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The Impact of Different Dog-related Stimuli on Engagement of Persons With Dementia

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Abstract

Objective—To provide further empirical evaluation of the effectiveness of animal-assisted therapy in nursing home residents with dementia.

Methods—Participants were 56 residents of 2 suburban Maryland nursing homes and had a diagnosis. Activities of daily living performance was assessed via the minimum data set and cognitive functioning assessed using the Mini-Mental State Examination. Engagement with dog-related stimuli was systematically assessed via the observational measurement of engagement.

Results—Mean engagement duration was significantly lower for the small dog. Highest mean engagement duration was found for the puppy video, followed by the real dog and lowest was for the dog-coloring activity. Positive attitudes were found toward the real dogs, robotic dog, the puppy video, and the plush dog. No significant differences were found in engagement duration among our dog-related stimuli.

Conclusions—Nursing homes should consider animal-assisted therapy and dog-related stimuli, as they successfully engage residents with dementia.

Keywords

animal-assisted therapy; nursing home residents; dementia; dog

Nursing home residents with dementia often lack the skills needed for successful communication, with the result being that social interactions become limited. In fact, Cohen-Mansfield et al[1] found that nursing home residents with dementia were alone during 22% of their waking hours. One way to promote social interactions in the nursing home is through animal-assisted therapy (AAT),[2,3] which involves interaction with a trained animal facilitated by a human handler. Outcomes of AAT include providing relaxation and pleasure or providing rehabilitation.[3] Animal-assisted therapy is well suited for nursing home residents with dementia as it provides social interaction that is not dependent on the resident's level of cognitive functioning; that is, a dog will provide companionship regardless of a resident's state of awareness. A dog is a nonjudgmental listener and would not react negatively to hearing repetitions of the same phrase or story.

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The literature contains many anecdotal reports of positive results from AAT in persons with dementia as well as some published findings from controlled studies. When comparing a group of 7 persons in a closed psychiatric ward (6 with dementia, 1 with schizophrenia) with matched controls, Walsh et al[4] found that the presence of a visiting dog resulted in fewer loud or aggressive outbursts (such that the noise level on the unit was lower) as well as a reduction in heart rate (suggestive of a calming effect) in the experimental group. The study participants reverted to their former behaviors after the dog was removed. In an experimental, within-participant repeated-measures design, Churchill et al[5] studied persons with dementia who manifested increased agitated behavior in the evening hours ("sundown syndrome"). Study participants were observed during 2 conditions—dog with researcher and researcher alone (control condition). Analysis revealed that the frequency and duration of socialization behaviors (eg, leans, smiles, looks toward, tactile contact, and verbalization) increased and agitation decreased in the presence of the dog relative to the control condition. The authors reported that interaction with the dog was linked with less confusion and served to stimulate reminiscence and memories, distracting the participant from agitation during the sundowning hours. Other investigators have corroborated the findings of Churchill et al[5] in other samples of nursing home residents with dementia, reporting increases in socialization and decreases in agitation as a result of AAT.[6–10] Additionally, AAT has been reported to improve apathetic state[11] and improve emotional well-being[12] in nursing home residents with dementia. A link between study participants' past interest in or ownership of animals and positive outcomes has been reported.[8, 13]

As it is not always practical to bring live animals to nursing homes, some researchers have focused on robotic animals or plush animals (also called stuffed animals) for their residents. In 2004, Libin and Cohen-Mansfield[14] compared an enhanced robotic cat (NeCoRo) to a plush cat in a study of 9 agitated nursing home residents with dementia. Statistically significant decreases in agitation (relative to baseline) were seen with the plush cat, and a similar trend was seen with the robotic cat. In addition, statistically significant increases in interest and pleasure were found with the robotic cat, and while test statistics for the plush cat were not significant, the authors reported a trend in the same direction. Tamura et al[15] compared a metal robotic dog (AIBO) with a plush motor-driven toy dog in a group of 13 persons with severe dementia in a geriatric health care facility. Statistical analyses were not provided for this study; however, results suggest that the study participants responded to both dogs with social behaviors (eg, talking, watching, clapping, touching, and caring for the dog), with more of these behaviors being directed at the plush motor-driven toy dog. In addition, fewer interventions on the part of the occupational therapist were observed with the plush motor-driven toy dog than with the metal robotic dog. Recently, in a group of nursing residents with neither cognitive impairment nor a diagnosis of Alzheimer's disease, AIBO was compared with a live dog and results showed that AAT with either led to similar improvements in loneliness relative to a control group.[16] Banks et al[16] noted that some residents and staff were initially reluctant to interact with AIBO but that this resistance dissipated with exposure.

