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Authors: Rutter, Nicholas J., Stukas, Arthur A., Howell, Tiffani J., Pascoe, Jack H., and Bennett, Pauleen C.

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Improving access to conservation detection dogs: identifying motivations and understanding satisfaction in volunteer handlers

Nicholas J. Rutter^{A,*} , Arthur A. Stukas^B, Tiffani J. Howell^A, Jack H. Pascoe^C and Pauleen C. Bennett^A

For full list of author affiliations and declarations see end of paper

***Correspondence to:**

Nicholas J. Rutter
Anthrozoology Research Group, School of
Psychology and Public Health, La Trobe
University, PO Box 199, Bendigo, Vic. 3552,
Australia
Email: NRutter@ltnu.edu.au

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ABSTRACT

Context. The use of conservation detection dogs (CDDs) is an established, highly efficient means by which data on cryptic and low-density plant and animal species can be collected in a relatively cost-effective way. Nonetheless, the time and resource costs associated with purchasing, training, and maintaining CDDs can be prohibitive, particularly for smaller organisations seeking to contribute to environmental work. A volunteer-based model of CDD training and deployment could make highly skilled teams more accessible to such groups, but little is known about why volunteers might choose to participate in such a program or what factors might maintain their motivation. **Aims.** We previously reported on the effectiveness of a volunteer-based model of CDD training that began with 19 dog-handler teams. In the current study, we identify owner-reported motivations for, and satisfaction with, engaging in this 3 year program. **Methods.** We used a combination of quantitative data from established questionnaires and qualitative data from semi-structured interviews to explore functional motivational themes among volunteers. **Key results.** We identified six functional motivational themes in participants. Overall, volunteers tended to be initially motivated by a desire to engage in a meaningful activity with their dog. Handlers often reported engaging in iterative goal-setting and attainment through successive project stages, a strengthening of the dog-owner relationship and a growing tendency to place more emphasis on environmental/conservation-related goals as the program developed. **Conclusions.** Suitable volunteers and their pet dogs can be trained as skilled CDD-handler teams. Importantly, teams can continue to participate in a volunteer-based program and contribute to conservation efforts for up to 4 years or longer, if their motivations and goals of participation can be facilitated through participation. **Implications.** This is important information as training volunteer CCDs requires a substantial investment in terms of time and other resources. Only by focusing on factors which foster an optimal recruitment strategy and then enhance program satisfaction and participant retention, are such programs likely to be cost-effective in the longer term.

Keywords: anthrozoology, conservation management, endangered species, faeces, invasive species, olfaction, scent.

Introduction

As species extinction rates increase (Pimm *et al.* 2014), the costs of monitoring endangered, cryptic, or invasive species require stakeholders to become increasingly efficient in utilising the limited resources available (James *et al.* 2001; Ferraro and Pattanayak 2006; Wright *et al.* 2015). One method of monitoring is through the use of Conservation Detection Dogs (CDDs); dogs trained to use scent to locate biological material from plants and animals relevant to conservation efforts (Beebe *et al.* 2016). The olfactory sensitivity of dogs and their motivation to work with people has seen them working to find a range of conservation-related targets, ranging from endangered species such as

gorillas (Arandjelovic *et al.* 2015) and orcas (Wasser *et al.* 2017) to invasive ants (Lin *et al.* 2011) and weed species (Goodwin *et al.* 2010; Needs *et al.* 2021).

Compared to existing survey methods, CDDs can be more effective and more economical in determining the presence/absence and abundance of plants and wildlife in a minimally-invasive way (Jenkins *et al.* 1963; Arnett 2006; Harrison 2006; Dematteo *et al.* 2009; Goodwin *et al.* 2010; Cristescu *et al.* 2015). Nonetheless, there are considerable costs associated with meeting the training, housing, and welfare requirements of CDDs. For example, many species that CDDs are trained to detect have seasonal survey periods, meaning dogs may not be working for extended periods of time. During these periods, the financial and welfare requirements of maintaining highly energetic dogs remain. This is particularly problematic for smaller, volunteer-based environmental organisations with limited resources, which often provide much of the on-ground workforce (Ryan *et al.* 2001).

Citizen science, the involvement of citizens from the non-scientific community in academic research (Tulloch *et al.* 2013), has a long history in some environmental fields and is becoming increasingly important to conservation science as the strain on resources grows (Tulloch *et al.* 2013; Wright *et al.* 2015). Some canine-related citizen science programs have been developed (Hecht and Spicer Rice 2015), but a volunteer-based model of CDD training and deployment is relatively new. A model in which owners are taught to train and handle their own pet dogs in a safe and competent way may improve CDD accessibility. This can also attract new volunteers who primarily want to spend time with their dog to engage with conservation projects, thereby increasing environmental awareness and human resources more broadly.

In a pilot program, a small group of Australian volunteers and their pet dogs were trained to detect Tiger quoll (*Dasyurus maculatus*) scats (Conservation Ecology Centre 2017). Following the initial success of this program, a series of studies by Rutter *et al.* (Rutter *et al.* 2021a, 2021b, 2021c) documented the development of a program in which 19 volunteers and their pet dogs participated in CDD team training and deployment. While this work indicates that volunteer teams can be trained to perform CDD roles, the long-term feasibility of such a model remains unclear.

