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Stress- or Arousal-Related Behaviours in Agility Dogs Attending Centres with Different Training Approaches: An Exploratory Study

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Abstract: Agility is a canine sport that requires both physical ability and close coordination between dogs and their handlers. Although agility is often regarded as a positive activity for dogs, it may also elicit stress or heightened arousal. In this exploratory study, handler-reported behaviours of 52 agility dogs were assessed across five stages of agility participation: on the way to the agility club (T0), upon arrival (T1), during training (T2), during breaks (T3) and when leaving the club (T4). Of these dogs, 36 attended a centre where aversive training techniques were used (Centre A), whereas 16 attended a centre that relied primarily on non-aversive methods (Centre B). Handlers from Centre A were more likely to report barking during training and breaks, as well as a greater number of behaviours considered potential indicators of stress or heightened arousal during training, than handlers from Centre B ($p < 0.05$). Given the exploratory design, small sample size, several confounding factors, and the absence of correction for multiple comparisons, the findings should not be interpreted as evidence that the observed differences were attributable solely to the training approach. Further research using larger samples, better control of potential confounding factors, and complementary behavioural and physiological measures is needed to draw more robust conclusions.

Keywords: agility; aversive techniques; behavioural indicators; dog welfare; positive reinforcement

HIGHLIGHTS

- Stress- or arousal-related behaviours were compared between agility dogs attending two centres with different training approaches.
- Differences between centres were observed in barking during training and breaks, as well as in the overall frequency of potential indicators of stress or heightened arousal during training.
- The exploratory study design and several confounding factors preclude causal conclusions and highlight the need for further research.

INTRODUCTION

The Dog-Human Bond

The relationship between dogs and humans is thought to date back 12,000 to 30,000 years (Bionda et al., 2023; Freedman & Wayne, 2017; Grimm, 2015; Jouventin et al., 2016; Siniscalchi et al., 2018). Throughout this period, dogs have been bred and selected for a wide range of tasks, from hunting, herding, and livestock protection to more recent roles such as drug detection or serving as guide dogs for visually impaired people (Bionda et al., 2023; Cavanaugh et al., 2008; Fernandes et al., 2017; Rooney & Bradshaw, 2004; Topál et al., 1997). Effective training plays an essential role in the human-dog relationship, enabling dogs to perform these tasks while adapting to human society (Deldalle & Gaunet, 2014; Dinwoodie et al., 2021; Vieira de Castro et al., 2020).



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The Relationship Between Agility and Stress

Agility is a sport in which dogs are guided through a series of obstacles within a limited time, requiring speed, accuracy, physical fitness, and obedience (Pastore et al., 2011; Rovira et al., 2007; The Kennel Club, n.d.). Agility dogs are exposed to multiple environmental and social stimuli that may elicit stress or heightened arousal, although agility is generally considered an enjoyable activity (Carpenter et al., 2020; Pastore et al., 2011).

Stress is a state of the organism triggered by internal or external factors that disrupt homeostasis and elicit physiological and behavioural responses (Mormède et al., 2007; Pastore et al., 2011; Polgár et al., 2019; Veissier & Boissy, 2007). Because physiological measurements are not always feasible under field conditions, behavioural indicators are widely used to assess stress and welfare in dogs (Beerda et al., 1998, 1999; Deldalle & Gaunet, 2014; Pastore et al., 2011). Handler-completed questionnaires provide a practical tool for assessing behavioural changes over time, as handlers are generally familiar with their dogs' behaviour (Mariti et al., 2012).

Training Methods and Welfare

One of the factors that may influence the occurrence of behaviours associated with stress or heightened arousal is the training method employed (Arhant et al., 2010; Fernandes et al., 2017; Vieira de Castro et al., 2020). Training methods may be classified as either reward-based or punishment-based (Casey et al., 2021), and the method considered most appropriate is typically selected by the people working with the dogs (Fernandes et al., 2017; Ziv, 2017).



