Human Animal Interaction Research: Lessons Learned, Potential Realized Through The Bio-psycho-social Model

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Part 1: Owners and Pets Exercising Together (OPET)

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OPET Team
Special Thanks….

OPET was made possible thanks to the generous financial support of the WALTHAM Centre for Pet Nutrition
Background…

- From the human perspective…
  - Increasing rates of obesity, diabetes, chronic conditions
    - > 60% of American adults overweight/obese
    - Today’s children life expectancy < their parents
  - Less than 50% engage in physical activity
  - Nearly 25% participate in no physical activity
From the canine perspective…

– Increasing rates of obesity, diabetes, osteoarthritis
– 25-45% of dogs considered to be obese
Background...

- U.S. Humane Society recommends twice daily walking to improve canine health and fitness
- U.S. Surgeon General recommends 30 minutes of physical activity/day or approximately 10,000 steps per day
OPET Purpose

- Owners and Pets Exercising Together
  - To examine relations between health and health-related behaviors of pet owners and their dogs
  - To examine the impact of veterinarian-based counseling for dog owners to engage in more physical activity with their pet on health outcomes of both owner and dog
Inclusion Criteria

• Owners 18 or older

• Dogs 2 years or older

• No activity impairing medical conditions
OPET Phase I

- Self-Report Measures
  - Demographics
  - International Physical Activity Questionnaire-SF
    - Self report of weekly physical activity
  - Medical Outcomes Study Social Support Survey (MOS)
    - Measure of tangible, affectionate, positive interaction, emotional, and informational support
  - Standard Form-12
    - Perceived mental health and physical functioning
  - Lexington Attachment to Pets Scale (LAPS)
    - Three domains of attachment
- Physical Assessment
  - Height and Weight with standard scale
OPET Phase II: Randomized Controlled Trial

- **Owner Physical Activity Monitoring**
  - Pedometer (no step feedback)
  - NEW-LIFESTYLES NL-2200 (Lifecorder EX) Accelerometer
    - Stores 200 days of data
- **Diary**
- **Dog Labs**
  - Complete blood count (CBC)
  - Glucose
  - Cholesterol
  - Triglycerides
- **Owner Labs**
  - Complete blood count (CBC)
  - Glucose
  - Cholesterol
  - Triglycerides
### Participants with Pedometer Data

<table>
<thead>
<tr>
<th>Demographics</th>
<th>SC Group (n=10) % or M (SD)</th>
<th>PA Group (n = 21) % or M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Women</td>
<td>100%</td>
<td>86%</td>
</tr>
<tr>
<td>Ethnic minority</td>
<td>10%</td>
<td>14%</td>
</tr>
<tr>
<td>Married</td>
<td>70%</td>
<td>48%</td>
</tr>
<tr>
<td>Age (yrs)</td>
<td>43.6 (16.9)</td>
<td>44.7 (15.1)</td>
</tr>
<tr>
<td>Owner BMI</td>
<td>24.7 (4.8)</td>
<td>29.6 (7.1)</td>
</tr>
</tbody>
</table>
Correlations between Body Mass Index and Self-Reported Measures of Health, Social Support, and Physical Activity Variable Correlation* with Owner BMI (P)

### Somatic measures

<table>
<thead>
<tr>
<th>Variable</th>
<th>Correlation* with Owner BMI (P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner age</td>
<td>( r = 0.02 ) (NS)</td>
</tr>
<tr>
<td>Dog body conditioning score</td>
<td>( r = -0.81 ) (NS)</td>
</tr>
</tbody>
</table>

### Self-report measures

<table>
<thead>
<tr>
<th>Variable</th>
<th>Correlation* with Owner BMI (P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lexington Attachment to Pet Scale</td>
<td>( r = -0.29 ) (P = .03)</td>
</tr>
<tr>
<td>SF-12 physical component</td>
<td>( r = 0.20 ) (NS)</td>
</tr>
<tr>
<td>SF-12 mental component scores</td>
<td>( r = -0.2 ) (NS)</td>
</tr>
<tr>
<td>Medical Outcome Survey social support scores</td>
<td>( r = -0.27 ) (P = 0.02)</td>
</tr>
<tr>
<td>International Physical Activity Questionnaire (self-reported physical activity levels)†</td>
<td>( r = 0.08 ) (NS)</td>
</tr>
</tbody>
</table>

