Animal-Assisted Therapy and Loneliness in Nursing Homes: Use of Robotic versus Living Dogs

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Loneliness is a common problem in long-term care facilities (LTCF) and previous work has shown that animal-assisted therapy (AAT) can to some degree reverse loneliness. Here, we compared the ability of a living dog (Dog) and a robotic dog (AIBO) to treat loneliness in elderly patients living in LTCF. In comparison with a control group not receiving AAT, both the Dog and AIBO groups had statistically significant improvements in their levels of loneliness. As measured by a modified Lexington Attachment to Pets Scale (MLAPS), residents showed high levels of attachment to both the dog and AIBO. Subscale analysis showed that the AIBO group scored lower than the living dog on "animal rights/animal welfare" but not on "general attachment" or "people substituting." However, MLAPS measures did not correlate with changes in loneliness, showing that attachment was not the mechanism by which AAT decreases loneliness. We conclude that interactive robotic dogs can reduce loneliness in residents of LTCF and that residents become attached to these robots. However, level of attachment does not explain the decrease in loneliness associated with AAT conducted with either a living or robotic dog. **(J Am Med Dir Assoc 2008; 9: 173–177)**

Keywords: Animal-assisted therapy; robots; nursing home; loneliness; attachment

Loneliness is a common problem frequently encountered among the elderly[1] in long-term care facilities (LTCF). Many factors contribute to loneliness. The model of Peplau and Perlman[2] differentiates between predisposing factors that make individuals prone to loneliness and precipitating events that can cause the onset of loneliness. Predisposing factors to loneliness include characteristics of the person (for example, a shy individual or one who lacks social skills), characteristics of the situation, and general cultural attitudes. Precipitating events include the breakup of a relationship or moving to a new community. Precipitating events result in a mismatch between the individual's social relations and the person's social needs or desires. A change in 1 of these 2 factors without a corresponding change in the other can result in loneliness. Those with major disruptions in their lives are prone to loneliness. Women, regardless of age, are more prone to loneliness than men.[3,4] Many predisposing and precipitating factors are extremely common in residents of LTCF.[4]

Loneliness, unlike dementia or depression, essentially is a subjective perception. In other words, those who perceive themselves as lonely, regardless of objective assessments or outside opinions, are, in fact, lonely. Evaluation, therefore, must rely on instruments like the University of California Los Angeles (UCLA) Loneliness scale[5] that can ascertain the individual's perceptions.

One suggested method of decreasing loneliness in long-term care facilities is the use of animal-assisted therapy (AAT), also termed pet therapy or pet-facilitated therapy. Elderly who live with a pet are less lonely than those who do not.[6] Previous work has shown that AAT can reduce loneliness in residents in LTCF.[7–9] Previous work found that visits as infrequent as once per week are effective in reducing loneliness.[8] Work has also shown that it is interaction with the dog, not increased socialization among the residents, that accounts for the improvement in loneliness.[9] As such, one-on-one visits with an AAT animal are likely to be more effective than group visits.

The exact mechanisms by which AAT results in decreased loneliness are unclear. One hypothesis is that the human becomes attached to the AAT animal.[7] Attachment has been defined as an emotional bond that supports a sense of closeness, well-being, and security.[10] Supporting this, Baun et al[11] found that relaxation as assessed by decreasing blood pressure was greater when one was petting a familiar dog than when one was petting an unfamiliar dog. Voith[12] found that humans become attached to their pets and that 99% of pet owners consider the pet to be a member of the family. When pet ownership and attachment are correlated with loneliness[7–9] and happiness,[13] only attachment correlated with depression.[14] Of the several scales used to measure attachment

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to pets, the one most appropriate to nursing homes is that of Johnson et al,[15] termed the Lexington Attachment to Pets Scale (LAPS). This is a 23-item questionnaire originally designed for telephone interview and validated in community-dwelling pet owners. Principal component analysis has shown 3 orthogonal factors: "general attachment," "people substituting," and "animal rights/animal welfare."