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Traditional dog training techniques primarily rely on positive punishment and negative reinforcement, both of which involve the use of aversive stimuli (Arhant et al., 2010; Haverbeke et al., 2008; Hiby et al., 2004; Ziv, 2017). Positive punishment consists of applying an aversive stimulus following undesirable behaviour, whereas negative reinforcement involves the removal of the aversive stimulus when the dog exhibits the desired behaviour (Hiby et al., 2004). Although these techniques may be effective in certain situations (Christiansen et al., 2001; Marschark & Baenninger, 2002), they have also been associated with welfare concerns and behavioural problems, including stereotypies, fear, and aggression (Arhant et al., 2010; Dinwoodie et al., 2021; Haverbeke et al., 2008; Ziv, 2017).

In contrast, positive reinforcement, which involves providing a reward following a desired behaviour (Hiby et al., 2004), and negative punishment, in which a positive stimulus is removed to interrupt an unwanted behaviour (Casey et al., 2021), have been associated with fewer behavioural problems, improved obedience, reduced distress, and fewer human-dog conflicts (Arhant et al., 2010; Casey et al., 2021; Dinwoodie et al., 2021; Zilocchi et al. 2016). Although positive reinforcement-based techniques are increasingly used in dog training, they are still frequently combined with punitive methods, particularly in working dogs (Hiby et al., 2004; Marschark & Baenninger, 2002; Rooney & Cowan, 2011).

Research Gaps in Agility Dog Welfare

Although the relationship between training methods and dog welfare has been extensively investigated in companion and working dogs (Angle et al., 2009; Carpenter et al., 2020; Gillette et al., 2011; Pastore et al., 2011; Rooney et al., 2007), considerably less attention has been paid to dogs participating in canine sports, particularly regarding behavioural responses across the different stages of agility participation. Most previous studies have focused on isolated aspects of training or competition, whereas agility involves a sequence of distinct experiences, including anticipation before training, exposure to the training environment, active performance, waiting periods, and departure from the agility centre. The assessment of behavioural responses across these successive stages, and in agility clubs characterised by different training approaches, may contribute to a more comprehensive understanding of dogs' emotional experiences and welfare within this sporting context.

Study Objectives

The aim of this exploratory case-comparison study was to compare the frequency of stress- or heightened arousal-related behaviours in agility dogs

attending two centres with different training approaches. It was hypothesised that dogs attending the centre employing aversive techniques would exhibit these behaviours more frequently than those attending the centre relying primarily on non-aversive methods.

MATERIALS AND METHODS

Study Subjects and Data Collection

A total of 52 handlers of agility dogs voluntarily and anonymously participated in this study. 36 handler-dog dyads attended an agility centre where aversive training techniques were used (hereinafter referred to as Centre A), whereas 16 were attended a centre that relied primarily on reward-based methods and negative punishment (hereinafter referred to as Centre B). The description of participating centres has been provided in [Table 1](#).

Information on the training practices and other characteristics of each centre was obtained through repeated direct observations conducted by the author during visits to both facilities. These observations were descriptive and not systematically quantified. Consequently, the frequency of specific interventions, including physical corrective techniques, could not be determined. The centres also differed in several characteristics besides their training approaches. Therefore, the present study should be interpreted as an exploratory case-comparison between two agility centres rather than as a controlled evaluation of training methods. Participating breeds are listed in [Table 2](#).



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Characteristics of the Participating Agility Centres		
Characteristics	Centre A	Centre B
General characteristics	- Operating for 7 years. - Main activity: agility. - Additional services: obedience training, scent detection, introductory herding, and dog daycare.	- Operating for 20 years. - Main activity: obedience training. - Additional services: scent detection and dog daycare.
Trainer characteristics	7 years of experience as an agility instructor. - Experience as an agility competitor. - Uses positive reinforcement combined with positive punishment.	20 years of experience as an agility instructor. - Experience in canine behaviour education and rescue dog training. - Uses positive reinforcement combined with negative punishment.
Handler characteristics	Higher proportion of handlers participating in agility competitions.	Most handlers attend for recreational purposes, and few participate in agility competitions.
Training environment	Sessions are conducted in groups of up to 4 dyads. The trainer determines the order of participation, and dyads take turns.	Sessions are conducted individually, allowing the trainer to focus exclusively on one handler-dog dyad.
Training approach	- Incorrect performances are corrected using verbal punishment, typically a loud 'No!'. If the dog fails repeatedly, the obstacle is skipped. - In cases of overarousal, the trainer recommends physical corrective interventions, including kicking the dog and forcefully grabbing the lumbar skin.	- When a dog performs an exercise incorrectly, the handler gently pets the dog and repeats the task from the last successfully completed part. - Overarousal is managed by interrupting the exercise (negative punishment).
Training practices	- Most handlers reward dogs with toys, while some use food rewards. - Most runs begin when the dog starts moving, rather than when the handler gives a release cue.	- Most handlers reward dogs with food, although some prefer toys. - Dogs are released onto the course only after remaining stationary and responding to the handler's cue.

