Journal of Pediatric Nursing 36 (2017) 84–91

Contents lists available at ScienceDirect

Journal of Pediatric Nursing

Effects of Animal-assisted Activities on Biobehavioral Stress Responses in Hospitalized Children: A Randomized Controlled Study

Sandra M. Branson, Ph.D., RN [a,*,1], Lisa Boss, Ph.D., RN, CNS, CEN [a,2], Nikhil S. Padhye, Ph.D. [a,3], Thea Trötscher, RN [a,4], Alexandra Ward, Medical Student [b,5]

[a] Department of Nursing Systems, The University of Texas Health Science Center at Houston School of Nursing, Houston, USA
[b] Department of Medicine, John P. and Kathrine G. McGovern Medical School, Houston, USA

ARTICLE INFO

Article history:
Received 9 February 2017
Revised 5 May 2017
Accepted 23 May 2017
Available online xxxx

Keywords:
Anxiety
Animal-assisted activities
Biobehavioral
Children
Hospital
Stress

ABSTRACT

Purpose: This study assessed the effectiveness of animal-assisted activities (AAA) on biobehavioral stress responses (anxiety, positive and negative affect, and salivary cortisol and C-reactive protein [CRP] levels) in hospitalized children.
Design and Methods: This was a randomized, controlled study.
Method: Forty-eight participants were randomly assigned to receive a 10-minute AAA ($n = 24$) or a control condition ($n = 24$). Anxiety, positive and negative affect, and levels of salivary biomarkers were assessed before and after the intervention.
Results: Although increases in positive affect and decreases in negative affect were larger in the AAA condition, pre- and post-intervention differences between the AAA and control conditions were not significant. In addition, pre- and post-intervention differences between the conditions in salivary cortisol and CRP were not statistically significant. Baseline levels of anxiety, cortisol, and CRP had a significant and large correlation to the corresponding post-intervention measures. Scores on the Pet Attitude Scale were high but were not associated with changes in anxiety, positive affect, negative affect, or stress biomarkers.
Conclusions: Although changes were in the expected direction, the magnitude of the effect was small. Future randomized controlled trials with larger recruitment are needed to determine the effectiveness of AAAs in reducing biobehavioral stress responses in hospitalized children.
Practice Implications: Nurses are positioned to recommend AAA as a beneficial and safe experience for hospitalized children.

Hospitalized children face significant anxiety and negative emotions related to serious health problems and unfamiliar hospital settings (Bossert, 1994; Tiedeman & Clatworthy, 1990). During times of stress, levels of neuroendocrine biomarkers such as cortisol are elevated and can negatively affect immune function and recovery by down-regulating inflammatory responses (Schneiderman, Ironson, & Siegel, 2005; Steptoe, Hamer, & Chida, 2007). Animal-assisted activities (AAAs) are endorsed by healthcare providers as a cost-effective intervention in various healthcare settings that provide motivational, educational, recreational, and therapeutic benefits to patients (AVMA, 2017; SCAS, 2013). The aim of the current study was to test the effectiveness of AAA in reducing biobehavioral stress responses in hospitalized children.

Several studies have shown that AAAs improve positive mood/affect in hospitalized children (Bouchard, Landry, Belles-Isles, & Gagnon, 2004; Kaminski, Pellino, & Wish, 2002; Stoffel & Braun, 2006; Wu, Niedra, Pendergrast, & McCrindle, 2002), but determining AAA effectiveness and generalizing findings are hampered by a variety of methodologies used, with variable rigor. One group reported hospitalized children had a higher level of positive affect after a brief AAA than after playing with people (Kaminski et al., 2002); however, the study used non-random sampling, which can introduce selection bias. Other researchers reported that AAAs improved hospitalized children's general positive feelings, but the absence of a control group limited the validity of the findings (Bouchard et al., 2004; Wu et al., 2002). As noted by Chur-Hansen, McArthur, Winefield, Hanieh, and Hazel (2014), the authors of one qualitative study among hospitalized children reported AAA promoted calmness and positive mood, but the absence of triangulation limited the validity of the findings (Stoffel & Braun, 2006).

