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"Scent work is incorporated in almost everything I do": Investigating dog trainers' perceptions of scent-based activities for companion dogs

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ABSTRACT

Scent-based activities are a popular activity to provide dogs an outlet centred on their natural abilities and dogs of any physical ability can participate. We aimed to investigate how professional dog trainers are using scent-based activities and explore perceptions around the impact of olfactory enrichment and exercises on behaviour in companion dogs. The online survey contained 29 questions across four sections, with a total of 566 responses analysed from trainers from around the world. The most commonly practiced scent-based training activity was scent work, training companion dogs to locate odours for a reward. Further, the most commonly used scent enrichment activity was sniff-based walks (sniffaris; 85 %), providing sensory garden spaces (46 %) or offering food via scatter feeding (92 %) or snuffle mats (87 %). Trainers have a belief that trained scent work tasks are good for dogs and that scent enrichment activities can be effective in reducing general fearfulness, anxiety, and addressing overexcitement. As evidence is currently limited in this area, future work should investigate which dog-centered scent-based activities may enhance their wellbeing.

1. Introduction

Scent-based activities include any recreational or sporting activity involving a dog using their nose to either investigate an environment, with the purpose of enriching the individual, or a trained scent detection task to search for and locate a target odour (Fountain et al., 2024). Scent-based activities are primarily dog-driven and require problem solving independent of the handler, unlike other canine sports such as agility, rally obedience or competition obedience, which are directed by the handler providing cues and prompts to dogs (Mellor et al., 2024). Activities focused on olfaction have become popular to provide dogs an outlet centred on their natural abilities and one which dogs of any physical ability can participate (Semione, 2024).

In the sport of scent work, dogs are trained to search for essential oils or oils such as gun or truffle oil. This activity exists as recreational classes or competitions. Dogs who have engaged in scent work have shown increased optimism (Duranton and Horowitz, 2019), persistence in problem solving in cognitive tasks and stronger inhibitory control across tasks (Mellor et al., 2024). There is an increasing need to understand more about how scent detection affects the welfare of dogs across various populations, particularly given the rising popularity of scent sports among companion dogs (Rooney and Parr-Cortes, 2023).

Olfactory enrichment refers to the introduction of specific scents or the provision of access to natural environmental scents for dogs, with the aim of positively influencing their behaviour and overall well-being (Wells and Hepper, 2017). Private home environments often limit foraging and exploration opportunities while caregivers are out, making mental stimulation increasingly important for companion dogs (Bender and Strong, 2019; Duranton and Horowitz, 2019). This is especially important when considering the amount of time dogs spend alone at home while their caregivers are at work or otherwise occupied, as many dogs may experience separation related distress and other challenging behaviours when left alone or are under stimulated (Harvey et al., 2022; Heys et al., 2024; Stephan et al., 2021). Recent studies have started to investigate the impact that both environmental olfactory enrichment and engaging in scent detection has for pet dogs on their behaviour and wellbeing (Berg et al., 2024; Rooney and Parr-Cortes, 2023). Scent enrichment, such as essential oils or fragrances placed in the environment, has shown some promising welfare benefits for shelter and companion dogs (Fountain et al., 2024). The positive effects of essential oils to reduce stress-related behaviour has been reported in several studies in dogs (Binks et al., 2018; Dare and Strasser, 2023; Graham et al., 2005;

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Stanghellini, 2019), in rats where sweet orange oil had anxiolytic properties (Faturi et al., 2010) and other animal models (De Sousa et al., 2015).

This paper aimed to investigate the perceptions and practices of dog trainers via a questionnaire. First, we aimed to find out how much dog trainers are using scent-based activities and the types of activities they most often use. The second objective was to investigate the perceived benefits of scent work on canine behaviour and to explore dog trainers' beliefs regarding the effects of scent-based activities on dog behaviour. Scent-based activities (here forth referred to as scent activities) encompasses all types of scent-based enrichment and training.

2. Methods

2.1. Human ethics

The questionnaire used in this study was approved by University of Adelaide Human Research Ethics Committee (H-2023–139).

2.2. Questionnaire

The questions were developed through literature research and discussions with dog trainers experienced with scent-based activities, then piloted with five professional dog trainers. The final version was revised based on feedback collected during the pilot.

The questionnaire contained 29 questions across four sections (See Supplementary material) and was available on Survey Monkey from July to August 2023. There were 10 questions in Section 1 relating to respondent demographics and background experience in dog training (e.g. age, gender, country, education, dog behaviour credentialing and experience, and method of dog training). Section 2 contained 7 questions relating to background experience and services offered with scent-based activities in their professional training. A brief description of each type of scent activity and a definition of what was meant by these terms were provided in each question (Table 1). The categories included whether each activity was used in the context of 1) group classes (weekly classes or activities with multiple dogs), or an activity used within a class setting, 2) one to one activities, including face to face or online coaching one client on how to do an exercise; 3) referrals to other trainers offering the service or 4) the service is not offered (Table 3).

Section 3 comprised 3 questions directed to trainers offering scent activities as classes or private training, exploring how they practice scent activities. Questions 19–21 were only filled by professional trainers, who offered scent activities as their practice.

The fourth section comprised 9 questions relating to dog trainer perceptions of scent activities. Five of these questions were Likert style and four were open ended questions. Respondent agreement for Likert-type questions was assessed using broad agreement, defined as the combination of responses indicating 'agree' and 'strongly agree'. In questions 25 and 26, respondents' beliefs regarding effectiveness were analysed by combining responses. The categories 'strongly agree' and 'agree' were merged to represent the group labelled as 'effective,' while the responses 'not at all effective' and 'rarely effective' were combined to form the 'not effective' group. The neutral responses were retained as a separate category, along with the option for 'I don't know/I'm not sure.' Two final open-ended questions asked trainers what other ways they are using scent work activities in their profession and whether they thought any negative effects exist from scent activities. Common responses were identified and sorted into categories. These were competition stress/stressful environment, arousal/overexcitement/frustration, behaviour problems, risks from use of aversives, handler problems, toxicity risks of odours and health concerns. Categories were identified for uses of scent work were improved behaviour outcomes, classes and training sessions, decompression/destress, mental stimulation and relationship building/caregiver education.

Scent work was defined in this questionnaire as a task where a dog is

Table 1
Definitions of scent-based activities.

