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Effects of dogs' visits to a public exhibition

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Abstract: Outdoor activities with dogs are known to be physically and mentally beneficial to them and their owners, but less is known about their circulation in public spaces. This study aimed to understand the effects of dog-owner dyad's visits to an interactive exhibition on the dogs' behaviour and the perceptions of owners, visitors, and staff. 38 dog-owner dyads were studied in four rooms (Angry Birds, Dòing, Explora and Access) over eight periods of 90 minutes during which animals' behaviour was sampled, and questionnaires were filled out by owners, visitors, and staff. Results showed that a very high percentage of owners and more than half of the visitors and staff acknowledged benefits for dyads, with a great majority not feeling disturbed by the presence of the dogs. Only 6% of visitors mentioned less tolerance to dogs in this space, exclusively associated with their own beliefs and apprehensions. Dogs' behaviour was characterised by 44% of the time in managing surrounding stimuli (stress management), 28% in neutral behaviour, 27% in interactions with humans, dogs, and the environment, and merely 1% in the expression of avoid/fear specific patterns. Training promoted more displaced activities and interaction with owners in less favourable contexts for possible control, coordination, and reassurance. As expected, dogs' behaviour varied with rooms, showing higher reactivity in the more dynamic one (Angry Birds). Calm and well-managed dogs' behaviour is likely to have promoted the perception of non-disturbance by other people. In conclusion, well-behaved dogs may visit public spaces promoting a higher quality of dog-human interactions.

Keywords: dog-human interactions; dog stress; dog welfare; public place visits

HIGHLIGHTS

- Dogs visiting public locations with their owners reacted with the expected activation for novel contexts and almost did not show misadjusted behaviour.
- Trained dogs exhibited few but more displacement activities and interactions with owners as a likely way to regulate behaviour.
- Owners, staff and visitors agreed the visit had been beneficial for the dyad and other visitors did not feel disturbed by the dogs.
- Overall, within the conditions of this study, dogs can accompany their owners to public places with benefits to their stimulation and interactions.

INTRODUCTION

Worldwide, households have been increased by dogs. Often regarded as family members, dogs are no longer walked only due to physiological needs, but also for the pleasure of their company (Campbell 2016). This change is shown from a growing perception of dog behaviour and needs. Some countries enabled access to some areas for dogs, though under some restrictions (e.g., on leash) (Dobák & Kiss 2020). To promote dog-owner outdoor activities parks in urban areas have increased, supported by citizens (Gaunet et al. 2014).

Walking dogs has benefits for both owners and dogs: security's perception (Cutt et al. 2008), increased social interactions among people (Wells 2004) and dogs (Westgarth et al. 2008), more owner and dog's physical activity (Hoerster et al. 2011; Feng et al. 2014), better dogs' health, overall sense of community, and closer owner-dog relationships (Urbanik & Morgan 2013). However, some people dislike dog walking, based on noise/smells, safety, and expenditure (Urbanik & Morgan 2013). Cultural factors affect different perceptions and play an important role in banning or accepting dogs in public areas (Weston et al. 2014).

Giving dogs access to public areas may depend on dog-owner behaviour and its potential disturbance of other people, which shaped owners' interest in managing their dogs' behaviour (Diverio et al. 2016; Dobák & Kiss 2020). However, their ability to read canine body language is often limited and varies with different factors (Campbell 2016), such as dog's breeds (Siniscalchi 2018; Zilcha et al. 2018), owner's age or sex (Mariti et al. 2012), people's previous experience (Tami & Gallagher 2009), selective attention (Mack 2003) or owner's general attitude (Zilcha-Mano et al. 2011; Schöberl et al. 2017).

Dogs' communication includes acoustic, olfactory, tactile, or visual signs (Siniscalchi et al. 2018). They also use postural signals to communicate and provide cues about their comfort level (Firnkes et al. 2017). Dog-owner interactions are based on dogs' specific natural repertoire of behaviour (Siniscalchi et al, 2018). Being dogs good at reading human facial expressions (Müller et al. 2015), they can interpret human subtle signs, even if never trained (Reid 2009). This adjusts behaviour in anticipation of humans' actions (Müller et al. 2015).

Owners interpret dog behaviour when compared to people without experience (Diesel et al. 2008), mainly for less conspicuous patterns of behaviour (Tami & Gallagher 2009). Owners are more alert to changes in their dog's regular behaviour but may have challenges in interpreting some ambiguous patterns and early signs of stress (Mariti et al. 2012; Mariti et al. 2015).

Training is an important tool for better adjustment of dogs to live in a mixed human-dog society. For example, early socialisation in pup classes induces better reactions in later dogs' encounters (Blackwell et al. 2008) and advanced trained dogs are less neophobic (Marshall-Pescini et al. 2008). Sensible approaches to training are paramount as punishment can lead to poor welfare, misbehaving and consequent abandonment (Todd et al. 2018). Contrarily, positive reinforcement has been shown to reduce stress levels during training

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sessions (Vasconcellos et al. 2018), reduce stereotyped behaviour (Coleman 2011) and enhance positive welfare, resulting in a balanced and cooperative relationship with humans (Greenebaum 2010).

Positive relationships are opportunities for dogs' adjustment to novel environments without risking their or other people's welfare. Adaptation starts with arousal responses because animals need to appraise the surrounding stimuli and react accordingly (Beerda 1997). With no behavioural signs of prolonged disturbance, it is expected that welfare will not be affected (Mariti et al. 2012). A quick and appropriate adjustment is important for the safety of surrounding people, as potential fear-related aggression is less likely to occur (Haug 2008). In a positive relationship, owners can help their dogs with this process of adjustment through good interpretation skills of early stress. To better understand and train their dogs, most owners become self-taught trainers, while others seek professional training (Pirrone et al. 2015). However, the appropriate owners' education highly contributes to the recognition of relevant dog signs, thus shaping the quality of human-dog interactions in the household and public areas (Mariti et al. 2012).

