RESEARCH NOTE

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Effects of a dog activity tracker on owners' walking: a community-based randomised controlled trial

Matthew N. Ahmadi[1*], Raaj Kishore Biswas[1], Lauren Powell[2], Adrian Bauman[3], Cathie Sherrington[4], Anthony Podberscek[5], Paul McGreevy[6], Ryan E. Rhodes[7] and Emmanuel Stamatakis[1]

Abstract

Objective A promising strategy to increase population physical activity is through promotion of dog walking. Informed by multi-process action control and nascent dog-walking theory, we examined the effectiveness of a 3-month technology-based (dog tracker) 2-arm randomised controlled dog-walking intervention to increase dog-owner daily physical activity in the general community in Sydney, Australia.

Results 37 participants were allocated to the intervention group (mean age = 43.2 [SD 11.9]) and 40 to the control group (mean age = 42.3 [SD 11.9]). Both groups averaged more than 10,500 steps/day at baseline. There was no evidence of within- or between-group physical activity differences across timepoints. The results remained consistent after exclusion of participants who had data collected during COVID-19 lockdowns. Compared with baseline, both groups had significant increases in sedentary time during the post-intervention, and 6 month follow-up. The absence of significant differences between-group physical activity differences may be attributable to the ceiling effect of both groups already being sufficiently active. These results provide useful guidance to future studies intended to assess the efficacy of technology-based dog-walking interventions. Future dog-walking interventions should specifically target physically inactive dog owners. Trial Registration: ACTRN12619001391167 (10/10/2019); Retrospectively registered.

Keywords Physical activity, Dog-walking, Tracker, Daily steps, Community

*Correspondence:
Matthew N. Ahmadi
matthew.ahmadi@sydney.edu.au
[1]Hub D17, Charles Perkins Centre L6 West, School of Health Sciences, Faculty of Medicine and Health, The University of Sydney, Sydney, NSW, Australia
[2]School of Veterinary Medicine, University of Pennsylvania, Philadelphia, USA
[3]Charles Perkins Centre, School of Public Health, Faculty of Medicine and Health, University of Sydney, Sydney, Australia
[4]Sydney Musculoskeletal Health and School of Public Health, Faculty of Medicine and Health, Institute for Musculoskeletal Health, University of Sydney, King George V Building, Royal Prince Alfred Hospital (C39), Sydney Local Health District., Sydney, Australia
[5]University of Sydney, Sydney, Australia
[6]School of Environmental and Rural Science, Faculty of Science, Agriculture, Business and Law, University of New England, Armidale, NSW 2351, Australia
[7]School of Exercise Science, Physical and Health Education, University of Victoria, Victoria, BC, Canada

Introduction

Physical inactivity is a major public health problem that is responsible for as much preventable mortality and chronic disease as smoking [1]. Beyond physical health, physical activity (PA) and particularly walking are important for human mental health outcomes [2, 3]. Despite the clear benefits of PA, questionnaire data suggest that 27% of the adult population globally and 37% of adults in high-income countries are insufficiently active [4]. In Australia, only 15% of adults meet the full physical activity guidelines [5].

One novel strategy to increase population PA is through the promotion of dog-walking. Dog ownership is popular worldwide, including 45% of American households [6], 48% of Australian households 7 and 27% of adults in the United Kingdom [8]. Dogs can motivate their owners to walk by providing social support, companionship, and a sense of obligation to walk [9]. On average, cross-sectional studies show that dog owners report approximately one hour more PA and 18 min more walking per day than non-dog owners, yet only 60% of dog owners walk their dogs at least once a week [10].

Few studies have looked at the efficacy of dog-walking interventions for promoting human PA, with most reporting positive results [11, 12]. A study of 49 dog owners found owners performed an average of 58 min more walking per week following a social cognitive theory PA intervention when compared with controls. The dog owners, who reported little to no dog walking at baseline, were sent regular emails that aimed to foster self-efficacy and social support and provided information on goal setting. The impacts of the 12-week intervention were also maintained one year later [11]. A second pilot study of 58 inactive dog owners found provision of educational materials about dog-walking led to a mean additional 1823 steps/day over a 12-week period compared with the control group [13].

