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RESEARCH ARTICLE

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The effects of a theory-informed intervention on physical activity behaviour, motivation and well-being of frontline aged care workers: A pilot study with 6-month follow-up

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Abstract

Issue addressed: Due to the nature of their jobs, frontline aged care workers may be a population at risk of poor health and lifestyle habits. Support of their well-being through the workplace is likely to be complex. The objective of this study was to assess the effectiveness of a need-supportive program for changing physical activity and psychological well-being via the motivational processes of behavioural regulations and perceived need satisfaction.

Methods: Frontline aged care workers ($n = 25$) participated in a single cohort, pre–post pilot trial. The program included a Motivational Interviewing style appointment, education on goal setting and self-management, the use of affect, exertion and self-pacing for regulating physical activity intensity and practical support activities. Outcomes (7-day accelerometery, 6-min walk, K10 and AQoL-8D), and motivational processes (BREQ-3 and PNSE) were measured at baseline, 3 and 9 months, and analysed using linear mixed models for repeated measures.

Results: There were significant increases in perceived autonomy at 3 months (Δ .43 ± SE: .20; $p = .03$) and 6-min walk distance at 9 months (Δ 29.11 m ± SE: 13.75; $p = .04$), which appeared to be driven by the relative autonomy index (behavioural regulations in exercise questionnaire [BREQ-3]). Amotivation increased at 3 months (Δ .23 ± SE:.12; $p = .05$); which may have been due to low scores at baseline. No other changes were demonstrated at any timepoint.

So what?: Participants demonstrated positive changes in motivational processes and physical function, however, due to the low levels of participation in the program, the program had a negligible impact at the organisational level. Future researchers and aged care organisations should aim to address factors impacting participation in well-being initiatives.

KEYWORDS
health promotion, mental health, motivation, motivational interviewing, motor activity, occupational health

1 | INTRODUCTION

Theory-informed behaviour change interventions aim to use theory to optimise intervention outcomes; however, the real-world effectiveness of these interventions for health behaviour change remains elusive and previous reviews of the literature have demonstrated mixed results.[1–3] Occupational factors such as low job demand with low control, high job strain and shift work have previously been associated with unhealthy behaviours in healthcare employees, including physical inactivity and cigarette smoking.[4,5] Similarly, participation in some workplace health promotion activities may be impeded by work factors such as having low peer and supervisor support of participation[6,7] and high job demand and low control over how an individual's work is undertaken.[7] Therefore, while the workplace is often considered to be a convenient means of targeting the health behaviour of large numbers of employees, the effectiveness of these interventions may be confounded by such occupational factors.

Community-based support workers and residential care workers provide care to older individuals at home and within residential aged care facilities.[8] These workers support older adults with maintaining their lifestyle and activities of daily living through tasks such as cooking, cleaning, social support and personal care.[8,9] The recent final report from the Royal Commission into Aged Care Quality and Safety in Australia has highlighted some complex and systemic issues within aged care which have ultimately resulted in reduced quality of employment for these workers and quality of care for consumers.[9] Understaffing, low pay, high staff turnover, lack of opportunities for upskilling, high physical and emotional job demands and low job control for employees in direct care roles have become commonplace across the industry.[9] As such, the aged care industry becomes a difficult context within which to support employee well-being.

As a typically older workforce managing many occupational challenges including shift work, high physical workloads and often low pay and job instability,[5,8,10] frontline aged care workers are an employee population at high risk of poor physical and mental health.[8] Therefore, due to its important role in physical and mental well-being, the prevention of chronic illness and injury, and the maintenance of physical capacity in ageing, physical activity could be a useful tool for improving the health of an aged care workforce. Despite this, only a small number of previously published trials test workplace physical activity interventions in aged care employees.[11–13] Retention rates in these studies have typically been around 70%, and levels of adherence to interventions are variable, with one study reporting adherence to the intervention as less than 50%.[11]

1.1 | The role of need support in well-being and behaviour change interventions

The role of need support in behaviour change stems primarily from two sub-theories of Self-Determination Theory.[14] *Organismic Integration Theory* which proposes that an individual's behavioural regulations (i.e., the 'motivations' underlying a behaviour) can be more or less self-determined. Those that are more self-determined stem from the individual, such as engaging in a behaviour for enjoyment (*intrinsic regulation*) or its consistency with one's sense of identity (*integrated regulation*). Those that are less self-determined stem from external motivators, such as reward or fear of punishment (*external regulation*). The theory proposes that an individual is more likely to engage in and maintain a behaviour over time when their behavioural regulations are more self-determined.[15]

The second sub-theory is *Basic Psychological Needs Theory*, which proposes that humans have innate psychological needs of *autonomy*, *competence* and *relatedness* that must be satisfied within a given context to facilitate internalisation of behavioural regulations.[14,16] Methods such as need-supportive approaches have shown promising results within previous health promotion trials,[17,18] and more recently, support of the relationship between these theorised change mechanisms and health behaviour outcomes in interventional studies have been demonstrated through meta-analytic structural equation modelling.[19]

Motivational Interviewing is a clinically developed approach to behavioural counselling[20,21] that is fundamentally consistent with a need-supportive approach. Interventions applying Motivational Interviewing techniques have demonstrated positive outcomes for promoting physical activity behaviour in a variety of populations.[22] The success of these approaches may relate to their potential to empower individuals to take charge of their own behaviour, thereby theoretically having the potential to effect longer-term behaviour change.

1.2 | The call for transparency and rigour in intervention development and evaluation

Traditionally, theory-informed interventions have often been limited by poor application or subsequent reporting of theory within the intervention development process,[23–25] poor methodological quality of trials,[25,26] and issues of confounding by the use of multiple behaviour change strategies and theoretical constructs.[24] With a growing call for transparency with regard to intervention development, there has now been an increasing number of trials with clear application of theory and moderate to strong quality of research design.[1] Similarly, frameworks such as the Intervention Mapping framework have been developed with the aim to improve the integration of theory into intervention design and the transparency around these methods.[27]

In addition, evaluation of the implementation, and context within which an intervention is being implemented have been noted to be as important as the measurement of the outcomes themselves.[28] Process evaluations, that examine the myriad of elements that may influence outcomes of an intervention in a real-world context, are therefore critical to the interpretation of outcomes related to complex interventions. Having systematic and transparent development of interventions can enable thorough testing through pilot studies and evaluation to allow refinement prior to implementing a randomised controlled trial.[29] As such, transparency and rigour within the development and testing, and use of evaluation of theory-informed interventions is needed to enable the refinement of behaviour change theory and progression of the scientific field.[23,30,31]

Considering the information presented here, a systematic and iterative approach drawing from the Intervention Mapping framework[27] was applied to the development of the Activity for Well-being program. This was a physical activity and well-being program for frontline aged care workers that was piloted and evaluated using a mixed methods approach to examine the implementation, feasibility and effectiveness of the intervention. While the intervention development process, and the feasibility and process evaluation of the Activity for Well-being program have been outlined previously,[32,33] the current study aims to present the findings of the pilot trial pertaining to the effectiveness of the program at the individual participant level. Findings from previous research, and the process evaluation and feasibility study of the current program are used to inform the interpretation of the quantitative findings outlined within this manuscript.

The objectives of this study were:

1. To assess the real-world effectiveness of the Activity for Well-being program for influencing change in physical activity behaviour and psychological well-being over the course of a pilot trial and follow-up period (3 and 9 months), within an aged care workplace setting.
2. To assess the effectiveness of the Activity for Well-being program for influencing change in behavioural regulations and perceived need satisfaction as the processes hypothesised to influence physical activity behaviour and psychological well-being in the target population (frontline aged care workers).