Overall, outdoor dog-owner activities are proven to be beneficial for both. However, there is little evidence of the quality of dog-owner activities in public indoor areas. This study aims to better understand the effects of dogs visiting a public exhibition on their behaviour and owners' perceptions, other visitors and staff members. Authors hypothesised that these visits would be potentially positive for dog-owner dyads and that dogs' welfare will not be compromised by the visits, not expecting major disturbances to other people, although visitors may show low tolerance to dogs' presence.

METHODS

This study is based on the observation of dogs' behaviour during visits to the Pavilion of Knowledge – Ciência Viva, an interactive science and technology museum in Lisbon (Portugal). Perception of dogs' visits was qualitatively analysed through questionnaires and dogs' behaviour was quantitatively based on observations.

Participants

The selection of 39 owner-dog dyads was based on previous screening questionnaires. Exclusion criteria included aggression and/or deficient health.

Dogs' age ranged between 8 months and 11 years (mean of 4±3,5 years). Of 29 females and 10 males, 54% had owner or professional obedience training, between 2-18 months old. The sample included 67% of neutered dogs and 54% of defined breeds.

Over half of the sample were well socialised, being perceived by owners as mostly playful (30%), well behaved (24%), and energetic (17%) animals. Over 60% react in some way to stimuli such as conspecifics (62%), adult humans (64%) or children (62%) and 72% were indifferent to darkness. Of all dogs, 59% used to pull on the leash.

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Questionnaires were also filled by 71 visitors and 32 staff members on duty on their perception of dogs' interference with visits.

Brief characterisation of areas

Four exhibition rooms were chosen for behavioural observations based on their different potential stimuli: Angry Birds (AB), Access Area (ACC), Dòing (DOI) and Explora (EXP) (Figure 1). AB was an open space with a temporary exhibition (angry birds), with noisy activities for children, and frequent sudden stimuli. ACC was an entry and exit area located in one of AB's endings, routing dyads to AB or the upper floor. DOI was a secluded and quiet room for children activities (e.g., handcraft). EXP was a popular, dark and spacious room with low background noise from physics and mechanical devices, people, and flashlights.

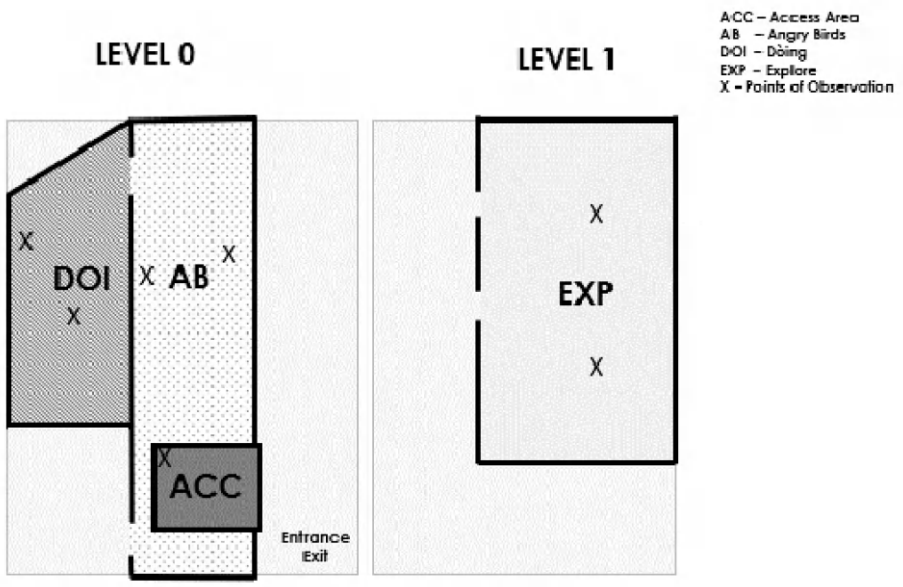

Figure 1. Map of areas visited by dyads

Adapted ethogram and categorisation of postures and behaviours

Postures sampled in this study were summarised in Table 1a, of which a group of four was functionally categorised in 'avoid/fear postures' occurring exclusively in this context. The remaining could be sampled in either neutral, interactive or stress management contexts.

Behavioural patterns were summarised in Table 1b, categorised by their context of occurrence. 'Stress Management' involved pant, an arousal response to a stimulus; appraisal, such as hypervigilance or lip licking (focus of attention to stimuli to interpret them), displacement activities, such as yawning or scratch and bark as an active behavioural pattern also reflecting higher arousal (Beerda et al. 1998). 'Interactions' occurred when animals searched for contact with owners (e.g., look owner), with other humans, other dogs or the environment (e.g., smell). 'Avoid/fear context behaviours' were active expressions of fear or avoidance (e.g., avoid) (Beerda et al. 1998). Further details on specific

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behavioural and postural patterns are described in Appendix I.

Behavioural sampling

Dogs' visits occurred between March-August 2018, in five mornings and three afternoons of the first Sunday of each month. This summed eight 90-minute periods of observations. A pilot study aimed to promote observers' training and refining of questionnaires.

Observers were randomly distributed in the areas, with one or two per area. Dyads were identified by an owner's holding card with the number order of entrance. All dogs circulated on a leash and were never left unattended.

Each observer was in place 5min before the sampling started and never interfered with the dyad. Visit circuit, owners' arrival time, time spent in each room and number of visits per room were not controlled. In each observation period, scans were performed at intervals of 30 seconds. Each sampling point contained information on dog postures and behaviours.

Questionnaires and surveys

Four questionnaire forms were developed for owners (pre-and post-visit), visitors and staff's perceptions of the visits with dogs. Owners' forms characterised their dogs and their visits' expectations and perceptions. Staff and visitors' forms characterised their perception of behaviour and dogs' effects on people. Questionnaires were filled on-spot using tablets, in the beginning, and end of visits and were pre-tested in the pilot-study.

Data analysis

To qualitatively characterize and compare perceptions, percentages of replies were calculated. Based on the 90-minute behavioural sampling design, a maximum number of 6840 sampling points (8 periods * 180 observation points * number of observers) could have been achieved. However, only 2546 points were sampled, corresponding to the actual time dogs were in the rooms. Proportions of time spent in each behavioural pattern or posture were calculated as a total number of scans per room.