There are financial and resource costs associated with any volunteer program. While some level of participant attrition over the course of a program should be expected (Stukas *et al.* 2015), selecting and retaining volunteers who are likely to engage in long-term participation in a volunteer-based CDD program is of critical importance in balancing the costs of training against the benefits of eventual deployment. Motivations to volunteer vary and can change over time (Clary and Snyder 1999; Ryan *et al.* 2001). Promoting long-term retention (e.g. 5+ years) of skilled volunteers may therefore rely on the ability not only to select suitable volunteers to begin with, but to

modify the volunteer experience to cater for the changing motivations and goals of participants.

The functional approach to volunteerism (Clary *et al.* 1998) is widely used to characterise volunteers' motivations (Bruyere and Rappe 2007). It proposes that people volunteer because it serves a function for them, with one popular classification scheme identifying at least six functions (Clary *et al.* 1998). Numerous studies have explored the motivations of participants engaging in environmentally orientated programs, which often focus on opportunities for participants to express their values and learn new things (Ryan *et al.* 2001; Bruyere and Rappe 2007; Wright *et al.* 2015). While these provide good insight into the validity of applying the functional approach to understanding motivations in environmentally oriented volunteer roles, it is unclear how the opportunity to participate in an activity with one's dog may influence the motivations and satisfaction with the experiences of volunteers.

Understanding factors that motivate volunteers to participate in a CDD program, and factors that influence their satisfaction and retention over many months or years, is imperative for small conservation groups wanting to invest their limited resources in volunteers with a high probability of success. In this mixed methods study, existing questionnaires and qualitative interviews were modified and used to explore the motivations of volunteer CDD handlers, their satisfaction with their experience and any relationship between these factors and retention in the program.

Method

Participants

This research took place between 2017 and 2019 in Bendigo, Victoria, Australia, a regional town with a population of approximately 150 000 people (Australian Bureau of Statistics 2017). It forms part of a larger project that began when 19 community volunteers and their pet dogs commenced the first of four successive training stages, to become CDD teams. During Part A, 19 dog-handler teams undertook a 12-week training program in controlled laboratory conditions, during which they learned initial dog training and scent detection principles in order to search for myrrh essential oil (Rutter *et al.* 2021a). Following Part A, 14 teams commenced Part B, during which they spent 12 weeks learning search strategies and skills to enable them to search for myrrh in simple field conditions on an open sports field (Rutter *et al.* 2021b). Thirteen teams then completed a 7-week training phase in Part C, where they learned to search for myrrh in complex field conditions (i.e. box-ironbark bushland) (Rutter *et al.* 2021b), before transferring their detection skills to scats of the threatened greater glider (*Petauroides volans*) in an additional 4 weeks of training (unpublished). In Part D, eight of these teams participated in up to 3 days of

pilot field deployment searches for greater glider scats. Some team members also participated in a small pilot study to detect an endangered species of Stonefly (Rutter *et al.* 2021c) and another study to detect freshwater turtle nests (unpublished). Participant demographics and participation in each stage are presented in Table 1. All research presented in this study was approved by La Trobe University Human Ethics Committee (S17-107 and HEC18045) and Animal Ethics Committee (AEC17-37 and AEC18039).

Measures

Quantitative data were collected through three validated measures. The Volunteer Functions Inventory (VFI) (Clary *et al.* 1998) measures people's motivation to engage in volunteering in six areas, or functions, identified by the functional approach to volunteerism (Clary *et al.* 1998). These include Career functions (developing skills to assist career pursuits); Social functions (opportunities to participate with friends or to engage in work that is considered valuable to a person's social connections); Value functions (expressing values through actions); Understanding functions (learning new skills or practising/developing existing ones); Enhancement functions (building self-esteem and experiencing psychological enhancement) and Protection functions (allowing volunteers to cope with feelings of stress or guilt through volunteering) (Clary *et al.* 1998). The VFI comprises 30 items on a 7-point Likert scale, and the wording of all questions was modified slightly to make them relevant to an environmental volunteering context. Five additional items were added to explore the degree to which volunteers were motivated by the opportunity to engage in an activity with their dog. These items are: 'Volunteering in this program allows me to spend quality time with my dog'; 'Volunteering in this program can improve my relationship with my dog'; 'Volunteering in this program helps me to better understand my dog'; 'I enjoy working with people who value training and spending time with their dog'; 'I am proud of my dog's contributions to protecting the environment.'

The Functional Benefits Scale (FBS) (Clary *et al.* 1998; Stukas *et al.* 2009) uses the match between volunteer motives and the six functional benefits outlined in the functional approach to volunteering (Clary *et al.* 1998) to predict volunteer satisfaction. The FBS comprises 18 items on a 7-point Likert scale. In this study, some questions were modified to make them relevant to an environmental volunteering context and we included a question on whether participating in the project improved the dog-handler relationship.

