Journal of Community Health Nursing

ISSN: 0737-0016 (Print) 1532-7655 (Online) Journal homepage: http://www.tandfonline.com/loi/hchn20

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To cite this article: Cheryl A. Krause-Parello PhD, RN, FAAN & John Kolassa PhD (2016) Pet Therapy: Enhancing Social and Cardiovascular Wellness in Community Dwelling Older Adults, Journal of Community Health Nursing, 33:1, 1-10, DOI: 10.1080/07370016.2016.1120587

To link to this article: http://dx.doi.org/10.1080/07370016.2016.1120587

Published online: 26 Jan 2016.

JOURNAL OF COMMUNITY HEALTH NURSING
2016, VOL. 33, NO. 1, 1–10
http://dx.doi.org/10.1080/07370016.2016.1120587

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Pet Therapy: Enhancing Social and Cardiovascular Wellness in Community Dwelling Older Adults

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ABSTRACT

Pet therapy can be therapeutic for older adults living in the community. A crossover design was used to examine changes in blood pressure and heart rate before and after a pet therapy visit versus a volunteer-only visit in 28 community dwelling older adults. Relationships among stress, pet attitude, social support, and health status were also examined. Study findings supported that pet therapy significantly decreased blood pressure and heart rate. Ultimately, the findings supported the notion that community health nurses should consider developing and implementing pet therapy programs in the communities they serve. Further implications for community health nurses are discussed.

Worldwide, the older population—comprised of individuals 60 years of age and older—is growing faster than any other age cohort (World Health Organization, 2014). The older population has increased from 6.3 million since 2000 to 41.4 million in 2011 (Administration on Aging, 2013). In the United States, over 13.3%, or about one in eight, individuals are classified as an older adult. Furthermore, 28% (11.8 million) of noninstitutionalized older persons live alone (8.4 million women, 3.5 million men; Administration on Aging, 2013). It is predicted that as the population increases, so will the number of elderly individuals living alone (Administration on Aging, 2013).

Social support is essential to maintaining positive health and well-being in older adults living in the community (Krause-Parello, 2008a). Moreover, there are important health effects and benefits from social affiliation and companionship (Friedmann, Katcher, Thomas, Lynch, & Messent, 1983). One emerging option is a visiting pet therapy program to promote health and social wellness for older adults in the community. Social wellness is the adeptness to develop personal relationships with others and to be a part of a positive social network. The idea of a pet therapy playing a role in social wellness dates back to the 1960s (Levinson, 1969), and current research supports the benefits of pet therapy in enhancing social wellness in older adults (Menna et al., 2012). Furthermore, the positive relationships among social support, health, and wellness in older pet owners are well documented (Krause-Parello, 2008b, 2012; Krause-Parello & Gulick, 2013). Since Levinson's work in 1969, pet therapy has grown significantly as a therapeutic modality for older adults (Moretti et al., 2011).

Stress has been evidenced to have a direct effect on cardiovascular health measures (Friedmann, Thomas Son, Chapa, & McCune, 2013), and for the older adult there may be external and compounding conditions that negatively affect stress, such as alterations in health status, relocation, and loss of a loved one (Krause-Parello, 2008b). In a recent study, an increased risk of cardiovascular mortality was found for older adults living in the community (Carrière et al., 2013). The result of this study suggested that community-dwelling older adults may have a

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decrease in social support and an increase in social isolation, putting them at a higher risk of cardiovascular mortality. This underscores the relevance of our research. Pets, such as dogs, cats, and birds, are consistently well documented in the literature as a source of social support. They are also known to have a positive effect on decreasing stress and improving health and social wellness in older adults (Krause-Parello, 2008a; Miltiades & Shearer, 2011; Wells & Rodi, 2000). Research suggests that human-to-human social support directly affects the impact of perceived stress on physiologic responses such as blood pressure (BP) and heart rate (HR; Institute of Medicine, 2001), which further begs the question of whether pets can, indeed, provide the degree of social support necessary to produce these effects. Pet therapy programs have the potential to be a valuable resource for an individual who enjoys the company of pets and could positively influence cardiovascular health in older adults living in the community. However, many older adults do not have the opportunity to interact with companion animals for a variety of reasons such as housing restriction, resources, and mobility. As such, the purpose of this research was to investigate specific changes in cardiovascular health measures—namely, BP and HR—before and after pet therapy in older adults to provide quantitative data regarding the effects that interacting with a companion animal may have. Relationships among stress, pet attitude, social support, and self-reported health status were also examined.