A Generalised Linear Mixed Model (GLMM) was applied to compare the fixed effects of Room (AB, ACC, DOI, EXP), Observer (6 observers) and Training (trained or not trained), and the random effects of Dog ID on dog's general activities (postures, stress management, neutral behaviour, interactions, avoid/fear behaviours). The model best representing the data set (based on Akaike information criterion, AIC) was: Activity ~ Room + Observer + Training + (1|Dog). Results for Room effect refer to significant or non-significant differences between AB room and the remaining rooms, as AB is the only temporary exhibit. GLMM were done with the R-Project statistical environment (R Development Core Team 2018), packages "R commander" and "GLM (stats)". The significance level was set at 0.05. Appendix II provides details of GLMM parameters for the analysis of dogs' postures and behaviours among different rooms, observers, and training levels.

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RESULTS

Perceptions of the visits with dogs

From the sample of 39 owners, with an average age of 37,7±9,3, 82% had previously owned 1-2 dogs (n=21) or more than 3 (n=11). Similarly, 82% of owners perceived their dogs as family members. Of the 71 sampled visitors without dogs, 66% had their own dogs back at home. In the exhibition, most of these visitors (72%) had one to three encounters with dog-owner dyads during the visit and only 28% encountered four to seven dyads. Of 32 staff members with surveillance duties, 59% were familiar with dogs in their private life.

Owners expressed their expectations before the visits, with 39% foreseeing to have problems of some kind during the visit. These were related to socialisation (n=4), elimination (n=3) and stimuli reactivity (n=3) issues. Other mentions also included disobedience and anxiety (n=5). However, after the visits, only 13% of owners reported constraints of any kind (n=4) and the dog to be afraid (n=1). All owners indicated perceived benefits to themselves due to bringing their dogs, and almost as many (95%) reported benefits to their dogs.

All visitors considered that dyads behaved correctly. The majority (65%) did not feel affected by the dogs' presence, 30% mentioned benefits to themselves from encountering dogs because they like to see them accompanying their owners, they feel that the animals bring a pleasant atmosphere, and their behaviour was perceived as appropriate (Figure 2). Only 6% of visitors felt disturbed by the dogs. Specifically asked whether they thought that these visits could benefit the dogs, 54% answered affirmatively (Figure 2).

Most of the staff (82%) reported owners' neutral behaviour (walking or standing in a calm posture), and only 18% perceived owners' efforts to control the dog. 80% of the staff did not notice any disturbances and only 20% mentioned benefits to the visitors (Figure 2). 67% of the staff specifically reported the perception that these visits were beneficial to both owners and the dogs (Figure 2).

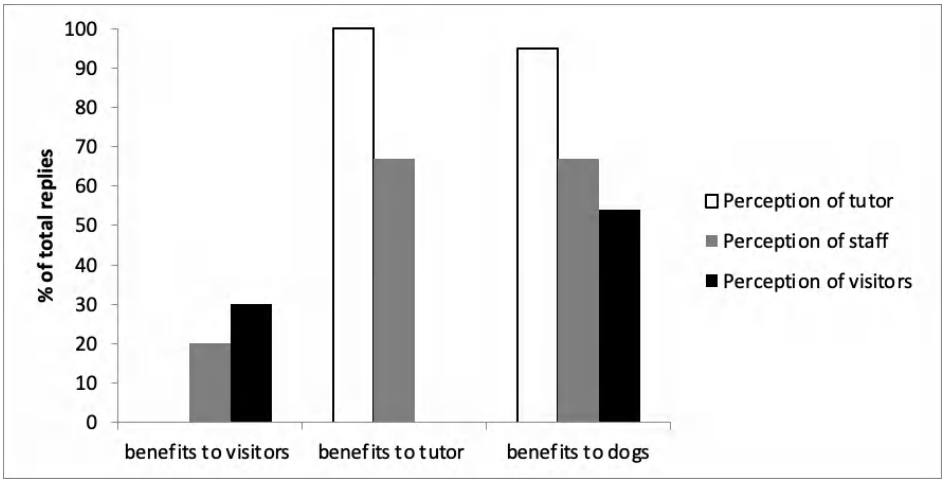

Figure 2. Benefits of the visits as perceived by owners, visitors, and staff (total % of replies).

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Brief characterisation of the dogs' visits

A sample of 38 dogs was observed during their visit with owners to the four rooms of the exhibition (Figure 3). Visits' duration varied from 7 to 80 minutes, with an average time of 16±5 minutes. The 'Explora' (EXP) room was visited by 36 dogs entering, which stayed there for 53% of the average visiting time. The same number of dogs visited 'Access area' (ACC) but with a much lower permanence of 12% of the total time. The 'Angry Birds' (AB) room were visited by 34 dogs, which spent 18% of the total visiting time there. The 'Dòing' (DOI) room was the least visited room, with only 26 dogs and only 17% of the total visiting time (Figure 3).

In some cases, dogs re-entered the rooms. ACC was where this was more frequent (2,3±0,14 times), followed by AB (1,7±0,15 times), EXP (1,4±0,10 times) and DOI (1,2±0,08 times). The usual route followed by the owner-dog dyad was entering in ACC area and proceeding to EXP or AB rooms. When the first option was AB, EXP tended to be the last room visited. Otherwise, DOI was mostly the last visited room.