Activity	Description
Scent work and nose work	Canine sports or recreational activities in which dogs are trained to find a 'hide', typically comprised of essential oils to earn a food or toy reward.[1]
Tracking	Training dogs to follow a scent trail left by humans or other animals across different surfaces, often by trailing disturbed vegetation or soil, with the dog able to indicate on discarded articles and the trail left by the tracked individual on the ground.
Mantrailing	Requires a dog to follow a scent trail matched to a stimulus or article that is presented to the dog (match-to-sample procedure) – the dog must match the odour to the one presented and track it.
Search and rescue	Dogs trained to locate missing persons across various settings and may be undertaken by privately owned dogs or working dogs.
Earthdog	Requires dogs to detect and locate contained rodents in a simulated underground or tunnel set up.
Barn Hunt	Involves dogs searching for rodents in an arrangement of hay or straw bales.
'Find it'/Object search	A trained, directed search in which dogs are taught to search for objects with human odour (mobile phone, keys, wallet) but may be used with directed food searches. Competition obedience has traditionally included an article search, with the handler's odour on an article.
Scent discrimination	Teaching a dog to search for a specific target scent such as truffles, animal scats or odours, currency, articles. The dog must discriminate between and ignore other scents in the environment.
Enrichment Activity	
Scent-based enrichment[2]	
Sensory gardens	An outdoor area planted with pet-friendly herbs, plants and flowers, and which may have additional smells scattered before use.
Biological scents	Any animal related odour (rabbit urine, sheep faeces, horsehair) introduced to the dog's environment for investigation.
Food essences, dried spices, essential oils or fresh herbs	Presented by dilution of these products, (e.g. vanilla essence, dried thyme, clove oil or fresh oregano), in water and being sprayed or scattered on surfaces or diffused into the air.
Sniffari	A walk or physical exercise with a dog which has a focus on letting the dog explore with their nose, with no social disturbances. A sniffari may include an area arranged with combinations of other scent activities such as biological scents, essential oils or spices and herbs.
Food-based enrichment[3]	
Scatter feeding	Food searching and treasure hunting where a dog needs to search for food scattered on the ground or hidden across an area.
Snuffle mats/activity mats	Dog searches for food hidden in a material mat or mat with pockets and flaps. Snuffle mats are typically made with strips of fleece material fixed to a mat, where dry treats are hidden under the strips of material and the dog must seek the treat out using their sense of smell.
Food games	Shell games, where food is hidden under a cup, shell, or in a hand, where the dog must guess the location of the hidden treat by using their nose.
Box games	Food hidden in boxes that the dog must locate which is not part of a formal nose work training criterion.

[1] Official recognised competition oils in Australia and the US are birch *(Betula lenta)*, anise *(Pimpinella anisum)*, clove *(Eugenia caryophyllata)*, and cypress *(Cupressus sempevirens)*. In the UK, the official odours are whole cloves (rather than an essential oil), gun oil (Napiers VP90 Gun Oil), and Truffle oil (English Truffle Oil). In Sweden, eucalyptus (*Eucalyptus globulus*), lavender (*Lavandula angustifolia*) and bay leaves (*Laurus nobilis*) are used.

[2] Scent-based enrichment (olfactory enrichment) - a dog uses their nose to investigate environmental stimuli, but where no consumption is involved.

[3] Food-based enrichment - any activity/toy/puzzle that a dog can engage with to access food but involves sniffing to find and locate the food.

trained to find a target odour and given a reinforcer once they locate it (e.g. nose work classes). The term nose work is intended to be synonymous with scent work in this case. Training methods were categorised as rewards-based, balanced training or traditional training. Rewards-based was defined as using a clicker or marker, providing a reinforcer after a desired behaviour (i.e. food or toy), shaping desired behaviours. Traditional-based training methods were defined as correcting undesirable behaviour verbally or physically (leash pop or other physical correction), compulsion (placement of pressure on backend for sit), dominance and/or pack theory focused advice. Balanced training was defined as a mixture of the above. None of the references to scents and scent-based activities include pheromone-based products as part of the definition.

2.3. Participants

Participants were recruited via dog training and scent work organisations, and the questionnaire was open to any country. A link to the online questionnaire was emailed to known organisations requesting to invite their members to participate. Snowball sampling recruitment was also used with organisations and individuals sharing the link online via social media. Inclusion criteria stated participants should be professional dog trainers, who had been working with dogs in a professional capacity (providing advice and expertise on dog training and behaviour for a fee) for a minimum of 6 months, were over the age of 18 and speak English fluently.

2.4. Statistical analysis

Participant results were downloaded from Survey Monkey and imported into IBM SPSS Statistics (Version 29.0.1.0; IBM Corp., Armonk, NY) for data cleaning and descriptive analysis. Most analyses (e.g., descriptive stats, chi-square tests) were conducted in SPSS, while post-hoc statistical tests (e.g., residual analysis, z-tests) were performed in Python using SciPy and statsmodels. Significance was assessed at $p < 0.05$.

Chi-square tests of independence were performed to examine associations between categorical variables (types of scent activities and practiced format). Post hoc analysis of standardised residuals was used to identify category combinations that contributed to significant associations. Residuals exceeding ± 2 were considered indicative of significant deviation from expected frequencies. To control for multiple comparisons, a Bonferroni correction was applied. Cramér's V was used to assess the effect size of the relationship between activity type and behaviour issue.

For the 5-point Likert-scale items assessing trainers' beliefs, one-sample Wilcoxon signed-rank tests assessed whether median responses differed significantly from the neutral midpoint (3), accommodating the ordinal data without assuming normality. For binary coding of belief statements (Agree vs. Neutral/Disagree), one-sample proportion z-tests were conducted to test whether the proportion of agreement significantly differed from a benchmark value of 0.50, representing a neutral distribution of opinion. A Bonferroni-adjusted alpha level of 0.00625 was used for these tests, reflecting the analysis of eight statements.

3. Results

A total of 645 responses were received, with 79 responses excluded due to incomplete data: 14 did not consent, 61 contained demographic answers only and 4 respondents identified as volunteer dog handlers rather than professionals taking a fee for services. This resulted in 566 responses for analysis. Participants were mostly female and ranged in age from 18 to over 65 years (see Table 2). Survey respondents came from 32 countries, with most from the US, UK and Australia. Thirty percent (n = 166/566) of trainers had no qualifications or certifications in dog training or behaviour. The trainers that did were most likely to be certified by the Certification Council for Professional Dog Trainers (CCPDT; 16 %, 91/566). Of credentials completed, 68 % (n = 386/566) of trainers had completed one qualification, 24 % (n = 133/566) had completed two and 6 % (n = 34/566) of trainers had 3 qualifications. Less than 2 % (n = 8/566) of trainers completed more than three credentials. The average experience as a dog trainer was 10.7 years (Median = 8 years) ranging from 6 months to 52 years. Trainers spent an average of 18 h per week (Median = 15 h) training dogs professionally with a range of less than one hour to 80 h. Dog trainers were mostly sole trainers in their practice.

