (NUM).

Effectiveness – Outcome Measures

Outcome measurements were assessed at baseline, at end of intervention to measure changes (at 3-month), and at 6-month follow-up to measure maintenance. The primary outcomes included changes in physical activity behavior, including moderate-to-vigorous physical activity (MVPA) measured with accelerometers, and diet behavior (FFQ). Secondary outcomes were chronic disease risk markers (weight, body mass index - BMI, waist circumference and blood pressure). Changes in self-rated health, and diet and physical activity self-efficacy and social support were assessed.

Unlike pedometers, accelerometers can measure important domains of physical activity such as duration, intensity, and daily steps; and are non-reactive.[24] On the other hand, pedometers are better as intervention tool as they encourage physical activity.[25] For this reason, physical activity outcomes were measured with accelerometers (GT3X+ model, Actigraph LLC, Florida US), which have been validated for the measurement of physical activity and sedentary behavior.[26] According to best practice guidelines, a valid day comprises of at least 10 hours of wear time, and at least 4 valid days (including 1 weekend day) were required for statistical analysis.[27,28] The main outcomes were time spent in sedentary, light, MVPA, and steps per day.[26] Participants who met the physical activity guidelines of 150-300 minutes of MVPA per week were classified as physically active, and not meeting the guidelines classified as inactive.[29]

Participants' dietary patterns were assessed with a FFQ (Australian Eating Survey for adults - AES®, Newcastle Innovation Australia), and the Australian Recommended Food (ARF) score.[30,31] The AES was used to record food consumption for the previous 3 months. Participants were briefed on how to complete the FFQ and given a hard copy of the FFQ for them to fill it up on their own time. Once returned to the researcher, all questionnaires were de-identified and sent to Newcastle Innovation (Newcastle, Australia) for electronic scanning and analysis. FFQ analysis output

included macro and micronutrient intake and ARF score for each participant and time-point. This score is based on regular consumption of foods that are in line with the Australian dietary guidelines, e.g. whole grains, low-fat dairy, fruit and vegetables.[32,33] A point is awarded for each item reported as being consumed at least once a week with scores ranging from 0–74 (74 reflects the healthiest or most optimal diet quality).[30] FFQ data were used to assess changes (pre-post intervention) in overall ARF score, and prevalence of healthy choices (e.g. % energy intake from fruit and vegetables) and energy-dense-nutrient-poor choices (e.g. % energy intake from discretionary foods).

Weight and height were measured using an electronic scale (Charder MS 3200, Hamburg, Germany) and manual stadiometer (SECA 217-172-1009, Hamburg, Germany), approximating to the nearest 0.1 kg and 0.1 cm, respectively. These measures were used to calculate BMI following the formula BMI= weight (kg) / height $(m)^2$, and to categorize participants in BMI 18.5-24.99= normal weight, ≥25-29.99=overweight; ≥30= obese.[34] Waist circumference was measured at the narrowest point (mid-point), and following the protocol published by the World Health Organization's expert report.[35] Blood pressure was measured with participants sitting quietly using an electronic sphygmomanometer. To ensure accuracy, all measurements were taken twice. In case of a difference >5% between the 2 numbers, a third measurement was taken. The average between the 2 subsequent measures with < 5% difference was reported. Diet self-efficacy and social support were measured using sub-scales from a validated questionnaires developed by Sallis et al.,[36] and adapted from Norman et al.[37] (α=0.82 and α=0.82, for each sub-scale respectively). Sub-scales included 6 questions each, assessing how confident the participant felt in overcoming barriers for healthy eating (e.g. "*Confident I can eat healthy when I am upset or having a bad day"*); or how often he/she perceived social-support for healthy eating (e.g. *"How often your colleagues/friends encourage you to eat healthy foods?"*).[37] For physical activity self-efficacy, the scales developed and validated by Benisovich et al. [38] and adapted by Pedersen et al. [39] were used (α=0.85). These

included 6 items and assessed confidence in overcoming barriers (e.g. *"Confident I can exercise for 20min even if I feel I don't have the time"*). For physical activity social-support, we used 5 validated questions (α=0.87)[36] that assessed how often participants felt their social environment supported/encouraged them to be active (e.g. *"How often your colleagues/friends gave you helpful reminders about your exercise?*). All self-efficacy questions included a 5-point Likert scale from 1-5, with response categories from "not at all confident" to "completely confident". Following the same ratings, social-support questions included response categories from "Almost always" to "Almost never".