Methodology

A crossover design was used to investigate changes in BP and HR before and after a pet therapy session with a volunteer handler-canine therapy dog team versus a session with a volunteer and no therapy dog. Because each participant received both treatments, this design had the advantage of eliminating individual subject differences from the overall treatment effect, thus enhancing statistical power. Furthermore, the relationships among stress, pet attitude, social support, and health status were also examined based on the participants' responses on reliable and valid study instruments.

Sample and setting

A convenience sample was recruited from Caregiver Volunteers of Central Jersey. The sample (N = 28; see Table 1) included both male (n = 12) and females (n = 16) participants whose age ranged from 60 to 102 (M = 82.9: SD 9.62; two values missing) and a majority were White (n = 22; 82.1%); a small percentage were Hispanic/Latino (n = 2; 7.1%) or Black (n = 1; 3.6%). Three individuals declined to list their race. More than half of the participants were married (n = 16; 57.1%), followed by widowed (n = 7; 25%), or never married (n = 3; 10.7%), with a small percentage divorced/separated (n = 2; 7.1%). A majority of the participants lived with a spouse or significant other (n = 16; 85.7 %); followed by lived alone (n = 8; 28.6 %) or with a friend (n = 2; 7.1%), lived with a parent (n = 1, 3.6%), and lived with a sibling (n = 1; 3.6%). This sample size provides a power of 80% to detect a correlation of size 0.514 in a two-sided test of size .05 (Brown et al., 2010).

Caregiver Volunteers of Central Jersey is a nonprofit, interfaith organization whose mission is to assist the older adults in New Jersey with everyday tasks. One of the many free services offered is The Caregiver Canines Therapy Dog Program. This program provides older adults with pet visitations from certified volunteer handler-canine therapy dog teams. The program is used to bring love, companionship, and comfort via pet therapy to older adults in their home based on the overarching idea that dogs provide comfort and unconditional love, and are known to help relieve stress. Participants were eligible to participate if they met the following inclusion criteria: (a) enrolled in the Caregiver Canines Therapy Dog Program, (b) resided in independent housing, and (c) were able to communicate in English.

Table 1. Participants demographic and characteristics (N = 28).

Variable Description	*n*	%
Marital status		
Married/Partnered	16	57.1
Widowed	7	25
Never married	3	10.7
Divorced/Separated	2	7.1
Race		
White	22	82.1
Hispanic/Latino	2	7.1
Black	1	3.6
Other	3	10.7
Living arrangement		
Spouse/Significant other	16	85.7
Lives alone	8	28.6
Lives with friend	2	7.1
Parents	1	3.6
Sibling	1	3.6
Self-rated health status		
Excellent	5	17.9
Very Good	3	10.7
Good	7	25.0
Fair	10	35.7
Poor	2	7.1
Missing	1	3.6

Instruments

Demographics

A demographic questionnaire was developed specifically for this study. Participants were asked to indicate their age, marital status, race, living arrangements, and health status.

Stress

Stress was measured using the perceived stress scale (PSS; Cohen, Kamarck, & Mermelstein, 1983). The PSS is a 10-item summative Likert-type scale that measures the degree to which life situations are appraised as stressful. The instrument uses a five-point scale: 0 (most negative option) to 4 (most positive option) and total scale score can range from 0 to 40, with higher scores indicating a greater appraisal of life situations as stressful. The psychometric properties of the instrument have been evaluated in past studies (Ezzati et al., 2014). Concurrent validity was evaluated by examining the PSS relationship with gender, depression, anxiety, and positive and negative affect schedule (PANAS). Divergent validity was assessed by examining the PSS correlation with the Bodily Pain Index from Short Form (36) Health Survey (SF-36). Spearman's correlations, t-tests, and analysis of variances were used as appropriate. Correlations between PSS and the SF-36 bodily pain measure, which was not intended to measure perceived stress, were low (PSS: $r = 0.18$, $p < 0.001$; PF: $r = 0.14$, $p < 0.001$; NF: $r = 0.17$, $p < 0.001$; Ezzati et al., 2014). This instrument has been found to be reliable in a sample of young adults in that the coefficient alpha of .85 was reported in a study of 67 respondents (Stawski, Sliwinski, Almeida, & Smyth, 2008). The Cronbach's alpha obtained for the current study was .85.