An interesting trend has been to use robotic dogs as pets. This has occurred especially in Japan and other Western countries among those who have lifestyles that make it difficult to attend to the biological needs of living dogs. The most investigated robotic dog is AIBO (Sony Corporation, Tokyo, Japan). Chat room analysis indicates that humans become psychologically engaged with AIBO, with 79% ascribing essences (presence of biological or animistic underpinning), 60% ascribing agency (presence of mental states such as intentions, feelings, and psychological states), and 59% ascribing social standing (engagement of AIBO in communications, connections, and companionship) to their AIBOs.[16] However, moral standing (worthy of moral regard or responsibility, having rights, or deserving respect) was seldom assigned to AIBO. In a study comparing a living dog and AIBO, children 7–15 years of age were more interactive with the living dog and ascribed higher levels of physical essences, mental states, sociability, and moral standing to the living dog.[17] However, AIBO also achieved very high levels on these scores. A study from Hamamatsu University[18] found that AAT with AIBO improved loneliness and other health-related quality of life measures.

Here, we asked a series of questions in a study of AAT with AIBO and a living dog in residents in a LTCF located in a midwestern US metropolitan area: Does AAT with AIBO decrease loneliness and, if so, how does this compare with that of a living dog? Does attachment occur with AIBO or with a living dog and, if so, how do these compare? Does the decrease in loneliness correlate with measurable attachment to AIBO and a living dog?

METHODS

Residents were interviewed at 3 LTCF in St. Louis, MO. Studies were approved by the IRB at Saint Louis University School of Medicine. Residents were excluded if they scored less than 24 on the the modified mini-mental status exam,[19] had allergies to dogs or cats, scored less than 30 on the UCLA loneliness scale, or had a known history of psychiatric disease or Alzheimer's disease. Recruited individuals were randomized to a group that received no AAT (Control) or to groups that received AAT with AIBO (AIBO) or a living dog (Dog). The AIBO used was a model 210A (Figure 1) with hearing and communication capabilities. The AAT groups received weekly visits lasting 30 minutes from either AIBO or the living dog for 8 weeks. Sessions occurred in the resident's room and consisted of the resident sitting in his or her chair or upright in bed with the dog or AIBO next to the resident. AIBO was kept stationary in its recharging cradle next to the resident, but not allowed to walk about. Residents in all 3 groups were given the UCLA loneliness scale (Version 3) before any sessions of AAT and then again (posttest) 7 weeks later (control group) or during week 7 of the AAT sessions. Two residents each dropped out of the AIBO and Dog groups.

Fig. 1. *Aibo and a resident of a long-term care facility.*

The Lexington Attachment to Pets Scale (LAPS) was modified (MLAPS) to be more appropriate to the LTCF setting. Specifically, the following changes were made: (1) Questions 1–23: All instances of "my pet" changed to "the pet"; (2) Question 17: "I play with my pet quite often" is omitted; (3) Question 22: "Owning" is changed to "Having" and so reads "Having a pet adds to my happiness." The MLAPS was validated in its target population of community dwellers by giving both it and the LAPS to 20 community-dwelling individuals. Possible scores for the MLAPS ranged from 0 to 66. Three subscale scores (general attachment, people substitution, and animal rights/animal welfare) were generated based on principal component analysis performed on the LAPS by Johnson et al[15] who scored each item for the orthogonal factor for which it was most robustly associated.

Means are given with their standard error terms and n. Two means were compared by Student's *t* test and more than 2 means were compared by analysis of variance (ANOVA) followed by Newman-Keuls range test. Correlation and regression analyses were performed by the least squares method using the Prism 4.0 statistical package (GraphPad, Inc., San Diego, CA).

Changes in the loneliness score (delta Loneliness) were calculated by subtracting the posttest score from the pretest score so that a positive value indicates improvement in loneliness and a negative value indicates increased loneliness.