The Cat/Dog-Owner Relationship Scale (C/DORS) (Howell *et al.* 2017) comprises 33 items on a 5-point Likert scale, with three subscales that measure the quality of the pet-owner relationship in the following areas: the type and frequency of pet-owner interactions, the perceived emotional closeness of an owner and their pet, and the owners' perceived costs of pet ownership.

In addition to these established questionnaires, qualitative data were collected through multiple semi-structured interviews with handlers. Interviews were designed to explore three key aspects of the experience of participants' in the program: (a) motivations and intentions of participants to begin or continue volunteering in the program; (b) satisfaction of participants with their program experience, including the fulfilment of any previous motivations or goals; and (c) feedback from participants on what could be done to help make participation in the program easier or more enjoyable. All participants were asked the same initial questions, although the interviewer explored relevant themes and ideas with further questions as they emerged. Interviews were conducted either in-person or via telephone.

Procedure

Participants completed the modified VFI (mVFI) before commencing Parts B and C of the training program. The modified FBS (mFBS) was completed at the end of Parts A and B. The C/DORS was completed at the end of Parts A, B and C. One researcher (NR) conducted semi-structured interviews with volunteers at five stages throughout the project: an initial interview before commencing training ($N = 19$); three interim interviews, at the completion of Part A ($n = 17$), Part B ($n = 14$) and Part C ($n = 14$); and a training program completion interview at the end of Part D ($n = 6$). All participants remaining in the program at any given point participated in the interviews, with the exception of the final interview, during which several volunteers were unavailable. Data collection activities are summarised in Table 2.

Analysis

Statistical analysis of quantitative data from the mVFI, mFBS and C/DORS surveys was not informative due to the small sample size. Instead, relevant descriptive statistics are presented. Handler interviews were grouped into initial, interim and exit phases. The data were transcribed and then subjected to inductive content analysis, which was chosen in an attempt to reduce the possibility of the data being forced into the pre-existing coding frameworks or preconceptions of the authors (Braun and Clarke 2006). Emerging themes were validated through discussions between authors. Quotes are presented below to give voice to the participants, with filler words (e.g. 'um, ah,' etc.) removed to aid readability. All names have been replaced by pseudonyms to maintain confidentiality.

Results

Descriptive statistics on the mVFI are presented in Table 3. These reveal that, at the end of Parts A and B, handlers

Table 1. Demographic characteristics and length of participation of volunteer dog-handler teams.

Dog-handler team #	Owner-reported dog breed	Dog sex	Dog age at recruitment (years)	Handler gender	Handler age at recruitment (years)	Program phases completed	Program participation outcome to date
#1	Rhodesian Ridgeback	Intact male	5.8	M	39	A, B, C, D	Retired after 3 years (dog age/health). New dog in training with handler
#2	Australian Kelpie	Intact male	5.7	F	58	A, B, C, D	Retired after 2.25 years (dog age/health)
#3	Miniature Poodle	Neutered female	2.5	F	60	A, B, C, D	Ongoing after 3.75 years
#4	Samoyed	Neutered female	2.2	F	34	A, B, C, D	Ongoing after 3.75 years
#5	Rough Collie	Neutered male	6.6	F	63	A, B, C, D	Ongoing after 3.75 years
#6	Cocker Spaniel x Toy Poodle	Neutered male	2.1	F	29	A, B, C, D	Inactive since March 2019 after relocating, but interested in handler-only participation
#7	Weimaraner	Intact male	4.9	M	54	A, B, C, D	Ongoing after 3.75 years
#8	Labrador x Kelpie	Neutered male	3.3	F	31	A, B, C, D	Ongoing after 3.75 years
#9	Cavoodle	Neutered male	1.8	F	50	A, B, C, D	Inactive since July 2019 after unrelated injury
#10	Australian Cattle Dog	Neutered female	7.3	F	65	A, B	Exited after 1 year (dog aggression)

(Continued on next page)

Table 1. (Continued)

Dog-handler team #	Owner-reported dog breed	Dog sex	Dog age at recruitment (years)	Handler gender	Handler age at recruitment (years)	Program phases completed	Program participation outcome to date
#11	Border Collie	Neutered female	4.7	M	68	A, B, C, D	Ongoing after 3.75 years
#12	Border Collie	Intact male	1.3	F	50	A	Exited after 3.5 months (not selected for Part B)
#13	Whippet, Greyhound, Staffordshire Bull Terrier mix	Neutered male	5.5	F	30	A	Exited after 3.5 months (relocated)
#14	Border Collie	Neutered female	3.8	F	25	A, B, C, D	Ongoing after 3.75 years. New dog in training with handler
#15	Border Collie	Neutered female	8.6	F	67	A, B, C, D	Retired after 3.25 years (dog age/health)
#16	Labrador	Neutered male	2.7	F	37	A, B, C, D	Inactive since January 2020 (3-h drive to attend training became prohibitive)
#17	Finnish Lapphund	Intact male	3.17	F	27	A	Exited after 3.5 months (relocated)
#18	Bull Terrier x Kelpie	Neutered female	3.92	F	24	-	Exited after 7 training sessions (handler aversion to training with meat)
#19	Border Collie	Intact female	1.67	F	23	—	Exited after 5 weeks (handler became too busy with other commitments)

Table 2. Summary and timepoints of all data collected through the modified Functional Benefits Scale (mFBS), the Cat/Dog Owner Relationship Scale (C/DORS), the modified Volunteer Functions Index (mVFI), handler interviews, training and assessments during each phase of the program.