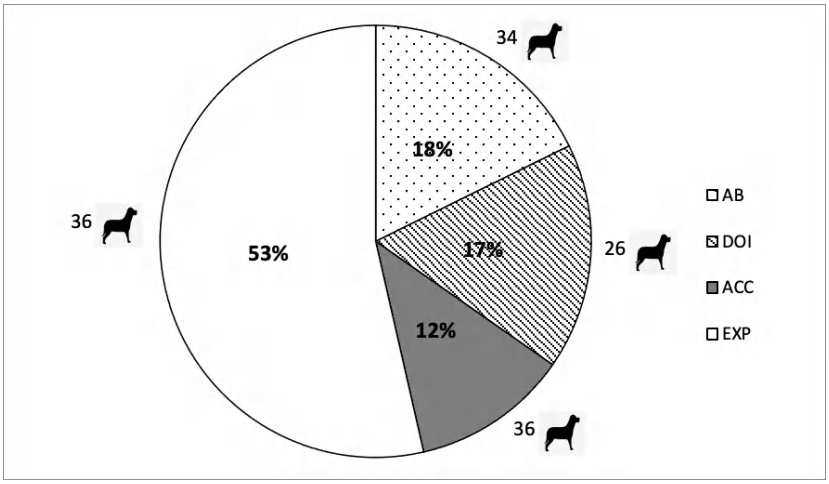

Figure 3. Number of dogs visiting each room and respective total permanence time (%) AB – Angry birds; DOI – Dòing; EXP – Explora; ACC – Access area.

Total proportion of postures and behaviours

The most frequent posture was high posture (41%), followed by 39% of active postures (composed of walk=24%; pull the leash and avoid/fear=7% each and rear=1%) and sit/lay (20%) (Table 1).

Stress management, encompassing displacement activities, appraisal, bark and pant, was the most frequent set of behaviours (44%), followed by neutral behaviour (28%) and interactions (27%). Avoid/fear behaviours were almost inexistent (1%) (Table 2).

Comparison of postures among different rooms

High posture was less frequent in AB than in DOI (N=167; t=2.053; p=0.042) and ACC (N=167; t=2.087; p=0.039) and was not statistically different from EXP (Figure 4a, Appendix II). Walk was more frequent in ACC (N=167; t=2.099;

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Category/Posture	
High posture (41%)	
Walk (24%)	
Sit/Lay (20%)	
Pull (7%)	
Rear (1%)	
Avoid/Fear Postures (7%)	Ambivalent posture (6%)
	Avoid II (1%)
	Avoid III (0%)
	Low posture (0%)

Table 1. Proportions of postures (%).

Supra-category/Category/Pattern of behaviour		
Stress management (44%)	**Pant (83%)**	
	Appraisal (13%)	Hipervigilant (54%)
		Lip licking (36%)
		Paw lift (10%)
	Displacement activies (3%)	Yawning (48%)
		Shake (31%)
		Scratching (21%)
	Bark (1%)	
Neutral behaviour (28%)		
Interactions (27%)	**Interactions with tutor (38%)**	Look tutor (68%)
		Tutor pet (24%)
		Ingest (8%)
	Interaction with environment (40%)	Smell (92%)
		Interaction with object (8%)
	Interaction with humans (15%)	
	Interaction with dogs (7%)	
Avoid/Fear Behaviour (1%)	**Avoid I (65%)**	
	Scare (21%)	
	Freeze (14%)	

Table 2. Proportions of behavioural patterns, categories, and supra-categories of behaviour (%).

p=0.038) and DOI (N=167; t=2.008; *p*=0.047) when compared to AB, but less frequent in EXP (N=167; t=-2.166; *p*=0.032) (Figure 4a). There was, however, an effect of observer (N=167; t=2.441; *p*=0.017). Dogs spent a significant higher percentage of time in sit/lay posture in DOI when compared with AB (N=167; t=3.051; *p*=0.003), but time in this posture did not differ between EXP and AB,

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and between ACC and AB (Figure 4a, Appendix II). Rear was more frequent in AB when compared to ACC (N=167; t=-2.060; p=0.041) and EXP (N=167; t=-2.128; p=0.035) but did not differ between AB and DOI (Figure 4b, Appendix II).

All rooms but DOI presented differences among the distribution of the three most frequent postures (Friedman, N=38; df=2: AB χ2=17,074; p<0.001; EXP χ2=20,014; p<0.001; ACC χ2=13,754; p=0.001; Figure 4a).

Training did not influence the percentage of time spent in the main postures nor in rear in neither room (Appendix II).