Self-rated health (ranging from poor to excellent) was assessed using a single item question extracted from a validated tool (SF-36 Health Survey).[40] The researcher (LT) administered all the questionnaires listed in this study in hard copies and collected them between the first and second contact (baseline) and within a week of the end of intervention and follow-up time points (Third and Fourth contact, respectively), as shown in Figure 1. The researcher was available to answer any questions regarding questionnaire completion.

Adoption, Implementation And Maintenance

Adoption and implementation were measured with questionnaires at the end of intervention to assess material use and frequency use. Intervention dose was measured by recording the number, date, type, and views of posts delivered through Facebook; number of participants receiving pedometer and app instructions, and using them; and number of participants not willing to use any given intervention tool (i.e. join the Facebook group, download the app, or use the pedometer). Maintenance was assessed using the data collected 6-month after the active intervention had ceased. At the end of the intervention, participants answered open-ended questions about the components they liked most, those that were less useful, and suggestions to improve a future intervention. In

addition, short interviews were conducted with participants who attended the 6-month assessment and those lost during the intervention. Interviews aimed to answer 3 research questions 1) external/internal factors influencing intervention outcomes; 2) determinants of behavior change and intervention adoption/effectiveness; 3) reasons for dropout or disengagement. For example, participants were asked to comment on changes in their job and lifestyle since the end of intervention, including behaviors they maintained or improved since then. They also were asked about factors that might have influenced intervention effectiveness (e.g. willingness/difficulties when implementing behavioral changes).

Data Analysis

All available participants' data were analyzed, and missing data were managed with Intention-to-Treat analysis using *"last observation carried forward"* imputation.[41] Descriptive statistics (mean, standard deviation, percentages) were calculated for demographic and outcome measures at baseline to characterize the study population. Normality was assessed visually with frequency histograms and statistically with Shapiro-Wilk Test, with $p<0.05$ indicating the data significantly deviates from a normal distribution. Chi-square test of independence was used to compare categorical variables. Differences in outcome measures at baseline, 3-month, and 6-month, were examined using a repeated measures analysis (ANOVA). Given that a previous systematic review10 showed variable intervention effectiveness in this population, selective comparisons between specific time-points were decided a priori (even if ANOVA did not indicate any significant effects). Comparisons were made using paired samples T-test, assessing changes from baseline to 3- and 6-month measures, and then between 3- and 6-month to assess maintenance of eventual outcome changes. Sub-group analysis for complete data (i.e. participants who returned to follow-up session) was performed. All statistical analyses were conducted in SPSS 22.0 (2016 version, SPSS Inc. Chicago, Illinois, USA). P-values were based on 2-sided tests and considered statistically

significant at $p<0.05$. Qualitative data were analyzed following thematic analysis with a realistic approach.[42] Information was collated in themes, which aimed to report relevant information regarding intervention feedback and factors related to participants' behavior change.

RESULTS

Participants' demographic and occupational characteristics are described in Table 2. The majority of participants were female and worked in direct care wards (In patient, Intensive Care Unit, Emergency Room). More than half (55%) were working at least 1 night shift a week, and 87% were working on full-time basis (≥36h/week).

Reach

Forty seven nurses enrolled in the intervention. Common reasons given by those nurses interested but who did not enroll included lack of time, intervention materials not appealing, preferred a weight-loss program or a personalized diet prescription. Overall reach was poor, with 13% of total potential participants being reached and 9.4% willing to enroll in the intervention. At 3-month, the end of intervention time point, n=27 nurses were re-tested (~40% drop-out) of which n=12 attended the 6-month maintenance assessment.

Effectiveness

Intervention outcomes on diet and physical activity behaviors are summarized in Table 3. MVPA, and daily steps decreased slightly at 3-month (p=0.01, p=0.04), with MVPA further decreasing at 6-

month. In the repeated measures analysis including the three time-points (baseline, post, and maintenance), there was a significant time-interaction effect for MVPA and average daily steps ($p=0.01$, $p=0.05$). Some dietary behavior improvements were observed. Fruit and vegetable intake improved significantly at 3-month, and decreased slightly at 6-month follow-up. The remaining dietary outcomes and changes were not statistically significant. There was no significant time-effect interaction for any of the dietary outcomes. Except for MVPA, changes in diet and physical activity behaviors using complete data at each time-point (Table 4) were similar to those observed with Intention-to-treat analysis (see Table 3). MVPA significantly increased at 6-month only in the compete data

Changes in clinical measures and self-efficacy/social-support scales are shown in Table 5. There were non-significant changes in BMI, waist circumference, and self-efficacy/social-support scales at 3- and 6-month.