2 | METHODS

2.1 | Participants, recruitment and research design

All participants in the Activity for Well-being intervention were community-based support workers or residential aged care workers employed by a large, not-for-profit aged care organisation. Participants were recruited via an email invitation that was sent out to frontline staff based in the greater Adelaide region, including inner metropolitan and outer suburbs and regions. Additional promotion for the program was undertaken via posters, newsletter announcements and presentations at team meetings. For inclusion into the study, participants had to be currently employed by the funding organisation as a frontline aged care worker at the time of recruitment, and 18 years of age or older. The pilot trial was run as a single cohort, pre–post intervention study with outcome measures (7-day continuous accelerometery [GENEActiv], the Kessler 10-item psychological distress scale (K10), the assessment of quality of life [AQOL-8D] and 6-min walk), and motivational process measures (behavioural regulations in exercise questionnaire [BREQ-3], the psychological need satisfaction in exercise [PNSE], and the health care climate questionnaire [HCCQ; 3 months only]) collected at baseline, 3 and 9 months. Signed, informed consent was obtained from all participants prior to entering the program. Ethical approval for this project was obtained from the University of South Australia, Human Research Ethics Committee (protocol ID: 0000036767). Registration with the Australian and New Zealand Clinical Trials Registry (registration number: ACTRN12617001395325) can be found at https://www.anzctr.org.au/Trial/Registration/TrialReview.aspx?id=373693. Universal Trial Number (UTN): U1111-1202-3589.

2.2 | Intervention

2.2.1 | Development and theoretical bases

The development of the Activity for Well-being program used guidance from the Intervention Mapping framework and has been previously described in detail.[32] Briefly, the program was developed using a participatory approach, drawing information from implementing staff and potential end-users (needs assessment). This included initial meetings with upper-level implementing staff, which highlighted the frontline workers as an employee group in need of additional health and well-being support due to the nature of their roles. Subsequent semi-structured interviews with frontline workers ($n = 10$, all community based) were designed to explore barriers and facilitators of physical activity and exercise, and preferences for the subsequent intervention. Discussion was initiated via two open-ended facilitating questions: (1) What factors do you feel make it difficult for you to be physically active? (2) What factors do you feel help you to be physically active? The interviews used a semi-structured, emergent-systematic approach where the course of the discussion developed from the responses of the participant and additional exploratory questions were used to obtain more information or redirect the conversation where appropriate. Additionally, each interview ended with discussions about individual preferences for intervention components or approaches. All interviews lasted for approximately 30–60 min and were audio recorded for the purpose of transcription and analysis. The thematic trees that were developed from the interviews with frontline workers are shown in Material S1, and tables of selected quotes are shown in Material S2. The program was then systematically developed by selecting Self-Determination Theory and evidence-based (Motivational Interviewing and self-management) methods for facilitating change, and the subsequent development of program components. The targeted personal health determinants for the program included the psychological needs of *autonomy*, *competence* and *relatedness* as Self-Determination Theory constructs. Additionally, *positive exercise-related affect* was included as a determinant due to its value as a predictor of physical activity behaviour,[34] and its compatibility with the concepts encompassed by Self-Determination Theory.

2.2.2 | Intervention components and implementation

After baseline testing, each participant met with an accredited exercise physiologist (AEP) with Masters-level training in Motivational Interviewing (first author). This initial Motivational Interviewing style appointment was used to collaboratively develop an individual activity plan that was designed to provide a realistic starting point for the individual in order to facilitate behaviour change. As such, activity plans were not based on national physical activity guidelines,[35] but instead took a 'something is better than nothing' approach that included only the volume of activity that each individual felt they could realistically achieve as an initial goal. Participants were encouraged to try and

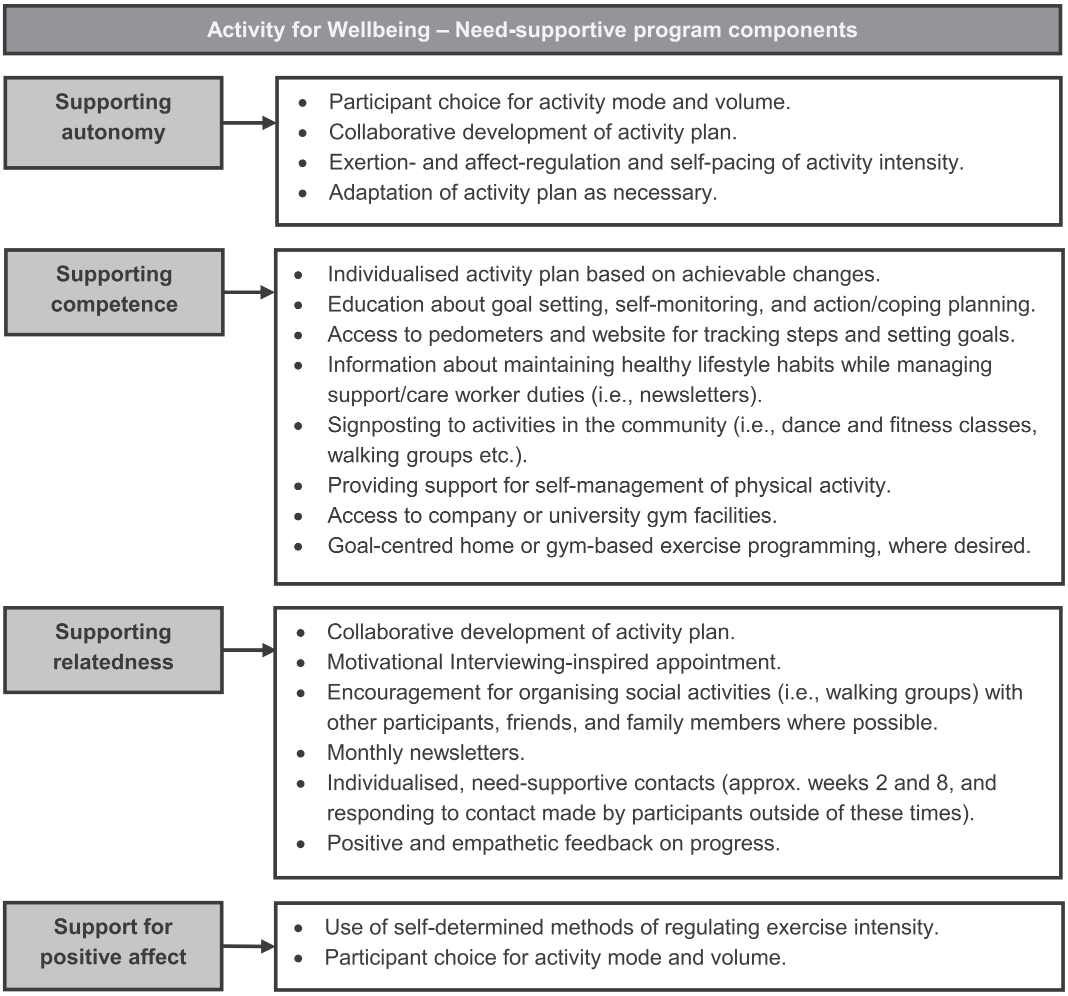

FIGURE 1 Program components as elements of need support.

progress this over time. Program participants received education on goal setting, action and coping planning, self-monitoring via a pedometer or own wearable device, and education on the use of self-determined methods of activity intensity regulation including affect, ratings of perceived exertion (RPE) and self-pacing. To facilitate the use of these methods of regulating physical activity intensity, participants were given a business-sized card with the Feeling Scale[36] and RPE scale[37] to keep, and were provided instructions as to how to use each of these scales and self-pacing for regulating physical activity intensity. The participants were given the opportunity to actively experience using these scales during a 6-min walk.

Throughout the intervention, the AEP assisted participants with a number of support activities which included the option to use research grade pedometers provided as a part of the program, and access to a website that was previously piloted[38] and modified for the target population. The website had a function for tracking step counts, setting tiered goals (three different weekly step goals based on whether the participant was feeling 'good', 'okay' or 'bad'), and links to health information (i.e., webpages and fact sheets from national organisations accrediting exercise and nutrition professionals), and local community activities including but not limited to dance, yoga and fitness classes held at local community centres, scheduled events such as fun runs, and walking groups in different council areas. All support activities and components of the intervention are outlined in Figure 1.