Program phase	Data collection activities completed by each team				
	Activity 1	Activity 2	Activity 3	Activity 4	Activity 5
Recruitment	Demographics survey	Recruitment interview			
Part A	12-week training phase and search assessments	mFBS survey	C/DORS survey	Interim interview A	
Part B	mVFI survey	12-week training phase and search assessments	C/DORS survey	mFBS survey	Interim interview B
Part C	mVFI survey	7-week training program and search assessments	4-week Greater Glider scat training program and search assessments	C/DORS survey	Interim interview C
Part D	Greater Glider training/survey deployments	Training program completion interview			

Note: Participation beyond Part D is ongoing and is not included in this table.

scored highest on the dog-related function, followed by the values and understanding functions, respectively (Table 3).

Descriptive statistics on selected questions from the mFBS are presented in Table 4. It shows that relatively high scores were obtained on questions that related to dog, enhancement, and value-related functions, and overall enjoyment. There was little change in mean scores of volunteer satisfaction between interim and exit surveys, with the group mean typically remaining highest on values- and enhancement-themed questions, dog-handler relationship questions and overall enjoyment. Lower scores were obtained on questions relating to the career, protective, understanding and social functions of volunteering.

Descriptive statistics on the C/DORS are presented in Table 5. Mean scores on all three subscales were initially reasonably high, suggesting that the participants had good relationships with their dogs at the time of recruitment. There were small but consistent increases in the pet-owner interactions and perceived emotional closeness subscales at the exit stage of the project, relative to the initial and interim stages, which indicates a better perceived relationship. Scores on the perceived costs of owning a pet subscale declined, indicating participants perceived increased costs associated with caring for their dog.

Several themes emerged from the handler interviews conducted prior to the beginning of Part A. These can be summarised as follows:

Dog-handler relationship: Participants spoke often about a desire to spend time training or working with their dog. For example, when asked why they were motivated to join the program, one participant reported ‘...hanging out with my dog....seeing what my dog can do’ [#3] and another ‘I need an activity for my dog and I’ [#8]. Several volunteers were specifically motivated by the structured, dog training aspect of participation and by the opportunity to develop specific skills around scent detection. One

participant, for example, reported ‘Honing my own dog training skills in my repertoire’ [#6] and another ‘I’m fascinated by learning theory’ [#15]. A smaller portion of participants were particularly motivated by a perceived opportunity to eventually gain paid employment with their dogs. They described ‘I want to do this professionally’ [#13].

Environment/Conservation: Also common were comments about being motivated by environmental protection and conservation factors. These appeared to range in importance, from being considered a ‘bonus’ of participation, as seen in the comment ‘I might as well help the environment if I’m going to train dogs’ [#4], through to being a core motivation, reflecting a pre-existing value, as indicated by the comments ‘I’m passionate about conservation’ [#1] and ‘I am an environmental activist’ [#10].

Meaningful application: A third theme to emerge from the initial interviews was participants’ desire to do something meaningful and useful, but without a strong focus on environmentally-oriented roles. Participants commonly made statements such as that they were motivated by ‘...volunteering for useful purposes’ [#17] or that ‘I’m always motivated to do something when it concerns dogs and their ability and their usefulness to be able to do stuff that’s helpful to our society in general I guess without using them as tools’ [#15].

When participants were interviewed during the program, a very strong theme to emerge was that they enjoyed their participation, and that this was motivating them to continue to participate. Participants said things like ‘I enjoy it, it’s different to other stuff I do. I read stuff about other dog sniffing projects and it’s good to be a part of something just like it’ [#3] and ‘I wasn’t sure of Dougal’s capabilities but it’s enjoyable to watch his progress and success’ [#6]. This is not to say that all aspects of the program were enjoyable. Participants reported experiencing performance anxiety

Table 3. Group mean scores on the modified Volunteer Functions Inventory at the end of Parts A and B.

Function/motivation for volunteering	Recruitment: Part A end (n = 12)				Interim: Part B end (n = 6)			
	Mean	Median	s.d.	Alpha	Mean	Median	s.d.	Alpha
Career: A motivation to volunteer based on development of skills that may help with career pursuits	1.84	0.70	2.02	0.94	1.03	0.00	1.59	0.96
Social: A motivation to volunteer based on the opportunity to participate with friends or to engage in work that is considered valuable to a person's social connections	2.18	1.40	2.20	0.76	1.91	0.70	1.89	0.80
Values: A motivation to volunteer based on allowing expression of values through actions	6.10	6.30	1.01	0.87	5.76	5.56	1.32	0.92
Understanding: A motivation to volunteer based on learning new skills or practising/developing existing ones	4.55	4.90	2.05	.77	4.46	4.90	1.98	0.26
Enhance: A motivation to volunteer based on building self-esteem and experiencing psychological enhancement	3.05	2.80	2.00	0.71	2.43	3.15	2.06	0.95
Protect: A motivation to volunteer based on allowing volunteers to cope with feelings of stress or guilt through volunteering	2.25	1.75	2.20	0.84	2.26	3.50	1.87	0.85
Dog: An additional subscale exploring whether spending time with one's dog was a motivating factor	6.50	7.00	0.75	0.80	6.39	6.50	0.73	0.92