The present study focused on dogs and was conducted to provide further empirical evaluation of AAT in a group of 56 nursing home residents with dementia. Filan and Llewellyn-Jones,[3] in a literature review of AAT for persons with dementia, noted that the AAT studies in nursing homes to date have been limited by small sample sizes (ranging from 7 to 28 persons; 1 study included 62 persons). We included a standard poodle as well as 2 miniature schnauzers (one was 11 pounds and the other was 25 pounds) in our study because it is conceivable that residents may have a preference for a dog on the basis of size. As some residents may be afraid or allergic to dogs, we also included a variety of dog-related stimuli—a plush dog, pictures of dogs to color with markers, a robotic dog, and a puppy video—and evaluated the engaging value of these stimuli. In addition, we looked at

the influence of a past preference for dogs on our response measures. Indeed, it has been shown that interventions based on past identity roles result in greater interest, pleasure, and involvement than the typical structured activities for residents with dementia.[17]

Method

Participants

Participants were 56 residents from 2 suburban Maryland nursing homes, all with a diagnosis of dementia. In all, 44 participants were women (79%), and the mean age was 87 years, ranging from 61 to 101 years. The majority of participants were Caucasian (84%), and most were widowed (63%). The majority of the participants had completed at least high school (84%), with 36% of them also completing some college education. Activities of daily living (ADL) performance, which was obtained through the minimum data set (MDS),[18] averaged 3.4 (SD 1.0, range 1–5; scale: 1 = *independent* to 5 = *complete dependence*). Cognitive functioning, as assessed via the Mini-Mental State Examination[19], averaged 9.1 (SD 6.2, range 0–21). Participants had an average of 7.2 medical diagnoses and received an average of 9.5 medications (both routine and pro re nata [prn]).

Assessments

Background data were collected through chart review and one-on-one interviews with the study participant and a relative of the participant. Engagement was assessed through systematic observations via the observational measurement of engagement (OME).

Background assessment—Data pertaining to background variables were retrieved from the residents' charts at the nursing homes by a trained research assistant and included information about gender, age, marital status, medical information (medical conditions from which the participant suffers; a list of medications taken), and performance of activities of daily living (ADL; from the MDS).[18] Activities of daily living performance was assessed for 10 activities (bed mobility, transferring, locomotion on the unit, dressing, eating, toilet use, personal hygiene, bathing, bladder incontinence, and bowel incontinence) using a scale from 1 to 5, with 5 representing maximum dependence; a mean ADL score was calculated for each participant. Research assistants who were trained with regard to standardized administration and scoring procedures administered MMSE.[19] To determine whether dogs were important and enjoyable to the participant before the onset of dementia and at present, we used the leisure activities portion of the self-identity questionnaire (SIQ).[20] The SIQ was completed during a telephone interview with the participant's closest living relative and whenever possible, we interviewed the study participant.

Observational Measurement of Engagement—OME data were recorded through direct observations using specially designed software installed on a handheld computer, the Palm One Zire 31. Each stimulus was presented with an explanation and demonstration. Presenters asked whether the participant would like to engage in the activity and then left the room. In the cases of the real dogs, a handler remained with the dog. We recorded whenever the participant refused the engagement stimulus (through words or actions). Specific outcome variables on the OME are described below.

