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State of the art review: Promoting dog walking for healthy lifestyles

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Invited State of the Art Review

Encouraging dog walking for health promotion and disease prevention

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93

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101 **Abstract**

102 Regular physical activity is associated with numerous health benefits, including the prevention of
103 many chronic diseases and conditions or a reduction in their adverse effects. Intervention studies
104 suggest that promoting dog walking among dog owners who do not routinely walk their dogs
105 may be an effective strategy for increasing and maintaining regular physical activity. Strategies
106 that emphasize the value of dog walking for both dogs and people, promote the context-
107 dependent repetition of dog walking, enhance the social-interaction benefits, encourage family
108 dog walking and ensure availability of public space for dog walking may encourage increased
109 dog walking. Research also supports organizing buddy systems via ‘loaner’ dogs to facilitate
110 informal walking by dog-owners and non-dog-owners. Given the number of homes that have
111 dogs, strategies that promote dog walking could be effective at increasing physical activity levels
112 among a significant proportion of the population. Maximizing the potential for dog walking to
113 positively impact on the health of individual people (and dogs) will only occur through
114 implementing programs with broad population-level reach. Policies that facilitate dog walking at
115 the community and population levels, such as ‘dogs allowed’ places, off-leash zones, and dog-
116 friendly built environments and parks, may contribute to greater physical activity through dog
117 walking.

118

119 **Keywords:** Dog, Review, Walking, Physical Activity, Health Promotion

120 **Introduction**

121 *Physical activity recommendations*

122 Physical activity reduces the risk of premature death, supports positive mental health and
123 enhances healthy aging.¹ In adults, as little as 150 minutes per week of brisk walking can yield
124 significant health benefits, according to the 2008 Physical Activity Guidelines for Americans.¹
125 Similar physical activity guidelines exist for the UK,² Canada³ and Australia.⁴ Importantly,
126 physical activity bouts do not need to be long in duration to promote health; bouts of 10 minutes
127 of moderate-to-vigorous intensity physical activity are beneficial for disease prevention and
128 control,⁵ and even light activity such as moderately-paced walking is beneficial.^{6,7}

129
130 Despite the health benefits of regular physical activity and the ongoing delivery of public health
131 campaigns encouraging people to do more physical activity, millions of people worldwide do not
132 meet recommended levels. In the US, less than 50% of adults meet physical activity guidelines,⁸
133 with only 44% of Australian adults,⁹ 52% of Canadian adults¹⁰ and 61% adults in the UK¹¹
134 meeting recommended levels. Unfortunately, nearly half of all individuals who begin formal
135 exercise programs drop out within six months.¹² This lack of adherence may be related to the
136 nature of many of these exercise programs and point to an urgent need for new and more
137 effective approaches to increase physical activity levels.¹³ It has been suggested that there is a
138 need for a “paradigm shift” in the prescription of physical activity to one that involves the
139 prescription of “purposeful” activity such as walking or biking to destinations or walking the
140 dog.¹²

141

142 Walking is a low cost activity that if undertaken at recommended levels could reduce the
143 incidence of chronic disease and the associated healthcare costs.¹⁴ Walking requires no expensive
144 equipment or gym membership; most people are able to do it; it can be incorporated into daily
145 tasks; and people can easily vary the amount of energy they expend by varying the frequency,
146 intensity, and duration of their walks as needed.¹⁵ Walking is the most common and popular form
147 of physical activity for many adults.¹⁶ The 2015 release of *Step It Up! The U.S. Surgeon*
148 *General's Call to Action to Promote Walking and Walkable Communities* underscores the
149 importance of increasing walking and walkability as a strategy not only to improve physical
150 health, but also to make communities safer, support social cohesion, reduce air pollution and
151 benefit local economies.¹⁵ A novel strategy for improving population levels of walking may be
152 lying right at our feet. Dog walking has the potential to increase overall levels of walking and has
153 been associated with a number of associated individual and community level physical, mental
154 and social health benefits.¹⁷⁻¹⁹