Pet attitude scale

Pet attitude was measured by the pet attitude scale (PAS; Templer, Salter, Dickey, Baldwin & Veleber, 1981). The 18-item summative 7-point Likert-type rating scale measured the subjective experience of pet attitude by utilizing degrees of agreement and disagreement: 1 (*strongly disagree*), 2 (*moderately*

disagree), 3 (*slightly disagree*) 4 (*unsure*), 5 (*slightly agree*), 6 (*moderately agree*), 7 (*strongly agree*), and the total scale score can range from 18 to 126, with higher scores indicating a more positive attitude toward pets. Criterion-oriented validity was established by contrasting two groups: one working with animals and the other preparing for a people-helping career. The kennel workers scored significantly higher than the social work students 112.88 and 97.72, respectively, $t = 3.53$, $p < .01$ (Templer & Arikawa, 2011). The reliability of the scale was established with a Cronbach alpha of .93 and a test–retest reliability of .92 (Templer, Salter, Dickey, Baldwin, & Veleber, 1981). The Cronbach's alpha in the current study was .70.

Social support

Human social support was measured by the Social Support Strategy Indicator (CSI): seeking support subscale (Amirkhan, 1990). The instrument is an 11-item summative Likert-type scale that uses anchors ranging from 1 (*not at all*) to 3 (*a lot*). The total scale score can range from 11 to 33, with higher scores indicating a greater use of that social support strategy. Construct validly was established by correlating the seeking support subscale with the Social Support Questionnaire $r = .30$, $p < .01$ (Sarason, Sarason, Shearin, & Pierce, 1987). The internal consistency for the CSI: seeking support subscale was $\alpha = .93$; (Amirkhan, 1990). The Cronbach's alpha in this study was .87.

Perceived health status

Perceived health status was measured by a single question on the demographic form "How would you rate your health at present? The question used anchors ranging from *excellent* (1) to *very good* (2), *good* (3), *fair* (4), and *poor* (5), and the total scale score can range from 1 to 5, with higher scores indicating a poor health status.

BP and HR

BP and HR were measured using a Reli On Easy Wrap Automatic Blood Pressure Monitor. The monitor had an adjustable easy wrap cuff for a proper fit and an artery marker for correct cuff placement. The Reli On Easy Wrap Automatic Blood Pressure Monitors used for this study were new, calibrated, and reliable based on manufacture for adults.

Data collection

Initial recruitment was led by the program's executive director and staff member. The director and staff member identified potential participants who were part of the Caregiver Canines Therapy Dog Program and contacted them via telephone to ascertain interest in participating in the study. If the potential participants expressed interest, a research team member followed up with a telephone call to discuss the study details with the potential participant.

The participants contacted were enrolled in the canine visitation program for at least 1 month. The instrument packet took approximately 20 min to complete.

There were a total of two visits to the home: one from a volunteer-handler canine team, the other a volunteer with no canine. The visits were approximately 1 week apart. The data were collected during scheduled visits (e.g., afternoon). The respective visits were scheduled during the same timeframe and lasted approximately 1 hr. The participants were not told the order of the visits (e.g., volunteer-handler canine team, then volunteer no canine or vice versa). Each home visit session took approximately 60 min. For this research study, it was standard for both visits that the interactions only involved sitting and chatting. The general conversation included topics about things such as the weather and books. All attempts were made by the experimenter to control the

range of conversation with the goal of eliminating open-ended conversation topics as a potential confounding variable affecting physiological reactions. The researcher monitored and recorded the participant's BP and HR measurement before and approximately 2 min after the conversation ended.

There were minimal risks to the participants in this project, given that the participants were already enrolled in the Caregiver Canines Therapy Dog Program and were accustomed to the animals. In this program, the dogs were matched with participants based on volunteer availability, location, and preference stated by the older adult client. Some requested little dogs (i.e., Dachshunds), while others requested big dogs (i.e., Golden Retrievers). All dogs involved in this program are certified and have passed the Canine Good Citizenship test and therapy dog certification test through the New Jersey-based therapy dog certification associations. To reduce risk, the certified handlers were always present with the dog and available to assist during each visit with the participants. Participants were not left alone with the canine at any time during this project. There were minimal risks to the dogs, as the dog handlers were specifically trained to recognize stress and anxiety, as well as injury to their dogs. The handlers had a preprepared plan to remove the dog from the home if the dog displayed signs of stress or injury. The therapy teams consisted of different breeds of dogs such as Dachshunds, Golden Retrievers, and mixed breeds. The therapy dogs that the volunteers work with were owned by and live with their handlers.