Attitude toward the stimulus during an engagement trial was measured on a 5-point scale: *negative*, *neutral, somewhat positive, positive,* and *very positive* (this scale was collapsed from the original 7-point scale from the OME).[21] We also recorded the highest rating of attitude (on the 5-point scale) that had been seen during the trial. Based on high correlations suggesting these capture a single construct,[21] these ratings were averaged to form an attitude variable.

Duration referred to the amount of time that the participant was engaged with the stimulus. This measure started after presentation of the engagement stimulus and ended at 15 minutes, or whenever the study participant was no longer engaged with the stimulus. Duration was measured in seconds.

Interrater reliability—Interrater reliability of the OME was assessed by 6 dyads of research assistants' ratings of the engagement measures during 48 engagement sessions with nursing home residents. Intraclass correlation (α values) averaged .76 for the engagement outcome variables.

Procedure—Informed consent was obtained for all study participants from their relatives or other responsible parties. Additional information on the informed consent process is available elsewhere.[22] Our main criterion for inclusion was a diagnosis of dementia (derived from either the medical chart or the attending physician) based on *Diagnostic and Statistical Manual of Mental Disorders* (Fourth Edition; *DSM-IV*) criteria and the report of the National Institute of Neurological and Communicative Disorders and Stroke–Alzheimer's Disease and Related Disorders Association (NINCDS-ADRDA). The criteria for exclusion were the following.

- The resident had an accompanying diagnosis of bipolar disorder or schizophrenia.
- The resident had no dexterity movement in either hand.
- The resident was not able to be seated comfortably in a chair or wheelchair.
- The resident was younger than 60 years. (This is due to the fact that early onset dementia presents itself differently than the later onset dementia that we are studying.)

Once consent was obtained for eligible participants, background information was obtained from each participant's chart in the nursing home. In addition, the MMSE was administered to each participant. Those who received MMSE scores greater than 23 were dropped from the study, as persons with a comparatively higher level of cognitive functioning are usually able to articulate their interests and needs.

Engagement Stimuli—The stimuli presented were a puppy video, a dog-coloring activity, a plush dog, a robotic dog (approximately US$78 from an online store such as Toys R Us), a small dog (an 11-pound miniature schnauzer), a medium dog (a 25-pound miniature schnauzer), and a large dog (a 44-pound standard poodle, see Photo 1). The 3 real dogs were selected on the basis of their good behavior as well as the fact that they were hypoallergenic.

Systematic observations of engagement—At the start of each engagement trial, a research assistant asked whether the participant would like to engage in the activity and then left the room. If the participant refused the engagement stimulus, the research assistant removed it and left the room, and this information was recorded on the OME. Engagement trials took place between 9:30 AM and 12:30 PM and between 2 PM and 5:30 PM, as these are the times that residents are not usually occupied with care activities at the nursing home (eg, meals in the dining room, bathing). Individual engagement trials were separated by an intertrial interval of at least 5 minutes. A second research assistant, who remained unobtrusive, observed the participant's reaction and engagement with the stimulus via the OME, entering the data directly onto a Palm Pilot Zire31. As described earlier, the OME included items measuring the participant's attitude toward the stimulus and duration of engagement. Each trial lasted a minimum of 3 minutes (unless the participant refused the stimulus, in which case the trial ended immediately). If the participant showed no interest in the stimulus after 3 minutes, the trial was terminated and the first research assistant retrieved

the engagement stimulus. If the participant became engaged with the stimulus, the trial lasted throughout the extent of the participant's engagement—up to a cutoff time of 15 minutes. When it appeared to the research assistant that the study participant was no longer engaged (for those trials that lasted more than 3 minutes), the research assistant continued to observe the study participant, ending the trial after 30 seconds if the study participant showed no further engagement.