Participants responded to questions on a 7-point Likert scale, with higher scores indicating greater endorsement of those motivations.

around assessments and their actual search performances, and some experienced concern about whether their dog was enjoying being involved in the program. For example, one participant reported 'We were ready to pull the plug in Part A. Sheba wasn't enjoying it. I was. But [starting to use] the ball [as a reward] changed it, this time she's enjoyed it more' [#11]. Fortunately, any issues causing negative experiences were usually able to be resolved.

A perceived improvement in the participant's relationship with their dog was also frequently reported during interim interviews. Participants made comments such as 'Our game stepped up, we're starting to gel more ... We got better at communicating with each other'. [#11] and '... how much better I get along with Jeff and how much more we understand each other...he's more than just a pet' [#8]. One participant described that they were 'Learning to trust my dog and learning to read him properly. Seeing his improvement, learning more about him, and trusting him a bit more and make decisions without my input.' [#16].

In addition to these themes, many participants described experiencing a sense of personal accomplishment and pride as the program progressed and they reached their goals. One participant, for example, reported 'Barry actually finding something. It amazes me that he can find it...and me recognising he's found it' [#9]. This sense of accomplishment often coincided with completing one stage of the project and progressing to the next, which was seen by some participants as a milestone and often coincided with iterative goal setting through the formulation of new goals to achieve the next training milestone. As one participant said 'I gained the feeling of succeeding...something to look forward to' [#7]. And from another, 'I wanted to continue to see everything through and see if he could transition to a new odour, which he did quite well.' [#1].

Of potential importance in terms of program sustainability, 'social connection and cohesion' emerged as an unexpected theme that appeared to increase in relevance as the project progressed. Most participants reported that connecting with other volunteers was positive. For example, '...the other participants talking and socialising. We've known each other a long time and we'll ask about what they've been up to. We're all dog people so we've always got something to talk about.' [#6]. However, there were instances of disharmony, typically early in the program when it appeared that a small number of participants were less positive about the program and had different attitudes towards the program goals than did most participants. This disharmony was largely resolved as training progressed and these people either discontinued their involvement or changed their attitudes as the training environment changed from being indoors to outdoors, with this generally enhancing participants' motivation to continue. As one participant reported midway through the program after training moved from an indoor laboratory to outdoor settings; 'Things were different this time, people were more relaxed and talking

Table 4. Group mean scores on the most representative item from each subscale of the modified Functional Benefits Scale (mFBS) at the end of Parts B and C.

mVFI function theme	mFBS example question	Interim: Part B end (N = 13)			Completion: Part C end (N = 13)		
		Mean	Median	s.d.	Mean	Median	s.d.
Career	Through volunteering in this project, I have learned skills that will help me in my paid work.	2.37	1.40	2.53	3.18	4.20	2.49
Values	Through volunteering in this project, I have done something for a cause that I believe in.	6.05	7.00	1.99	5.87	5.60	0.73
Enhance	I have found my volunteer experience personally fulfilling.	6.19	6.30	1.06	6.08	6.30	0.78
Understanding	I have learned how to deal with a greater variety of people through volunteering in this project.	2.60	3.00	2.08	4.09	4.90	1.20
Protect	I am meeting my environmental obligations through my volunteer work in this project.	3.12	3.5	2.31	3.85	3.50	1.95
Dog	Volunteering in this project has improved the relationship I have with my dog.	6.52	7.00	0.66	6.24	6.30	0.83
Social	My family and/or friends would have been disappointed if I had stopped volunteering in this project before the end of this phase.	0.70	0.00	1.11	2.33	2.10	2.09
Overall enjoyment ^A	I enjoyed my volunteer experience	6.35	6.30	0.78	6.35	6.30	0.67

Participants responded to questions on a seven-point Likert scale, with a higher score indicating a greater degree of satisfaction relating to the question.

^A'Enjoyment' is not a formal scale of the VFI or FBS, yet this question was highly endorsed and is included as a measure of overall enjoyment and satisfaction.

socially. It's something to do with being outside. The dynamics have changed.' [#7].

Also important in terms of sustainability, motivations centred around the environment or conservation appeared to grow in importance for some participants, particularly those who initially endorsed engaging with their dog as their primary motivation for joining the program. Several participants confirmed that the environmental aspects of the project became as motivating as the dog engagement aspects. For example, 'My initial motives were to work and train Barry, now it's 50/50 dog/conservation project.' [#9] and 'The start was very much dog training [motivations] but now it's more both.' [#14]. However, some participants with initially strong environmental motives found that these goals were not satisfied during the middle stages of the project, which remained focused on training. They reported 'It's hard to say we've met the conservation side yet, but it's really cool to see what projects we'll be working on and where we'll deploy dogs and what we can help with.' [#16] and 'I hadn't known about turtles, the three species. We haven't really started on wildlife scent yet, so environmental motives aren't fulfilled.' [#4].