Ethical considerations

The rights of human subjects were protected by obtaining approval from the Institutional Review Board of a state university located in New Jersey prior to data collection.

Data analysis

Data were analyzed using SPSS for Windows, version 22 (IBM Corp. Released, 2013), and the *R* statistical package. Pearson product-moment correlations were calculated for the study variables. Medians and quartiles were calculated. The study followed a two-period two-treatment crossover design (Jones & Kenward, 2003), as such allowed for explanatory variables. Our primary analysis used the model without period or carryover effects. The appropriateness of this approach is demonstrated later. The effect of canine visitation on diastolic BP was calculated by subtracting the diastolic BP after the canine visit (intervention condition) minus the value before canine visit. Similarly, the effect of volunteer visit (control condition) on diastolic BP was calculated by subtracting the diastolic BP after volunteer visit minus the diastolic BP before the friendly volunteer visit. Finally, the difference in effects on diastolic BP attributed to canine visit over volunteer visit is determined by subtracting the effect of canine visit on diastolic BP minus the effect of canine visit on diastolic BP. That is, subtract the diastolic BP after canine visit minus the diastolic BP before canine visit, minus the diastolic BP after friendly volunteer visit, and then plus the diastolic BP before healthy volunteer visit. For example, if the diastolic BP before healthy volunteer visit is 85 mm Hg, the diastolic BP after healthy volunteer visit is 80 mm Hg, the diastolic BP before canine visit is 92 mm Hg, and the diastolic BP after canine visit is 82 mm Hg, then the difference attributable to the friendly volunteer is 80–85 = −5, and the difference attributable to the canine visit is 82–92 = −10. The advantage of canine visit over friendly volunteer visit is then (92–82)–(85–80) = −5, giving a five mm Hg larger drop attributable to the canine visit as compared with the friendly volunteer visit. The systolic BP and HR were handled analogously. Two-tailed tests were used to determine statistical significance ($p \leq .05$).

Results

Data cleaning revealed that some respondents did not answer all of the questions making up the stress, social support, and pet attitude scales. Therefore, partially completed scales were completed by imputing values using Buck's method (Little & Rubin, 1987); when the imputed values fall outside

Table 2. Study variable correlation table.

		Health	Stress	Pet Attitude	Coping
Health	Pearson correlation	1	−.426*	.006	.082
	Sig. (2-tailed)		.030	.975	.689
	N	26	26	26	26
Stress	Pearson correlation	−.426*	1	−.150	.081
	Sig. (2-tailed)	.030		.456	.689
	N	26	27	27	27
Pet Attitude	Pearson correlation	.006	−.150	1	.098
	Sig. (2-tailed)	.975	.456		.625
	N	26	27	27	27
Coping	Pearson correlation	.082	.081	.098	1
	Sig. (2-tailed)	.689	.689	.625	
	N	26	27	27	27

*$p \leq .05$ (two-tailed).

the range of observed values, the appropriate end of the range of observed values is used instead. The mean scores were determined for stress ($M = 20.13$; $SD = 6.44$); pet attitude ($M = 89.44$; $SD = 20.27$); social support ($M = 21.58$; $SD = 5.47$); and health ($M = 2.96$, $SD = 1.26$). Most of the correlations were nonsignificant (see Table 2). However, correlational analysis revealed that stress was inversely related to subjective health rating ($p = 0.029$). Note that a higher rating corresponds to poorer health. Scatterplots showed no non-linear relationship.

The effect of six explanatory variables, subjective health, gender, age, stress, social support, and pet attitude, on each of three response variables, effect of pet therapy on systolic BP, effect of pet therapy on diastolic BP, and effect of pet therapy on HR, were evaluated using linear regression. Expert-directed forward stepwise model selection, followed by backward variable elimination, was used. Based on expert opinion, it was determined that main effects would be included without interactions. Graphical diagnostics were performed on model outputs to ensure model adequacy. The approach used was suggested by Montgomery, Peck, and Vining (2012), with the initial set of regressors determined by a methods expert who assisted with calculations and predictions. This analysis was repeated on changes after the canine treatment. In this case, health rating and systolic BP ($p = 0.0210$) and stress and systolic BP ($p = 0.0039$ were significantly correlated (see Table 3).