A promising, yet largely unexplored, option to increase human PA is through wearable dog activity trackers. Such devices can give continuous feedback to the owner through a smartphone app and are particularly promising for goal-setting and behavioural monitoring, both of which have been identified as necessary for successful dog-walking promotion. By focusing on canine activity, these interventions could also tap into the owners' feelings of obligation to walk their dogs and the value they place on exercise for their dogs, both of which are associated with increased dog-walking [9, 14]. That said, there is no research on the feasibility or effectiveness of dog activity trackers in terms of increasing human PA and improving health and wellbeing of dogs and their owners. To maximise the use of resources, it is important to determine the effectiveness and long-term feasibility of commercially available technology-based solutions in comparison with low-cost interventions (such as educational materials).

The aim of the current pilot study was to examine the feasibility and effectiveness of a dog-walking intervention featuring technology-based self-regulation and education on the physical activity levels of dog-owners compared to education alone. The intervention used a commercially available wearable dog activity tracker that provides dog activity feedback to owners. We examined if the intervention induced more PA in the treatment group than the control group. As a secondary outcome, we also examined changes in sedentary time.

Methods

Using an open parallel 2-arm randomised controlled trial design (Registration number: ACTRN12619001391167; registered 10/10/2019), we recruited 77 dog-owners from the community who were randomly allocated to receive: (a) a 3-month dog activity tracker–based intervention including a FitBark2 (FitBark), dog-walking education materials [13], weekly text messages (1 per week) and two phone calls (one mid-week and one on the weekend (lasting 5–10 min discussing participant progress and their experience with using the Fitbark device); the (intervention group); or (b) dog-walking education materials and two phone calls (the control group). The intervention was based on multi-process action control [15] and nascent dog-walking theory [14] that recognizes the need for educational materials to promote intention-based PA, such as dog-walking, combined with behavioural monitoring, goal setting and coping strategies to translate these intentions into behaviour that, over time, forms habits and identity. Here, we examined the potential of technology-based self-regulation plus education compared with education alone. Recruitment started in October 2019 and was completed in March 2022. Participant eligibility criteria and recruitment strategies are provided in Supplemental Text 1. Briefly, participants had to be current dog owners and not currently owning another pet and be free of any injuries or physical limitations that would prevent walking. The dog had to be free of any veterinary conditions that would limit activities such as walking, be older than 6 months, and not having entered the last quintile of expected lifespan for the given breed or cross breed. Participants were recruited via university communications, online resources (e.g.: social media and networking sites), community flyers, and community focused events (e.g.: Million Paws Walk).

Dog-owners completed objective PA measurements at baseline (0 months), immediately post-intervention (3 months) and six months post-intervention (9 months) using a thigh-worn accelerometer (ActivPAL micro) worn continuously for 7 days. The primary outcome was average total steps per day of valid wear. Secondary outcomes included:

- stepping intensity: defined as average steps/min for the 30 highest minutes, but not necessarily consecutive minutes/day (i.e., Peak 30);
- cadence-based stepping metrics reflective of the free-living stepping context [16, 17]:
  - incidental steps, < 40 steps/minute; or.
  - purposeful steps, ≥ 40 steps/minute;
- sedentary time: time spent in a seated or reclined position.

Participants were randomized using a random number generator by a research assistant not involved in data collection. Each participant was mailed an ActivPAL monitor and e-mailed a set of education materials. Participants in the intervention-arm were also mailed a Fitbark2 monitor for their dogs after baseline assessment. During the intervention period, participants were sent one personalised text-message per week as a prompt for dog-walking. The comparison participants were e-mailed the same set of education materials as intervention participants.

Table 1 Participant baseline characteristics ($n=77$)

	Control	Intervention
n	37	40
Dog owner characteristics		
Purposeful steps, mean (sd)	9303.51 (3290.61)	8347.30 (2772.53)
Incidental steps, mean (sd)	2999.62 (884.30)	2641.45 (766.56)
Total steps, mean (sd)	12303.19 (3672.91)	10988.77 (3093.35)
Male, n (%)	5 (14)	6 (15)
Age, mean (sd)	43.19 (11.87	42.31 (11.91
Education level, n (%)		
Bachelor	17 (46)	15 (38)
Postgraduate	14 (38)	15 (38)
Other	6 (16)	10 (25)
Participants in COVID-19 lockdown during study period (%)	26 (70)	27 (68)
Peak 30-min cadence, mean (sd)	108.68 (12.49)	107.00 (12.41)
Owner-reported dog energy level n(%)[a]		
High	9 (24)	7 (17)
Medium	14 (38)	22 (55)
Low	13 (35)	11 (28)
Sedentary behaviour (mins/day), mean (sd)	663.76 (99.57)	698.22 (88.56)

[a] missing, $n=1$

Statistical analysis

We conducted statistical analysis for the project on an intention-to-treat basis using R (version 4.2.1). For a medium effect size of d=0.58 with 80% power and 5% alpha, 37 participants in each group were required. We fitted linear mixed effects model to assess the changes in PA between the two groups. Between group differences across primary and secondary PA outcomes over time were examined using a group x time interaction, where within-person repeated observation was treated as a random intercept. The models were adjusted for dog-owners' gender, age, level of education, and timing of data collection (i.e., whether it occurred during a COVID-19 lockdown; intervention $N=27$; control $N=26$). In sensitivity analyses, we excluded participants who had data collection during a COVID lockdown period.