155

156 ***The potential of dog walking to increase physical activity***

157 Dog ownership by itself has been associated with health benefits and a reduction in medical
158 costs;²⁰ a greater likelihood of surviving a heart attack;²¹ lower blood pressure, triglyceride, and
159 cholesterol levels;²² and better emotional and psychological health.²³ A longitudinal study found
160 that pet owners make 15% fewer annual visits to the doctor than non-owners and people who
161 continuously own a pet are healthier than those who cease to own a pet or who never had one.²⁰
162 Furthermore, a 2013 American Heart Association Scientific Statement on 'Pet Ownership and
163 Cardiovascular Risk' concluded that pet ownership, particularly dog ownership, may be
164 reasonable for reducing cardiovascular disease risk and that the data are most robust for a

165 relationship between dog ownership and cardiovascular disease risk reduction, particularly dog
166 ownership and increased physical activity, primarily through dog walking.²⁴

167
168 In addition to the wider benefits of having a dog, walking dogs has been shown to promote
169 engagement in and adherence to regular physical activity.^{25,26} A meta-analysis of 29 published
170 studies examining dog owner and non-dog owner physical activity found that dog owners
171 compared with non-dog-owners reported more minutes per week of physical activity (median:
172 dog owners= 329; non-dog owners = 277) and/or walking (median: dog owners = 129; non-dog
173 owners = 111).²⁵ Nevertheless, the best estimates available suggest that only 60% of dog owners
174 walk with their dog at all.²⁵ The role that dogs play in facilitating walking in their owners is due
175 to several factors, the most significant regarding the dog-owner relationship, in particular the
176 motivation provided by the dog to walk.²⁷ Closely related to an owner's perception of the
177 motivation their dog provides to walk is the sense of responsibility to walk their dog; dog owners
178 who report feeling a sense of responsibility to walk their dog have a higher level of physical
179 activity than those who do not report the same degree of personal responsibility.²⁸ Dogs also
180 provide social support by being an exercise companion.^{12,28-31} Walking with a dog has also been
181 found to increase walkers' feelings of safety and security, particularly in women.³²

182
183 The potential of dog walking as a strategy to increase levels of walking and overall health is
184 apparent when considering the high levels of pet ownership in many developed countries. The
185 US has 83 million dogs with almost 44% of US households having at least one dog.³³ There are
186 estimated to be 4.2 million pet dogs in Australia; 19 dogs for every 100 people;³⁴ 31-46% of
187 Canadians own dogs³⁵ and 9 million dogs reside in households in the UK.³⁶ Given the
188 importance of increasing health-enhancing physical activity and the number of homes that have

189 dogs, encouraging, supporting and facilitating dog walking could be an effective strategy for
190 increasing regular physical activity among a significant proportion of the population.

191

192 *Aim and scope of this review*

193 The aims of this paper were to: i) Review evidence from longitudinal observational and
194 intervention studies using dog walking as a strategy for increasing physical activity levels; ii)
195 Review evidence of the influence of the physical and policy environment on where and how
196 people walk with their dog; and iii) Provide recommendations for implementing dog walking in
197 population-wide practice to improve physical activity levels and health.

198

199

200 **Evidence for dog walking as a strategy to increase physical activity levels**

201 To date, there have been several small-scale longitudinal observational and intervention studies
202 designed to promote dog walking as a means of increasing physical activity.

203

204 *Longitudinal observational studies*

205 Findings from two natural experiments found that dog acquisition results in people walking
206 more.^{30,37} Serpell's study followed new pet owners for 10 months and assessed self-reported
207 frequency and duration of recreational walks.³⁷ New dog owners were more likely to increase the
208 frequency and duration of recreational walks over 10 months compared with new cat owners and
209 non-pet owners.³⁷ Furthermore, Cutt et al. found that after 12 months follow-up, people who
210 acquired a dog accumulated approximately 48 minutes per week of recreational walking
211 compared with just 12 minutes per week by people who remained non-dog owners ($p < 0.05$).³⁰

212 Similar findings have been observed in older adults. A cohort study of older adults examined the
213 relationship between walking among dog owners and non-dog owners over three years.³⁸ At
214 three-year follow-up, dog walkers were twice as likely to meet physical activity guidelines
215 compared with non-dog owners or non-dog walkers.³⁸ To date only one study has published
216 findings from an evaluation of a community based health promotion project which included dog
217 walking as a strategy to increase physical activity levels.³⁹ The Australian ‘10,000 steps
218 Rockhampton’ project aimed to encourage dog walking through brochures and posters including
219 information on the benefits to both human and canine health, however while the overall project
220 was successful in increasing community levels of physical activity, the dog walking promotion
221 component was not fully evaluated.³⁹