Analytic approach—Dependent measures were duration and attitude. When a study participant refused a stimulus, we coded duration as 0 seconds and scored the attitude variable as negative for that trial for the purpose of analysis. The stimulus that was refused most often (by 46% of the residents) was the small real dog. Refusal rates for the other stimuli were the coloring task: 45%, the medium real dog: 41%, the robotic dog: 36%, the puppy video: 35%, the plush dog: 30%, and the large real dog: 22%.

The data were examined using repeated measures of analyses, and the Bonferroni test was used for subsequent analyses. Content analysis was performed on the verbal responses made by residents during engagement trials. Response categories were developed by a team of raters, and then 2 research assistants (who had not taken part in the observations) independently rated all responses; the interrater agreement rate (for exact agreement) averaged 94%.

Results

In the first analysis, we examined the duration and attitude to the 3 real dogs via repeated measures of analysis of variances (ANOVAs). The test statistics for both analyses were statistically significant (see Table 1). Subsequent to the ANOVAs, Bonferroni tests revealed that mean engagement duration was significantly lower for the small dog (75.2 seconds) as compared to the large dog (154.9 seconds, $P = .009$) and to the medium dog (133.6 seconds, $P = .041$). As to the analysis of attitude to the 3 sizes of dogs, a significant Bonferroni statistic emerged in the comparison of the large dog (mean attitude = 2.8) to the small dog (mean attitude = 2.2, $P = .001$). The mean attitude toward the medium dog fell between these 2 values, at 2.5. This result is consistent with our analysis of refusal rates that showed that roughly twice as many residents refused the medium or small dog as refused the large dog (refer to the refusal rates provided above in Analytic Approach).

We then performed repeated measures ANOVAs to look at the engagement value of the other dog-related stimuli relative to the real dogs. For these analyses, we averaged across the 3 sizes of dogs for duration and attitude for each study participant, using a mean score of real dog for analyses. The other variables included in the analyses were a puppy video, a robotic dog, a plush dog, and a dog-coloring activity. The test statistic for the ANOVA pertaining to attitude was significant ($F_{(4.216)} = 2.661$, $P = .034$, see Table 2). Results of the Bonferroni test revealed that mean attitude was significantly more positive for the real dog (2.5) relative to the coloring activity (2.0). Mean attitude for the other engagement stimuli fell between these 2 values. Although the ANOVA pertaining to duration did not yield a statistically significant result, it can be seen in Table 2 that the highest mean engagement duration was found for the puppy video (160.5 seconds), followed by the real dog (120.2 seconds). The lowest mean engagement duration was for the coloring activity (96.7 seconds).

To determine whether interest in dogs (either in the past or present) relates to engagement, a repeated measures ANOVA was performed in which interest was included as the between participants variable and the within participants variable had 2 levels: dog stimuli (averaged across the 3 sizes of real dogs, puppy video, dog-coloring activity, plush dog, and robotic

dog) and nondog stimuli (averaged across a squeeze ball, a large print magazine, an activity pillow, flower arrangement activity, and building blocks). The resultant interaction term was not significant.

We then performed another repeated measures ANOVA in which interest in dogs was included as the between participants variable and the within participants variable was the 3 sizes of real dogs. The test statistic for the interaction term was significant for the analysis pertaining to attitude ($F_{(2.88)} = 3.819$, $P = .026$). As can be seen in Figure 1, mean attitude was similar across the 3 sizes of dogs when the study participants had no interest in dogs; however, for those study participants who had a past or present interest in dogs, the mean attitude increased from the small to medium to large dog. A similar trend was seen for the analyses of duration, but the test statistic did not reach statistical significance.

Of the 56 nursing home residents in our study, 38 made comments during observations with the dog stimuli. A total of 108 comments were made (some study participants made more than 1 comment). In contrast, only 2 comments were made by the 56 study participants during control observations (ie, trials during which no stimuli were presented and the study participants had no interaction with a research assistant).