Results

Participant baseline characteristics are shown in Table 1. A total of 40 participants were randomised to the comparison group (average age [SD] = 42.3 [11.9] years) with 83% having a Bachelor's degree or higher. There were 37 participants randomised to the intervention group (average age = 43.2 [11.9] years) with 79% having a Bachelor's degree or higher.

Both groups were highly active (Table 1) averaging > 10,500 steps/day. During baseline, the total daily step count was higher in the control group than in the intervention group. The step counts declined at post-intervention but increased slightly at 6 month follow-up for both the intervention and control groups (Supplemental Table 1). A similar pattern was found for purposeful steps/day (Supplemental Fig. 2 bottom left). Incidental step count (Supplemental Fig. 2 bottom right) increased in both groups over time. Stepping intensity (as indicated by Peak 30 cadence) (Supplemental Fig. 2 top) declined over time for both groups although the changes were small and not statistically significant (Supplemental Fig. 2 top).

There was no evidence of between-group changes across time (Table 2). The mixed effects model did not show any evidence of within-group differences. This was consistent after excluding participants who were enrolled during COVID-19 lockdowns (Supplemental Table 1) and after adjustment for dog energy level reported by the owners (Supplemental Table 2). Supplemental Fig. 3 displays a waterfall plot showing the percent change in daily steps for individual participants in the treatment and control groups, illustrating the proportion of participants in the treatment group who responded to the intervention relative to those in the control group. During baseline, sedentary behaviour was higher for the intervention group. Sedentary time decreased from baseline to post intervention slightly but increased at 6 month follow-up

Table 2 Results for steps/day, peak 30 cadence (walking intensity), purposeful steps/day, incidental steps/day, and sedentary time/day

Outcome	Baseline to Post intervention		Baseline to 6 month follow up	
	Beta (95% CI)	*P*-value	Beta (95% CI)	*P*-value
Total number of steps/day				
Time effect (intervention)	-141.49 (-1421.71–1138.73)	0.828	-665.9 (-2160.58–828.78)	0.380
Time effect (control)	-33.96 (-1263.38–1195.45)	0.957	-418.49 (-1964.08–1127.09)	0.594
Group x Time Interaction	107.52 (-1414.40–1629.45)	0.889	247.4 (-1498.29–1993.10)	0.780
Peak 30 cadence				
Time effect (intervention)	-4.2 (-8.93–0.53)	0.082	-4.84 (-10.36–0.68)	0.085
Time effect (control)	-2.14 (-6.68–2.40)	0.953	-4.49 (-10.20–1.22)	0.588
Group x Time Interaction	2.06 (-3.56–7.68)	0.047	0.35 (-6.10–6.80)	0.914
Purposeful steps/day				
Time effect (intervention)	34.23 (-1170.00–1238.46)	0.955	-387.74 (-1793.66–1018.18)	0.587
Time effect (control)	34.61 (-1122.11–1191.34)	0.953	-399.82 (-1853.08–1053.44)	0.588
Group x Time Interaction	0.38 (-1431.85–1432.61)	0.999	-12.08 (-1654.28–1630.12)	0.988
Incidental steps/day				
Time effect (intervention)	-176.61 (-429.96–76.74)	0.171	-274.57 (-570.34–21.20)	0.069
Time effect (control)	-68.07 (-311.51–175.36)	0.953	-13.58 (-319.15–292.00)	0.588
Group x Time Interaction	108.53 (-192.97–410.04)	0.478	260.99 (-84.53–606.52)	0.138
Sedentary time (hours/day)				
Time effect (intervention)	0.73 (0.18–1.27)	**0.01**	0.89 (0.25–1.53)	**0.007**
Time effect (control)	0.49 (-0.04–1.01)	0.068	0.54 (-0.12–1.20)	0.108
Group x Time Interaction	-0.24 (-0.89–0.41)	0.472	-0.35 (-1.10–0.40)	0.355

Mixed effects models for repeated measures fitted to physical activity outcomes with time and groupwise differences adjusted for dog-owners' gender, age, level of education and if data collection occurred during COVID lockdown

(Supplemental Fig. 4). When sedentary time was analysed across time, there was no evidence of significant differences between groups (Table 2). No major within group changes were observed for sedentary time as the mean for baseline, post intervention and 6 month follow-up for intervention and control groups were 698, 704, 690 min and 664, 663, 669 min, respectively (Supplemental Fig. 4).