The easiest way to understand the effect of health rating, stress, and social support was to fix the other variables at their median, with gender fixed to an intermediate value between males and females. This strategy provided a single measure of differential response for subjects with a standard moderate covariate pattern. The disadvantage was that the response is not associated with any particular subject, because generally no subject will have covariate values at the median, and no subject will have the intermediate gender value. When health rating was fixed at its lower quartile, the systolic BP drops on average by 9.19 more during canine treatment than during human treatment, and when health rating was fixed at its upper quartile, the systolic BP rises on average by 7.91 under canine treatment than during human treatment.

Table 3. Regression models for systolic blood pressure.

Coefficient	Estimate	Std. Error	*t* Value	pr(>|*t*|)
Intercept	−30.04	18.82	−1.60	0.0357*
Health	8.55	3.07	2.79	0.0210*
Gender	17.49	7.66	2.28	0.0952
Stress	1.33	0.53	2.51	0.0039**
Coping	−1.43	0.67	−2.13	0.0824

Notes. Residual standard error: 14.07 on 18 degrees of freedom (1 observation deleted due to missingness). Multiple R-squared: 0.4348, Adjusted R-squared: 0.3092.
*$p \leq .05$ (two-tailed). **$p \leq .01$ (two-tailed).

Table 4. Regression for diastolic BP.

Coefficient	Estimate	Std. Error	*t* Value	pr (>|*t*|)
Intercept	91.83	45.85	2.04	0.0551*
Age	−0.68	0.47	−1.46	0.1612*
Coping	−1.73	0.84	−2.06	0.0522

Notes. Residual standard error: 20.95 on 20 degrees of freedom (1 observation deleted due to missingness). Multiple R-squared: 0.2248, Adjusted R-squared: 0.1473.
*$p \leq .05$ (two-tailed).

Table 5. Regression models for change in heart rate.

Coefficient	Estimate	Std. Error	*t* Value	pr (>|*t*|)
Intercept	2.71	9.62	0.28	0.7809
Health	3.75	1.74	2.16	0.0431*
Coping	−0.59	0.36	−1.63	0.1199

Notes. Residual standard error: 9.158 on 20 degrees of freedom (1 observation deleted due to missingness). Multiple R-squared: 0.2622, Adjusted R-squared: 0.1885.
*$p \leq .05$ (two-tailed).

Again, here and in the following, a lower health rating corresponds to better health. When stress was fixed at its lower quartile, the systolic BP drops on average by 5.94 more with canine treatment than with solely human treatment. When social support was fixed at its upper quartile of 24, systolic BP increased on average by 4.66 more with canine treatment than with solely human treatment. When social support was fixed at its lower quartile, systolic BP rises by an average of 7.24 more under canine treatment as compared to solely human treatment, and when social support was fixed at its upper quartile, systolic BP crops by an average of 4.94 under canine as opposed to solely human treatment. The best fitting model for diastolic BP contained age, and social support, but none of the variables in the regression model for diastolic BP were significant (see Table 4).

The best fitting model for HR contained health rating and social support. Health rating was significant ($p = 0.0431$; see Table 5). When health rating was fixed at its lower quartile, HR drops by an average of 2.78 on canine therapy relative to human therapy, and when heath rating was fixed at its upper quartile, HR rises by an average of 4.72 on canine treatment relative to human treatment.

We then modelled differences in changes in response variables (systolic and diastolic BP, and HR) between the human and canine treatments the same way; but in this case, added a variable indicating whether canine treatment came first or second. In each case, we considered interactions between treatment order and the other covariates, but the resulting models were deemed implausible using the expert-directed model selection scheme described previously. These rejected models with interactions represent the standard crossover model for the response variable including carryover effect (which in this case was confounded with period effect), and the lack of utility for these models justifies our modelling without period or carryover effects. Notably, even though treatment order was included as a potential covariate in each model, in each case it was rejected in the model selected by the investigators, assisted by stepwise selection techniques, as the best model.