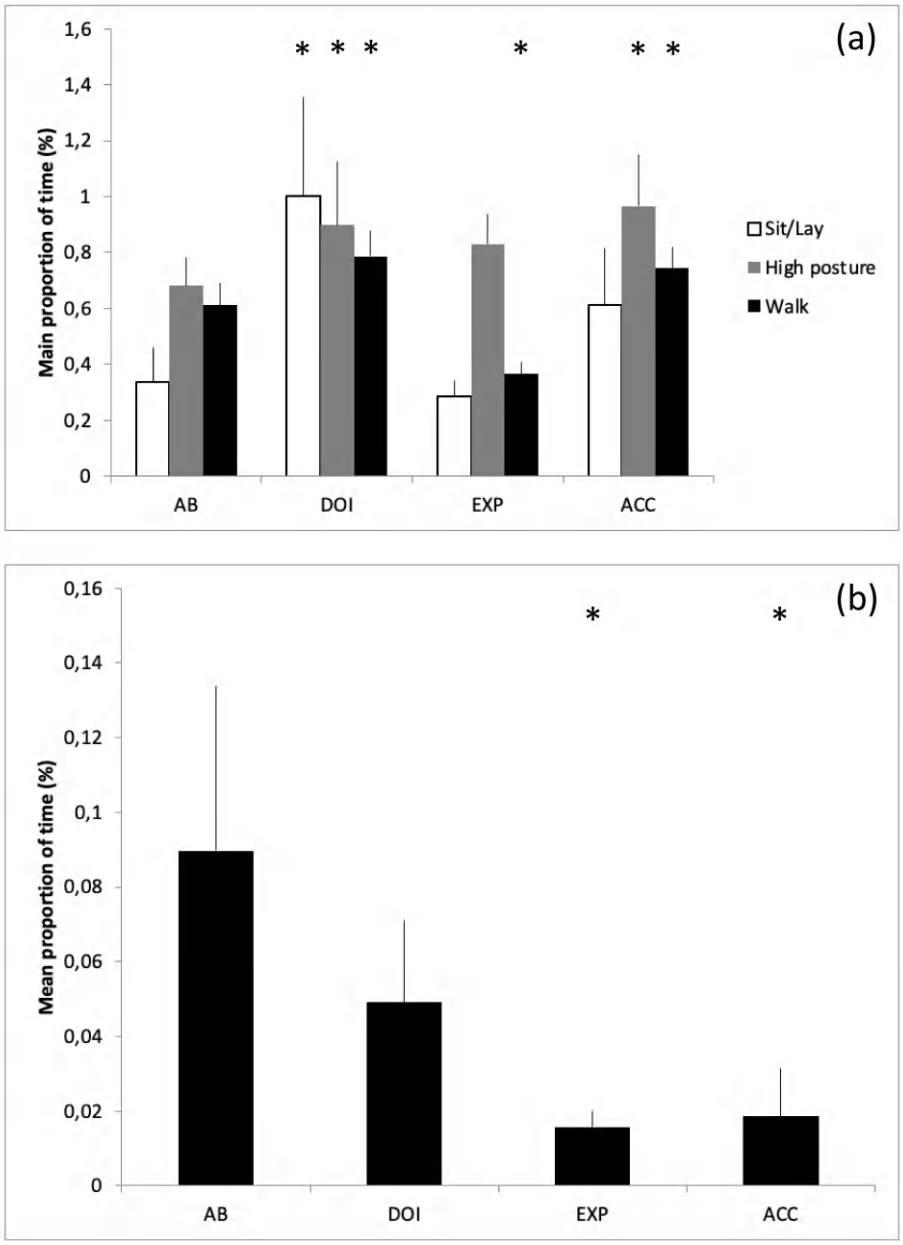

Figure 4. Mean proportion (%) of (a) main postures per room. (b) rear posture per room. AB – Angry birds; DOI – Dòing; EXP – Explora; ACC – Access area. Asterisk denotes group that is significantly different (p < 0.05) from AB Room.

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Comparison of stress management-related behaviours among different rooms

Pant was the most expressive behaviour categorised under the stress management category (81%, Table 2), being similar among rooms and trained/ no trained dogs (Appendix II). There was, however, an effect of observer (GLMM: N=167; t=2.353; p=0.020).

Appraisal included hypervigilance (54%), lip licking (36%) and paw lift (10%) and represented 13% of the time in stress management (Table 2). There were no differences in these behaviours in relation to rooms or training (Appendix II).

Only 3% of stress management was spent in displacement activities, which included yawning (48%), shake (31%) and scratching (21%)(Table 2). Percentage of time spent in displacement activities did not differ between rooms but trained dogs showed more displacement activities (N=167; t=2.110; p=0.041), which were more frequent in AB (N=167; t=2.245; p=0.026) and DOI (N=167; t=2.457; p=0.015) (Figure 5, Appendix II).

Bark was a rare event with only 1% of the stress management activities (Table 2) and did not differ between rooms and training (Appendix II).

Comparison of neutral behaviour among different rooms

Neutral Behaviour was a frequent behaviour (28% of total time, Table 2), with dogs spending significantly more time displaying neutral behaviours in DOI (N=167; t=2.159; p=0.033) and ACC (N=167; t=2.269; p=0.024) compared to AB. No significant effect of training was detected (Figure 6, Appendix II).

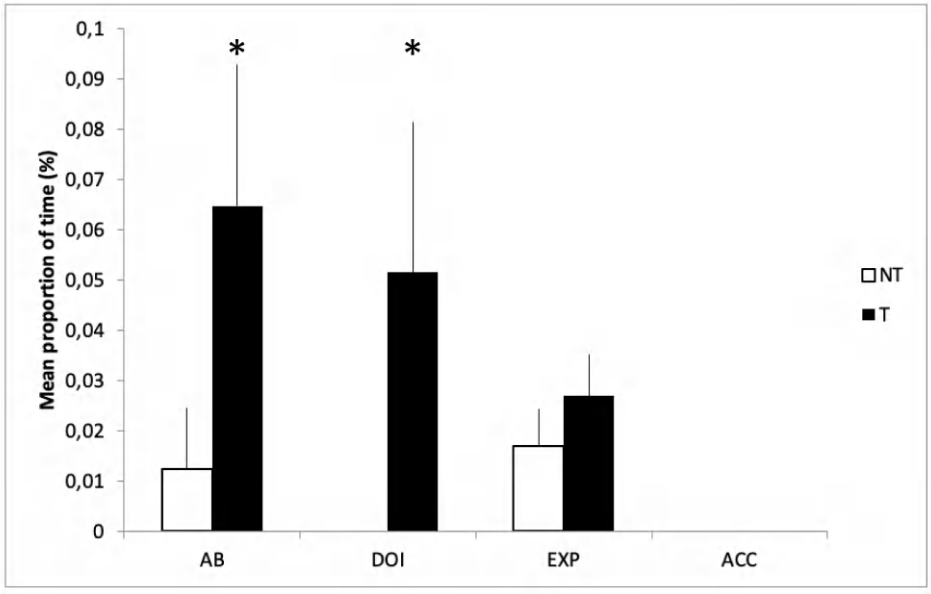

Figure 5. Effect of dogs' training in the mean proportion (%) of displacement activities per room. AB – Angry birds; DOI – Dòing; EXP – Explora; ACC – Access area. NT – Non-trained dogs; T – Trained dogs. Asterisk denotes group that is significantly different (p < 0.05) from non-trained dogs of AB Room.