* Spearmen p.
Changes in IPAQ-SF METs

Pre-Intervention: 2524 (2295)
Post-Intervention: 4433 (4212)

Mean (SD) Weekly METs

SC
PA

2000
2500
3000
3500
4000
4500
5000

Pre-Intervention
Post-Intervention
Changes in Pedometer Weekly Steps

<table>
<thead>
<tr>
<th></th>
<th>Pre-Intervention</th>
<th>Post-Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (SD) Weekly Steps</td>
<td>8028 (2852)</td>
<td>8940 (2845)</td>
</tr>
<tr>
<td></td>
<td>8000</td>
<td>8734 (3252)</td>
</tr>
<tr>
<td></td>
<td>8200</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8400</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8600</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8800</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9000</td>
<td></td>
</tr>
</tbody>
</table>

SC
PA
Changes in Dog Body Condition Score

Main effect for pre- vs. post-intervention, $t=2.88$, $p=.007$.
No between group differences.
Changes in Dog Weight

Main effect for pre- vs. post-intervention, $t=2.88$, $p=.007$.
No between group differences.
Changes in Owner Weight

<table>
<thead>
<tr>
<th></th>
<th>Pre-Intervention</th>
<th>Post-Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (SD) Weight (lbs)</td>
<td>159 (33)</td>
<td>177 (48)</td>
</tr>
<tr>
<td>SC</td>
<td>172 (46)</td>
<td></td>
</tr>
<tr>
<td>PA</td>
<td>159 (33)</td>
<td>152 (28)</td>
</tr>
<tr>
<td>Combined</td>
<td>160 (24)</td>
<td>164 (25)</td>
</tr>
</tbody>
</table>

Legend:
- SC: Social Cohesion
- PA: Physical Activity
### Correlates of attachment to pets (LAPS) and social support (MOS)

<table>
<thead>
<tr>
<th>Age</th>
<th>Correlation coefficient</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAPS</td>
<td>-0.488</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>MOS tangible</td>
<td>0.316</td>
<td>0.021</td>
</tr>
<tr>
<td>MOS affection</td>
<td>0.201</td>
<td>0.086</td>
</tr>
<tr>
<td>MOS interaction</td>
<td>0.164</td>
<td>0.162</td>
</tr>
<tr>
<td>MOS emotional</td>
<td>0.230</td>
<td>0.049</td>
</tr>
</tbody>
</table>
Correlates of attachment to pets (LAPS) and social support (MOS)

<table>
<thead>
<tr>
<th></th>
<th>Pet Owner Weight</th>
<th>Pet Owner BMI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Spearman correlation</td>
<td>P-value</td>
</tr>
<tr>
<td>LAPS</td>
<td>0.247</td>
<td>0.067</td>
</tr>
<tr>
<td>MOS tangible</td>
<td>-0.226</td>
<td>0.053</td>
</tr>
<tr>
<td>MOS affection</td>
<td>-0.283</td>
<td>0.014</td>
</tr>
<tr>
<td>MOS interaction</td>
<td>-0.227</td>
<td>0.052</td>
</tr>
<tr>
<td>MOS emotional</td>
<td>-0.228</td>
<td>0.051</td>
</tr>
<tr>
<td>PCS</td>
<td>-0.237</td>
<td>0.047</td>
</tr>
</tbody>
</table>
## Correlates of attachment to pets (LAPS) and social support (MOS)

<table>
<thead>
<tr>
<th></th>
<th>METS</th>
<th>Activity (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Spearman correlation</td>
<td>P-value</td>
</tr>
<tr>
<td>LAPS</td>
<td>0.069</td>
<td>0.626</td>
</tr>
<tr>
<td>MOS tangible</td>
<td>0.030</td>
<td>0.806</td>
</tr>
<tr>
<td>MOS affection</td>
<td>-0.084</td>
<td>0.492</td>
</tr>
<tr>
<td>MOS interaction</td>
<td>0.002</td>
<td>0.989</td>
</tr>
<tr>
<td>MOS emotional</td>
<td>-0.195</td>
<td>0.106</td>
</tr>
<tr>
<td>PCS</td>
<td>0.260</td>
<td>0.034</td>
</tr>
</tbody>
</table>
Both groups combined (n=41)

Percent change from baseline (95% CI)

- METS
- Time
- Steps
- PO wt
- BMI
- BCS
- Dog wt
Was the intervention effective?