Content analysis of the 108 verbal responses made by study participants during observations with the dog stimuli yielded the following 10 response categories:

Describing the appearance of the stimulus (eg, “Look at the fat puppy,” “Gorgeous”)

Complementing the stimulus (eg, “Nice dog,” “She is cute”)

Describing the behavior of the stimulus (eg, “She’s licking me,” “She’s looking around”)

Talking or giving instruction to the stimulus (eg, “You are a good girl,” “You’re wonderful)

Remembrance/personal pet ownership (eg, “I had a dog named Bob,” “She looks like my dog”)

Questions about the stimulus (eg, “Does she play with other dogs?”, “How old is she?”)

Off topic/irrelevant remark (eg, “It’s hot out there”)

Not interested in stimulus (eg, “That’s enough,” “Take this”)

Unknown—not English

Nonsense/confusion

The greatest number of responses were evoked by the real dogs, while the fewest responses were seen with the plush dog and coloring stimuli (see Table 3). As to the content of the responses, we found that the majority of these pertained to complementing the stimulus, questions about the stimulus, talking to or giving instructions to the stimulus, and describing the appearance of the stimulus.

Discussion

Results of the present study demonstrate that residents with dementia can be successfully engaged with dog-related stimuli. We found that the attitude of the nursing home residents of our study was most positive toward the real dogs, in contrast to the somewhat positive attitude toward the dog-coloring activity. However, this does not mean that the residents

were successfully engaged only by the real dogs. On the contrary, attitude was also positive toward the robotic dog, the puppy video, and the plush dog. Although statistical analysis did not reveal significant differences in engagement duration among our dog-related stimuli, we saw that residents were engaged the longest with the puppy video (mean duration = 160.5 seconds), followed by the real dogs, the robotic dog, the plush dog, and the dog-coloring activity (mean duration = 96.7 seconds). At first glance, a mean duration of less than 3 minutes may seem brief and not impressive. However, it is important to recognize any type of stimuli with the potential to engage residents as nursing home residents with dementia typically spend the majority of their time engaged in no activity at all, with studies finding rates of unstructured time in the nursing home to be as much as two thirds of the day[1,23,24] or more.[25] In a study of 107 nursing home residents with dementia, Buettner and Fitzsimmons[26] found that nearly 45% received little to no facility activities, 20% received occasional activities, and 12% received daily activities—although these activities were deemed inappropriate for the functional levels and interests of the residents.

More support for the engaging value of our stimuli comes from results of the content analysis of the verbal responses made by the study participants. Despite the cognitive decline of these residents, they talked about previous pets, asked questions, complemented, and talked directly to the dog-related stimuli, with the majority of their verbalizations being appropriate for the situation. Although the 3 real dogs evoked the highest number of spoken comments by the residents, residents also made comments about the robotic dog and the puppy video. In contrast, the study participants made only 2 comments during control (no stimulus) observations. Previously, Greer et al[27] compared real cats, plush cats, and a control (no stimulus) condition in 6 women with moderate dementia and found an increase in meaningful communication and the greatest number of words in the presence of the real cats. Curtright and Turner[28] examined how impaired communication in an 86-year-old woman with dementia was affected by AAT. Conversations in the presence and absence of a real cat as well as a realistic-looking plush cat were recorded and then categorized as either complete, incomplete, or non-information conversations. Both the real cat and plush cat were linked with more complete conversational units than were seen with the baseline or stimulus withdrawal conditions. Although we found in the current study that more conversational units of all types were said in response to the real dogs rather than the plush dog, all 3 studies show that the animal-related stimuli evoked a greater number of verbal responses than did the no stimulus conditions.

We do not know why the residents of the present study showed a preference for the large dog over the medium dog and the small dog. One possibility is that the medium and small dogs were both schnauzers while the large dog was the only poodle and perhaps seen as novel by the residents. Future studies might want to include more than 1 breed for each size of dog. Another possibility is that the residents were differentially influenced by the presence of the human handlers,[3] although previous researchers have found that the nursing home residents preferred dogs over an accompanying researcher[5] or other residents.[2] Clearly more research is warranted.