The themes identified during the initial and interim interviews were revisited in the exit interviews. When reflecting on the whole training program, most participants reported improvements in their relationship with their dog. This fulfilled the goals of many participants who began the project with motivational themes around spending time training their dog. As one participant said 'Finnan and I gelled as a team....I feel like we work as a team, he listens and I want to let him do his job.' [#2]. And from another participant 'Seeing how far we've come as a team. We've got better at communicating with each other.' [#15]. Motivations around participants being able to work with their dogs in the field remained somewhat unfulfilled, as not all volunteers had participated in field deployments at the time interviews were conducted. As one stated 'It was a bit disappointing we couldn't go to Hanging Rock and do actual deployments as opposed to field training' [#1].

As described above, a portion of volunteers reported developing interest in environmental issues over the course of the program (A, B). 'I've started taking more interest in conservation issues...I've got more understanding of what's going on and species I didn't know about, numbers of at-risk or endangered species... I googled our target animals but also other species.' [#15]. This led to development of new environmentally-oriented motivations in some participants as the program progressed. Conversely, participants who reported pre-existing motivations surrounding environmental themes generally found many of these unfulfilled at the time of the final interviews, which were prior to many field deployments. As one participant stated 'Those [environmental motivations] are not satisfied yet...My 'selfish motivations' have been met but not so much the greater good motivations...I think within one deployment that will be

different' [#8]. Another participant concurred, reporting that 'I really wanted to do [Part] C as I really wanted to be at the point where we can detect targets. I want to get onto something other than myrrh. Something real and tangible. I feel like once we go on deployments we will get those goals achieved' [#16].

Despite not having met all of their goals, the themes of enjoyment and personal accomplishment remained strong during the exit interviews. As one participant reported 'I've gained personal satisfaction, not a trophy... you're not competing against something. This is more satisfying that anything I've ever done' [#5]. And for another, 'I'm satisfied but only more satisfied if I could do it for a living...I've got far more out of this than anything else I've done with a dog' [#1]. A third reported similarly, 'Now that we've transferred onto [training to detect] greater glider scat [my motivations are] 50% satisfied. But once I'm actually able to get out and be on deployment it will be really, really cool. It's just been a matter of timing unfortunately.' [#16]. Participants who accomplished the final goal of participating in field deployments (Parts C and D) generally found these highly fulfilling: '...it wasn't as easy as I thought, but the more I learnt the better we got and the more serious I got. My commitment got stronger' [#2] and '[I gained] a sense of fulfilment and achievement. I didn't set out with a specific idea of 'I'm going to do this and get this'...I got more out of it than I expected... as we progressed it got better... stepping up from [indoor scent] pots to the [outdoor sports] oval to the bush it became more involved and that's enjoyable.' [#11]. The potential to have a real impact was important '[Deployments were] really fun and really exciting because I was able to do the real thing.... It felt like now I'm doing something that may have an impact.' [#15] and '[Deployments were] more fulfilling than training. We are putting training to work... I had no expectations of field surveys; I just went with it' [#11].

Also remaining apparent were the social benefits reported previously. 'I think towards Part B and C it got me out much more and built my confidence in socialising with other people apart from my small social circle. I'm more confident going out meeting people than I was previously.' [#4] and 'The group now is cohesive and I know everybody now. At the start it wasn't like that and [another participant] was a problem in Parts B and C' [#15].

Discussion

We sought to identify the motivations and satisfaction of participants in a volunteer-based model of conservation detection dog (CDD) training and deployment. A mixed methods approach was employed, allowing us to draw on an extensive literature validating a functional approach to volunteering, and to expand upon this existing framework by conducting detailed interviews with participants over

time. This allowed us to overcome some of the limitations associated with using quantitative methods when working with necessarily small participant numbers, but it also meant that we could explore themes that arose early in the study and take advantage of the rich data emerging from the fact that many of the participants engaged with our CDD program for more than 3 years.

Results of the initial modified Volunteer Functions Inventory (mVFI) survey showed that participants were mostly motivated to engage in an activity that allowed them to express their personal values through action. These functional categories, such as values and understanding functions, are similar to those identified in many other volunteering contexts (Clary *et al.* 1998; Chacón *et al.* 2017). In one dog-related research study exploring the motivations of animal assisted therapists, handlers similarly ranked values motivations and the idea of a dog and handler being a 'team' as important to participation (Collins and Vroman 2015). Other established motivations were less robust, although those based on learning new skills or practising/developing existing ones were also quite strong. The subscale added to the mVFI to detect whether volunteer motivations might reflect a desire to spend time with one's pet dog rated very highly.