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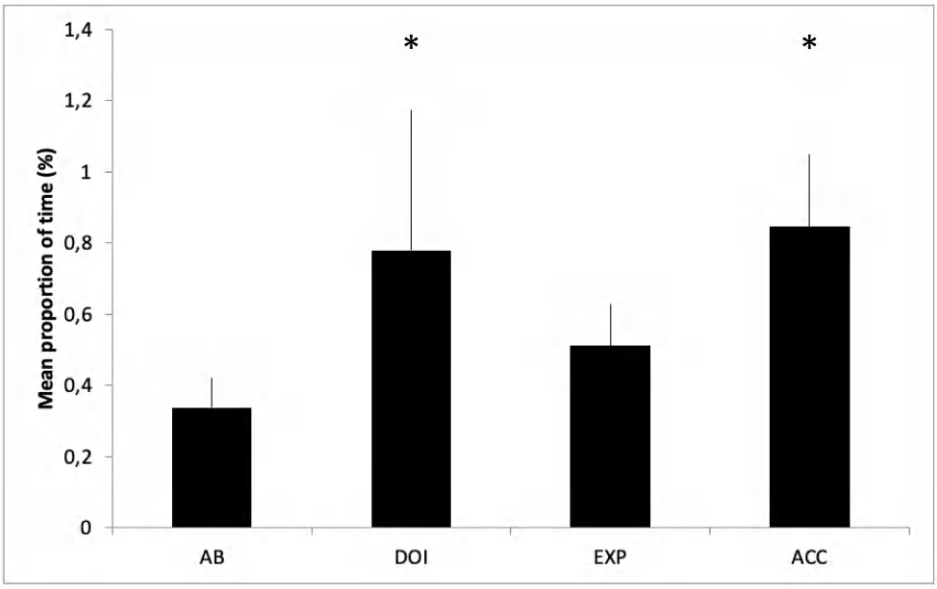

Figure 6. Mean proportion (%) of neutral behaviour per room. AB – Angry birds; DOI – Dòing; EXP – Explora; ACC – Access area. Asterisk denotes group that is significantly different ($p < 0.05$) from AB Room.

Comparison of dogs' interactions among different rooms

Most interactions occurred with owner (40%) and with the environment (38%) (Table 2). Environmental Interactions in DOI were higher than in AB (N=167; t=2.461; p=0.015) but did not differ between AB and the remaining rooms. Training did not influence dogs' environmental interactions but there was an observer effect (GLMM: N=167; t=-2.775; p=0.006) (Figure 7a, Appendix II).

Owner interactions in DOI were significantly more frequent than in AB (GLMM: N=167; t=2.173; p=0.031). Training had a significant effect on the percentage of interactions with owner (N=167; t=2.104; p=0.041), with trained dogs displaying more owner interactions in the ACC (N=167; t=2.080; p=0.039) and DOI (N=167; t=2.477; p=0.014) rooms than in AB room (Figure 7b). A significant observer effect was also reported (N=167; t=3.724; p=0.001).

There were no effects of training or rooms in interactions with other humans (visitors and staff), with which the dogs spent 15% of the total time spent in interactions (Table 2, Appendix II).

Dog interactions was the least expressive behaviour (7%, Table 2), with no differences between rooms or training (Appendix II). An effect of observer was detected, tough (GLMM: N=167; t=4.822; p< 0.001).

Comparison of avoid/fear-related postures and behaviours among different rooms

Only 1% and 7% of the total time was spent in Avoid/Fear behaviours and postures, respectively (Table 1; Table 2). Avoid/Fear behaviours were more frequent in AB when compared with the remaining rooms (Postures, AB-ACC: N=167; t=-2.000; p=0.048; AB-DOI: N=167; t=-2.504; p=0.014; AB-EXP: N=167; t=-2.091; p=0.038), as well as avoid/fear postures (Postures, AB-ACC: N=167;

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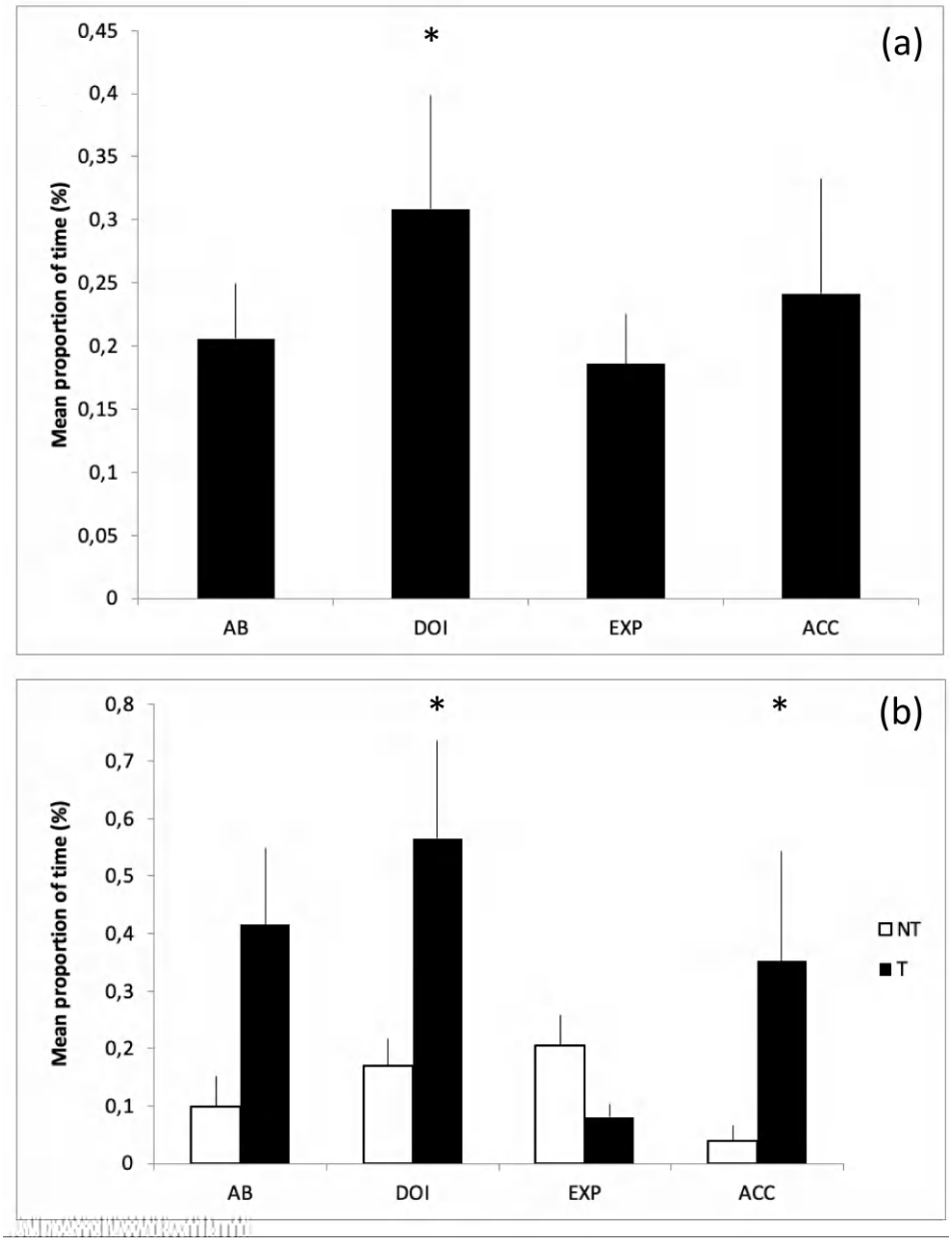