222

223 *Intervention studies*

224 Overall, findings from the handful of intervention studies lend support for the role of dog walking
225 in physical activity promotion. Of the seven dog walking intervention studies published to date,
226 six were randomized controlled trials⁴⁰⁻⁴⁵ and one utilized a pre-post design.⁴⁶ The latter study
227 was successful in reducing participant weight, increasing physical activity, and maintaining a
228 high adherence rate to a ‘loaner’ dog (dogs from an animal shelter) walking program.⁴⁶ Dog
229 handlers were low income residents of a subsidized housing unit and walked dogs with
230 participants (N=26) five times a week for either 26 or 50 weeks. The 50-week program had a
231 72% adherence rate.⁴⁶ It is worth noting that the use of loaner dogs in this study may mean that
232 the findings are less relevant for strategies aimed at increasing dog walking in the general dog-
233 owing population.

234

235 Various intervention strategies have been tested so far including: overweight people exercising
236 with overweight pets;⁴² delivery of a one-time educational information about the benefits of
237 exercise for dogs;⁴⁴ veterinary counseling on dog walking;⁴¹ utilization of online social networks
238 to promote weekly neighborhood dog walks;⁴⁵ encouraging family dog walking;⁴³ or weekly
239 email messages to promote benefits and reduce barriers to dog walking.⁴⁷ The People and Pets
240 Exercising Together (PPET) study was a one year controlled weight loss study which recruited
241 overweight people with and without overweight dogs.⁴² Participants met weekly for the first 16
242 weeks, then once a month at months 5, 6, 9, and 12. Meetings were led by a registered dietitian
243 who instructed participants in recognizing and adopting healthy eating, exercise, and coping
244 patterns. At 12 month follow-up, there was no significant difference in the increase in time spent
245 in physical activity between the dog owners and non-dog owner, however dog owners
246 accumulated two thirds of their total weekly physical activity with their dog.⁴²

247
248 In the Children, Parents, and Pets Exercising Together (CPET) study, Morrison and colleagues
249 (2013) provided a 10-week family-based intervention which included three home visits, two
250 phone calls, and two text messages targeting parents, children and the dog to be active together.⁴³
251 The intervention was delivered by physical activity specialists and an animal behaviorist. Overall,
252 there were no significant differences between intervention (N=13 families) and control (N=15
253 families) groups for parent or child accelerometer measured moderate-vigorous physical activity,
254 nor self-report weekly minutes of dog walking.⁴³ Participants reported the study as successful in
255 providing sufficient information for safe dog walking and motivation to increase dog walking.⁴³
256 In a separate study, an email based intervention provided bi-weekly emails for four weeks and
257 weekly emails for eight weeks.⁴⁷ These emails targeted the human and canine benefits of dog

258 walking and provided motivational cues to increase dog walking. Findings showed that
259 participants in the intervention group accumulated significantly more weekly minutes of dog
260 walking than the control group.⁴⁰ Immediately post-intervention, the intervention group reported
261 an average of 79.4±53.7 weekly minutes of dog walking compared to 19.4±23.9 weekly minutes
262 in the control group ($p<0.05$). These differences remained significant at 6 months follow up
263 ($p<0.05$), however at 12 months the intervention group averaged 80.0±134.4 weekly minutes of
264 dog walking while the control group averaged 18.6±21.4 weekly minutes of dog walking
265 ($p<0.10$). This study's longer follow-up period provides evidence of the effectiveness of
266 promoting dog walking long term.