Discussion

We found that the intervention had no effect on the primary or secondary outcomes, as there were no between-group differences in any PA or sedentary time metrics. The absence of group differences may be attributable to the high levels of dog-owner PA levels at baseline. Both groups of owners recorded more than 10,500 steps per day prior to the intervention, indicating they were already highly motivated to walk and be physically active. Overall, participants in our study averaged 45% more steps/day than the general Australian population (that averages 7,400 steps per day [18]). Previous dog-owner walking interventions that reported significant physical activity changes had primarily focused on inactive [11, 13] or overweight and obese dog owners [19].

We speculate that our findings may also have been impacted by the two COVID lockdowns that occurred in Sydney during March 2020 through October 2021, overlapping with the post intervention and 6 month follow-up data collection periods. Recent studies reported overall physical activity and specifically walking levels declined by 3–9% during COVID lockdowns in Australia [20, 21]. Both groups performed fewer total and purposeful steps at follow-up but showed a marginal increase in incidental steps (which are most likely to occur indoors). Taken together our findings suggest the increase in sedentary time, decrease in total steps and purposeful steps but marginal increase in incidental steps could in part be effected by the lockdowns that prevented people from engaging in outdoor activities. Notably, previous research has reported purposeful steps may have greater health benefits than incidental steps [16] It has been previously reported engaging in outdoor recreational activities contributes the majority of the accumulated daily steps or total physical activity adults attain [22] and higher daily steps accumulation may offset the deleterious health effects of sedentary time [23]. The absence of access to outdoor activities such as active commuting or recreational maybe, in part, why we did not see changes in walking pace (e.g.: peak 30 cadence), which may have additional health benefits beyond total daily steps [17, 24], even when increasing walking pace or activity intensity occurs in short bursts [25, 26]. From a behavioural perspective outdoor activities are associated with greater positive engagement and lower depression compared to indoor activities [27]. The inability to engage in outdoor activities during lockdown may have diminished the potential behavioural change impact of the intervention. Our sensitivity analysis, including only participants who completed the study during non-lockdown periods, did not show between group differences. However, total daily and purposeful steps did not decrease among these participants.

Strengths and limitations

We observed high rates of acceptability and adherence to the use of the technology-based intervention, reflected through the low attrition with ~80% of participants providing a follow-up assessment and active engagement with weekly intervention phone calls. Our pilot study highlights the feasibility of implementing dog trackers in future community-based interventions. There are several limitations that warrant consideration and may inform future studies. Our findings suggest the need to use eligibility criteria related to baseline PA levels to reach a population of physically inactive dog owners and those potentially at risk of comorbidities. Although we observed low attrition rates in our sample, the majority of our sample were active adults. Future studies should assess if the low attrition rate is consistent among inactive adults. The use of convenience sampling resulted in highly active participants, leading to a healthy participant effect.

Conclusion

Future studies are needed to determine if the use of dog trackers can incentivise inactive adults to increase habitual physical activity or if inactive adults are not inclined to use dog trackers. Our study results provide useful guidance for future studies aiming to assess the efficacy of technology-based dog walking interventions.

Abbreviations

PA physical activity

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s13104-024-06989-0.

Supplementary Material 1

Author contributions

Concept and design: ES, LP. Drafting of the manuscript: MNA, LP, ES, RKB, AB, CS, AP, PM, RER. Statistical analysis: RKB. Interpretation of data: MNA, LP, ES, RKB, AB, CS, AP, PM, RER.

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Data availability

Data is available upon reasonable request to matthew.ahmadi@sydney.edu.au.

Declarations

Ethics approval and consent to participate

Ethical approval was obtained from the University of Sydney Human Research Ethics Committee (2016/921) and the Animal Ethics Committee (2017/1134). The study was registered with the Australian New Zealand Clinical Trials Registry (https://www.anzctr.org.au/). All participants provided informed written consent.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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