Table 1. Description of participating centres. Centre characteristics and training practices were documented through repeated direct observations conducted by the author during visits to both facilities and were not quantified systematically.



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Breed distribution	Centre	
	A (n = 36)	B (n = 16)
Border Collie	22	3
Brittany Spaniel	1	0
Catalan Sheepdog	0	1
Jack Russell	1	1
Labrador Retriever	0	1
Schnauzer	1	0
Spanish Greyhound	0	1
Spanish Water Dog	3	2
Weimaraner	0	1
Mixed breed	8	6

Table 2. Participating breeds.

An online questionnaire was administered via Google Forms platform to the handlers of the 52 participating dogs. The questionnaire was specifically developed for this study based on previous research on canine stress and welfare during training and sporting activities (Carpenter et al., 2020; Mariti et al., 2012; Pastore et al., 2011). Although it was not formally validated, the behavioural indicators were derived from published studies and selected because they were considered readily identifiable by handlers. The first section of the questionnaire collected descriptive information about the dogs, including sex, neutering status, age, size, breed, lifetime agility experience, time spent training at the current centre, and weekly training frequency. The second section asked handlers to indicate which of the behaviours listed in [Table 3](#) were exhibited by their dogs during five stages

of agility participation: on the way to the club (T0), upon arrival at the club (T1), during training (T2), during breaks (T3), and when leaving the club (T4).



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Ethogram of the Behaviours and Postures Evaluated		
Category	Behaviour	Description
Indicative of a calm or relaxed state	Sleeping	Resting with the eyes closed, accompanied by reduced responsiveness and minimal voluntary movements.
	Lying down	Body positioned on the ground, with the abdomen or side in contact with the surface.
	Relaxed posture	Calm body posture characterised by smooth movements.
Potential indicator of stress or heightened arousal	Drooling	Excessive salivation.
	Whining	High-pitched vocalisations emitted with the mouth closed.
	Panting	Increased inhalation and exhalation frequency, with the mouth open and tongue protruding.
	Barking	Short, loud vocalisation produced with the mouth open.
	Staring at the course	Intense gaze directed towards the agility course.
	Mouthing/Soft biting	Quick and gentle biting without causing serious injury.
	Scratching the car	Clawing the interior of the vehicle.
	Body tension	Rigid body posture and/or signs of agitation characterised by continuous or sudden movements.
Other	Body shaking	Trembling or shivering of the body.
	None of the above (NA)	None of the listed behaviours were observed.
	Other	Additional behaviours reported by handlers.

Table 3. Ethogram of behaviours and postures assessed in the present study, developed based on Carpenter et al. (2020) and Pastore et al. (2011).

Assessment of Stress- or Arousal-Related Behaviours

The occurrence of 12 behaviours was evaluated (Table 3). Of these, 9 have previously been associated with stress or heightened arousal in dogs: drooling, whining, panting, barking, staring at the course, mouthing/biting, scratching the car, displaying body tension, and body shaking (Carpenter et al., 2020; Huber et al., 2017; Mariti et al., 2012; Pastore et al., 2011; Polgár et al., 2019; Rooney et al., 2007; Schilder & Van der Borg, 2004; Sheppard & Mills, 2003; Stephen & Ledger, 2005; Vieira de Castro et al., 2020). However, because these behaviours are not specific to stress and may also reflect anticipation, excitement, or frustration, depending on the context, they were considered potential indicators of stress or heightened arousal rather than definitive measures of stress. The remaining 3 behaviours were considered indicative of a calm or relaxed state: sleeping, relaxed posture, and lying

down (Hennessy et al., 1998; Mariti et al., 2017; Owczarczak-Garstecka & Burman, 2016; Rugaas, 1997; Vieira de Castro et al., 2020).

Participants were informed that the study aimed to investigate dogs' emotional states during agility activities. However, no specific information regarding the study hypotheses or the expected outcomes was provided.