RESULTS

There were no statistical differences among the pretest UCLA loneliness scale scores for the Control (n = 13), AIBO (n = 12), or Dog (n = 13) groups. The mean loneliness score was 45.9 ± 1.16 (n = 38). The delta loneliness scores are shown in Figure 2. ANOVA showed a statistical difference among the groups ($F(2, 35) = 37.3$, $P < .01$). Newman-Keuls posttest showed that the Control group (n = 13) was statistically different from the AIBO ($P < .05$, n = 12) and the Dog ($P < .05$, n = 13) group, but there was no statistically significant difference between the AIBO and Dog groups. Pretest loneliness scores correlated with posttest scores and with delta loneliness scores for control and combined results, but not for Dog or AIBO alone. The correlation between pretest and delta loneliness scores for combined results was m = 0.437, i = (−18.9), r = 0.459, n = 38, $P < .005$.

The MLAPS and LAPS were compared in 20 community-dwelling individuals (Figure 3). The Pearson r = 0.9937, the $r^2 = 0.9874$, the slope correlating LAPS (x) to MLAPS (y) was 1.01, and the intercept was (−3.04).

The MLAPS showed significant attachment in both the AIBO (47.2 ± 4.03, n = 12) and the Dog (55.0 ± 3.73, n = 13) groups (Figure 3; maximum score 66). Student 2-tailed *t* test showed no statistical difference between these 2 groups (Figure 4). Subscale analyses showed no differences between the Dog and AIBO for scale 1 (general attachment: Dog: 25.5 ± 1.4, AIBO: 23.1 ± 1.6, maximal score 30) or scale 2 (people substituting: Dog: 16.5 ± 1.7, AIBO: 13.4 ± 1.9, maximal score 21) with both receiving high scores. Because of previous work showing that AIBO is seldom ascribed moral standing,[16] we hypothesized a priori that AIBO would score lower in the LAPS scale 3 (animal rights/animal welfare) and so compared these groups with a 1-tailed *t* test. AIBO (10.3 ± 0.91) scored lower than the Dog (12.6 ± 0.712) by 1-tailed *t* test ($t = 2.0$, $df = 23$, $P < .05$; 2-tailed showed a strong trend with $P = .058$), but both groups still scored high out of a maximum score of 15 (Figure 5).

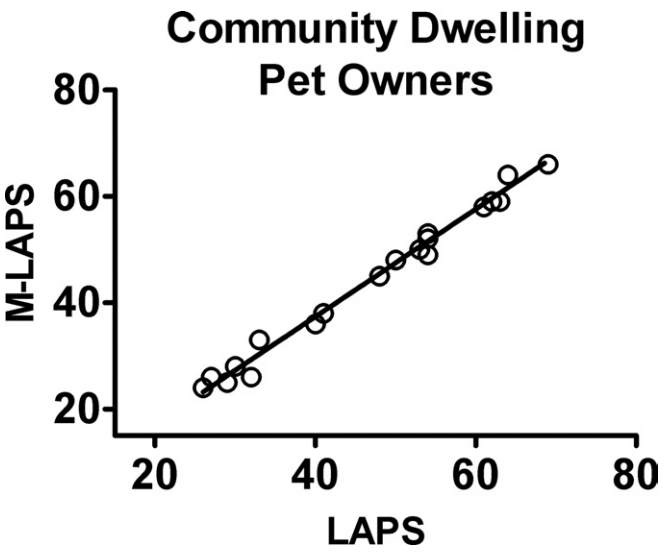

Fig. 3. *LAPS versus MLAPS as assessed in community-dwelling pet owners. A high degree of correlation between LAPS and MLAPS indicates that the modifications did not affect the validity of the scale.*

Figure 6 correlates the delta Loneliness scores with the MLAPS scores. There was no statistically significant correlation between these 2 parameters.