Most trainers provided basic manners and puppy classes. Of the trainers offering scent-based services, scent work was offered by most trainers (60 %, n = 342/566), followed by tracking (14.8 %, n = 84/566) and mantrailing (9.9 %, n = 56). Most respondents said they offered either one (30 %, n = 172/566) or two (24 %, n = 136/566) canine sports. Fourteen percent (n = 79) offered three sport activities and less than 10 % (n = 56) engaged in more than four sports. Eighty nine percent of trainers (n = 505/566) that responded to the question regarding practiced methods, considered their training methods to be rewards based training methods. No respondents identified their training practices as traditional based.

3.1. Olfactory and food-based enrichment

Sniffaris, scent gardens and biological scents were used most frequently (Table 3). For food-based enrichment, scatter feeding and snuffle mats were the most used activities.

Chi-square goodness-of-fit tests were conducted to examine whether the distributions of olfactory and food enrichment strategies differed significantly from uniform distributions. Results indicated significant deviations for both enrichment types. For olfactory enrichment, the frequency of responses differed significantly across enrichment types, $\chi^2(6, N = 1379) = 629.11$, $p < 0.001$, with sniffari being the most frequently reported option. Presenting lavender scent and trainers not using any of the listed items were among the least selected options. Similarly, the distribution of food enrichment responses was significantly skewed, $\chi^2(4, N = 1882) = 426.49$, $p < 0.001$, with scatter feed and snuffle mat reported most often, while trainers selecting none of the available items being least common. These findings indicate clear preferences in the use of both olfactory and food enrichment.

Respondents were asked about the use of a series of scent-related activities within their professional practice (Table 4). Scent work was most likely to be offered in private sessions (41 %, n = 314). Scent work was the most common activity offered in both private and group classes compared to the other activities (69 %, n = 525). The object search 'find it' exercise and scent discrimination were commonly used by trainers in both group classes and private tuition. Barn hunt and Earthdog were the activity least likely to be offered. A chi-square test of independence revealed a significant association between activity type and method of practice, $\chi^2(15, N = 1920) = 834.33$, $p < 0.001$, indicating that the distribution of practice methods differed significantly across activities. Post hoc analysis of standardised residuals indicated 'scent work' and 'find it' activities were significantly more likely to be conducted via private sessions and group classes (standardized residuals > 7), and less frequently reported as not offered (residuals < -5). Conversely, 'Barn Hunt/Earthdog' and 'search and rescue' activities were significantly less often delivered through class or private training formats (residuals < -6) and more commonly not offered (residuals > 6).

Table 2
Dog trainer demographics.

Category	Variable	N = 566 (%)
Gender	Female	495 (87.5)
	Male	56 (9.9)
	Nonbinary	15 (2.6)
Age	18 – 24	7 (1.2)
	25 – 34	124 (21.9)
	35 – 44	126 (22.2)
	45 – 54	125 (22.2)
	55 – 64	131 (23.1)
	> 65	53 (9.3)
Country	United States of America	173 (30.5)
	Australia	148 (26.1)
	UK	115 (20.3)
	Canada	36 (6.3)
	New Zealand	18 (3.2)
	Other[a]	75 (13.2)
Education		
	No formal education	8 (1.4)
	High school (e.g. GED)	56 (9.9)
	Associate degree, Vocational/TAFE/Trade	161 (28.4)
	Bachelor's degree (BA, BSc, Honours)	178 (31.4)
	Postgraduate certificate or diploma	47 (8.3)
	Postgraduate Master's degree or equivalent	87 (15.3)
	Postgraduate PhD degree or equivalent	30 (5.3)
Dog Training Credentials*		
A. Formal academic or vocational qualifications		
	Certificate IV (Ie. Delta, vocational certificate)	55 (8.4)
	Certificate III Dog Training and Behaviour	40 (6.1)
	Companion Animal Sciences Institute (DipCBST/ ABST)	27 (4.1)
B. Professional certifications and memberships		
	Certified Professional Dog Trainer (CPDT/CPDT-KSA/ CBCC-KA)	91 (13.8)
	Institute of Modern Dog Trainers (IMDT)	63 (9.6)
	Karen Pryor Academy (KPACTP)	54 (8.2)
	International Association for Animal Behaviour Consultants (CABC/CDBC)	33 (5.0)
	Animal Behaviour and Training Council (AT/ATI/ ABT/AAB/CAB/VB)	33 (5.0)
	International Association of Canine Professionals (CDT)	19 (2.9)
	Animal Behavior College (ABCDT)	17 (2.6)
	Academy for Dog Trainers (CTC)	15 (2.3)
	Pet Professional Guild Accreditation (CCTA/PCBC/ PCT)	14 (2.1)
C. No formal accreditation/Other		
	None	160 (24.3)
	Other[b]	28 (4.2)
Number of employees		
	None (Sole trainer)	343 (60.5)
	1	62 (10.9)
	2 – 3	76 (13.4)
	4–7	58 (10.2)
	8 +	28 (4.9)
Canine sports and activities		
Scent-based sports and activities offered as services*		
	Nose work/Scent Work	342 (60.4)
	Tracking	84 (14.8)
	Mantrailing	56 (9.9)
	Search and Rescue	39 (6.9)
Non-scent based sports and activities offered as services*		
	Basic Manners / Puppy Class	407 (71.9)
	Agility	105 (18.6)
	Rally - O	99 (17.8)
	Competition Obedience	77 (13.8)
	Tricks	29 (5.1)
	Hoopers	26 (4.6)
	Freestyle	24 (4.2)
	Other[c]	82 (14.5)
Training Methods practiced		
	Rewards based training	505 (89.2)
	Balanced training	61 (10.8)

aOther countries: Austria (5), Belgium (3), Brazil (1), Chile (3), Denmark (1), Estonia (1), Finland (2), France (2), Germany (4), Greece (1), Hungary (1), India (2), Ireland (5), Israel (2), Italy (2), Malaysia (1), Malta (1), Mexico (1), Netherlands (7), Norway (4), Philippines (1), Poland (2), South Africa (9), Spain (2), Sweden (9), Switzerland (3), Thailand (1).

bOther dog training credentials: AbsoluteDogs Certificate (8); Certified Separation Anxiety Training (CSAT; 7), Victoria Stillwell Academy (VSA-CDT; 6); Pat Miller Certified Trainer (PMCT; 3); Animal Behavior Society Certified Behaviorist (CAAB/ACAAB; 2); DogNostics Dog Trainer Certification (DN-DTC/DBCD; 2).

cOther sport falling below 3 %: Barn hunt (13), Disc dog (13), Canine parkour (12), Treibball (10), Lure coursing (10), Herding (8), Dock dogs (8), Flyball (8), IGP/IPO (7), Earthdog (4), Sledding (3), Mondioring (3).