Statistical Analysis

To assess whether the two agility centres were balanced in terms of descriptive variables, Fisher's exact test was used. This test was selected because of the small sample size ($n = 52$) and because contingency tables were highly unbalanced, resulting in expected cell frequencies below 5. Fisher's exact test was also used to evaluate differences between agility centres in the frequency of the recorded behaviours. Given the exploratory nature of the study and the limited sample size, no correction for multiple comparisons was applied. Although this approach increases the risk of Type I error, it reduces the likelihood of overlooking potentially informative results for future hypothesis generation. Therefore, statistically significant findings should be interpreted with caution. Statistical significance was set at $\alpha = 0.05$. All analyses were performed using Microsoft Excel (version 2310) and IBM SPSS Statistics (version 29.0.1.0).



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RESULTS

Descriptive characteristics were compared between dogs from the two agility centres despite the unequal sample sizes (Centre A, $n = 36$; Centre B, $n = 16$). No significant differences were detected for the variables examined. However, the marked differences in breed composition, particularly the proportion of Border Collies ([Table 2](#)), should be considered when interpreting the findings.

Behavioural responses during agility practice were compared between centres, revealing significant differences in barking at T0, T2, and T3 ([Figure 1](#)).



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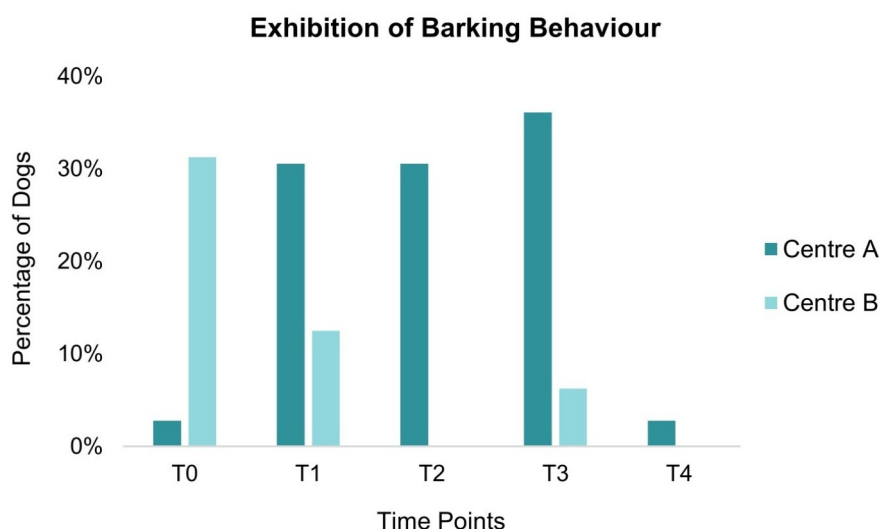


Figure 1. Relative frequencies of dogs exhibiting barking at each study time point (T0-T4), shown separately for each centre, where T0 = on the way to the club, T1 = upon arrival at the club, T2 = during training, T3 = during breaks, and T4 = when leaving the club.

Handlers reported barking more frequently in dogs from Centre B at T0 (31.25% vs. 2.78%; $p = 0.00812$), whereas dogs from Centre A barked more frequently at T2 (30.56% vs. 0%; $p = 0.01159$) and T3 (36.11% vs. 6.25%; $p = 0.03994$) (Figure 1). No significant differences were detected at T1 or T4.

To explore the potential influence of breed distribution, additional Fisher's exact tests were conducted at each time point (T0-T4) to examine whether barking behaviour was associated with Border Collie breed status (Border Collie vs. non-Border Collie). A significant association was detected only at T2 ($p = 0.017$), suggesting that breed may have contributed to the higher frequency of barking observed at this time point. However, given the limited sample size, these findings should be interpreted with caution, because breed composition may also have contributed to the observed difference between centres.

An exploratory post hoc analysis was conducted to provide an overall descriptive assessment of stress- and heightened arousal-related behaviours across the agility session. For each time point (T0-T4), the total number of these behaviours was calculated for each centre and compared using Fisher's exact test. A significant difference was detected at T2 ($p = 0.00367$), whereas no significant differences were observed at the remaining time points. Nevertheless, the overall frequencies of behaviours considered potential indicators of stress or heightened arousal were consistently higher in Centre A than in Centre B across all five time points (Figure 2).