Although Richeson[3] had observed the importance of past interest in animals, noting that many of the guardians wanted their loved ones to participate in AAT because of their history with animals, our analysis of dog stimuli versus nondog stimuli did not reveal significant differences between residents who had an interest in dogs and those who did not. Yet, a subsequent analysis that included only the 3 real dogs revealed that the attitude of study participants with a past or present interest in dogs was significantly more positive for the large dog and to a lesser degree, the medium dog, than what was observed for those study participants who had no interest in dogs. It is possible that our sample size of 56 was too small to adequately handle this type of analysis. Larger studies could better address this

question as well as examine the impact of dementia on engagement with dog-related stimuli for persons with a past interest in dogs.

The benefits of introducing real dogs to nursing home residents with dementia are that dogs are adept at reading subtle body language and responding appropriately, are able to initiate interactions, and show genuine affection and pleasure during interactions.[3] Another benefit is that dog handlers across the nation are willing to bring their dogs to nursing homes without charging a fee. The downside is that some residents may be fearful or allergic to dogs, and some nursing home administrators may be resistant due to concerns about liability. Moreover, reactions to a real dog are not always positive, such as when a resident swats the dog's nose or a staff member jumps in front of the dog to scare it.[29] Given the results of the current study, we suggest that nursing homes consider alternative dog-related stimuli, such as a puppy video or robotic dog, in additional to traditional AAT.

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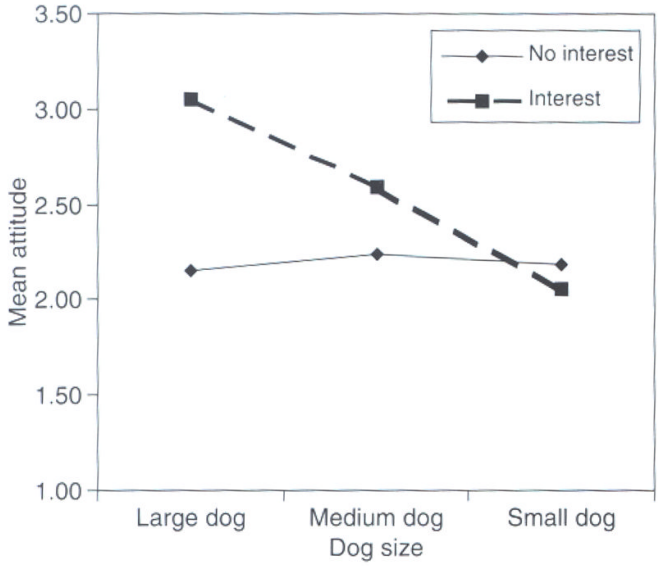

Figure 1.
Mean attitude as a function of dog size for study participants with past or present interest in dogs versus those with no interest.