* respondents could select more than one option

Table 3
Frequency of scent-based enrichment types used by dog trainers.

Olfactory enrichment used	N = 566 (%)
Sniffari	473 (83.6)
Sensory Garden	259 (45.8)
Biological scents	243 (42.9)
Food essences/spices or herbs	143 (25.3)
Essential oils	113 (20.0)
Lavender	102 (18.0)
None of these	46 (8.1)
Food enrichment used	
Scatter feed	515 (91.0)
Snuffle mat	489 (86.4)
Box games	455 (80.4)
Food puzzle/games	396 (70.0)
None of these	27 (4.8)

Respondents could select multiple options.

Table 4
Scent activity services offered by dog trainers. N (%).

Activity type	Private Sessions	Group Classes	Refer	Don't offer
Scent Work	314 (55.5)	211 (37.3)	123 (21.7)	110 (19.4)
'Find it'	256 (45.2)	117 (20.7)	58 (10.2)	175 (30.9)
Scent discrimination	173 (30.6)	82 (14.5)	94 (16.6)	223 (39.4)
Mantrailing	78 (13.8)	68 (12.0)	102 (18.0)	287 (50.7)
Search and Rescue	67 (11.8)	47 (8.3)	94 (16.6)	324 (57.2)
Barn Hunt/ Earthdog	11 (1.9)	8 (1.4)	81 (14.3)	358 (63.2)

Respondents could select multiple options across service types or referrals.

3.2. *Scent work in practice*

Trainers were asked the percentage of time they spent training scent activities in their profession. Time spent training scent activities professionally ranged from 1 to 100 % with the mean being 34 % (SD = 31) of the time. Sixty-one percent (n = 347/566) of trainers also run their own dogs in scent activities. Participants were asked if they held credentials specific to scent work (in addition to the dog behaviour credentials in Table 2). Sixty percent (n = 340/566) of all trainers hold no scent work specific credentials. Of the 28 % (n = 161/566) that stated they were accredited in scent work or nose work, 7 % (n = 38/566) individuals stated they have a Certified Nose Work Instructor accreditation through the National Association of Canine Scent Work (USA). Sixteen percent (n = 89/566) stated they have an operational background (have trained working dogs in a professional setting as a handler such as a police detection handler). When asked about types of reinforcers (rewards) used during scent training, 54 % of respondents selected food rewards (n = 513), while 39 % selected toy rewards (n = 372). The use of only verbal praise (n = 43; 5 %) or pats (n = 16; 2 %) were less commonly selected. Trainers could select more than one option for the type of reinforcer they used during scent training.

Three questions were asked to respondents who had specified the capacity in which they were involved in scent-based activities was offering these services as classes or private sessions. The three questions were skipped for trainers who specified they are not offering scent activities in their profession. When introducing odour to a dog, trainers paired odour directly by presenting the scent to the dog in conjunction with the food or toy reinforcer (45 %, n = 160/352), or taught dogs to search for food first, and introduced odour at a later stage when dogs were proficient in searching (40 %, n = 141/352). A smaller number trained dogs an 'alert' behaviour as a first step, pairing the alert to the odour before teaching the search (15 %, n = 51/352).

Respondents most frequently reported using essential oils and competition oils for training (birch, cypress, anise, clove, gun oil, lavender; 45 % n = 247). Other common odours used in scent training were rubber Kong pieces (18 %, n = 101), human odour (17 %, n = 93), vegemite (2 %, n = 9) and 'Other' (18 %, n = 96) including biological odours derived from animal sources (n = 18), tea and food essences (n = 9) and food (n = 7). Biological odours include animal-based scents derived from an animal source such as urine, faeces or animal hair.

Fifty nine percent of trainers who responded in this section kept dogs in cars or out of visual proximity so that they could not see other dogs between scent activities (59 %,n = 125/213), while other trainers tethered dogs in visual proximity to other dogs or kept them in crates where they could see other dogs (41 %, n = 88/213).

3.3. *Beliefs about scent work and behaviour*

Participants were asked about reasons people are motivated to do scent work with their dogs, 504 responses were received, and participants could select multiple responses. The most common reason to motivate individuals was considered to be 'fun' (31 %, n = 374) and 'relationship between handler and dog' (27 %, n = 314). 'Dogs not suited to other sports or activities' was less frequently selected (17 %, n = 204), as was 'trials or competition' (11 %, n = 134) and 'behaviour therapy' (11 %, n = 131). A number of respondents selected 'other' (3 %, n = 31) and specified answers including, 'it tires dogs out', 'for professional work', 'easier than other sports', 'provide enrichment', and 'to try something new'.