DISCUSSION

We found here that elderly residents living in long-term care facilities who received scheduled AAT with either a living or robotic dog were significantly less lonely than those who did not receive AAT (Figure 2). We found no difference between the effectiveness of a living and robotic

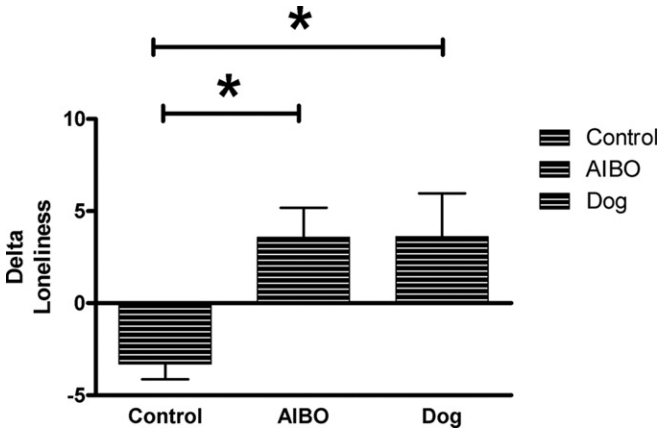

Fig. 2. *Effects of AAT with a robotic dog (AIBO) and a living dog (Dog) on loneliness. AAT with either AIBO or a living dog resulted in similar improvements in loneliness when compared with a control group ($P < .05$) not receiving AAT.*

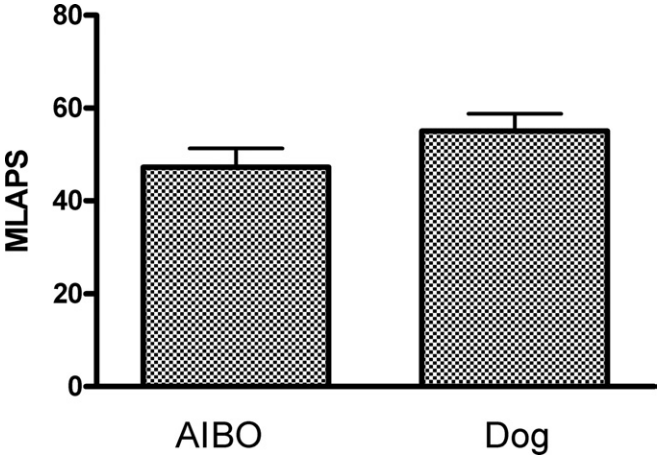

Fig. 4. *Attachment as measured by the MLAPS in residents receiving AAT with either AIBO or a living dog. Both groups showed high levels of attachment that were not statistically different from each other.*

dog in reducing loneliness. As in a previous study,[8] we found a correlation between pretest and posttest loneliness scores and between pretest and delta loneliness, indicating that those who were most lonely improved the most. This correlation existed for the control group as well, indicating that the most lonely who did not receive AAT became increasingly lonely.

Previous work has shown that enhancement of interactions among residents does not account for the AAT-associated improvements in loneliness.[9] Here, we tested whether attachment could underlie the AAT effect. The LAPS was modified (MLAPS) to be more appropriate as indicated in the methods section to the parameters of the study. The MLAPS was validated by comparing MLAPS and LAPS scores in community dwelling individuals who owned pets, the original population for which the LAPS was designed (Figure 3). This comparison found a Pearson r in excess of 0.99, suggesting that the MLAPS retained in original validity of the LAPS. Residents scored high on attachment scales to both AIBO and a living dog (Figure 4). Residents who received the living dog had an arithmetically higher level of attachment than those who received AIBO, but the difference was not statistically significant. More importantly, attachment as measured by the MLAPS did not correlate with the change in loneliness (Figure 6). The lack of correlation between delta loneliness and MLAPS suggests that attachment to either AIBO or the living dog does not account for their abilities to reduce loneliness.