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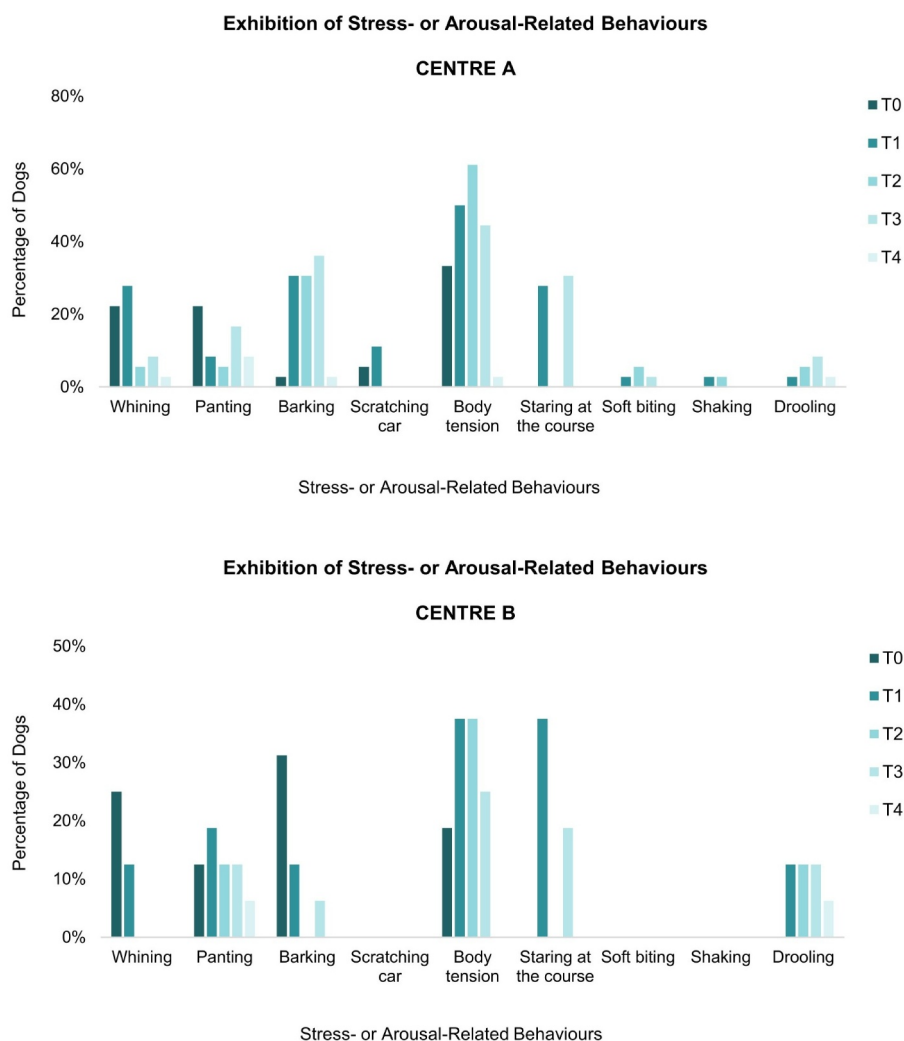


Figure 2. Relative frequencies of stress- or arousal-related behaviours at each study time point (T0- T4), reported separately for each centre, where T0 = on the way to the club, T1 = upon arrival at the club, T2 = during training, T3 = during breaks and T4 = when leaving the club.

DISCUSSION

The present study assessed behavioural responses across different stages of agility practice, from the anticipatory phase before arrival at the training centre through to the completion of the session. This approach aimed to provide a more comprehensive understanding of dogs' emotional experiences and welfare within the sporting context, an area that remains comparatively underexplored. To this end, the frequency of behaviours considered potential indicators of stress, heightened arousal, or emotional activation was compared between dogs attending two agility centres that differed in their reported training approaches and other environmental and management-related factors.