Respondents were asked to rate their agreement towards statements

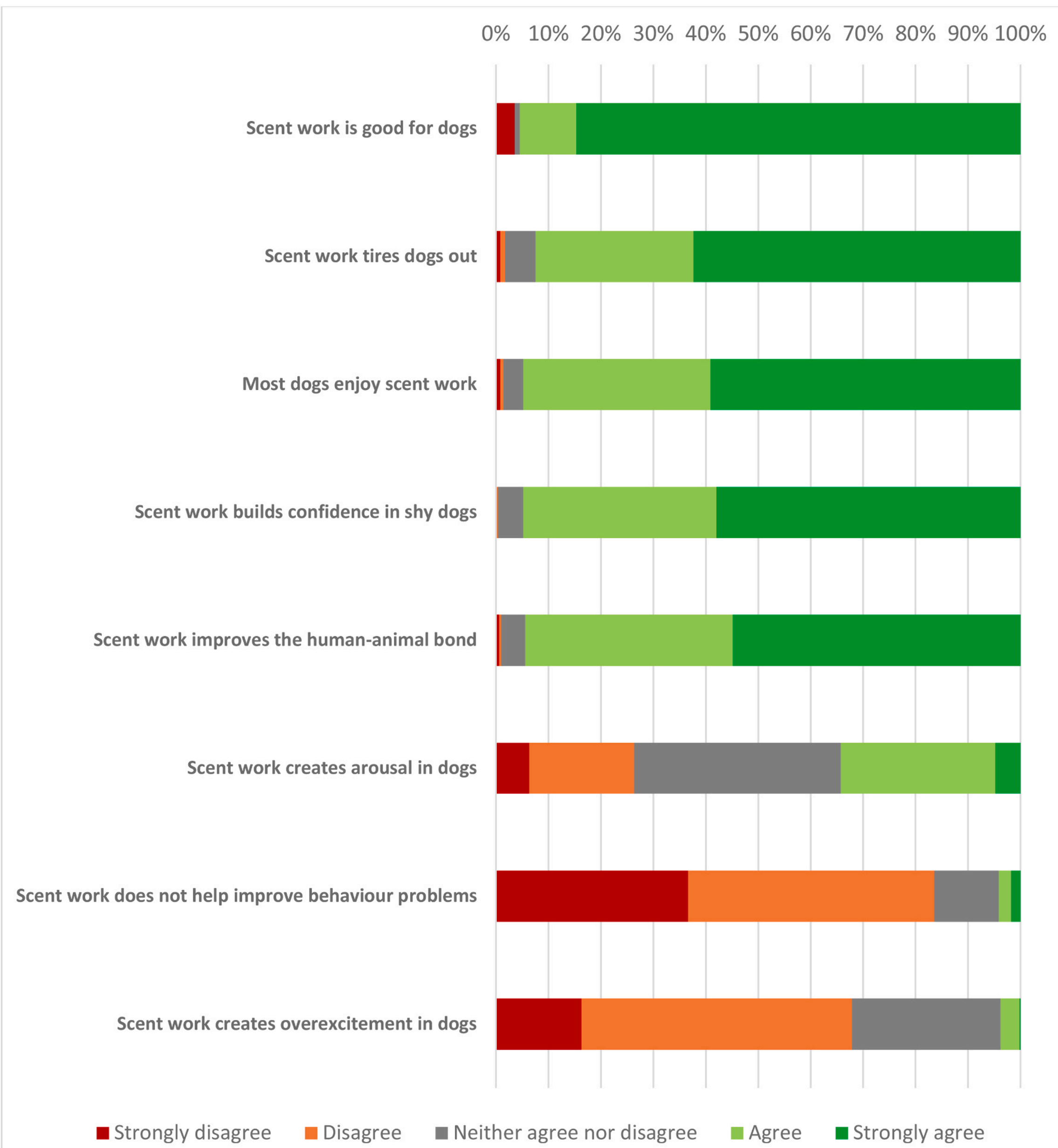

Fig. 1. The beliefs of trainers (n = 566) regarding agreement to statements about scent work/nose work.

about scent work. One-sample proportion z-tests were conducted to determine whether the proportion of respondents agreeing with each belief statement differed significantly from a neutral benchmark of 50 %. All statements showed statistically significant deviations from neutrality ($p < 0.001$), even after Bonferroni correction (adjusted $\alpha = 0.00625$). The majority of respondents disagreed with statements suggesting scent work creates overexcitement, creates arousal, or is ineffective in addressing behaviour problems. In contrast, there was significant agreement with statements describing scent work as beneficial, including its role in improving the human-animal bond, building confidence in shy dogs, being enjoyable for most dogs, providing mental stimulation (e.g., tiring dogs out), and being generally good for canine well-being. Respondents considered scent work to be good for dogs, that most dogs enjoy scent work and disagreed that dogs were aroused by engaging in scent work. Most respondents disagreed with the statement 'scent work does not improve behaviour' (see Fig. 1).

Trainers were asked to rate the extent to which they agreed specific behaviour variables were likely to be reduced by doing scent work (Table 5). A chi-square test of independence was performed to assess the relationship between behavioural variables and response frequencies on a 5-point Likert scale. The results indicated a statistically significant association, $\chi^2(11) = 1170.24$, $p < 0.001$, indicating that response distributions differed significantly across the 12 behaviour variables. Post hoc analysis of standardised residuals identified several combinations that contributed to the significant association. Agreement was significantly higher than expected for 'generalised fearfulness' ($z = 10.96$), 'generalised anxiety' ($z = 9.67$), 'destructive behaviour' ($z = 5.42$), and 'overexcitement' ($z = 5.39$). Agreement for 'reactivity to unfamiliar dogs' was also above expected levels ($z = 2.90$). Conversely, disagreement was significantly more frequent than expected for 'severe separation anxiety' ($z = 8.75$), 'pulling on lead' ($z = 7.85$), 'dog-dog inter-house aggression' ($z = 7.44$), and 'jumping up on people' ($z = 5.49$). Standardised residuals were interpreted using a Bonferroni-adjusted alpha level of 0.0021, with values exceeding ± 3 considered statistically significant.

Trainers were asked to rate the types of scent activities that are effective in reducing anxiety and overexcitement (Supplementary material S2). A chi-square test was performed to assess the relationship between perceived effectiveness of various scent activities on canine anxiety, which showed a statistically significant association, $\chi^2(12) = 680.09$, $p < 0.001$. Post hoc analysis of standardised residuals identified behaviour variables contributing to this association. Significant positive residuals for agreement with effectiveness were observed for 'sniffaris' ($z = 4.21$) and 'scatter feed' ($z = 3.38$), indicating these activities were rated as effective more often than expected by chance. Conversely, 'Mantrailing/tracking' showed a significant negative residual for perceived effectiveness ($z = -8.43$) and large positive residuals for both disagreement ($z = 3.02$) and uncertainty ($z = 19.48$).

Chi-square tests revealed a significant association between scent activity type and perceived effectiveness on reducing overexcitement in dogs, $\chi^2(12) = 613.10$, $p < 0.001$. Post hoc analysis of standardised residuals revealed specific behaviour variables driving this association. 'Sniffaris' demonstrated significantly greater than expected agreement ($z = 3.31$), with significantly fewer responses indicating disagreement ($z = -2.73$) or uncertainty ($z = -5.50$). Similarly, 'directed search for food' and 'scatter feed' showed higher agreement ($z = 2.43$ and 2.00, respectively) and lower uncertainty ($z = -5.26$ and -4.46, respectively). In contrast, 'Mantrailing/tracking' was associated with significantly lower agreement ($z = -8.39$) and higher rates of both disagreement ($z = 2.71$) and uncertainty ($z = 19.81$). Other activities, including 'snuffle mats', 'find it', and 'scent work/nose work', showed smaller deviations from expected frequencies.