In the initial appointment and need-supportive follow-ups during the 3 months of the active intervention, the AEP actively encouraged participants to seek and use the support of the AEP. Participants were made aware that they were able to contact the AEP for any type of support until the end of the follow-up period (the 9-month time point). During the 6 months following the initial intervention period, the AEP support, newsletters and self-management tools such as the pedometer and website, were not withdrawn; however, additional support and follow-ups were no longer actively offered by the AEP. This approach was taken in order to promote autonomy in activity management by the program participants without completely withdrawing need support.

2.3 | Outcomes and motivational process measures

The primary outcomes for the study were physical activity behaviour and psychological well-being. Physical activity was measured using

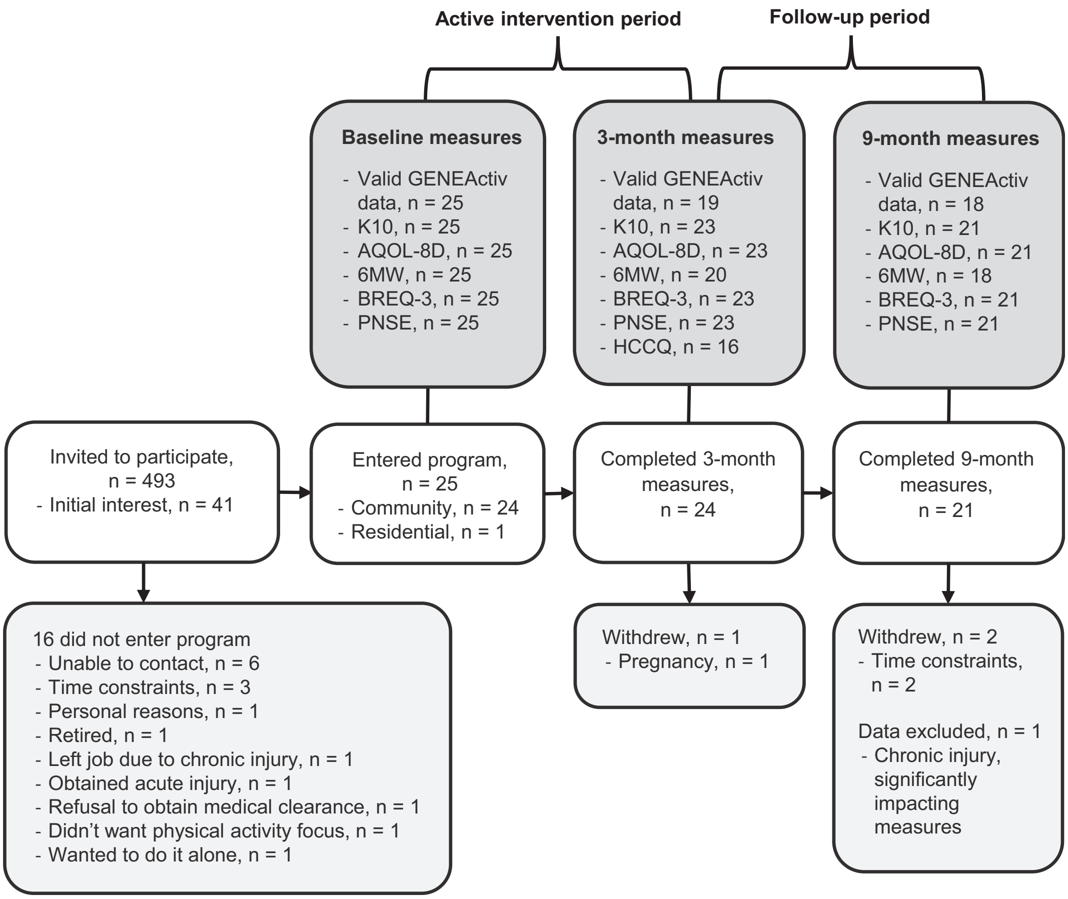

FIGURE 2 Flow of participants through the program, and summary of data collected. 6MW, 6-min walk; AQOL-8D, assessment of quality of life (8D) questionnaire; BREQ-3, behavioural regulations in exercise questionnaire (version 3); HCCQ, health care climate questionnaire; K10, Kessler 10-item psychological distress scale; PNSE, Psychological Need Satisfaction in Exercise questionnaire.

GENEActiv Original accelerometers (*Activinsights, UK*), with the sampling frequency set at 50 Hz. Participants were instructed to wear the accelerometers for 7 days and record sleep and non-wear times. Psychological well-being was measured using the K10[39] and the AQOL-8D.[40] The secondary outcome measure was a 6-min walk which was undertaken according to the Guidelines by the American Thoracic Society.[41]

The motivational process measures included behavioural regulations and perceived need satisfaction in exercise, which were measured using the BREQ-3,[42,43] and the PNSE questionnaire[44] at baseline, 3 and 9 months. Perceived autonomy support was measured by the HCCQ[45] which was completed online directly after the 3-month outcome measures. The HCCQ was managed by a member of the research team who was not involved in the implementation of the program, and the responses were used to measure perceived autonomy support as a part of the fidelity assessment.

2.4 | Data processing and analysis

Accelerometer data were processed using a custom program (Cobra software) in MatLab, version R2019b (The Mathsworks Inc, USA). Sleep and non-wear times were excluded using participants' self-reported logs and were adjusted manually on visual inspection of the data. Participants' data were included if they presented a minimum of four valid days of data including at least one non-work day. A valid day was classified as at least 600 min (10 h) of wear time.[46] Data inclusion criteria were based on those used in the National Health and Nutritional Examination Survey study.[46] The cut-points for sedentary time and activity intensity were based on those outlined by Esliger et al.[47] These cut-points were as follows: sedentary time: <1.50 METs; light activity: 1.50–3.99 METs; moderate activity: 4.00–6.99 METs; vigorous activity: ≥7.00 METs. Data were analysed in 60-s epochs to calculate the measured amount of sedentary time and time spent in light, moderate, vigorous and moderate to vigorous physical activity (MVPA) in minutes per day, and MVPA minutes per day in bouts of 10 min or more. The mean daily number of minutes per day for each classification was calculated for individual participants at each time point.

Individual responses to the K10 questions were summed to calculate an overall score for each participant. Interpretation of the K10 scores used the thresholds outlined in the 2001 Victorian Population Health Survey.[48] For the AQoL-8D, standardised, unweighted scores were used for data analysis. Participant scores for individual questions of the AQoL-8D were grouped into their respective domains.

TABLE 1 Participant characteristics at baseline ($n = 25$).

	Category		n	%
Gender	Female		22	88
	Male		3	12
Ethnic/cultural background	Australian		12	48
	UK		9	36
	European (non-UK)		4	16
English as a first language	Yes		24	96
	No		1	4
	Min	Max	Mean (SE)	
Age (years)	24.00	69.00	54.48 (2.32)	
Body mass index (kg/m^2)	22.60	47.46	30.21 (1.129)	
Sedentary time (min/day)	350.57	689.57	499.89 (18.04)	
Light time (min/day)	166.57	404.43	288.35 (13.33)	
Moderate time (min/day)	51.29	279.29	115.51 (10.96)	
Vigorous time (min/day)	.00	7.86	1.87 (.56)	
MVPA (min/day)	18.14	230.00	117.38 (11.21)	
MVPA bouts (min/day in bouts of ≥10 min)	4.86	214.71	55.63 (9.40)	
AQOL-8D (standardised and unweighted score)	51.06	95.70	79.72 (2.02)	
K10 (score)	10.00	38.00	15.88 (1.10)	
6 min walk distance (m)	364.00	682.00	533.64 (15.98)	
6 min walk, mean RPE	9.93	13.17	7.00 (.38)	
6 min walk, mean affect	3.15	5.00	−1.00 (.32)	
Perceived autonomy (PNSE)	3.00	6.00	4.90 (.19)	
Perceived competence (PNSE)	2.33	6.00	4.35 (.25)	
Perceived relatedness (PNSE)	1.50	6.00	3.99 (.24)	
Relative Autonomy Index (weighted BREQ-3 score)	.25	18.25	8.80 (1.23)	
BREQ-3—Amotivation	.00	1.50	.82 (.08)	
BREQ-3—External regulation	.00	1.50	.47 (.13)	
BREQ-3—Introjected regulation	.00	4.00	2.15 (.23)	
BREQ-3—Identified regulation	1.00	4.00	2.79 (.16)	
BREQ-3—Integrated regulation	.00	4.00	1.94 (.26)	
BREQ-3—Intrinsic regulation	.25	4.00	2.56 (.21)	

Abbreviations: AQOL-8D, assessment of quality of life (8D) questionnaire; BREQ-3, behavioural regulations in exercise questionnaire (version 3); K10, Kessler 10-item psychological distress scale; MVPA, moderate-vigorous physical activity; PNSE, psychological need satisfaction in exercise questionnaire; RPE, rating of perceived exertion; SE, standard error of the mean; UK, United Kingdom.