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Figure 7 (a) Mean proportion (%) of interactions with the environment per room. (b) Effect of dogs' training in the mean proportion (%) of interactions with owners per room. AB – Angry birds; DOI – Dòing; EXP – Explora; ACC – Access area. NT – Non-trained dogs; T – Trained dogs. Asterisk denotes group that is significantly different ($p < 0.05$) from non-trained dogs of AB Room.

t=-2.043; *p*=0.043; AB-DOI: N=167; t=-3.382; p=0.001; AB-EXP: N=167; t=-2.051; *p*=0.052) (Figure 8). Training did not influence behaviour or postures, but there was an observer effect on both behaviours (N=167; t=2.236; *p*=0.027) and postures (Observer 1: N=167; t=2.459; *p*=0.015; observer 2: t=2.337; *p*=0.021) (Appendix II).

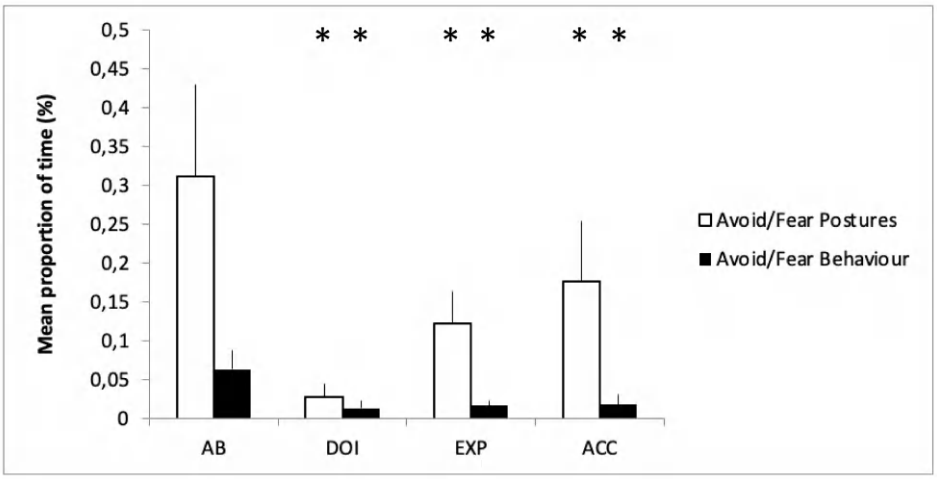

Figure 8. Mean proportion (%) of avoid/fear postures and behaviour per room. AB – Angry birds; DOI – Dòing; EXP – Explora; ACC – Access area. Asterisk denotes group that is significantly different ($p < 0.05$) from AB Room.

DISCUSSION

Perceptions of the visits with dogs

Owners perceived the visits with dogs as being mutually beneficial and constraint-free. Nevertheless, some had lower expectations of how they would behave during the visit, maybe due to the unusual context. Visitors and staff members reported dyads' behaviour as regular and non-disturbing. They agreed in high benefits to both dogs and owners and, to a lesser extent, to themselves. The general agreement of beneficial effects of dog-owners visiting the exhibition suggests that joint activities in public spaces make up for positively emotional moments for everyone involved. Similar results were reported for observed dyads (Westgarth et al. 2017) and passers-by (Terán 2014) during walks. Half of the visitors and staff members having their own dogs might have influenced our results. It is known that the perception of how dogs influence humans' wellbeing is impacted by experience with dogs and their behaviour (Boyd et al. 2004; Wan et al. 2012). Visitors refer to well-behaved dogs and noticed good owner-dog relationships. Appropriate dogs' behaviour and the perception of close owner-dog relationships may be relevant factors for dogs' public acceptance (Dobák & Kiss 2020), build up by owners spending time and developing communication channels with their dogs as well as by undertaking some type of dog training (Clark & Boyer 1993; Greenebaum 2010; Mariti et al. 2012).

Notably, four visitors felt uncomfortable with the presence of dogs (6% of the total sample), two not liking dogs, one having breed-related fear, and the other disagreeing with dogs attending public exhibitions. Given the generalised access restriction of dogs to public places in Portugal, the authors consider these results to be suggestive of a much higher tolerance for dogs than previously expected. However, all cases of rejection should be acknowledged and well addressed to ensure a balanced and fair co-existence of animals and humans in public spaces.