Chi-square test of independence analyses revealed statistically significant differences in perceived effectiveness for several enrichment activities when comparing anxiety with overexcitement. 'Mantrailing/tracking', 'sniffaris', and 'directed food searches' showed the strongest differences ($p < 0.0001$), indicating these activities were rated as more effective for anxiety than overexcitement. In contrast, 'scent work/nose work' ($p = 0.1399$) and 'snuffle mats' ($p = 0.2109$) showed no significant difference. Cramér's V was conducted to evaluate the strength of association between the specific scent activities and their reported effectiveness for addressing either anxiety or overexcitement. Five activities demonstrated statistically significant associations, indicating differential effectiveness across behaviour variables (See Supplementary material S2). 'Mantrailing/tracking' showed the strongest association (Cramér's $V = 0.267$), approaching a medium effect size. 'Sniffaris' ($V = 0.171$), 'directed food searches' ($V = 0.164$), 'Find it' games ($V = 0.124$), and 'scatter feeding' ($V = 0.102$) also exhibited small but statistically meaningful effects.

All respondents were asked to what extent they agree it is acceptable to correct a dog (leash or verbal correction) for a series of behaviours during scent work training (Supplementary material S3). A significant relationship exists between dog behaviour variable and perceived acceptability of correction, $\chi^2(8) = 44.71$, $p < 0.001$. Standardised residuals identified key associated agreements about behaviour. 'False positive' was rated 'Sometimes' and 'Always acceptable' less than expected (–3.21, –2.04), while 'Never acceptable' was higher (+1.77). For 'eliminates in training area', the 'Always acceptable' category had significantly more agreement than expected (residual = 4.24). Additionally, 'overly distracted' behaviour was rated 'Always acceptable' less frequently than expected (residual = –2.00).

In response to one open ended question 'do you believe there are any negative effects for dogs doing scent work or scent activities, if so what are they?', 383 (68 %) trainers volunteered responses. Following removal of 182 'no' or 'N/A' responses, two hundred and one responses were analysed and sorted into seven 'negative effect' categories (Table 6). Some respondents provided answers which contained multiple categories. The most frequently mentioned concern for potential negative effects was competition stress or environmental stressors ($n = 54$), followed by arousal ($n = 44$) and behaviour problems ($n = 42$).

The next open-ended question asked, 'Do you incorporate scent work activities to improve behaviour outcomes for dogs in any other ways?'. Following removal of sixty 'no' or N/A responses, the remaining 303 responses were analysed and organised into categories. Of respondents that noted ways of incorporating scent activities into their practice, changed behaviour outcomes was the most common use identified ($n = 109$).

Table 5
Broad agreement of dog trainers regarding extent to which the following behaviours are reduced through participation in scent work. N (%).

Variable	N	Agreement	Disagreement
Generalised fearfulness	505	411 (81.4)	94 (18.6)
Generalised anxiety	505	391 (77.4)	114 (22.6)
Destructive behaviour	505	325 (64.4)	180 (35.6)
Overexcitement	504	324 (64.4)	180 (35.7)
Reactivity to unfamiliar dogs	505	286 (56.6)	219 (43.4)
Reactivity to humans	503	229 (45.5)	274 (54.5)
Mild separation anxiety	505	225 (44.6)	280 (54.5)
Noise phobias	505	214 (42.4)	291 (57.6)
Jumping up on people	503	151 (30.0)	352 (70.0)
Dog-dog inter house aggression	502	119 (23.7)	383 (76.3)
Pulling on lead	504	113 (22.4)	391 (77.6)
Severe separation anxiety	503	98 (19.5)	405 (80.5)

For the purpose of analysis, responses were grouped into two categories: Agreement ("Agree", "Strongly agree") and Neutral/Disagreement ("Neither", "Disagree", "Strongly disagree"). This was done to simplify interpretation.

See supplementary material (S1) for clarifications of behaviour variables in survey question 24.

4. Discussion

This survey aimed to explore beliefs and practices related to scent-

Table 6
Responses separated into categories for the open-ended questions relating to perceived negative effects of scent activities and ways trainers incorporate scent activities into their practices. Respondents could provide more than one theme within a response.

Theme (Definition)	Quotes
Do you believe there are any negative effects for dogs doing scent work or scent activities, if so what are they? (n = 201)	
Competition Stress/Stressful environment (n = 54)	
Expresses concern over environmental stressors	'Competition environments can be aversive for some dogs so they can be in conflict between arousal at nose work and anxiety in the trial environment'
Arousal/overexcitement/frustration (n = 44)	
Expresses concerns about dog arousal levels	'Some dogs do get over aroused from scenting which can cause frustration in both dog and handler if the dogs is over threshold and not able to indicate or perform trained behaviours.'
Behaviour problems (n = 42)	
Expresses concerns regarding distraction to smells in other settings, stimulus control issues, increase leash pulling/scavenging/counter surfing	'Searching the environment of food can create an undesirable habit (distraction, counter-surfing).'
Risks from use of aversives (n = 28)	
Expresses concerns regarding handler use of aversives	'If punishment is used, then for most dogs the beneficial effects would be much depleted or even lost altogether.'
Handler problems (n = 17)	
Expresses concerns regarding handlers	'Some owners can be overbearing'
Toxicity risk of odours (n = 9)	
Expresses concerns regarding toxicity risk that odours may pose	'Strength of odors used is a concern.'
Health concerns (n = 7)	
Expresses concern about physical body strains, respiration issues and overheating.	'If a dog is doing scent work in the heat, there is a risk of the dog overheating due to not panting enough.'
Do you incorporate scent work activities to improve behaviour outcomes for dogs in any other ways? (n = 303)	
Improved behaviour outcomes (n = 109)	
Expresses belief about resulting behaviour change	'SW [scent work] has helped several shy dogs and environmentally sensitive dogs cope with these challenges and improve communication between the handlers/owners and their dogs.' 'Worked wonders for a dog with severe spinning and self-mutilation. Owner learned to recognize triggers and would set a few hides if she saw the precursors to him "losing it". After hunting no negative behaviors. They were able to take him off all drugs. This dog that any change in his routine or environment would set him off, after a year or so of regular classes could participate in classes held at a busy park be totally focused and go home a happy and relaxed dog.'
Classes and training sessions (n = 79)	
Expresses examples of scent activities used within training sessions	'Treat scatters in grass or use of snuffle mats for behavior mod- to lower arousal levels and get the dog engaged in sniffing as an alternative behavior around triggers. Nose work and scent work searches in new places to help neophobic dogs acclimate to a space.'
Mental stimulation (n = 53)	
Expresses ways in which scent work improves dogs' lives	'Scent work can help senior dogs to become more active again and even improve first signs of dementia. It is a great activity to form a bond with a new (adult/adopted) dog. And last but not least: I wouldn't call it scent work, but scent does work: leaving a worn shirt with a dog when left alone often helps calming down in a new environment (hotel, new home/car etc.).' 'Low impact exercise for normally high energy dogs following surgery or when recovering from injury. It's also an easy way for owners to exercise a very active dog when the owner is incapacitated in some way, or when extreme weather prevents outdoor exercise.'
Decompression/destress (n = 47)	
Expresses belief of relaxation, lowering stress levels or arousal after scent work activities.	'I will condition certain scents to create emotional responses, such as releasing a scent into the environment when a dog is relaxed to use in non-relaxing situations such as the vets. Will also use human scent conditioning via positive association with an article of clothing that smells like a stranger if dog doesn't like people coming into the house.'
Relationship building/caregiver education (n = 15)	
Expresses belief handling skills and knowledge of body language improve with scent classes	'Really mostly to improve owners handling and training skills. It is a great activity to work on reinforcement frequency, quality, placement and timing. Also to work on clean loops, the power of repetition, observing small signals from dogs etc. The dogs gain, on that their owners develop these skills.'