The summed scores for each domain were then standardised to a scale of 0–100 using the spreadsheet and formula provided by the instrument developers (Centre for Health Economics, Monash University, Australia).

Mean BREQ-3 scores were calculated for the six individual domains of the BREQ-3 questionnaire. The mean scores for each domain were weighted by multiplying the score by the weighting value and summing them to calculate the Relative Autonomy Index (RAI). Due to the theoretical and statistical limitations associated with the RAI, as outlined by Chemolli and Gagne,[49] statistical analysis was also undertaken on the individual domain scores for each time point. Perceived autonomy, competence and relatedness satisfaction in exercise were measured using the mean score for each domain of the PNSE questionnaire.[44] Individual HCCQ scores were calculated by reversing the score for item 13 and calculating the mean score for all items.

A linear mixed model for repeated measures with first-order autoregressive structure (AR [1]) was run in SPSS (version 25.0; IBM Corporation, Armonk, NY) to analyse all outcome and motivational process measures from baseline, 3 and 9 months. Due to a small sample size, complex mediation analyses and the inclusion of multiple covariates into the mixed models was inappropriate. Instead, the impact of motivational process measures was assessed by including the RAI, individual BREQ-3 domains and PNSE domains individually as covariates within the mixed model for any significant outcome. The mean differences were compared to those from the original mixed models (unadjusted) to assess for potential influence by these motivational process measures. Measures of affect and perceived exertion were each analysed with a two-factor (across time, intra- and inter-assessment) analysis of variance (ANOVA) for participants who completed measures at all three time points. Analyses of RPE and affect included the raw measures of affect and RPE for each minute of the 6-min walk at each time point. Lastly, all mixed models were repeated with the exclusion of the male participants to check for any influence of gender bias within the pilot sample.

2.5 | Process evaluation

Full details of the methods and results of the process evaluation have been previously outlined.[33] Briefly, the process evaluation used survey data ($n = 118$; 99 community based and 19 residential) to assess reach and adoption of the program. A mixed methods approach was used to assess the fidelity of the implementation of the intervention, and semi-structured interviews were used to assess the feasibility and context of the program ($n = 19$). The interviews included a mix of program participants ($n = 10$; nine community based and one residential), non-program participants ($n = 6$; four community based and two residential) and implementing staff ($n = 3$; one community based and two residential). The results of the process evaluation were used to guide the interpretation of the quantitative findings in the current manuscript.

3 | RESULTS

3.1 | Recruitment and population

A total of 493 employees from six participating sites and areas were invited to participate in the program. Initially, 41 employees (8.32%)

TABLE 2 Results of the linear mixed model—Primary and secondary outcomes ($n = 25$).

Outcome	t_2–t_1 Δ (SE)	p	t_3–t_2 Δ (SE)	p	t_3–t_1 Δ (SE)	p
Sedentary time (min/day)	15.76 (16.73)	.35	13.00 (17.32)	.46	28.76 (21.56)	.19
Light time (min/day)	−20.87 (10.93)	.06	3.89 (11.28)	.73	−16.99 (14.43)	.25
Moderate time (min/day)	−10.40 (9.17)	.26	−11.58 (9.47)	.23	−21.98 (12.07)	.08
Vigorous time (min/day)	−.07 (.56)	.90	.96 (.58)	.11	.89 (.70)	.21
MVPA (min/day)	−10.56 (9.28)	.26	−10.62 (9.57)	.28	−21.18 (12.23)	.09
MVPA bouts (min/day in bouts of ≥10 min)	−8.73 (8.33)	.30	−5.87 (8.61)	.50	−14.60 (10.84)	.18
AQOL-8D (standardised and unweighted score)	−2.06 (1.43)	.16	2.61 (1.49)	.09	.55 (1.94)	.78
K10 (score)	.69 (1.06)	.52	−1.94 (1.11)	.09	−1.25 (1.36)	.36
6-min walk distance (m)	.90 (9.91)	.93	28.21 (10.95)	.01**	29.11 (13.75)	.04*

Note: Standard error of the mean differences is presented in the parentheses.
Abbreviations: AQOL-8D, assessment of quality of life (8D) questionnaire; K10, Kessler 10-item psychological distress scale; MVPA, moderate-vigorous physical activity; t_1, baseline; t_2, 3 months; t_3, 9 months.
*$p \le .05$.
**$p \le .01$.

expressed interest in the program and 25 (5.07%) chose to participate. The most common reasons cited for not entering the program were lack of time and injury. The flow of participants through recruitment and participation, and a summary of data collected, is shown in Figure 2.

3.2 | Program outcomes and motivational process measures

Baseline characteristics of the sample are shown in Table 1. At baseline, program participants were meeting the current Australian physical activity and exercise guidelines (adults ages 18–64)[35] of 150–300 min of moderate physical activity per week. Baseline physical activity was measured as a mean of 117.38 (SE: 11.21) min of MVPA per day recorded by accelerometery, equivalent of 821.66 min per week. Similarly, the mean baseline AQOL-8D score of 79.72 (SE: 2.02) was consistent with unweighted normative data,[50] and the mean baseline K10 score of 15.88 (SE: 1.10) indicated low levels of psychological distress.[48] Mean baseline 6-min walk distance of 533.64 (SE: 15.98) fell at the lower end of the 50th percentile for females aged 50–59, and were consistent with the lower mean values reported for mixed male and female groups from seven countries.[51]

The results of the linear mixed model analyses for all outcomes are shown in Table 2. The only significant change in the linear mixed models for the outcome measures was a mean increase of 29.11 m (SE: 13.75) in 6-min walk distance, demonstrated at 9 months compared to baseline ($p = .04$). No differences in sedentary time, any of the physical activity categories or well-being measures were statistically significant at either time point.

The results of the linear mixed model analyses for all motivational process measures are shown in Table 3, noting that the motivational process measures outlined here are those related to the facilitation of behaviour change and are independent of any measures that were undertaken as a part of the process evaluation.[33] A significant increase in perceived autonomy satisfaction in exercise, as measured by the PNSE, was demonstrated at 3 months (Δ .43; $p = .03$), although no other measures were significant at this time point. Perceived autonomy satisfaction in exercise remained higher at 9 months than at baseline, however values were no longer statistically significant (Δ .41; $p = .09$). Baseline mean values for the BREQ-3 domain of amotivation were very low with a small standard error. This domain demonstrated a significant increase in domain score at 3 months (Δ .23; $p = .05$). This decreased again towards baseline at 9 months and was no longer significant compared to baseline (Δ .18; $p = .13$). No significant differences were demonstrated for the RAI or any of the individual BREQ-3 domains. Perceived autonomy support as measured by the HCCQ at 3 months ($n = 16$ respondents) was considered to be high with a mean score of 6.61 out of a potential score of 7. The mean number of participant-initiated communications during the program period was 4.24 (±2.57) and during the follow-up period was 2.13 (±4.51).