Subscale analysis of MLAPS showed differences only in scale 3 (Figure 5), but not in scales 1 and 2. Scale 3 correlates with animal rights/animal welfare concerns and its lower score is consistent with a previous analysis of an online chat room talk that indicates that AIBO is seldom ascribed moral standing (worthy of moral regard or responsibility, having rights, or deserving respect).

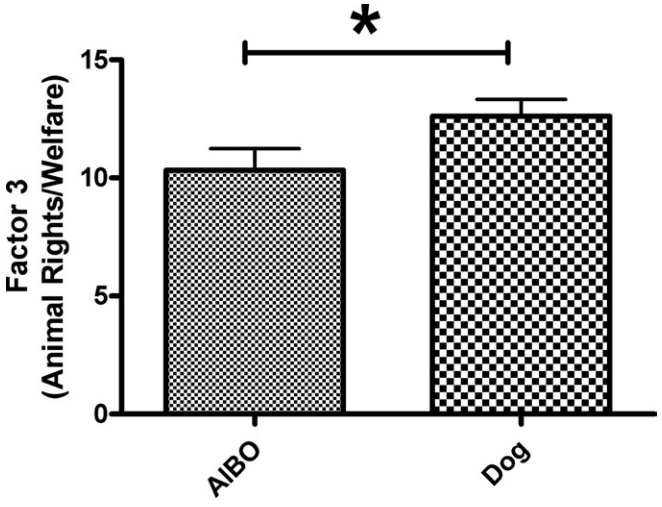

Fig. 5. *Subscale analysis for the orthogonal factor associated with animal rights/animal welfare. AIBO scored lower ($P < .05$) than the living dog.*

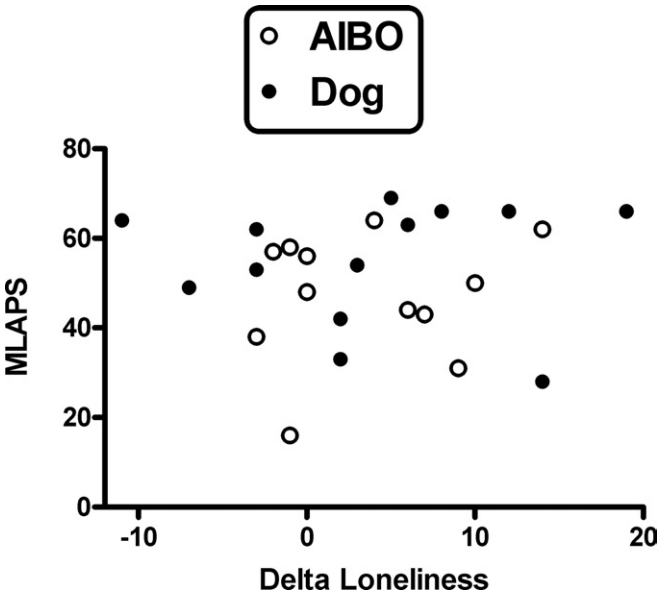

Fig. 6. *Relation between change in loneliness (Delta Loneliness) and MLAPS. There was no correlation between change in loneliness and MLAPS for AIBO, the living dog, or the combined group.*

Anecdotally, some residents and staff were initially reluctant to interact with AIBO; however, with exposure, this resistance largely dissipated. Acceptance of interactive robotics suggests their widespread use in geriatric facilities is feasible. Robotics are increasingly being used for in-home monitoring. We should note that AIBO was not used to its full capacity, but was kept in its recharging cradle sitting next to the resident. It was not allowed to walk around and its voice and face recognition programs were not used to full capacity. It is possible that if these options were used and if residents were assigned or given a personal robotic dog, then its effects might be further enhanced. In conclusion, this study found that interactive robotic dogs are effective in decreasing loneliness in residents of LTCF, that residents become attached to both the robotic and living dog, but that attachment did not underlie the effect of AAT on loneliness. Robotic dogs may be an option for those desiring pets or needing AAT in circumstances where the needs of living animals cannot be met.

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