based activities in the dog training industry. Specifically, we investigated how professional dog trainers are using scent-based activities in their practice and explored perceptions around the impact of olfactory enrichment and exercises on behaviour in companion dogs. The most practiced scent-based training activity was scent work, training companion dogs to locate odours for a reinforcer. Further, the most used enrichment activity was taking dogs on sniff-based walks (sniffaris) or offering food in scatter feeding or on snuffle mats. Most trainers believed participating in scent-based activities positively influenced dog welfare and helped reduce anxiety and overexcitement.

4.1. *Most common activities reported*

Scent work was the most common activity offered as a service and was most often taught privately in one-on-one sessions (41 %). Scent work has gained popularity as an offering in class settings, often with dogs participating one at a time, which may reduce social interaction with other dogs and making it ideal for those sensitive to unfamiliar dogs (The American Kennel Club, 2022). One explanation for the increased popularity of private coaching for scent work exercises may be lockdown restrictions or reduced interactions with other people during the Covid pandemic (Brand et al., 2022; Christley et al., 2020; Merritt et al., 2025). However, offering private sessions may accommodate dogs that have mobility limitations, geographical or social restrictions that prevent them from attending classes.

Sniffing-oriented walks, or 'sniffaris', were the most practiced enrichment activity (85 %). While there is no strict definition of a sniffari, anecdotal descriptions include dog-centered walks emphasising uninterrupted sniffing, and/or exploration of a pre-determined space without encountering other dogs (Miller, 2024). There is a higher frequency of ground sniffing for dogs off versus on-leash (Westgarth et al., 2010). On walks, sniffing provides information about the environment and previous passersby (Horowitz et al., 2013). Sniffing often precedes urination or defecation and helps dogs detect semiochemicals (chemical information about other individuals and species) and conspecific pheromones (Lisberg and Snowdon, 2009; Wyatt, 2017). Sniffing-focused walks provide the additional advantage of being either free, or relatively low in cost if transportation is necessary, and may serve as an easily accessible scent-based activity for many caregivers.Sensory gardens comprised of a planted area with dog-friendly (non-toxic) herbs, shrubs, flowers and biological scents were also common types of enrichment used (46 %). More research is needed to understand if activities such as sniffaris and scent gardens are contributing to improved behaviour outcomes for dogs. These activities may be easier for caregivers to implement compared to training a scent task.

4.2. Food-based vs non-food based scent enrichment

This survey investigated the use of food-based scent enrichment where dogs must find food, and scent-based enrichment where fragrances and odours are placed into the environment to influence behaviour. Provision of scents has been used as enrichment in many animal care settings, such as zoological facilities, animal shelters and kennels (Bini de Lima et al., 2023; Clark and King, 2008; Wells and Hepper, 2017).

Food-based scent enrichment had a higher frequency of reported use. Scatter feeding, snuffle mats and box games were all reported. Heys et al. (2024) also identified scatter feeding and snuffle mats as frequently reported enrichment feeding activities used by caregivers. In their survey, just over half of respondents reported scent games as a type of enrichment used, but they did not provide a definition of scent games. Heys et al. (2024) reported motivations for using food-based enrichment including delivery of meals and keeping unattended dogs busy, concluding that feeding from the bowl may be less stimulating. In our questionnaire, respondents reported the use of scatter feeding during exercise and training as a redirection technique, to provide dogs an alternative focus and act as a conditioning procedure to change an emotional response directed towards a present trigger (counterconditioning).

Scent-based enrichment activities were less frequently reported by trainers. Despite growing evidence for potential applications of scent-based enrichment (Fountain et al., 2024; Nielsen et al., 2015; Wells, 2009; Wells and Hepper, 2017), relatively few trainers employed essential oils, food fragrances or herbs and spices. Howard et al. (2024) and Murtagh et al. (2020) found shelter dogs engaged more with scented toys than unscented ones, but showed no overall scent preference, suggesting scent novelty matters more than type. Haverbeke et al. (2024) showed that lower essential oil concentrations had no behavioral effect, while a higher dose increased relaxation and reduced panting.