The results of the two-factor ANOVAs demonstrated a main effect across time intra-session for both RPE and affect. Mean RPE was significantly higher at the sixth minute ($\bar{X}$ 10.63; SE .56) compared to the first minute of the 6-min walk ($\bar{X}$ 9.65; SE .46; F [2.03, 30.50] = 4.40; $p < .01$). Mean affect was significantly lower at the sixth minute ($\bar{X}$ 2.87; SE .43) compared to the first minute of the 6-min walk ($\bar{X}$ 3.69; SE .24; F [1.65, 24.72] = 4.05; $p < .01$). No main effect was demonstrated for either variable across the three assessment time points and no interactions were seen.

3.3 | Covariate analyses

A covariate analysis was undertaken on the 6-min walk distance to identify if any individual motivational process measures influenced the

TABLE 3 Results of the linear mixed model—Motivational process measures ($n = 25$).

Motivational process measures	t_2–t_1 Δ (SE)	p	t_3–t_2 Δ (SE)	p	t_3–t_1 Δ (SE)	p
PNSE—Individual domains						
Perceived autonomy	.43 (.20)	.03*	−.02 (.20)	.93	.41 (.24)	.09
Perceived competence	.13 (.19)	.52	.25 (.20)	.21	.38 (.25)	.15
Perceived relatedness	−.24 (.27)	.27	−.18 (.28)	.52	−.05 (.33)	.87
BREQ-3—Individual domains						
Amotivation	.23 (.12)	.05*	−.05 (.12)	.66	.18 (.12)	.13
External regulation	.05 (.15)	.15	−.03 (.16)	.86	.02 (.18)	.91
Introjected regulation	−.17 (.23)	.46	−.07 (.24)	.76	−.24 (.29)	.40
Identified regulation	.02 (.15)	.88	.14 (.15)	.36	.17 (.19)	.38
Integrated regulation	.16 (.17)	.37	.19 (.18)	.29	.35 (.23)	.14
Intrinsic regulation	.04 (.15)	.81	.09 (.16)	.55	.13 (.20)	.52
Composite measures						
Relative Autonomy Index (weighted BREQ-3 score)	−.21 (.90)	.82	1.19 (.94)	.21	.98 (1.22)	.42

Note: Standard error of the mean differences are presented in the parentheses.
Abbreviations: BREQ-3, behavioural regulations in exercise questionnaire (version 3); PNSE, psychological need satisfaction in exercise questionnaire; t_1, baseline; t_2, 3 months; t_3, 9 months.
*$p \le .05$.

TABLE 4 Covariate analysis of the linear mixed model for change in 6 min walk distance (m), baseline to 9 months ($n = 25$).

Analysis	Δ	p
t_3–t_1, unadjusted	29.11	.04
t_3–t_1, adjusted for perceived autonomy satisfaction	33.26	.03
t_3–t_1, adjusted for perceived competence satisfaction	32.60	.03
t_3–t_1, adjusted for perceived relatedness satisfaction	29.82	.04
t_3–t_1, adjusted for Relative Autonomy Index	34.35	.01
t_3–t_1, adjusted for amotivation	28.47	.05
t_3–t_1, adjusted for external regulation	28.37	.05
t_3–t_1, adjusted for introjected regulation	30.27	.03
t_3–t_1, adjusted for identified regulation	26.14	.07
t_3–t_1, adjusted for integrated regulation	33.39	.02
t_3–t_1, adjusted for intrinsic regulation	31.52	.03

Abbreviations: t_1, baseline; t_3, 9 months; Δ, change in 6 min walk distance.

outcome. The results of this analysis are shown in Table 4. The largest positive effect on 6-min walk distance at 9 months compared to baseline was the RAI (Δ34.35 m; $p = .01$ adjusted by the RAI vs. Δ29.11 m; $p = .04$ unadjusted). This effect could be largely accounted to change in integrated regulation, which had a similar impact on 6-min walk distance in the adjusted linear mixed model (Δ33.39 m; $p = .02$).

3.4 | Female-only analyses

Even though the proportion of participants identifying as males (12%) to participants identifying as females (88%) in the pilot sample was considered to be reasonably representative of the target population (the entire workforce of the target organisation was known to be approximately 84% female), an additional analysis was undertaken excluding the three male participants to check for any notable impacts on the results. The results from the female-only analyses are outlined in Data S3. Results were broadly similar to those from the whole cohort. Notable findings for the female-only analyses were: (1) perceived autonomy satisfaction was significantly increased at 3 months (Δ .47; $p = .04$) in line with the results from the total sample (Δ .43; $p = .03$), and increased further from baseline at 9 months (Δ .53; $p = .04$), compared to a slight decrease from 3 months and a smaller difference from baseline in the total sample (Δ .41; $p = .09$); (2) the mean increase in 6-min walk distance from baseline to 9 months was larger in the female-only sample (Δ34.51 m; $p = .03$) compared to the whole cohort (Δ29.11 m; $p = .04$) and (3) the covariate analysis indicated a greater influence of need satisfaction on change in 6-min walk performance in the female-only analysis compared to that for the whole cohort (Data S3, Table C).

4 | DISCUSSION

The purpose of this study was to assess the real-world effectiveness of the Activity for Well-being program for influencing change in physical activity behaviour and psychological well-being, via the motivational process of behavioural regulations and perceived need satisfaction, over the course of a pilot trial and follow-up period in frontline aged care workers. The cohort demonstrated significant increases in perceived autonomy in exercise at 3 months, and 6-min walk distance at 9 months after participation in a highly autonomy supportive physical activity program. These results are consistent with Self-Determination Theory, as proposed by Deci and Ryan.[16] There is growing evidence that autonomy supportive health care environments may positively predict higher levels of participant autonomy, competence and relatedness regarding the target health behaviour.[52] Previous interventions applying Self-Determination Theory-based approaches to health behaviour change have shown some promising results.[19] While published interventions based in Self-Determination theory are limited in workplace contexts, Pedersen and colleagues[53] demonstrated increases in perceived competence in physical activity, autonomous self-regulations, predicted maximal oxygen uptake and other health characteristics within a worksite intervention for postal workers. Consistent with the concept of need support, Motivational Interviewing-based interventions have also demonstrated improvements in body mass index,[54] physical and mental health status[55] and sustainable return to work after rehabilitation[56] in a number of occupational contexts.

Despite the significant increases in perceived autonomy satisfaction and 6-min walk distance, no significant changes in objectively measured MVPA were demonstrated at any time point. Seasonal effects on physical activity may have influenced this outcome to an extent since many of the follow-up measures were undertaken during colder months of the year. Seasonal changes have been shown to account for declines up to 11%–44% in self-reported physical activity in adults.[57,58] Additionally, it is possible that the program may have attenuated decreases in physical activity in response to stresses from large organisational changes that were occurring over the post-intervention and follow-up periods; however, it is difficult to draw any strong conclusions based on the small sample size and single-group design of the current study. Even though some contextual factors were noted in the process evaluation as influencing the reach and adoption associated with the program, the influence of contextual factors on the adherence of those individuals who chose to participate in the program appeared to be small.[33] The process evaluation also indicated high fidelity of the implementation of program,[33] which was supported by the high mean score on the HCCQ presented here. This finding indicates other reasons for the lack of observed change. While it appears that the sample participants were meeting the current physical activity recommendations[35] at all time points, a major factor limiting the interpretation of these results is that the current guidelines are based on self-report data meaning the comparison of objective measures to the current physical activity guidelines becomes problematic.[46]

Similar to the findings for physical activity, no changes in the well-being measures were significant at any timepoint. The lack of a significant change in well-being measures again may have somewhat reflected the healthy scores at baseline. While the mean 6-min walk distance was slightly less than normative values for healthy adults[51] at baseline, there was a significant increase in this outcome at 9 months. Minimally important clinical differences have been calculated as 20–50 m in community dwelling older adults with mobility dysfunction,[59] 54 m in patients with stable severe chronic obstructive pulmonary disease,[59] and 14.0–30.5 m for multiple patient groups with pathology.[60] As such, the 29-m increase in the current, relatively healthy population may not be clinically meaningful. Despite this, the significant improvement does indicate some element of change in physical fitness, function or motivation that was reflected in the 6-min walk distance.