267
268 Finally, two interventions used a single contact to increase physical activity via dog walking^{41,44}
269 by providing educational material (either by mail or in-person during a veterinary visit) outlining
270 the benefits of dog walking and dog walking tips. Rhodes et al.'s (2012) study showed that
271 providing education about the health benefits of dog walking resulted in significant increases in
272 dog walking among owners.⁴⁴ However, both the intervention and control groups significantly
273 increased their physical activity, making it difficult to determine the effectiveness of the
274 intervention as delivered, but also highlighting that even minimal information about the
275 importance of dog walking for canine health may be beneficial⁴⁸ Other research suggests that the
276 subjective norm of family, friends, and in particular a local veterinarian, can influence dog
277 walking behavior.^{27,31}

278
279 Overall, the findings from the intervention studies conducted to date suggest that promoting dog
280 walking among dog owners who do not routinely walk their dogs may be an effective strategy for
281 increasing and maintaining regular physical activity. However, these studies can mostly be

282 considered pilot or feasibility trials and thus further intervention research is required to provide
283 stronger evidence of the effectiveness of intervention strategies to increase physical activity
284 through dog walking. Future intervention studies should consider the use of established physical
285 activity behavior change theories, large representative samples, blinded randomization, longer
286 follow-up post-intervention (ideally 12 months), objective measures of physical activity, walking
287 and dog walking behavior, and measurement of the level of adherence to the intervention
288 strategy. Further intervention studies are also required with other sub-groups in the population
289 such as children and older adults as well as other countries and cultures where dog-keeping
290 practices, population density and urban environments may differ.

291

292

293 **Evidence of the influence of the physical and policy environment on where and**
294 **how people walk with their dog**

295 The neighborhood built environment is that part of the physical environment that is human-made
296 (e.g., streets, buildings, facilities) and which is in close proximity to a person's home (i.e.,
297 typically within a 10-15 minute walk from home).⁴⁹ A wealth of evidence exists in support for
298 the influence of the neighborhood built environment on walking.^{50,51} This evidence also suggests
299 that specific built environment characteristics may support walking undertaken for different
300 purposes (e.g., transportation, leisure).⁵² A small but growing body of evidence shows that the
301 neighborhood built environment may be important for supporting dog walking.^{17,27} The influence
302 of the neighborhood environment on dog walking may be particularly relevant because
303 approximately 50-60% of all dog walking is undertaken within residential neighborhoods.^{31,53,54}

304

305 Qualitative findings suggest that the physical activity of dog-owners and non-dog-owners are
306 associated with some shared but also behavior-specific built environment characteristics. Dog
307 owners report that the availability and quality of sidewalks, safety, lighting, and attractive parks
308 influence their dog walking behavior.^{55,56} There are however, built environment barriers and
309 facilitators that dog-owners identify as particularly important for dog walking.⁵⁵⁻⁵⁷ The
310 availability of waste bags, trash bins, presence of dog waste, dog-related signage, presence of
311 natural wildlife, availability of destinations to walk to with their dog, and the availability of
312 specific exercise areas where dogs are allowed are considered important for supporting dog
313 walking.^{55,56} In particular, dog owners want to be able to walk their dogs off-leash.^{27,53,55}

314
315 Quantitative studies provide some support for the qualitative findings on the effect of the
316 neighborhood built environment on dog walking. McCormack et al.⁵⁸ found that compared with
317 those who resided in high walkable neighborhoods (i.e., grid street pattern), those residing in less
318 walkable neighborhoods (i.e., non-grid street pattern) had lower odds of walking their dog in a
319 usual week. In contrast, a study in older adults found no significant differences in the proportion
320 of frequent (≥ 4 times/wk) and infrequent (< 4 times/wk) dog walkers in terms of their objectively-
321 measured neighborhood street layout, proportion of green space, human or dog population
322 density.⁵⁹ Other studies have found no association between dog walking and self-report
323 neighborhood functional characteristics⁵⁴ or aesthetics.^{54,60} However, Richards et al. found that a
324 neighborhood walking environment score (comprising of large, open grassy areas; paths provide
325 interesting walks; interesting sights while walking; trees/shrubs), but not a dog-specific walking
326 environment score (i.e., presence of a local dog walking group; dog-waste bags and bins; off-
327 leash and dog permitted signage; playground separate from dog area), was positively associated
328 with dog walking.⁶¹ It is possible that the influence of the neighborhood built environment on dog

329 walking behavior varies according to whether dog owners are attempting to initiate dog walking
330 (or not) and how often they walk their dogs once they have begun the behavior. For example, a
331 study of Japanese adults' perceptions of the built environment (neighborhood availability of
332 destinations to take dog and off-leash areas, safety, and aesthetics) was positively associated with
333 the stages of change for dog walking (i.e., Trans-theoretical Model of behavior change stages of
334 pre-contemplation, contemplation, preparation, action, and maintenance).^{62,63}