Adoption, Implementation and Maintenance

Intervention adoption, calculated using the frequency of usage of intervention tools (i.e. pedometer, Facebook group, smartphone app), showed that 60% of participants used at least 1 tool. The majority of the participants (68.4%) used the app less than once a month or never, and they used the pedometer at least once a week (57.9%). Almost half of the participants (47.4%) engaged with the Facebook group at least once a week. The majority of participants reported that they set diet-related goals at least once a week (57.9%). Physical activity goals were set less frequently as 60% of participants reported they did not set physical activity goals at all, or less than once per month.

The intervention implementation was evaluated based on its performance and behavioral outcomes. As summarized in Table 1, part of the intervention was implemented as planned. Both “improved

physical activity" (intervention objective) and social aspects of behavioral outcomes were not met. Based on intervention material usage and participants' feedback (see Participants' Feedback section below) the behavioral outcomes for steps self-monitoring and diet goal-setting were partially met. Participants' behavioral outcomes for the Facebook group tool were not met. While content was posted on Facebook by the researcher (LT) as planned (i.e. recipes, tips and motivational messages), participants did not use or interact with this tool as expected with 1 participant posting content once. Social support between participants was lower than anticipated, resulting in minimal colleagues' encouragement towards behavior change.

As shown in Table 3, most diet and PA measures were maintained at 6-month with no significant changes from the end of the intervention (3-month time-point). Only MVPA and daily average steps showed a significant time-interaction effect in the repeated measures analysis. These results were similar to those observed in the sub-group analysis including only participants with complete data, shown in Table 4.

Participants' Feedback

Participants who attended the 3-month follow-up session provided feedback on the most and least helpful aspects of the intervention. Pedometers and Facebook content were considered good motivations. In line with adoption results, nurses did not find the app useful or reported they used it only for a short time at the beginning of the intervention. Participants suggested that future interventions should have a more specific program, such as having a meal plan or more contact sessions to receive feedback on their progress.

The one-on-one interviews conducted with n=14 participants, provided the researchers with a better understanding of the observed intervention effects, in particular for the improvements on diet

/reduced physical activity. A key theme to emerge from the data was that participants felt this intervention study increased awareness of their current health status, diet and physical activity behaviors by *"just being enrolled and being part of it"* (participant ID, N42); *" being accountable to someone (researcher leading the study)"* (N35), and "*knowing that there are other people doing it too"* (N24). Completing the food frequency questionnaire helped participants see that they were *"eating too much junk food and having irregular meal patterns"(N21) and "having bad diet habits"* (N24). The pedometer and the accelerometer were useful reminders because *"it's there (on the waist) and it's reminding you to be active".*

Most participants focused on implementing dietary changes only, instead of changing physical activity or both behaviors at the same time, as "it *is too hard to change both*" (N35) and *"it's easier to start with diet, I'm walking at work anyway everyday"* (N42) *"I'm losing weight anyway (just with diet)".* The strategies participants adopted to improve their diet included "*doing healthier options when buying food"(N37), "recipes and tips on how to make the best out of food helped me, it made me click and be more mindful"(N10), "I try to eat more veggies now"(N35).* Those participants who improved physical activity reported that this was due to other factors such as *"my friends do marathons and they got me started on running again"(N21) " I noticed I was putting on weight and decided to start running"(N16) " I try to do more walking, I walk the dogs"(N01)*

Participants who dropped out from the study were asked about potential improvements to the intervention that might lead to better participant retention. They reported that *"having a more frequent contact, someone that calls you and checks on your progress, someone to talk to";" enrolling with other people that work with you, I was the only one that enrolled in my ward".* Suggestions on how to increase intervention reach in the future included the researchers being more involved in staff meetings, so nurses get to know them and the project. Another suggestion was to enroll nurses from the same ward. However, some described this as difficult since nurses working

on the same ward do not always have sufficient rapport with each other (*"it can be awkward to tell an overweight/obese colleague that they should join because you don't know them that much",* N31). Participants also commented on providing healthier options at the hospital food outlets or for free in staff rooms, as currently these are "*full of cookies and biscuits, that's all you eat when you are hungry and they are there*" (N31).