Consistent with these data, initial interviews revealed three main motivating themes: the opportunity to spend time doing something with one's dog; a strong desire to do something related to environmental concerns; and a desire to engage in something meaningful. These clearly overlap the primary motivational themes revealed by the mVFI, although it should be noted that people wanting to spend time with their dog and/or do something to help the environment can do so without investing the substantial amount of time and effort necessary for CDD training and deployment. The critical factor drawing volunteers to a CDD training program is therefore likely to be that they perceive the activity as being meaningful and that it does indeed allow them to express their values through the required level of commitment, while spending time with their dog and/or doing something to aid the natural environment. This

'long-term commitment' aspect of such programs should therefore be emphasised in recruitment strategies.

Recruitment of volunteers for programs such as this would also benefit from considering that in our study, scores on the modified functional benefits scale and comments made during interim and exit interviews indicated that dog-handler relationship goals were largely satisfied though participation in the program; yet not to the extent that volunteers no longer wished to participate. Participants' relationship goals, at least in part, evolved from initially wanting to engage in a shared activity to more successive progress milestones. The strength of these goals tended to increase as the project developed. The dog-handler relationship is generally considered in the professional detection dog literature to be positively associated with search performance (Zubedat *et al.* 2014; Hoummady *et al.* 2016; Diverio *et al.* 2017; Jamieson *et al.* 2018a, 2018b). Information on how engagement in such a training program can enhance relationship quality between an owner and their dog, and thereby improve detection performance, may therefore be of critical importance in informing recruitment drives for volunteer CDD programs.

While dog-handler relationship themes were overwhelmingly positive throughout this study, this was not always the case. The decline in scores on the C/DORS Perceived Costs of owning a pet subscale declined, indicating participants perceived increased costs associated with caring for their dog. This is usually interpreted as reflecting a weaker or more demanding relationship (Dwyer *et al.* 2015; Howell *et al.* 2017; Table 5). These results may reflect the increased demands associated with attending frequent training and assessment sessions, despite most handlers reporting an overall strengthening of the dog-handler relationship. Furthermore, some dogs and some handlers displayed characteristics that were unsuitable for participation in the program. For the dogs, these included dog-dog aggression, motivational deficits or other incompatible behavioural traits such as strong impulses to chase wildlife or high distractibility. For the handlers, they included repeated failures to follow directions designed to keep participants safe,

Table 5. Scores on the three Cat/Dog Owner Relationship Scale (C/DORS) subscales at the end of Parts A, B and C.

Subscale	Recruitment: Part A end (n = 11)			Interim: Part B end (n = 13)			Completion: Part C end (n = 13)		
	M	s.d.	Alpha	M	s.d.	Alpha	M	s.d.	Alpha
Pet-owner interactions	3.87	1.28	0.69	3.81	1.35	0.52	4.07	1.14	0.72
Perceived emotional closeness	4.08	1.16	0.65	4.04	1.15	0.83	4.28	0.95	0.83
Perceived costs	4.48	0.73	0.77	4.46	0.79	0.80	4.31	0.92	0.93

Participants responded to questions on a 5-point Likert scale, with higher pet-owner interactions and perceived emotional closeness subscales, indicating a better perceived relationship. Conversely, lower perceived costs subscale scores suggest a more demanding relationship, which may relate to the increased demands associated with attending frequent training and assessment sessions.

such as keeping dogs on a lead when required, negative attitudes towards specific training activities and a general unwillingness to engage in friendly interactions with other participants. Such behaviours led to the discontinuation of some teams and may also negatively impact a dog-owner relationship, such as may occur if a motivated handler cannot participate due to unsuitable dog behaviours. While volunteer motivation is important to the success of volunteer projects, the capability and suitability of each dog-handler team must also be considered, as not every volunteer or their dog is appropriate for every activity. In the volunteering literature, 'volunteerability' as a construct has received attention elsewhere (Haski-Leventhal *et al.* 2018). In the context of volunteer CDD programs, we recommend that great care be taken in selecting both dogs and handlers for inclusion.

The second major motivator identified in this study, also consistent with the values-based functional approach of the VFI, was the potential for participants to do something to help the environment. Moreover, environment-related goals became increasingly motivating for several participants as the program developed; some participants with predominantly dog-handler relationship goals during recruitment later cited environmental goals as their main motivation. In some cases, this led to increased frustration for participants. We deemed that the slow, stepped approach we took to training was necessary to ensure the dogs, their handlers, target/non-target species and the environment were protected and that teams were able to competently perform the tasks. While this ensured that participants were able to spend time with their dogs and improve the dog-handler relationship, it simultaneously meant that environmental objectives were not addressed during the first 2 years of the project, where the emphasis was on skills building rather than actually finding environmental targets.

Environmental volunteering studies involving human-based bird counts have also reported increased emphasis on conservation related motives and 'value and recreation' scores (Wright *et al.* 2015; Larson *et al.* 2020). Furthermore, volunteer birdwatchers have been reported to specifically seek out rare species over common ones during surveys (Booth *et al.* 2011; Tulloch and Szabo 2012), perhaps as they are perceived by some as having more value. The lesson we learned was that incorporating environmental targets early on in a training program may be particularly beneficial. While it would be irresponsible to allow partly trained dogs and handlers to work in sensitive environmental contexts, it should be possible to create tasks that are of relevance to environmental objectives and that can be conducted in 'safe' environments such as indoors or in controlled outdoor environments. Incorporating these into training programs for volunteers is strongly recommended. An alternative strategy would be to encourage participants to engage in complementary activities elsewhere. In our project, several participants reported joining local human-

based conservation groups or undertook community education activities. Hence, our fostering of environmental/conservation-related motives may have contributed to participants seeking external volunteering opportunities.