335
336 Streets, parks, ovals, and bush land are popular destinations for dog walkers.⁵³ Parks, and in
337 particular those that offer dog-specific features, are important for encouraging people to walk
338 their dogs more often.^{31,64,65} Moreover, the proximity of dog and non-dog specific parks
339 influences an owner's park visits and dog walking behavior.^{31,53,58,66,67} For example, Cutt et al.⁵³
340 found that owners with a park with dog supportive features (i.e., dog litter bags and trash cans
341 and dog-related signage) within a 1.6 km street network distance of their homes were more likely
342 to walk with their dogs for at least 90 minutes per week. A lack of shade, seating, lighting, agility
343 equipment, water-play areas, dog-friendly features, and washrooms may discourage park visits
344 and in turn dog walking.^{55,56,65,66} While not specific to dog walking, findings from a natural
345 experiment, which included the installation of a fenced-in off-leash area along with other
346 environment modifications within a multi-use park was associated with an increase in walking
347 and vigorous-intensity physical activity among visitors.⁶⁸ Finally, despite some evidence that dog
348 owners who visit dog-specific fenced-in parks spend much of their time stationary,⁶⁵ dog owners
349 who take their dogs to parks in general are more likely to walk their dogs.⁶⁰ Even if dog-walkers
350 remain stationary within parks, walking dogs to and from parks can make an important
351 contribution to walking levels.

352

353 Dogs can also offer a sense of security for their owners when in public places. Positive
354 perceptions of neighborhood traffic and personal safety have been found to be associated with an
355 increased likelihood of dog walking among women⁵⁴ and girls⁶⁹ but not males. However, the
356 presence of dogs may deter some people walking locally, including those with and without
357 dogs.^{69,70} Furthermore, actual and perceived dog behavior, such as aggressiveness towards people
358 and other dogs, may deter owners and non-owners from walking their dogs.^{56,57,60,70} Strategies for
359 increasing dog walking among owners may also need to include a component which educates
360 owners about responsible dog ownership and etiquette especially in public settings where
361 interactions with other dog walkers and non-dog-walkers are likely to occur.

362

363 Despite some encouraging findings regarding the relationship between the neighborhood built
364 environment and dog walking, the evidence to date has several limitations. Most studies are
365 cross-sectional and do not statistically adjust for residential self-selection which limits causal
366 inferences. For example, dog-walkers may seek out neighborhoods with characteristics that will
367 facilitate their preference for dog walking.⁷¹ Nevertheless, there appears to be preliminary
368 evidence suggesting that improving neighborhood walkability is not only beneficial for
369 supporting transportation and recreational types of local walking, but may also specifically
370 encourage dog walking.

371

372

373 **Summary of intervention strategies for promoting dog walking**

374 At present, the heterogeneity of findings and limited number of intervention studies makes
375 identification of the key intervention strategies for promoting dog walking challenging.

376 Nevertheless, when findings from intervention studies are considered in tandem with the recent
377 review of dog walking correlates from observational studies,²⁷ certain practice relevant strategies
378 for increasing physical activity through dog walking may be promising.

379

380 The most significant correlate of dog walking across several studies is a strong sense of owner
381 responsibility and attachment to the dog.²⁷ Furthermore, education of the benefits of walking for
382 the dog has had positive outcomes for dog walking and physical activity levels in behavior
383 change interventions.^{40,44} Recent research has also shown that this sense of dog walking
384 responsibility is driven more from an understanding of the value of walking to canine health and
385 personal enjoyment (autonomous motives) than mere feelings of guilt (controlled motives).⁷²

386 This suggests that the promotion of dog-owner responsibility is a logical strategy for promoting
387 dog walking and for health professionals to recommend. Thus, physical activity promotion
388 strategies that impart on dog owners the value of dog walking to both the dog and owner and not
389 a sense of obligatory requirement may be more successful.

390

391 In order to change individual dog walking behavior, perceived barriers may need to be overcome.
392 These are likely to operate through an owner's sense of responsibility/motivation to walk the dog,
393 which could mean changing perceptions about the walking needs of the dog itself, or owner self-
394 efficacy to walk the dog could positively impact an owner's motivation to walk their dog.