The positive influence of the relative autonomy of behavioural regulations that was seen in the covariate analysis indicates that motivational processes may have played an important role in this change in performance. Although some limitations of the RAI have been previously highlighted,[49] the index was developed to reflect relative autonomy of behavioural regulations, and the current findings are consistent with the hypothetical mechanistic pathways underlying Self-Determination Theory.[61] Specifically, autonomy support is thought to lead to more self-determined motivation regarding a specific behaviour, which in-turn means more situational self-determined motivation and better performance in associated contexts.[62] This finding is consistent with the findings of previous studies that have found that autonomous motivation mediated the indirect relationship between autonomy support and competitive performance,[53] and cardiorespiratory fitness.[53,63] These findings must be considered within the limitations of the study, however, since participants were self-selected into the pilot trial there is likely to be some selection bias that may have influenced these results.

One unexpected difference was seen in the BREQ-3 domain of amotivation, which increased significantly at 3 months compared to baseline. Although on initial assessment this seems to defy reason, the amotivation domain of the BREQ-3 has been shown to have some inherent limitations related to skewedness of the data.[42] The baseline mean values for the amotivation domain of the BREQ-3 from the Activity for Well-being participants were very low, which is to be expected since the participants were self-selected into the program and were most likely motivated for change. Amotivation scores significantly increased at 3 months and still remained higher than baseline at 9 months. Such low values with low levels of variation could certainly result in a significant finding with only small changes from baseline. Another important consideration may be that the Activity for Well-being program was highly focused on self-reflection and self-management. The program encouraged the use of self-monitoring to manage activity levels and the use self-determined methods of regulating activity intensity such as affect, RPE and self-pacing. The strong focus on self-monitoring of behaviour and feelings could have elicited a heightened awareness of these factors, including their own levels of amotivation.

The current self-selected sample of 25 participants consisted of only 5% of the invited population. As demonstrated by the outcome data, these participants were generally healthy and active at baseline indicating a common issue for many health promotion interventions—that the program was unable to elicit participation from individuals that could benefit the most. Reasons for non-participation were explored as much as possible through the previously published process evaluation.[33] This included interviews with frontline workers that did not participate in the trial ($n = 6$; four community based and two residential) and indicated a combination of individual, implementation and contextual (occupational) factors contributed to the low levels of participation in the program. Contextual factors that were noted for community-based support workers during the process evaluation included irregular work patterns and environments and minimal contact with work peers that appeared to have negatively impacted participation in the program. While residential staff have a consistent workplace and somewhat more regular work schedules, contextual factors that were highlighted by residential staff during the process evaluation indicated that the physical and mental demands of the occupation and generally low levels of engagement and morale in the workplace were factors that potentially impacted participation in the pilot program outlined here. Some of these factors, particularly those identified by residential staff, are consistent with findings from previous studies.[6,7] The resulting single group, pre–post design and small sample size thereby makes it difficult to draw strong conclusions regarding the true efficacy of the program.

Finally, the findings of the current study were further complicated by the inclusion of only three male participants (12%). Although this appears to be a disproportionately low number, the entire workforce of the target organisation was known to be approximately 84% female, including those not in direct care roles where the proportion of females is generally expected to be larger. This number is also consistent with those reported in previous national Australian aged care statistics where female employees have been seen to make up 93%, 89% and 87% of the direct care workforce in residential facilities in 2007, 2012 and 2016 respectively, and around 90%, 90% and 89% of the home support workforce in 2007, 2012 and 2016, respectively.[8,64] As such, the high proportion of females participating in the pilot program was an expected finding and was considered to be closely representative of the whole target population. Despite this, all mixed models were rerun excluding the male participants to check for undue influence on the results. While the majority of the results where similar for both analyses, the most notable difference in the female-only analysis compared to the whole cohort was the greater influence of the motivational processes of perceived autonomy and competence satisfaction on the change in 6-min walk distance. The comparisons between the female-only group and the whole cohort indicate that perceived need satisfaction may have had a greater influence on the female participants compared to the male participants in this particular cohort.

5 | LIMITATIONS

The current study has several limitations including the lack of a control group that may have otherwise accounted for external influences, such as seasonal effects or attenuation of overall declines in physical activity levels. A larger sample size may have allowed for more complex statistical analysis of the outcomes and motivational process pathways. Similarly, the small sample size may mean that the pilot trial was underpowered to detect true change and has the potential to be erroneously influenced by a small number of participants. The self-selection of participants into the program would have introduced some selection bias. As such, it is likely that those individuals participating in the program already had readiness to change, while many that could have benefitted from the program would have chosen not to participate. Despite this, it must be acknowledged that the aims of the Activity for Well-being project were not to rigorously test the efficacy of the program in terms of quantitative outcomes, but to include these outcomes as a part of a larger evaluation including qualitative investigation to assess the benefits, limitations and feasibility of a program such as this for frontline aged care workers.

5.1 | Practical implications for wellness programs in aged care settings

While the quantitative data in isolation suggest some limited effectiveness of the Activity for Well-being program, when combined with the findings from the feasibility and process evaluation they demonstrate a clear discrepancy between the feasibility of the program at different levels.[33] While the overall impact at the organisational level was negligible due to the small cohort that participated in the current study, the qualitative post-program interviews indicated positive subjectively reported outcomes and good feasibility of the program at the individual level. The improvements in perceived autonomy in exercise and physical function, even if only small, give some support to individual-level feasibility and could even predict longer-term health benefits beyond what could be captured in the current study.

Program participation appeared to be impacted by a combination of individual, implementation and contextual factors.[33] These factors would need to be addressed by the funding organisation to facilitate participation, and subsequently improve the feasibility, cost-effectiveness and quantitative outcomes of any health promotion activity at the organisational level. Contextual factors that were reported by frontline workers such as high physical workloads, low job stability and low general engagement and morale, were consistent with the findings of the Royal Commission into Aged Care Quality and Safety,[9] which began during the final months of the implementation of this trial. The amalgamation of findings from these different parts of the current study and those of the Royal Commission indicate that industry-wide changes in legislation and funding structure, followed by organisational-level changes within the workplace context will be necessary before this type of intervention can create meaningful impact at the organisational level.

Despite these practical limitations, a program such as this may have a lot of potential for facilitating perceived well-being support within the aged care workplace. This type of program could be integrated into existing employee services, such as alongside early intervention physiotherapy and counselling support that is offered by many employers. The upskilling and utilisation of existing staff and facilities and ensuring good accessibility for aged care employees should optimise cost-effectiveness and engagement. For health promotion practitioners specifically, professional and ethical practise through the application of the core competencies for health promotion,[65] particularly enabling change and advocating for health, may support better implementation and engagement in programs such as this. Future researchers and organisations considering workplace health promotion programs aimed at long term health behaviour change, could benefit from a similar type of program or one with similar theoretical underpinnings; however, a comprehensive cost–benefit analysis and further piloting would need to be undertaken prior to implementation.

6 | CONCLUSIONS

The Activity for Well-being program was a need-supportive intervention that incorporated self-management tools, participant choice for activity mode in the development of participant activity plans, encouragement for the use of self-determined methods for regulating physical activity intensity and psychological need support. The program participants demonstrated significant increases in perceived autonomy in exercise at 3 months, followed by a significant increase in 6-min walk distance at 9 months. Covariate analysis demonstrated a positive influence on 6-min walk distance by the RAI, and primarily integrated regulation. The program participants also demonstrated a significant increase in the BREQ-3 domain of amotivation compared to extremely low baseline levels. This finding may reflect the skewed nature of this domain of the BREQ-3 or potential increases in participant awareness of their amotivation. The findings of this study support previous research demonstrating that provision of a need-supportive physical activity intervention may be useful for targeting perceived autonomy and behavioural regulations as potential predictors of physical activity behaviour; however, contextual factors that may impact staff participation would need to be addressed to optimise the overall impact of the program.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest. Various elements of the findings included in the current manuscript have been previously presented as a conference abstracts at the Exercise and Sports Science Australia Research to Practice Conference 2018, the International Society of Behavioral Nutrition and Physical Activity Annual Meeting 2019, the Exercise and Sports Science Australia Research to Practice Conference 2021 and within a final thesis that was submitted in partial fulfilment of the Doctor of Philosophy (Human Movement) at UniSA Allied Health & Human Performance, University of South Australia (conferred December 2020).