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Statistical analysis revealed significant differences between centres in barking behaviour at times T0, T2, and T3 ([Figure 1](#)). The finding at T0 (on the way to the club) deserves particular consideration, as it contrasts with the overall pattern observed during the stages of agility participation. Although the factors underlying this difference remain unclear, one possible explanation may be anticipatory arousal associated with the upcoming agility session. Previous studies have shown that anticipation can influence both physiological and behavioural responses in dogs (Gillette et al., 2011). Therefore, the increased barking observed at T0 in Centre B may reflect anticipatory positive arousal or general heightened activation associated with previous agility experience rather than a negative emotional state. However, this interpretation remains speculative, and alternative explanations cannot be excluded. Consequently, barking should be interpreted with caution when used as a sole indicator of welfare and should ideally be considered alongside other behavioural and physiological measures.

On the other hand, a greater proportion of handlers from Centre A reported barking at T2 (during training) and at T3 (during breaks) compared with handlers from Centre B ([Figure 1](#)). Training practices at Centre A included the use of verbal punishment and, in some situations, physical interventions intended to correct the dog's behaviour ([Table 1](#)). Previous studies have reported associations between the use of aversive training methods and behavioural indicators of poorer welfare in dogs.

The post hoc analysis further revealed significant differences between centres during the training phase (T2), with a higher number of behaviours associated with stress or heightened arousal being reported in Centre A than in Centre B ([Figure 2](#)). Moreover, relative frequencies indicated that dogs from Centre A were reported to display a greater number of such behaviours across all evaluated time points. Some behaviours, including mouthing/soft biting, body shaking, and scratching the car, were reported exclusively by handlers from Centre A ([Figure 2](#)). Collectively, these findings suggest a higher frequency of behaviours considered potential indicators of stress or heightened arousal in dogs from Centre A compared with those from Centre B. However, this analysis should be interpreted cautiously because it considered behaviours that may reflect different forms of emotional activation rather than exclusively negative affect.

Taken together, these findings suggest that dogs attending Centre A displayed more behavioural indicators compatible with stress or heightened arousal than dogs attending Centre B, as reported by their handlers. Nevertheless, these findings should be interpreted in the context of several



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important methodological limitations. The present study was not designed to isolate the effect of training method itself, as the participating centres differed in several additional characteristics, including differences in training structure (group vs. individual sessions), environmental complexity, trainer practices, and breed composition. Furthermore, the exploratory study design and the relatively small sample size limit the strength of the conclusions that can be drawn. These limitations are discussed below.

Barking is one of the easiest behaviours to identify for non-experts in canine behaviour (Kerswell et al., 2009). This may explain why it was one of the most frequently reported behaviours by the handlers in this study. Shabelansky & Dowling-Guyer (2016) found that barking was one of the most frequently reported behaviours by handlers of excitable dogs, which is consistent with the present findings. In the study by Mariti et al. (2012), the stress-related behaviours most commonly identified by handlers were trembling and whining, followed by aggression, excessive barking, and panting. Handlers likely tend to focus more on vocalisations and sudden body movements than on more subtle behavioural cues (Kerswell et al., 2009; Mariti et al., 2012). Consequently, this may have contributed to an overrepresentation of barking in the questionnaire responses relative to less conspicuous behavioural indicators.

The remaining behaviours evaluated in the present study may have been underreported by handlers because they are generally less conspicuous than barking and more difficult for handlers to detect. Beerda et al. (1998) reported that increases in oral behaviours, body jerks, body bending, yawning, restlessness, and low body posture may indicate acute stress in dogs. These behaviours should therefore be considered in future behavioural assessments, particularly when handler-reported questionnaires are used.

The overrepresentation of Border Collies in Centre A (22 of the 36 dogs evaluated) constitutes an important limitation. Additional analyses suggested that breed may have contributed to the barking differences observed during training, as Border Collie breed status was significantly associated with barking behaviour at T2. Given the known predisposition of herding breeds toward elevated arousal and vocalisation (Bionda et al., 2023; Carpenter et al., 2020; Carr et al., 2015; Juarbe-Díaz, 1997; Marschark & Baenninger, 2002; Zilocchi et al., 2016), breed-related effects may have influenced the difference in barking observed at T2 and cannot be ruled out. Future studies should therefore control for breed-related effects.



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It is worth noting that Centre A conducted group sessions involving multiple dog-handler dyads, whereas Centre B conducted individual sessions. The greater number of social and environmental stimuli present during group classes may have contributed to increased arousal and behavioural responses independently of training method. Conversely, the individual training format at Centre B may have reduced exposure to concurrent social and environmental stimuli. Therefore, the higher frequency of barking observed at T2 in Centre A may reflect a combination of training practices and other contextual factors that could not be disentangled within the design of the present study. Similarly, the higher barking frequency observed during T3 may also have been influenced by the greater number of environmental and social stimuli present during group sessions.