395 Evidence regarding dog-specific barriers and motivators (such as dog type and behavior) is
396 generally mixed²⁷ however perceptions about how much walking a dog of a particular size, breed
397 or age requires require attention. Although data regarding actual exercise requirements of
398 different breeds of dog is lacking, sensible recommendations based on expert opinion
399 (veterinarian) are possible and interventions should seek to change common dog-specific

400 perceived barriers such as ‘small dogs or old dogs require little exercise’. Owners may also need
401 to be referred to a qualified dog training professional to address barriers such as the dog’s
402 negative behavior or difficulty walking (e.g., pulling on the leash).

403
404 Future intervention strategies that use veterinarians to deliver messages about the importance of
405 daily dog walking might influence owners’ normative beliefs about walking with their dog may
406 be effective.⁴¹ Veterinarians have an important role to play because many dog owners regard their
407 veterinarian as a well-respected source of pet health advice.^{73,74} Family, friends and others dog
408 owners may also influence dog walking behavior. A number of studies provide evidence for
409 increased social interaction, social capital and sense of community facilitated by owning and
410 walking a dog.^{18,27,75-78} However, it is unclear whether this association is generally motivating to
411 people to walk their dog more, or simply an outcome of dog walking, For some (e.g., elderly,
412 family caregivers and socially isolated), the social interaction benefits of dog walking may be an
413 important facet of why they take the dog out for a walk and greet people^{19,70}.

414
415 Another potentially important aspect of promoting dog walking behavior is to help owners form
416 walking habits. Habit formation research has seen promising results in general physical activity
417 behavior research.^{79,80} Habit was the strongest predictor of dog walking, compared to factors such
418 as attitudes or self-efficacy, in a recent study.⁸¹ Habits represent impulses to perform a behavior
419 initiated via stimulus-response bonds⁷⁹ and contribute to physical activity largely via repeated
420 consistency in behavioral practices, salient cues associated with behavioral initiation, and
421 affectively rewarding behavior.^{82,83} In the case of dog walking, forming habits may help cue both
422 the owner and the dog to regular walking. A dog walking plan that includes context-dependent
423 repetition (same routine each day), with temporal, social, mood, or visual cues⁸⁴ that precede the

424 activity may be very helpful for encouraging increased dog walking. In addition, dogs are very
425 likely to pick up these consistent cues and provide further reinforcing prompts through their
426 behavior linked to the predictability of routine.

427
428 A good practice measure for turning physical activity motivation into action is the formation of
429 plans and tactics that can help overcome barriers and prioritize the behavior over other options
430 during free time.^{85,86} While some dog owners may benefit from building the motivation to
431 regularly walk the dog, at least half of owners need tactics to help turn their good intentions into
432 walking behavior.⁸¹ Overcoming barriers to dog walking is also a mediator of behavior change.⁴⁰
433 Thus, helping dog owners to set concrete schedules for dog walking with details on “when,
434 where, and how” (i.e., action plans), creating strategies for overcoming relapse (i.e., coping
435 plans) and prioritizing dog walking above other behaviors that may be deemed “time wasters”
436 could assist in the promotion of dog walking with individuals who aspire to do more.

437
438 As discussed, the social and neighborhood built environments are correlates of regular dog
439 walking. Dog walkers may benefit from the opportunity to socialize and thus regular walking
440 behavior can become the norm within accessible and dog friendly walking environments.²⁷ This
441 social component of dog walking has seen some promise in behavior change interventions at the
442 community⁴⁵ and family⁴³ level. Dog walking groups, buddy systems via loaner dogs, and family
443 dog walking time all hold promise as practical strategies for promoting dog walking. A top “10
444 local dog walks” information practice may also be helpful to suggest places that owners can walk
445 their dogs in safe and accessible environments.

446

447

448 **Implementing dog walking in population-wide practice**

449 Despite some years of research in the field of encouraging dog walking and health, progress has
450 been slow at the population level. A major challenge with dog walking interventions is their
451 limited application in population-wide practice to date. Research evidence to date has been
452 characterized by a patchwork of small scale programs and interventions generating pilot-level
453 evidence, with limited effort at scaling them up to the population level.²⁴ These small scale or
454 pilot community programs have provided examples of relevance to practice, but have seldom
455 been assessed for their generalizability or implemented at scale. Maximizing the potential for
456 dog walking to impact human (and canine) health can only occur through implementing
457 programs with broader population-level reach.