4.3. Attitudes of trainers to positive behaviour changes with scent

Trainers held an overall positive belief about scent work being good for dogs and predominantly agreed with statements emphasising the advantages of scent work, such as enjoyment and confidence building. There was broad agreement that scent work improves behaviour outcomes for dogs exhibiting general fearfulness and generalised anxiety. Trainers expressed agreement for reductions in destructive behaviour, overexcitement or arousal, and reactivity towards unfamiliar dogs and people. Overexcitement, arousal and low reaction latency to unfamiliar stimuli may be associated with impulsivity in dogs. Measures of behavioural reactivity and response to novelty have been used in validated scales (Wright et al., 2012, 2011). Recent research explored the impact scent work has on impulsivity, showing scent work engaged dogs had stronger inhibitory control compared to dogs that primarily engage in agility (Mellor et al., 2024). Mellor et al. (2024) also measured stress indicator behaviours during cognitive testing and obser`ved no difference in arousal levels for scent work trained dogs compared to agility or obedience trained dogs. Respondents in our survey showed less certainty around the statement that scent work creates arousal in dogs but disagreed that scent work creates overexcitement. Moreover, varying levels of experience and knowledge among trainers may influence their perception or interpretation of fear-based and other problematic behaviors, as well as the accuracy of their assessments (Walsh et al., 2024). Although trainers generally outperform non-professionals in identifying canine body language (Tami and Gallagher, 2009), professionals may differ in their interpretation of challenging behaviors associated with anxiety and fear, depending on their training background and attitudes (Hunter et al., 2020).

When asked about effectiveness of specific scent activities in reducing anxiety and overexcitement, the highest level of agreement between scent trainers was noted for sniffaris, directed food searches, snuffle mats and scent work/nose work. Current literature supports that nose work can increase optimism in dogs (Duranton and Horowitz, 2019) and it is known that training can be enriching for animals (Fernandez, 2022). Ohno et al. (2022) measured heart rate in search and rescue dogs, finding strong positive emotions were estimated from calculations of the beat-to-beat intervals, when dogs had located victims. However, the sample size was low, and results may differ from dogs in other settings. Another recent study found no significant changes in behaviours deemed desirable for adoption in shelter dogs that participated in scent work (Semione, 2024). However, the scent work intervention only lasted one session, presumably not long enough to see any notable behavioural changes nor achieve any stimulus control or fluency of the behaviour.

In open-ended questions about the uses of scent work in the context of training classes, trainers referred to using activities that calm, lower arousal and relax dogs. While it has been proposed that scent work training may be a targeted activity to benefit dogs (Fountain et al., 2024; Rooney and Parr-Cortes, 2023), there has not been adequate empirical research to support this. Trainers who specifically mentioned scent work as a treatment for behaviour problems provided anecdotal examples of cases in which scent work has resulted in positive changes, such as decreased general fearfulness and generalized anxiety (Hewings, 2019; Parthasarathy, 2011). Scent activities are something all dogs can seemingly excel at, regardless of their age, breed, size or sex (Chvala-Mannsberger et al., 2021; Salamon et al., 2024, 2025) and as reported by respondents in the open-ended questions, are an activity dogs can do if they are recuperating from injury, elderly or confined indoors.

When asked why people do scent work with their dogs, most trainers believe caregivers are motivated by the fun of participating. Notably, the perception that individuals engage in scent work with their dogs as a form of behavioral therapy was considerably lower, despite frequent anecdotal discussion (Bender and Strong, 2019; Hewings, 2019; Rooney and Parr-Cortes, 2023). In studies investigating motivation to participate in canine sports, reasons given include: providing exercise and enrichment for dogs and their handlers, spending quality time together, fostering social connections with other dog owners, engaging in activities aligned with their breed's natural abilities (such as sledding for Huskies), and pursuing competitive goals such as obtaining titles and winning competitions (Farrell et al., 2015; Pálinkás, 2024; Riemer and Thomas, 2005).

4.4. Attitudes of trainers to potential negative effects of scent work

Trainers were asked about possible negative effects of participating in scent work. Concerns included negative stress from trialing and competition, specifically about handlers prioritising winning above the dog's needs. Salivary cortisol and behavioral ethograms at agility competitions indicate the environment may be stressful for dogs (Pastore et al., 2011). Dogs exhibited increased restlessness, tail wagging, panting, and trembling before the event, along with elevated post-competition salivary cortisol - reflecting anticipation and arousal. These responses may represent either positive or negative stress. In Dickinson and Feuerbacher (2025), search and rescue dogs experiencing frustration had decreased heart rate variability and increased heart rate, which they conclude could indicate a negative impact on welfare.

Likewise, in our survey, arousal of dogs was a concern regarding negative effects on dogs in the open-ended questions. However, fewer trainers agreed that arousal increases because of scent work.

Further negative effects reported in the open-ended questions included risks from aversive stimuli used by the handler and health concerns. A small number of trainers applied physical or verbal corrections, but most trainers agreed it was never acceptable to apply a correction. Ziv (2017) summarised the concerns surrounding the use of aversive methods such as physical and verbal corrections, which can jeopardise physical and mental health in canines. Dogs who experience more aversive stimuli during training sessions have lower performance levels (Haverbeke et al., 2008). Presumably any form of perceived aversive paired with the target odour, such as if they mouth or lick the container, could diminish the search response, risk reducing performance and increase anxiety in the search environment. Injury can occur both from use of aversives, but also possible strains from physically demanding trials or competitions in which more studies are needed to understand prevalence (Essner et al., 2024).

There are limitations within this survey including the potential for a biased sample not fully representative of the dog trainer population. Like other surveys, our sample included mostly majority of female respondents with a large proportion of trainers identifying as rewards-based (Hunter et al., 2020). Further research should include a more diverse sample of respondents across gender identities and training methodologies. It is possible that trainers from different regions may have different working definitions of some terms in this survey defining scent activities or how they are practiced. Interpretation of canine behaviour and states of stress may vary across individuals of different professional levels and experience. Understanding of possible behaviour change outcomes across dog trainers is an area that would benefit from future research and responses from professionals may be a limitation in this study (Walsh et al., 2024).

5. Conclusions

We found the most common scent activities are private scent work training, sniffaris, and providing planted sensory gardens. Trainers believe that scent work is good for dogs and tend to agree that scent enrichment activities can be effective in reducing general fearfulness, anxiety, and addressing overexcitement. As evidence is currently limited in this area, future work should investigate the degree to which dog-centered activities that focus on their strongest sensory systems might provide independence to dogs and enhance wellbeing. These investigations could consider how providing agency during walks and time to sniff stimuli of interest to them might be of benefit. Further research into physiological and behavioural changes that occur as a result of participating in scent activities will be an important next step.

CRediT authorship contribution statement

Robert Hewings: Writing – review & editing, Methodology. **Susan J. Hazel:** Writing – review & editing, Supervision, Methodology, Formal analysis, Conceptualization. **Jade Fountain:** Writing – review & editing, Writing – original draft, Visualization, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Todd J. McWhorter:** Writing – review & editing, Writing – original draft, Supervision, Formal analysis.

Declaration of Competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.applanim.2025.106837.

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