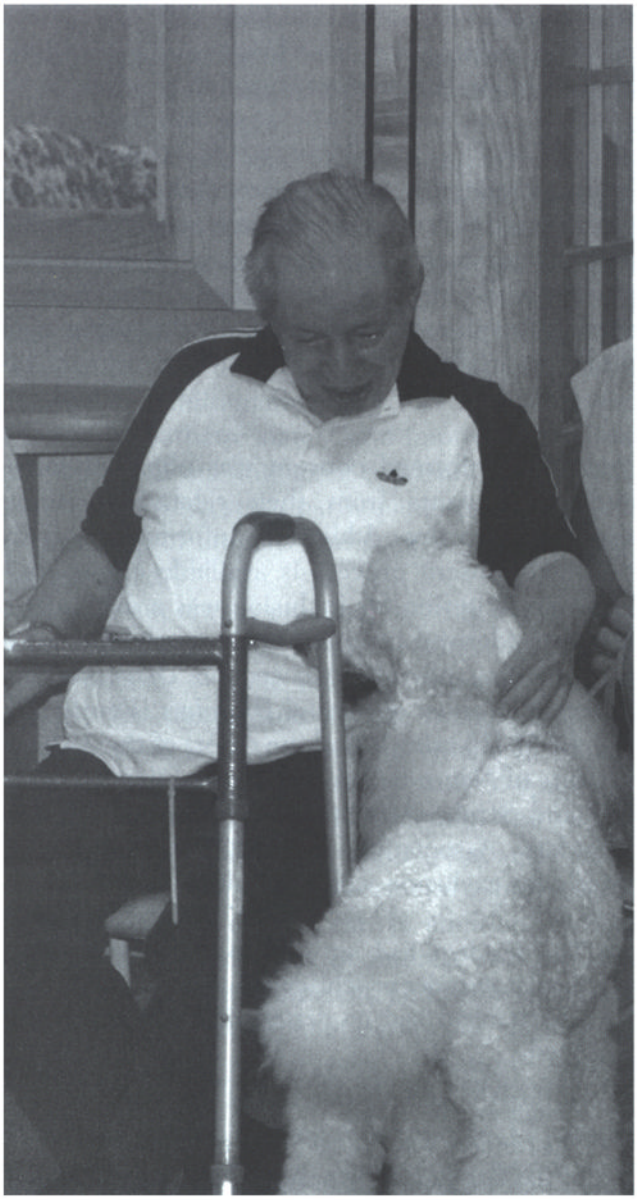

Photo 1.
The large dog with a study participant.

Table 1

Means and Test Statistics Pertaining to Repeated Measures ANOVAs for Engagement Duration and Attitude for the 3 Sizes of Real Dogs[a]

Dependent Variable	Engagement Stimulus	Mean	$F_{(2.106)}$	Probability
Duration (in seconds)	Large dog	154.9	4.303	.024
	Medium dog	133.6		
	Small dog	75.2		
Attitude[b]	Large dog	2.8	5.518	.005
	Medium dog	2.5		
	Small dog	2.2		

Abbreviation: ANOVA, analysis of variance.

[a] This analysis is based on n = 54 because 2 participants were not observed with all 3 dogs.

[b] 1 = negative, 2 = neutral, 3 = somewhat positive, 4 = positive, and 5 = very positive.

Table 2

Means and Test Statistics Pertaining to Repeated Measures ANOVAs for Engagement Duration and Attitude for the Dog-related Stimuli[a]

Dependent Variable	Engagement Stimulus	Mean	$F_{(4.216)}$	Probability
Duration (in seconds)	Real dog	120.2	0.937	.429
	Puppy video	160.5		
	Robotic dog	115.7		
	Plush dog	112.0		
	Dog-coloring activity	96.7		
Attitude[b]	Real dog	2.5	2.661	.034
	Puppy video	2.3		
	Robotic dog	2.4		
	Plush dog	2.3		
	Dog-coloring activity	2.0		

Abbreviation: ANOVA, analysis of variance.

[a] This analysis is based on n = 55 because 1 participant passed away during the study.

[b] 1 = negative, 2 = neutral, 3 = somewhat positive, 4 = positive, and 5 = very positive.

Table 3

Counts of Responses (Across Study Participants) to the Different Dog Stimuli[a]

Content of Response	Medium Dog	Small Dog	Large Dog	Robotic Dog	Puppy Video	Dog-coloring Activity	Plush Animal	Total
Complementing stimulus	6	4	4	3	3			20
Question about stimulus	6	7	1	1	2		1	18
Talking to stimulus or giving instruction to stimulus	4	4	4	2			2	16
Describing stimulus appearance	1	1	3	5	4			14
Not interested in stimulus	1		3	2	2	2		10
Off topic/irrelevant remark	2	2	1	1	1	2		9
Remembrance/pet personal ownership		3	2	1	1			7
Describing stimulus behavior	2	1	3					6
Nonsense/confusion	1	1	2		1	1		6
Unknown (not English)	1				1			2
Total	24	23	23	15	15	5	3	108

[a] A total of 108 comments were given by 38 of the 56 study participants; participants could have more than 1 response.