458

459 *The population-at-risk is the ‘challenge’ for practice*

460 It is well established that dog owners are more active than non-dog owners, primarily through
461 walking more, and are more likely to reach recommended levels of physical activity.²⁵ Findings
462 like these provide a rationale for dog walking and human health, but ignores the inactive [or non-
463 dog walking] population-at-risk amongst dog owners. Based on population-level research^{25,29,87,88}
464 at least a third of dogs are not walked regularly (although someone else may be walking them)
465 implying that populations of around 0.8 million Australian, 2.5 million Canadian, 11 million US
466 and 12 million Europeans are physically inactive adults and dog owners. These conservative
467 estimates provide a minimum denominator for practice, with the primary goal being to reach and
468 influence these millions of adults, children, and their under-walked canine companions.

469

470 *A framework for practice – dog walking interventions across health promotion and preventive*
471 *health settings*

472 Given the population segment defined ‘at risk’ above, urgent strategies with the potential for
473 greater reach are required, alongside evidence-generating research to confirm their effectiveness.

474 In order to profile the potential for dog walking in all preventive settings, a framework for dog
475 walking programs in practice is provided in Table 1; this shows the range of efforts that might
476 target individuals through to large scale environment changing policies. This framework is based
477 on the socio-ecological model, and considers strategies are required at multiple levels^{89,90} and that
478 programs need to emanate from a range of sectors and settings.

479

480 *Individual targeted programs to increase dog walking*

481 The framework starts with individually targeted dog walking behavior change advice in clinical
482 and other settings (Table 1). Despite the potential for individual advice to encourage physical
483 activity in clinical settings, the evidence base remains limited;⁹¹ further, it has been difficult to
484 implement on a wide scale through primary care. Nonetheless, dog walking provides a new
485 vehicle for brief advice to patients and if combined with practitioner’s understanding of their
486 patient’s sense of dog responsibility or commitment, could provide a useful adjunct to brief
487 prevention advice. It’s the potential for considering this setting for walking that is new for
488 clinicians. Similarly, the clinician’s (and veterinarians) role in recommending walking to people
489 with chronic disease could and should be broadened to include dog walking.^{92,93}

490

491 *Group settings for promoting dog walking*

492 Group settings for health promotion, such as workplaces and schools, pose challenges for
493 recommending dog walking, as many will not have a dog. However, dog walking could be

494 incorporated into workplace walking challenges and competitions, and contribute a major source
495 of ‘steps counted’ in workplace wellness.⁹⁴ Community settings are already being trialed for dog
496 walking interventions, as described previously (Table 1). However, methods for scaling these up
497 to reach many thousands of inactive dog owners, prospective dog owners, and people with
498 chronic health problems or special needs remains a practice-based goal. Wide reach is however
499 possible through e-health,⁴⁷ web-based or social media driven interventions. Use of social media
500 (e.g., Facebook) and other new media may prove more generalizable in recruiting dog owners to
501 participate in community dog walking.

502

503 *Population-wide strategies for promoting dog walking*

504 Dog walking in general physical activity mass media campaigns is well established and has been
505 successfully used in programs such as the ‘10,000 steps Rockhampton’,⁹⁵ as well as in the 2003
506 New Zealand ‘Push Play campaign’⁹⁶ and in the early 2000s in the *Find Thirty everyday*
507 campaign in Western Australia.⁹⁷ More recently, the US *Everybody walk! Mass media*
508 recommended dog walking.⁹⁸ This modeling of dog walking behavior is likely to be well
509 received and effective in encouraging population-level walking.

510

511 Population-wide strategies targeted at creating policy and physical environments that promote
512 and support dog walking are likely to be effective. Advocacy for dog walking oriented policy
513 relevant initiatives are needed, starting with park development, dogs allowed policies, off leash
514 zones and dog-friendly built environments (see Table 1). Further, the provision of parks with
515 dog-friendly features within walking distance to homes could encourage park visits and increase
516 dog walking among owners. At the larger level, allowing dogs on public transport and building
517 and creating more walkable communities will enhance the potential for people to walk dogs in

518 medium-high density residential areas in urban environments.^{99,100} From an urban planning
519 perspective there needs to be consideration for how built environment design can influence
520 different types of physical activity, including dog walking.