Limitations

There are limitations that must be taken under consideration when interpreting the findings. Due to the sample demographics, age and living arrangements (i.e., some participants living with others), the findings cannot be generalized, in part because a convenient, nonprobability sampling was employed, increasing the risk of selection bias. A purposive sample may have been more appropriate and may be the reason why the correlations were not largely significant. One criterion for participation was that the participant was already enrolled in the Caregiver Canines Therapy Dog Program.

Therefore, the results might only be generalizable to those who already participate in a dog therapy program and not to the wider population. In addition, there was a lack of control regarding the dog visitation due to different volunteer-canine teams which may have influenced the results (e.g., different dog breeds and handlers). However, the results of this study can be used to calculate effect size to help plan sample sizes for future studies. Furthermore, a larger sample would have made modelling clearer. Finally, the incomplete nature of survey responses required imputation of missing values, and so this nonresponse reduced the information available in the data set. The findings from this research can be used to calculate effect size to help plan sample sizes for randomized control trials to further investigate the efficacy of visiting pet therapy programs for older adults.

Discussion

The aim of this research was to investigate changes in cardiovascular health measures (e.g., BP and HR) before and after interaction with volunteer handler-canine therapy dog teams versus volunteer-no canine therapy, and examine the relationships among stress, pet attitude, social support, and self-rated health status. The results of this study contributed new knowledge about pet visitation for older adults living in the community. Community based programs such as Caregiver Canines Therapy Dog Program can provide older adults with a link to society through psychosocial support, social activity, participation, and interaction with the community member.

Our study found a significant relationship between systolic BP, health rating, gender, stress, and coping, that implies a greater decrease in systolic BP when visited by an animal then under conventional intervention for those with poorer self-rated health, higher stress, and poorer coping, and for men. There is a significant relationship between HR and health rating that predicts a larger decrease in HR under pet therapy than under conventional intervention for all possible health ratings. No significant relationship between diastolic BP and the variables considered was detected.

This research supports the Caregiver Canines Therapy Dog Program by providing the empirical evidence to verify the benefits of the program for older adults who participated in this study. Additional research in this area is needed to support future expansion of pet visitation programs to other communities that serve older adults. A pet visitation program provides an opportunity to enhance social and cardiovascular wellness through provision of companionship and distraction from mundane activities. In this sample, a visit from a therapy dog was found to enhance cardiovascular wellness in older adults who identify their health as poor. The older adults who participated in the program increased their weekly activity though socialization with a therapy dog. Additionally, it has been shown that involvement in a pet visitation program can also help older adults increase self-health empowerment (Shearer, 2007). Health empowerment is an important concept to understand in regards to older adults living in the community. As people age, their health becomes more complex and health promotion efforts to maintain positive health are important. Older adults that purposely participate in community based programs, such as Caregiver Canines Therapy Dog Program, may have a keen awareness of the role social support plays in wellness. However, this premise needs further exploration.

Community-based programs are needed to support quality psychosocial care for the aging population. The context of this research stems from the increased use and reported benefits of pet visitation in decreasing stress and social isolation, and enhancing wellness in the absence of human companionship in various health care settings, home health care, and private residents. Community-based visitation programs can enhance psychosocial support to improve the social environment. Therefore, pet therapy programs can be a valuable resource for an individual who enjoys the company of pets, and it has the potential to positively influence cardiovascular health in older adults living in the community.

Conclusion

The results of this study have implications for community health nursing and related disciplines. Pet therapy programs designed specifically for older adults living in the community have significant potential to support social and cardiovascular wellness in this cohort. Based on our results it is suggested that nurses working with older adults in the community consider developing and implementing pet visitation programs. This can be a collaborative effort with local pet therapy programs and interdisciplinary healthcare teams. These collaborations have potential to improve social and cardiovascular wellness, self-health empowerment, and enhance cardiovascular health in older adults living in the community. Future research is needed to expand on these findings. It is, therefore, suggested that development of a pet visitation program be rooted in assessment of the program and patient outcomes over time. Through this longitudinal assessment, pet visitation programs can be effectively appraised and evaluated. In summary, based on the findings of this research, community health nurses should consider developing and implementing pet therapy programs for the older adults they serve.

Resources

Anyone interested in beginning an in-home therapy dog program can contact Caregiver Volunteers of Central Jersey at 732.505.2273 or visit their web site at www.caregivervolunteers.org. Additional stories and photos can be found on their Facebook page www.facebook.com/caregivercanines.

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