DISCUSSION

A needs assessment in this group clearly showed that nurses valued social-support as a desirable aspect in an intervention, which could motivate behavior change in this group.[8] While the pilot intervention presented here aimed to promote behavior change by facilitating social support from colleagues, the process evaluation showed that participants' social support did not change nor did they engage with materials promoting social-support. Previous studies in nurses showed that social support and physical activity were promoted effectively by having a nurse-champion who led the intervention.[43] This may suggest that technology alone may not be effective for social support.

However, workplace interventions that provided regular face-to-face sessions showed similar results to this pilot study in terms of intervention implementation and adoption.[44] Viester *et al.*[44] included ~150 construction workers in the intervention group, of whom 50% regularly used the pedometers provided, and 23% used the information material. Another study showed higher participation and engagement when on-site exercise sessions were provided in addition to face-to-face meetings for goal-setting.[45] In this 6-month workplace intervention with n=367 academic hospital older employees (>45 years old), the participation to the onsite exercise sessions ranged from 44-63%. This approach resulted in increased minutes of weekly physical activity (sports participation), and higher fruit and vegetable intake by participants with higher compliance.[45] These

different results compared with this pilot study, highlight the importance of understanding the context where interventions take place to inform conclusions on their feasibility and effectiveness.[46]

This pilot study identified key problems that should be addressed before one can scale-up and confidently assess the effectiveness of diet and physical activity interventions in nurses. These include effective recruitment, retention and intervention strategies. Based on previous studies and participants' feedback, having nurse champions for recruitment and intervention delivery would be a valuable strategy to address implementation barriers in this group.[43]

In terms of intervention strategies, these should consider the target group's preferences in the context of their readiness to change and motivation to use the preferred materials. There was a discrepancy between what nurses said they wanted in an intervention (Needs Assessment), and what they were prepared to do.[8] This raises a flag on the limitations of using such approach to identify intervention materials, without considering participants' motivation and readiness to change.[47] Interventions that are matched to the participants' stage have shown to be effective and improve participants' engagement.[48] Conversely, while multicomponent strategies are described in the literature as effective and synergetic, the results presented here showed that this approach might not be "ideal" for nurses. Further examination of similar occupational groups with high stress, fatigue, and lack of time to identify if similar challenges also exist in these groups is warranted.

Strengths And Limitations

Although a thorough process evaluation following a sound and validated framework (RE-AIM) was conducted, some limitations to this study remain. Having a convenience sample and a large loss at follow-up could have led to selection bias, and thus affected the observed intervention effects and feedback results. Because the magnitude of change, reach and retention were limited, results should

be interpreted with caution in terms of effectiveness of the intervention. Further, adoption and implementation were measured at the end of the intervention in a retrospective way. Instead, measuring the use and engagement with the various intervention materials, would have provided information on whether uptake was constant, or whether it was reduced after a specific time.

IMPLICATIONS FOR FUTURE RESEARCH AND PRACTICE

For those nurses participating in this intervention, changing 2 behaviors at the same time was reported as challenging, with the majority of participants finding it easier to change diet than become more physically active. The high attrition and limited engagement with the intervention strategies suggests that workplace interventions for nurses may not be feasible using current approaches. A combination of technology and having a person actively supporting participants could be more effective. Personal support could be delivered by the researcher implementing the intervention and/or by a nurse champion onsite. Yet, intervention strategies might consider the target population's preferences in the context of their readiness to change and motivation to use the preferred resource materials. Measuring participants' baseline motivation/readiness to change could inform whether intervention strategies are suitable or not.

Alongside these, actively supporting participants either by the researcher or a champion onsite could improve the intervention's engagement and effectiveness Nurse and hospitals' managers should be involved actively during intervention planning, to assist researchers identifying the best nurse champions. Involving stakeholders at the early stages of intervention development has the potential to promote program ownership, which may promote reach and retention.[49] At present,

more innovative ways of recruiting and retaining participants in this group are needed before we can invest time and resources in larger interventions.