Mean scores on the mVFI Social subscale were relatively low across assessment periods, suggesting that social motivations were rarely a primary motivating factor for participants. Nonetheless, many social connections formed between handlers, between handlers and other dogs, and even between dogs, with ample opportunities for social interaction at training events and during deployments. Some participants even hosted teams who lived out of town during weekend workshops and organised group meals. Handler interviews suggested that both positive and negative social interactions were especially relevant to some participants and influenced the enjoyment and satisfaction of the overall group, with uncommon instances of social tension between volunteers causing disharmony before they were resolved. Urban environmental volunteers have been known to attend events as part of a group (Moskell *et al.* 2010), suggesting that fostering a friendly and positive group culture through social activities is likely important for volunteer groups. We suggest that positive social interactions may act as an important buffer against loss of motivation and enjoyment in situations where other goals are unfulfilled, and that promoting a group culture of positivity and mutual support is not only enjoyable, but extremely important to the long-term overall functioning of a volunteer CDD group (Omoto and Snyder 2002).

In terms of personal accomplishment, we noted that the commencement of each successive part of the project coincided with increased motivation to get to the next stage, which participants often considered to be 'more real'. During Part C, for example, a long-held goal for many participants of training to detect a conservation-related target odour (i.e. greater glider scat), was realised. Achieving this goal gave handlers a sense of satisfaction and accomplishment, which has been associated with duration of volunteering (Snyder and Omoto 2008), but subsequently led to a general shift in motivation towards a new goal; to 'make a find' i.e. detect a conservation-related target with their dog during a survey. This iterative process of changing motivational focus as goals of participation are realised and the next attainable milestone appears, was clearly important to many, but not all, participants. For these participants, retention appeared to be largely supported by satisfaction derived from two sources: the fulfilment of motivations and goals held at recruitment (Clary *et al.* 1998); and the fulfilment of new motivations and smaller, 'milestone' goals that developed throughout participation. Providing participants with opportunities to fulfil their volunteering motivations is an established way to help recruit and retain volunteers (Bruyere and Rappe 2007). However, the iterative goal-setting described here, and its ability to maintain the long term motivation of

participants, has not yet been investigated. It is possible that the incremental approach to training teams in this study may particularly suit successive goal setting. By incorporating successive training stages, offering multiple target species and working in different environments, volunteers had multiple opportunities for iterative goal setting and attainment. Applying goal-setting and goal implementation principles (Locke and Latham 2006) to training volunteer CDD teams may help foster satisfaction and longer term engagement.

While some level of participant attrition is to be expected in any volunteer project (Stukas *et al.* 2015), we consider retention in this project to be particularly robust; 13 of 19 initial pet dog-owner teams completed the full 3.5 year training project and six teams remain actively engaged in our work almost 4 years after their initial recruitment. In broad terms, successful handlers in this project had an initially moderate/strong dog-owner relationship and/or a moderate/strong interest in environmental or conservation issues, and a willingness to commit to a long-term group training schedule. A positive, flexible attitude to trialling unfamiliar training methods and to working with other dog-handler teams was also important. Successful dogs were generally highly motivated to work with their handler for food or play rewards, were reasonably sociable with other dogs and handlers, displayed a high level of functional obedience (e.g. complied with recall and 'emergency stop' cues) and, importantly, were safe around wildlife. No single characteristic describes participants who discontinued their involvement; however, these participants typically cited competing commitments (e.g. work, family or other interests), the need to relocate geographically due to family or work commitments, or dog unsuitability (e.g. concentration, motivation or sociability issues) as factors. Some teams that retired did so not through lack of motivation, but due to the considerations of aging dogs (see Table 1), with two handlers having since begun training new dogs using the methods learned in Parts A and B.

Overall, our results suggest that, with professional guidance, suitable pet dog-owner teams can be trained in CDD methods, and that teams can commit to long-term participation for at least 4 years. While such volunteers are unlikely to replace the need for professional CDDs, a pool of highly trained, safe, and competent volunteers can make important contributions to species conservation efforts and increase CDD accessibility to smaller conservation groups. Recruiting prospective handlers with the motives and characteristics identified in this study, facilitating iterative goal-setting, and responding to changes in the motivation of participants, may be useful strategies to promote volunteer satisfaction and long term retention of CDD volunteers. This, in turn, will help promote the cost-effectiveness of a volunteer-based model of CDD training and deployment while also raising the profile of environmental issues more broadly.

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Author affiliations

^AAnthrozoology Research Group, School of Psychology and Public Health, La Trobe University, PO Box 199, Bendigo, Vic. 3552, Australia.

^BSchool of Psychology and Public Health, La Trobe University, Bundoora, Vic., Australia.

^CConservation Ecology Centre Cape Otway, Cape Otway, Vic. 3233, Australia.