* Corresponding author.
E-mail addresses: Sandra.M.Branson@uth.tmc.edu (S.M. Branson), Lisa.Boss@uth.tmc.edu (L. Boss), Nikhil.S.Padhye@uth.tmc.edu (N.S. Padhye), Thea.T.Trotscher@uth.tmc.edu (T. Trötscher), alexandra.m.ward@uth.tmc.edu (A. Ward).
[1] 6901 Bertner Avenue, SON 724 Houston, TX 77030.
[2] 6901 Bertner Avenue, Houston, TX 77030.
[3] 6901 Bertner Avenue, SON 560 Houston, TX 77030.
[4] 6901 Bertner Avenue, SON 547 Houston, TX 77030.
[5] 6431 Fannin St, Houston, TX 77030.

http://dx.doi.org/10.1016/j.pedn.2017.05.006
0882-5963/

Tsai, Friedmann, and Thomas (2010) investigated the effects of an AAA on anxiety in hospitalized children and reported no significant differences in anxiety responses after the AAA; however, the study was limited by its post-test-only design, the small sample size ($N = 15$), and absence of a control group. Moreover, a post-hoc power analysis indicated a larger sample size ($N = 40$) would have been required to detect changes between the two conditions. More recently, using a more rigorous design with a randomized group assignment and a control group, Barker, Knisely, Schubert, Green, and Ameringer (2015) investigated the effects of AAA on anxiety responses in 40 hospitalized children who were randomly assigned to a 10-minute AAA or an active control condition (jigsaw puzzles). Anxiety was measured before and after the assigned condition. Although children in the AAA condition reported significantly lower post-intervention anxiety scores than those in the control condition, there were no significant differences within or between groups in pre- and post-intervention anxiety scores. The authors suggested an alternative explanation for their results was based on the low level of anxiety of hospitalized children at baseline.

AAAs have been shown to optimize immune responses in adult populations, but this has not been reported in hospitalized children. Several studies have reported significant decreases in cortisol, suggestive of stress attenuation, in adults interacting with therapy dogs (Barker & Dawson, 1998; Barker, Knisely, McCain, & Best, 2005; Barker, Knisely, McCain, Schubert, & Pandurangi, 2010; Cole, Gawlinski, Steers, & Kotlerman, 2007; Orlandi et al., 2007). Other researchers investigating adults who were asked to pet a dog reported significant increases in positive immune responses (e.g., salivary immunoglobulin A) among participants (Charnetski, Riggers, & Brennan, 2004).

Although some researchers have explored the psychological effects of AAAs in hospitalized children using self-report instruments, few researchers have used a biobehavioral approach with biological parameters to corroborate self-reports (Nepps, Stewart, & Bruckno, 2014). Kaminski et al. (2002) used a biobehavioral approach that investigated behavioral affect and salivary cortisol responses to AAA in hospitalized children. The authors reported that children in the AAA condition had a higher level of positive behavioral affect and decreased level of salivary cortisol, when compared with a play group condition, but there were no significant differences between the groups, however the study used non-random sampling. Although other stress biomarkers such as cortisol have been tested in prior studies, to our knowledge, no studies have investigated the biobehavioral effects of AAAs on psychosocial and stress-related inflammatory responses in children.

The methodological weaknesses of previous studies result in a gap in rigorous evidence to promote the use of AAAs in hospital settings. Owing to the mixed results of the few studies using a variety of patient populations and methods, the effectiveness of AAAs to reduce stress, anxiety, and improve mood and physiological stress responses in hospitalized children is unclear. Thus, in the current study, we sought to use a rigorous randomized controlled trial to measure biological stress parameters to corroborate self-report data on the impact of AAAs to improve biobehavioral stress responses in hospitalized children.