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FIGURE CAPTIONS

Figure – Intervention design and implementation flow chart

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Tables and figures

TABLE 1 – PARTICIPANTS DEMOGRAPHIC AND OCCUPATIONAL CHARACTERISTICS

(n=47)

Participant characteristics			
	Mean or *n*	SD	%
Gender (female)	41		87
Age	41.4	12.1	
Married (yes)	28		60
Tenure (years)	18.2	12.8	
Hospital			
Private	26		55.3
Public	21		44.7
Unit			
In patient	23		48.9
ICU	6		12.8
ER	3		6.4
*Other**	14		31.9
Role			
RN	22		46.8
CN/ Nurse Manager	14		29.8
Nurse Ed	5		10.6
Nurse Assistant/Midwife	6		12.8
Education level			
Cert/Diploma	11		23.4
Bachelor's	33		70.2
Master's	3		6.4
Shift work	26		55.3
1 night/week	14		29.8
2 nights/week	9		19.1
3 nights/week	3		6.4
Full-time status *(38h/week)*	41		87.2%

RN registered nurse, CN clinical nurse, Nurse Ed nurse educator or clinical facilitator, Nurse Assistant in Australia does not hold a nursing degree but a certificate and on the job training, duties involve assistance to Registered Nurses * *Education, Urology department and other nurse roles involving mostly deskwork*

TABLE 2 – Effects of a 3-month diet and physical activity workplace intervention for nurses. Results at end of intervention and 6-month follow-up time-points.

	Intervention effects on primary outcomes						
	Baseline (n=47)	**3-month (n=47)***	**6-month (n=27)***	**p-value[1]**	**p-value [2]**	**F****	**p-value**
Physical activity [#]							
% Sedentary Activity	58.4±8.5	57.9±8.7	59.1±8.8	0.70	0.51	0.226	0.70
% Light Activity	38.7±8.5	39.5±8.9	38.9±6.7	0.40	0.99	0.461	0.56
% MVPA (*median*)	3.0±1.9 (2.27)	2.5±1.9 (1.85)	2.5±2.0 (2.00)	**0.01**	0.06	46.23	**0.00**
Average Steps	8496±2528	8136±2395	7629±2342	**0.04**	0.32	3.617	**0.05**
Sedentary min	486.3±107.7	464.1±94.5	464.1±83.1	0.17	0.64	2.198	0.15
Light PA min	322.7±79.4	314.9±79.1	299.1±62.5	0.30	0.65	1.064	0.35
MVPA min (*median*)	24.0±16.2(19.7)	19.0±14.0(13.5)	19.3±15.4(16.1)	0.00	0.07	7.175	0.003
Meeting guidelines	45.2%	35.7%	23.1%			3.421[a]	0.18
Dietary behaviour [##]							
Energy intake (kJ)	7530.8±3591.8	7706.6±3601.2	7040.0±2381.4	0.45	0.21	0.485	0.62
ARF score (quality)	33.3±11.4	33.5±10.0	33.1±11.9	0.81	0.88	0.077	0.88
% Fruit & Vegetables	15.5±8.2	19.6±7.8	17.7±9.0	0.04	0.17	2.693	0.08
% E Discretionary food	27.9±12.2	27.1±11.5	23.4±11.8	0.38	0.22	1.840	0.18

* n=20 lost at 3-month, n= 15 lost at 6-months, missing data managed with Intention-To-Treat; ** **F:** F-value for repeated measurements; **[1]** P-value between baseline and 3-months data points ; **[2]** p-value between 3- and 6-months data point; **#:** Physical activity as average % of total daily time, median values for variables not normally distributed**; MVPA:** Moderate-to-Vigorous Activity; **##:** Food/nutrient groups as percentage (%E) of total daily energy intake; **Discretionary food:** category including chocolate, pastries, cake, candy and soft-drinks (energy dense nutrient poor foods); **[a]** Pearson Chi-square **[1]** p-value between baseline and 3-months**, [2]** p-value between 3-months and 6-months.

TABLE 3 - THE EFFECTS OF THE INTERVENTION ON PRIMARY MEASURES IN PARTICIPANTS with complete data at 3 AND 6-MONTH time-points (n=12)

Participants attending 6-months follow-up								
	Baseline		**3-months**		**6-months**		F^{*}	*p*- value
PA behaviour †	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*		
Sedentary Activity (%)	59.3	8.4	58.0	8.0	56.9	6.1	0.374	0.62
Light intensity Activity	38.0	7.6	40.7	8.1	40.7	6.6	0.563	0.53
MVPA (%)	2.8	1.6	1.6	0.8	2.8	2.1	3.642	**0.05**
Average Steps per day	8591	2991	7663	1856	8184	2046	1.093	0.35
Diet behaviour								
Energy intake (kJ)	7826.6	2694.5	8183.3	2804.4	7572.5	2798.3	0.520	0.57
ARF score (quality)	32.5	14.1	32.8	10.1	33.1	12.7	0.036	0.95
%E Fruit & Vegetables‡	14.8	7.4	19.1	7.0	16.9	8.5	1.809	0.19
%E Discretionary food‡	29.4	15.3	27.6	13.3	25.2	12.0	1.797	0.19