DATA AVAILABILITY STATEMENT

The data that supports the findings of this study are available in the supplementary material of this article.

ETHICS STATEMENT

Ethical approval for this project was obtained from the University of South Australia, Human Research Ethics Committee (protocol ID: 0000036767).

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REFERENCES

1. Lock M, Post D, Dollman J, Parfitt G. Efficacy of theory-informed workplace physical activity interventions: a systematic literature review with meta-analyses. Health Psychol Rev. 2020;15:1–25. https://doi.org/10.1080/17437199.2020.1718528
2. Taylor N, Conner M, Lawton R. The impact of theory on the effectiveness of worksite physical activity interventions: a meta-analysis and meta-regression. Health Psychol Rev. 2012;6:33–73. https://doi.org/10.1080/17437199.2010.533441
3. Dombrowski SU, Sniehotta FF, Avenell A, Johnston M, MacLennan G, Araújo-Soares V. Identifying active ingredients in complex behavioural interventions for obese adults with obesity-related co-morbidities or additional risk factors for co-morbidities: a systematic review. Health Psychol Rev. 2012;6:7–32. https://doi.org/10.1080/17437199.2010.513298
4. Chin DL, Nam S, Lee S-J. Occupational factors associated with obesity and leisure-time physical activity among nurses: a cross sectional study. Int J Nurs Stud. 2016;57:60–9. https://doi.org/10.1016/j.ijnurstu.2016.01.009
5. Miranda H, Gore RJ, Boyer J, Nobrega S, Punnett L. Health behaviors and overweight in nursing home employees: contribution of workplace stressors and implications for worksite health promotion. Sci World J. 2015;2015:915359. https://doi.org/10.1155/2015/915359
6. Kilpatrick M, Blizzard L, Sanderson K, Teale B, Jose K, Venn A. Barriers and facilitators to participation in workplace health promotion (WHP) activities: results from a cross-sectional survey of public-sector employees in Tasmania, Australia. Health Promot J Austr. 2017;28:225–32. https://doi.org/10.1071/he16052
7. Jørgensen MB, Villadsen E, Burr H, Punnett L, Holtermann A. Does employee participation in workplace health promotion depend on the working environment? A cross-sectional study of Danish workers. BMJ Open. 2016;6:e010516. https://doi.org/10.1136/bmjopen-2015-010516
8. Mavromaras K, Knight G, Isherwood L, Crettenden A, Flavel J, Karmel T, et al. The 2016 National Aged Care Census and survey—the aged care workforce, 2016. 2017.
9. Royal Commission into Aged Care Quality and Safety. Final report: care, dignity and respect. Safety RCiACQa. Commonwealth of Australia: Canberra, ACT; 2021. p. 1–326.
10. Rao Hill S, Clarke M. Linking employee wellbeing and stakeholder quality of life: the case of aged care. 2010.

11. Brox JI, Frøystein O. Health-related quality of life and sickness absence in community nursing home employees: randomized controlled trial of physical exercise. Occup Med. 2005;55:558–63. https://doi.org/10.1093/occmed/kqi153
12. Gerdle B, Brulin C, Elert J, Eliasson P, Granlund B. Effect of a general fitness program on musculoskeletal symptoms, clinical status, physiological capacity, and perceived work environment among home care service personnel. J Occup Rehabil. 1995;5:1–16. https://doi.org/10.1007/bf02117816
13. Pohjonen T, Ranta R. Effects of worksite physical exercise intervention on physical fitness, perceived health status, and work ability among home care workers: five-year follow-up. Prev Med. 2001;32:465–75. https://doi.org/10.1006/pmed.2001.0837
14. Deci EL, Ryan RM. Intrinsic motivation and self-determination in human behavior. New York: Plenum; 1985.
15. Ryan RM, Deci EL. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. Am Psychol. 2000;55:68–78. https://doi.org/10.1037/0003-066x.55.1.68
16. Deci EL, Ryan RM. The 'what' and 'why' of goal pursuits: human needs and the self-determination of behavior. Psychol Inq. 2000;11:227–68. https://doi.org/10.1207/s15327965pli1104_01
17. Samdal GB, Eide GE, Barth T, Williams G, Meland E. Effective behaviour change techniques for physical activity and healthy eating in overweight and obese adults; systematic review and meta-regression analyses. Int J Behav Nutr Phys Act. 2017;14:42. https://doi.org/10.1186/s12966-017-0494-y
18. Fortier MS, Duda JL, Guerin E, Teixeira PJ. Promoting physical activity: development and testing of self-determination theory-based interventions. Int J Behav Nutr Phys Act. 2012;9:1–14. https://doi.org/10.1186/1479-5868-9-20
19. Sheeran P, Wright CE, Avishai A, Villegas ME, Lindemans JW, Klein WMP, et al. Self-determination theory interventions for health behavior change: meta-analysis and meta-analytic structural equation modeling of randomized controlled trials. J Consult Clin Psychol. 2020;88:726–37. https://doi.org/10.1037/ccp0000501
20. Miller WR. Motivational interviewing with problem drinkers. Behav Psychother. 1983;11:147–72. https://doi.org/10.1017/S0141347300006583
21. Miller WR, Rollnick S. Motivational interviewing: preparing people to change addictive behavior. New York, NY: Guilford Press; 1991.
22. O'Halloran PD, Blackstock F, Shields N, Holland A, Iles R, Kingsley M, et al. Motivational interviewing to increase physical activity in people with chronic health conditions: a systematic review and meta-analysis. Clin Rehabil. 2014;28:1159–71. https://doi.org/10.1177/0269215514536210
23. Painter JE, Borba CPC, Hynes M, Mays D, Glanz K. The use of theory in health behavior research from 2000 to 2005: a systematic review. Ann Behav Med. 2008;35:358–62. https://doi.org/10.1007/s12160-008-9042-y
24. Stacey FG, James EL, Chapman K, Courneya KS, Lubans DR. A systematic review and meta-analysis of social cognitive theory-based physical activity and/or nutrition behavior change interventions for cancer survivors. J Cancer Surviv. 2015;9:305–38. https://doi.org/10.1007/s11764-014-0413-z
25. Cummins KM. Explanations for the cloudy evidence that theory benefits health promotion. Front Psychol. 2022;13:910041.
26. Young MD, Plotnikoff RC, Collins CE, Callister R, Morgan PJ. Social cognitive theory and physical activity: a systematic review and meta-analysis. Obes Rev. 2014;15:983–95. https://doi.org/10.1111/obr.12225
27. Bartholomew LK, Parcel GS, Kok G, Gottlieb N. Planning health promotion programs: an intervention mapping approach. 3rd ed. Hoboken, NJ: John Wiley & Sons; 2011.
28. Moore GF, Audrey S, Barker M, Bond L, Bonell C, Hardeman W, et al. Process evaluation of complex interventions: Medical Research Council guidance. Br Med J. 2015;350:h1258. https://doi.org/10.1136/bmj.h1258
29. Hoddinott P. A new era for intervention development studies. Pilot Feasibility Stud. 2015;1:36. https://doi.org/10.1186/s40814-015-0032-0
30. Prestwich A, Webb TL, Conner M. Using theory to develop and test interventions to promote changes in health behaviour: evidence, issues, and recommendations. Curr Opin Psychol. 2015;5:1–5. https://doi.org/10.1016/j.copsyc.2015.02.011
31. Brug J, Oenema A, Ferreira I. Theory, evidence and intervention mapping to improve behavior nutrition and physical activity interventions. Int J Behav Nutr Phys Act. 2005;2:1–7. https://doi.org/10.1186/1479-5868-2-2
32. Lock M, Post D, Dollman J, Parfitt G. Development of a self-determination theory-based physical activity intervention for aged care workers: protocol for the activity for well-being program. Front Public Health. 2018;6:341. https://doi.org/10.3389/fpubh.2018.00341
33. Lock M, Post D, Dollman J, Parfitt G. Feasibility and process evaluation of a need-supportive physical activity program in aged care workers: the activity for well-being project. Front Psychol. 2020;11:518413. https://doi.org/10.3389/fpsyg.2020.518413
34. Rhodes RE, Kates A. Can the affective response to exercise predict future motives and physical activity behavior? A systematic review of published evidence. Ann Behav Med. 2015;49:715–31. https://doi.org/10.1007/s12160-015-9704-5
35. Australian Government. Physical activity and exercise guidelines for adults (18 to 64 years). In: Doha A, editor. Department of Health and Aged Care. Canberra: Australian Government; 2021.
36. Hardy CJ, Rejeski WJ. Not what, but how one feels: the measurement of affect during exercise. J Sport Exerc Psychol. 1989;11:304–17.
37. Borg GA. Psychophysical bases of perceived exertion. Med Sci Sports Exerc. 1982;14:377–81.
38. Frensham LJ, Zarnowiecki DM, Parfitt G, King S, Dollman J. The experiences of participants in an innovative online resource designed to increase regular walking among rural cancer survivors: a qualitative pilot feasibility study. Support Care Cancer. 2014;22:1923–9. https://doi.org/10.1007/s00520-014-2177-4
39. Andrews G, Slade T. Interpreting scores on the Kessler psychological distress scale (K10). Aust N Z J Public Health. 2001;25:494–7. https://doi.org/10.1111/j.1467-842X.2001.tb00310.x
40. Richardson J, Iezzi A, Khan MA, Maxwell A. Validity and reliability of the assessment of quality of life (AQoL)-8D multi-attribute utility instrument. Patient. 2014;7:85–96. https://doi.org/10.1007/s40271-013-0036-x
41. American Thoracic Society. ATS statement: guidelines for the six-minute walk test. Am J Respir Crit Care Med. 2002;166:111–7. https://doi.org/10.1164/ajrccm.166.1.at1102
42. Markland D, Tobin VJ. A modification of the behavioural regulation in exercise questionnaire to include an assessment of amotivation. J Sport Exerc Psychol. 2004;26:191–6.
43. Wilson PM, Rodgers WM, Loitz CC, Scime G. "It's who I am…really!": the importance of integrated regulation in exercise contexts. J Appl Biobehav Res. 2006;11:79–104. https://doi.org/10.1111/j.1751-9861.2006.tb00021.x
44. Wilson PM, Rogers WT, Rodgers WM, Wild TC. The psychological need satisfaction in exercise scale. J Sport Exerc Psychol. 2006;28:231–51. https://doi.org/10.1123/jsep.28.3.231
45. Williams GC, Grow VM, Freedman ZR, Ryan RM, Deci EL. Motivational predictors of weight loss and weight-loss maintenance. J Pers Soc Psychol. 1996;70:115–26. https://doi.org/10.1037/0022-3514.70.1.115
46. Troiano RP, Berrigan D, Dodd KW, Mâsse LC, Tilert T, McDowell M. Physical activity in the United States measured by accelerometer. Med Sci Sports Exerc. 2008;40:181–8.
47. Esliger D, Rowlands AV, Hurst T, Catt M, Murray P, Eston RG. Validation of the GENEA accelerometer. Med Sci Sports Exerc. 2011;43:1085–93. https://doi.org/10.1249/MSS.0b013e31820513be