521

522 **Conclusion**

523 Studies have repeatedly demonstrated the potential of dog walking to increase community levels
524 of physical activity. Findings from intervention studies highlight practice relevant strategies for
525 increasing dog walking such as imparting on dog owners the ‘personal’ and ‘dog’ value of dog
526 walking, assisting owner’s and their dogs to incorporate dog walking as part of their daily routine
527 (i.e., habit formation) and highlighting the social benefits of being out and about in the
528 community walking dogs. Dogs may thus be considered a type of readily accessible and widely
529 prevalent ‘exercise equipment in the home and community’. At the same time, they are sentient
530 beings with needs and preferences of their own; however it is unlikely that increased exercise
531 would be detrimental to animal welfare). Physical and policy environments that consider the
532 needs of dog walkers are required. Implementing dog walking at the community and population
533 level requires a more opportunistic approach to advocating for dog walking messages and dog
534 walking strategies in physical activity programs, across diverse community settings. Such
535 programs will enable many in the community who are inactive dog owners to realize their health
536 potential as regular dog walkers thus positively impacting on population levels of physical
537 activity.

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546

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Table 1. A Typology For Dog Walking Programs In Practice

Level of prevention practice	Program strategy	Potential relevance for dog walking – facilitators and barriers in different practice settings
Individual targeted programs	Health professional advice; individualized counseling; primary care/physician's offices	<ul style="list-style-type: none"> - Potential high population reach - Brief advice on dog walking is potentially efficacious - Specific 'dog walking' advice is potentially stronger due to specificity of the behavior - Challenge is scaling up physical activity advice generated from selected primary care settings to widespread delivery of dog walking advice
	Individualized interventions; ehealth; tailored to individual	<ul style="list-style-type: none"> - Motivator and 'reminder' potential of dog walking groups - Could be supported by social media, dog walking groups on Facebook and other social media - Act as social support and reinforcement - Focus on moving from action to maintenance of dog walking behavior
	Disease based group programs (e.g., diabetic patients)	<ul style="list-style-type: none"> - Potential for referral to dog walking programs to provide physical activity and social support for people with chronic diseases - Difficulty in recruiting participants; transport to dog walking venues; may be suitable only for a subset of all walking-group patients
	Veterinarians/Animal behaviorists*	<ul style="list-style-type: none"> - Clear messaging for the exercise recommendations of dogs by breed type and age, emphasizing that nearly all dogs benefit physically and psychologically from being walked - Reward-based dog training advice to owners to help overcome barriers (e.g., dog aggression to people or dogs, pulling on lead, not coming when called) to enjoying dog walking.
Group and organizational settings	School or worksite settings	<ul style="list-style-type: none"> - Established as a specific approach for physical activity and mental health promotion (e.g., among children with and without disabilities) - Consider incorporating dog walking into workplace challenges to increase physical activity
Community settings	Local level community programs, neighborhood programs	<ul style="list-style-type: none"> - Main setting for dog walking is in local communities through dog walking groups and clubs - Promote and support 'loaner' dog walking groups. Groups can be formal (i.e., via animal welfare organizations) and informal (i.e., via neighbors and friends sharing dog walking duties with owners). - Foster use of local facilities, dog walking routes, animal shelter grounds and adjacent routes,

Population-wide high reach settings	Web site or ehealth population-wide interventions	<p style="text-align: center;">park redevelopment and off leash areas</p> <ul style="list-style-type: none"> - Potential for wide population reach, and may fit into scalable strategies, but dog walking may be only one component of physical activity promotion
	Mass media/social marketing campaigns Policy interventions/ large region or national programs	<ul style="list-style-type: none"> - Modelling dog walking behaviors used as an achievable strategy for increasing physical activity in large scale prevention focused mass media campaigns - Policies at local municipal level around dog walking regulations, infrastructure and developing dog walking-friendly environments that are compatible with the activities of non-dog walkers - Include dog walking as a specific strategy mentioned in national policy and plans around promoting physical activity

*It is recommended that Veterinarian/Animal behaviorist professionals use reward-based training methods rather than force or intimidation.