Moreover, handlers from the two centres may have differed in their experience and awareness of canine behaviour, potentially reflecting the differing training philosophies adopted by each centre. This may have influenced their ability to recognise and report behavioural indicators of stress and heightened arousal, thereby affecting the questionnaire responses. During data collection, the author also informally observed apparent differences in the overall training atmosphere between centres. Handlers and trainers at Centre A appeared to be performance-oriented, whereas those at Centre B generally followed a more relaxed approach. As these observations were not systematically recorded or quantified, they should be interpreted with caution. However, Buttner et al. (2015) reported that dogs may be influenced by the handlers' emotional states, particularly in agility contexts. Therefore, differences in handler attitudes and emotional responses during training may have contributed to the behavioural patterns observed in the present study.

As behavioural data were collected using handler-reported questionnaires, reporting bias cannot be excluded. Participants' awareness that the study concerned dogs' emotional states may have influenced their responses. As noted by Haverbeke et al. (2008), the human tendency to present oneself in a favourable light may have influenced participants' responses and introduced social desirability bias.

Furthermore, the questionnaire was not formally validated, which may have affected the reliability of the behavioural assessments and limits the reproducibility of the findings. Future studies should formally validate this questionnaire by assessing its psychometric properties. In addition, they should incorporate direct behavioural observations performed by trained observers, physiological measures, and larger, breed-balanced samples to

better understand the relationship between agility training practices and canine welfare.

Multiple comparisons were performed across various behaviours and time points, but no correction for multiple comparisons was applied, which increases the risk of Type I error. Because the study was exploratory and involved a relatively small sample, applying formal corrections would likely have further reduced statistical power and increased the risk of Type II error. Accordingly, unadjusted *p*-values were retained, and all statistically significant findings should be interpreted as exploratory, requiring confirmation in subsequent studies. In particular, the significant difference in barking behaviour observed at T2 should be interpreted with caution, as it may have been influenced by the unequal breed distribution between groups and therefore requires confirmation in larger, adequately powered confirmatory studies.

Despite the relatively small sample size, the present findings are broadly consistent with those reported in several previous studies (Blackwell et al., 2008; Casey et al., 2021; Deldalle & Gaunet, 2014; Fernandes et al., 2017; Haverbeke et al., 2008; Hiby et al., 2004; Rooney & Cowan, 2011; Vieira de Castro et al., 2020). These studies generally reported associations between reward-based training methods and lower levels of stress-related indicators compared with aversive or inconsistent training approaches. Nevertheless, consistency with previous findings does not eliminate the limitations inherent to the present study design and should not be interpreted as evidence that training approach alone accounted for the behavioural differences observed.

A growing body of evidence has reported associations between aversive training methods and poorer welfare outcomes in dogs (Capuzzi, 2019; Carpenter et al., 2020). However, debate regarding their use remains. Some authors have argued that aversive techniques may be effective, or even necessary, for achieving specific learning outcomes (Christiansen et al., 2001; Deldalle & Gaunet, 2014; Marschark & Baenninger, 2002). This diversity of perspectives highlights that important questions regarding the balance between training effectiveness and animal welfare remain unresolved. Consequently, further research using more robust and carefully controlled study designs is needed to better understand the welfare implications of different training practices across a range of training contexts and canine populations.



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CONCLUSIONS

This exploratory case-comparison of two agility centres revealed differences in handler-reported behavioural responses across agility training sessions. Handlers from Centre A reported a higher frequency of behaviours considered to be potential indicators of stress or heightened arousal than handlers from Centre B. Because the centres differed in multiple characteristics beyond training approach, including breed composition, training environment, and training structure, the findings should be interpreted cautiously and should not be considered evidence of causal relationships. Rather, they should be viewed as preliminary and hypothesis-generating. Future research should include multiple agility clubs with comparable training structures, balanced breed distributions, validated behavioural assessment tools, direct behavioural observations, and physiological welfare measures to better disentangle the effects of training approach from those of other confounding factors.

CONFLICTS OF INTEREST

The author declares no conflicts of interest.

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