PA**,** physical activity; SD, standard deviation; MVPA, moderate-to-vigorous activity; * *F* for repeated measures ANOVA; † Physical activity as average % of total daily time; ‡Food groups as percentage (%E) of total daily energy intake; ***ARF score***, Australian recommended food score, ***Discretionary food***, category including chocolate, pastries, cake, candy and soft-drinks (energy dense nutrient poor foods);

TABLE 4 – CHANGES IN CLINICAL MEASURES FOLLOWING AT 3- AND 6-MONTHS POST INTERVENTION

Intervention effects on clinical measures

	Baseline (n=47)	**3-m (n=47)**	**6-m (n=27)**	**p-value 3m**	**p-value 6m**	**F***	**p-value**
BMI (Kg/m^2)	28.3±6.1	28.2±6.0	26.1±5.7				
Overweight	31(66.0%)	30 (63.8%)	13 (50%)	0.71	0.32	0.967	0.34
Ideal Weight (<25)	16 (34.0%)	17 (36.2%)	13 (50%)				
Weight (Kg)	76.3±17.3	76.2±17.1	70.4±15.7	0.74	0.14	2.061	0.16
Waist (cm)	86.5±13.2	86.5±13.1	80.8±10.8	0.64	0.43	0.418	0.56
Self-rated health [a]	3.1±0.8	3.2±0.8	3.4±0.8	0.04	0.78	3.467	0.05
Poor to fair (%)	24.4	17.8	7.7			3.124[d]	0.21[d]
Self-efficacy [b]							
Diet score	2.4±0.8	2.5±0.8	2.8±0.9	0.44	0.40	1.349	0.27
Not confident	*47.7%*	*47.7%*	*30.4%*			2.211 [d]	0.33[d]
PA score	3.1±0.8	2.9±0.8	3.0±0.9	0.21	0.15	1.178	0.30
Not confident	*50.0%*	*47.7%*	*47.6%*			0.056[d]	0.97[d]
Social support [c]							
Diet score	2.8±0.8	2.9±0.8	3.0±0.8	0.66	0.45	0.313	0.61
Often supported	*39.5%*	*42.9%*	*52.4%*			0.959 [d]	0.62[d]
PA score	2.3±0.7	2.3±0.6	2.3±0.7	0.89	0.34	0.722	0.45
Often supported	*37.2%*	*32.6%*	*38.1%*			0.279 [d]	0.87[d]

* F: F-value for repeated measures analysis; PA: physical activity; [a] in a 1-5 scale, from poor to excellent; [b] 1-5 score from not confident at all to very confident; [c] 1-5 score from never get support to always; [d] Pearson Chi-square

TABLE 5 – IMPLEMENTATION OF INTERVENTION OBJECTIVES AND TOOLS

Intervention Objectives	Performance objectives	Tool	Expected behavioural outcome	Implemented/ Observed
• Improved diet quality • Increased physical activity	1) Swapping energy dense snacks with nutritious ones to avoid feeling hungry and making unhealthy choices 2) Limiting the availability of sweets and chocolate on the floor/wards 3) Bringing healthy meals at work and try to have regular meal patterns 4) Colleagues influencing each other to adopt a healthier lifestyle. 5) Implementing active transport and other small changes to promote PA 6) Increasing daily steps and minutes of PA, especially in their days off. 7) Using PA to socialise with colleagues/friends. 8) Exercising before/after shifts 9) Sharing positive experiences to motivate each other	Facebook group	• Share success stories or advice to improve diet & PA	✗
			• Find a colleague to exercise before/after shifts or actively commute to work.	✗
			• Self-nomination of nurse leaders willing to organise PA events or encourage healthy snacks during shifts.	✗
			• Posts with motivational and inspirational quotes to be active/healthy	✓
			• Participants are encouraged to post recipes/tips	✓
		App	• Participants set diet goals	✓
			• Participants set PA goals	✗
			• Participants use app to share goals and/or support others	✗
		Pedometer	• Participants check daily steps and set step-goal (e.g. >10,000 steps/day)	✓
			• Compare and share their steps with other participants	✗

PA: physical activity; □: Not implemented as planned; ✓: Implemented as planned