The conceptual model for the current study was derived from an expanded biobehavioral model (Kang, Rice, Park, Turner-Henson, & Downs, 2010) that integrates a physiological model of stress (Selye, 1974); the cognitive appraisal model of stress and coping theory (Lazarus & Folkman, 1984); and the stress, allostasis, and allostatic load model (McEwen, 2003). The adapted biobehavioral model posits that children respond to illness and hospitalization with anxiety, negative mood, and increased levels of the stress biomarkers cortisol and C-reactive protein (CRP). The focus of our study was the individual, environmental, psychosocial, and biological domains in the adapted model (Fig. 1).

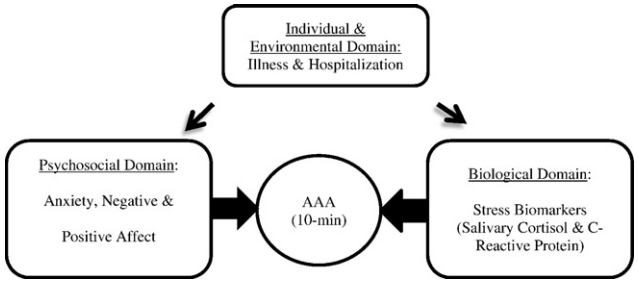

Fig. 1. Expanded biobehavioral model (adapted from Kang et al., 2010).

Method

Subjects and Setting

Power analysis was computed with G*Power 3.1 (Faul, Erdfelder, Buchner, & Lang, 2009) for a repeated measures design with two measurements per subject and two groups of subjects. Setting $\alpha = 0.05$ and with an estimated Cohen's $f = 0.46$ effect size (Cohen, 1988) for the interaction between time and group, and power = 80%, the estimated sample size was $N = 40$. The effect size was estimated from a previous data on inflammatory responses to AAA (Branson, Baun, Bergstrom, Kang, & Barker, 2014) using a similar inflammatory biomarker, Interluekin-1β. Anticipating missing data from a 15% attrition rate, we enrolled 48 subjects.

Patients were recruited from a medical-surgical unit in a large urban teaching hospital that had an established AAA program. Each therapy dog met obedience, temperament, and health standards required by the AAA program and the hospital and was deemed appropriate for therapy dog visitation. The animal handlers were volunteers, and no administrative costs were associated with delivering the program. Per hospital policy, the dogs were bathed before visitation, and each patient was required to wash his or her hands before and after the AAA. The therapy dogs included a standard poodle, English mastiff, Yorkshire terrier, shih tzu, schnauzer, pug, golden retriever, and two shelties. All except one animal handler was female. The study was conducted during the regularly scheduled AAA, which occurred twice per month between 10 a.m. and 1 p.m.; data were collected over 10 months.

Participants were included if they were 7–17 years old, understood English, alert, oriented (to person, place, and time), able to complete the study instruments, able to provide saliva specimens, had consent from their parent/legal guardian, and gave their own assent. Individuals were excluded if they were currently taking hormone replacement or steroidal anti-inflammatory medications, were in contact isolation, had been diagnosed with Addison's or Cushing's disease, or had fears or phobias of dogs or were allergic to dogs.

Study Design

We tested the effectiveness of a 10-minute AAA on biobehavioral stress responses (anxiety, mood/affect, and salivary cortisol and CRP) in hospitalized children using a randomized controlled trial with an existing AAA program in a pediatric hospital. The central hypothesis was that children who received the AAA would have larger decreases in anxiety, negative affect, cortisol, and CRP and larger improvements in positive affect than children in the non-AAA control condition.

We used a 2-arm randomized, controlled design, whereby participants were randomly assigned to either a 10-min AAA or a 10-min non-AAA control condition. The control condition (Fig. 2) was a plush stuffed dog (no person or live dog). Demographic data were collected at baseline verbally and via chart review. Outcome measures were collected twice, pre- and post-intervention, and included self-reported anxiety and mood (negative and positive affect) with well-established psychometric instruments, and saliva for the noninvasive biological