48. Victorian Government Department of Human Services. Victorian population health survey 2001: selected findings. Melbourne, Victoria: Victorian Government Department of Human Services, Rural and Regional Health and Aged Care Services Division; 2002.
49. Chemolli E, Gagne M. Evidence against the continuum structure underlying motivation measures derived from self-determination theory. Psychol Assess. 2014;26:575–85. https://doi.org/10.1037/a0036212
50. Maxwell A, Özmen M, Iezzi A, et al. Norms for the AQoL-6D and AQoL-8D multi attribute utility instruments. Centre for Health Economics. Melbourne, Victoria: Monash University; 2016.
51. Casanova C, Celli BR, Barria P, Casas A, Cote C, de Torres JP, et al. The 6-min walk distance in healthy subjects: reference standards from seven countries. Eur Respir J. 2011;37:150–6. https://doi.org/10.1183/09031936.00194909
52. Ng JYY, Ntoumanis N, Thøgersen-Ntoumani C, Deci EL, Ryan RM, Duda JL, et al. Self-determination theory applied to health contexts: a meta-analysis. Perspect Psychol Sci. 2012;7:325–40. https://doi.org/10.1177/1745691612447309
53. Pedersen C, Halvari H, Williams GC. Worksite intervention effects on motivation, physical activity, and health: a cluster randomized controlled trial. Psychol Sport Exerc. 2018;35:171–80. https://doi.org/10.1016/j.psychsport.2017.11.004
54. Wilson JL, Wolf DM, Olszewski KA. Reducing commercial truck driver BMI through motivational interviewing and self-efficacy. Workplace Health Saf. 2018;66:270–5. https://doi.org/10.1177/2165079918754585
55. Butterworth S, Linden A, McClay W, Leo MC. Effect of motivational interviewing-based health coaching on employees' physical and mental health status. J Occup Health Psychol. 2006;11:358–65. https://doi.org/10.1037/1076-8998.11.4.358
56. Park J, Esmail S, Rayani F, Norris CM, Gross DP. Motivational interviewing for workers with disabling musculoskeletal disorders: results of a cluster randomized control trial. J Occup Rehabil. 2018;28:252–64. https://doi.org/10.1007/s10926-017-9712-3
57. Shephard RJ, Aoyagi Y. Seasonal variations in physical activity and implications for human health. Eur J Appl Physiol. 2009;107:251–71. https://doi.org/10.1007/s00421-009-1127-1
58. Tucker P, Gilliland J. The effect of season and weather on physical activity: a systematic review. Public Health. 2007;121:909–22. https://doi.org/10.1016/j.puhe.2007.04.009
59. Bennell K, Dobson F, Hinman R. Measures of physical performance assessments: self-paced walk test (SPWT), stair climb test (SCT), six-minute walk test (6MWT), chair stand test (CST), timed up & go (TUG), sock test, lift and carry test (LCT), and car task. Arthritis Care Res. 2011;63:S350–70. https://doi.org/10.1002/acr.20538
60. Bohannon RW, Crouch R. Minimal clinically important difference for change in 6-minute walk test distance of adults with pathology: a systematic review. J Eval Clin Pract. 2017;23:377–81. https://doi.org/10.1111/jep.12629
61. Deci EL, Ryan RM. Self-determination theory: a macrotheory of human motivation, development, and health. Can Psychol. 2008;49:182–5. https://doi.org/10.1037/a0012801
62. Gillet N, Vallerand RJ, Amoura S, Baldes B. Influence of coaches' autonomy support on athletes' motivation and sport performance: a test of the hierarchical model of intrinsic and extrinsic motivation. Psychol Sport Exerc. 2010;11:155–61. https://doi.org/10.1016/j.psychsport.2009.10.004
63. Sibley BA, Hancock L, Bergman SM. University students' exercise behavioral regulation, motives, and physical fitness. Percept Mot Skills. 2013;116:322–39. https://doi.org/10.2466/06.10.PMS.116.1.322-339
64. King D, Mavromaras K, Wei Z, He B, Healy J, Macaitis K, et al. The aged care workforce final report 2012. In: Department of Health and Ageing, editor. Ageing. Canberra, ACT: Australian Government; 2013.
65. International Union for Health Promotion and Education (IUHPE). Core competencies and professional standards. Montreal, QC: IUHPE; 2016.

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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