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Dogs' general activities

Stress management involves the animal's evaluation of the surrounding environment and activation of a coping system, including arousal to focus attention, interpret and react to the stimuli (De Kloet et al. 2005). Dogs spent a significant amount of time in stress management (44%), - mostly panting - which has been associated with the activation of the sympathetic division of the nervous system to deal with the perceived stimulus (Beerda et al. 1997; Gähwiler et al. 2020). Being a regulatory mechanism of body temperature, panting is also related to the body's preparation for activity, whether in positive or negative contexts (De Kloet et al. 2005; Gähwiler et al. 2020; Pastore et al. 2011). Barking was a behaviour rarely observed but, similarly, it is a (higher) arousal behaviour that occurs in defensive, aggressive, confident, and playful contexts (Tami & Gallagher 2009). Appraisal was interpreted as a set of behavioural patterns occurring when dogs focused attention on a particular stimulus, whether in positive or negative stress contexts (Rodríguez et al. 2013). This comprised hypervigilance, lip licking and paw lift. Being hypervigilant enhances attention, focus and the assessment of incoming stimulus (Blanchard et al. 2011; Stellato et al. 2017). Lip licking has previously been associated with appeasing and greeting signals in dog-human relationships (Firnkes et al. 2017), being considered an indicator for both positive (Rehn & Keeling 2011) and negative (Beerda 1997; Beerda et al. 2000) arousal. Similarly, paw lifting has been associated with early stages of short-term stress (Hiby et al. 2006; Stellato et al. 2017).

AB was a room with more sudden and unpredictable stimuli, where animals also exhibited higher rear and less high posture. Interpreted together, the increased displacement activities performed in this area may have helped animals to adjust behaviour. Behaviours such as yawning, scratching, or shaking can be considered displacement activities when performed out of context and are commonly interpreted as tension release in face of new or conflicting stimuli (Anselme 2008; Maestripieri et al. 1992). A role of these activities in facilitating behavioural transitions was also described for captive ring-tailed lemurs (Buckley & Semple 2012). DOI was the room where dogs sat or laid the most, suggesting that increased displaced behaviours contributed to dealing with some boredom caused by an environment with less conspicuous stimuli. There was an effect of training in these behaviours in AB and DOI, which suggests that displacement activities are more used to control and adjust behaviour in trained dogs. Stress management-related behaviour was transitory and with no extreme behavioural patterns showing misadjustment. As such, it was interpreted as a desired adaptive response, which helped animals to face and explore the new environment.

Neutral behaviour was related to calm though alert and promptly active attitude towards relevant stimuli. This behaviour was exhibited in high posture (Beerda et al. 1998) sitting and laying positions. It was higher in DOI and ACC than in AB, where there were more stimuli to process.

Dogs' interactions included the environment, other dogs, their owners, and other humans. Interactions with the environment were mostly observed in DOI and included high smelling levels (92%). This is well in agreement with the

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recognised importance of dog's olfaction to explore and discriminate elements in the environment (Polgár et al. 2016; Murtagh et al. 2020). DOI's quieter characteristics, and the less owner's activity, while waiting for children to finish their manual activities, are possible reasons for dogs increased walk and interaction with this environment. The effect of training was especially visible in terms of interactions with owners, which is consistent with the known effect of training in enhancing the relationship of the dyad (Greenebaum 2010). Dog-owner interaction was more frequent in DOI and ACC. DOI was also where most sitting postures and neutral behaviour occurred, suggesting that some diminished stimulation may have been overcome by interactions with owners and the above-mentioned displacement activities. In ACC, an entrance/exit area, the increased interactions with owners by trained dogs may likely have been a strategy to coordinate behaviour in this transition area. As previously reported dogs tend to synchronize behaviour with their owners in outdoor areas (Duranton et al. 2018), showing a close relationship with them. Lower levels of interactions in EXP may be explained by the added owner engagement with this room's interactive elements (personal observations). Low-level interactions with other humans and among dogs show the visit's dynamics and the reason why neither visitors nor staff found dogs' presence invasive. Dogs mandatorily visited the Pavilion of Knowledge on a leash, which was convergent with the identified owners' willingness to keep under control the dog's behaviour in this public space (Dobák & Kiss 2020).

Avoid/fear behaviours and postures were most frequent in AB, given its heightened stimuli, but still very rarely expressed. This reaction was consistent with results observed in previous studies when dogs were introduced to novel stimuli (Stellato et al. 2017).

This study was a preliminary approach to the spontaneous behaviour of dog-owner visits to a public exhibition and naturally faced many constraints, which should be addressed in future studies. The need to involve many observers in four rooms simultaneously created an observer effect, despite the previous specific training to which observers were subjected by using films and discussing the adopted ethogram. In future studies, a pilot sampling in the actual observation settings should be carried out and evaluated for inter-observer consistency. Many variables were hard to control (e.g., visits' dynamics to rooms, contexts of difficult sampling), which can be overcome by addressing specific questions based on this overview.

Behaviour of dogs per room

AB was confirmed as a dynamic and intense room where dogs showed the lowest high postures and neutral behaviour, highest displacement activities, occasional expression of rear and avoid/fear patterns, all interpreted as means to control behaviour while walking through the room. On the opposite, DOI was the quietest room, with the highest level of sit/lay, neutral behaviour, walk and interactions with the environment. Interactions with owners and displacement activities are suggestive of coping behaviours while waiting to move. The ACC, as a transition area, had the highest walk and neutral behaviours, as well as interactions with other owners by trained dogs, as means to better control the

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transition. EXP was the most visited room and where dyads spent more time (53%) due to the owners' added engagement with the exhibition's elements. Both behaviours and postures suggest relaxed dogs walking with their owners through the room, with very little interactions and rare avoidance/fear activities.

CONCLUSION

Dogs visited the exhibition in stress management or neutral modes, having rarely shown aversive behaviour or lack of control. Conspicuous signs of fear/avoidance were rare but most frequent in the busiest room AB. Trained dogs have shown more displaced activities and interaction with owners in less favourable contexts (e.g., busy/boring areas) or where their coordination could be more valuable (e.g., transition areas). Calm and controlled dogs' behaviour favoured a perception of non-disturbance by other visitors and staff members, and all agreed in benefits, especially to the quality of dog-owner relationships.

CONFLICTS OF INTERESTS STATEMENT

The authors declare no conflicts of interest.

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ETHICAL STATEMENTS

Dogs' potential disturbance was reduced to a minimum given the exclusion criteria. Dog-owner dyads were free to walk through rooms and leave the exhibition at any moment.

Questionnaires were filled anonymously, and dog-owner dyad was identified by a number. Owners signed a term of responsibility upon entrance.

It did not require approval from the EU Directive 2016/63/EU.

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