![Bar chart showing percent change from baseline for different parameters.]

- Physical activity (n=27)
- Standard care (n=14)
Limitations

- Small number of participants at start/follow-up
- Preferred longer assessment period
- Tertiary care veterinarian hospital
- High SES of participants
- No control group without a pedometer
Rewards

- Challenging
- 7 different perspectives
- Depth of interpretation
- Forced reflection
- Richness of expertise
Conclusions

- Physical activity counseling can be accomplished in a veterinary hospital

- Providing general health counseling and a pedometer may
  - Increase physical activity
  - Decrease BCS and weight of dogs

- Physical activity counseling may not have specific effect on owner activity or health status
Future Directions

- Use a primary care veterinary clinic
- Use a human primary care clinical setting
- Using children and dog interactions to increase activity
Questions?
The Future: What We Want to Know…
Part 2: Biopsychosocial Efficacy of Service Dog Training in Service Members with PTSD

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COL Geoffrey Grammer, M.D.

Patricia A. Deuster, Ph.D., M.P.H.
Norman Epstein, Ph.D.
Suzzane Gibbons, R.N., Ph.D.
A patient and his child meet the newest generation of future Warrior Canine Connection service dogs.
Walter Reed National Military Medical Center
NICOe
Uniformed Services University
The University of Maryland
Georgetown University
Ft. Belvoir Community Hospital
Virginia Commonwealth University
University of Walter Reed Army Institute of Radiobiology
Warrior Canine Connection
"HERDING CATS"
Special Thanks

BIG DOG was made possible thanks to the generous financial support of the Congressionally Directed Research Program (CDRP)
AAI with Service Members and Veterans

1. History—AAI with SM & V
2. Clinical Background
3. What data do we need?
AAI with Service Members and Veterans

- Historical use of AAI/T in military system
  - 1876
  - Battle of the Greasy Grass
AAI with Service Members and Veterans

- Historical use of AAI/T in military system
  - 1900’s
    - WWI
• Historical use of AAI/T in military system
  • 1900’s
    • WWI

'On Feb. 5, 1918, he entered the front lines of the Chemin des Dames sector, north of Soissons, where he was under fire night and day for more than a month. The noise and strain that shattered the nerves of many of his comrades did not impair Stubby's spirits. Not because he was unconscious of danger. His angry howl while a battle raged and his mad canter from one part of the lines to another indicated realization. But he seemed to know that the greatest service he could render was comfort and cheerfulness.'
AAI with Service Members and Veterans

- Historical use of AAI/T in military system
  - 1900’s
    - WWI
    - St E’s
AAI with Service Members and Veterans

• Historical use of AAI/T in military system
  • 1900’s
    • Pawling Army Air Force Convalescent Center

The prime purpose of the Convalescent Center, in the words of one of the administrative officers, is "to restore the men to health and return them to duty."
AAI with Service Members and Veterans

• Historical use of AAI/T in military system
  • 1960’s–1990’s
    • Army Vet Corp
AAI with Service Members and Veterans

• Historical use of AAI/T in military system
  • 1960’s– 1990’s
    • Army Vet Corp

1983 LTC Thomas Catanzaro…”of the interdependent relationships of animals, humans, and the health professions, and also described many considerations for establishing an animal-assisted therapy program in his An Administrator’s Guide for Animal Facilitated Therapy Programs in Federal Healthcare Facilities.”
AAI with Service Members and Veterans

- Historical use of AAI/T in military system
  - 1960’s– 1990’s
    - Army Vet Corp
      - 1985 Specialty Advisor to SG
      - 1988 MPH @ UTK
AAI with Service Members and Veterans

- Historical use of AAI/T in military system
  - 1960’s–1990’s
    - Army Vet Corp
      - 1985 Specialty Advisor to SG
      - 1988 MPH @ UTK

- US Army Service Dog Training Center (SDTC) at Fort Knox, Kentucky
AAI with Service Members and Veterans

- Historical use of AAI/T in military system
  - 2002-2007 COSC
    - PT dog also provided emotional support
    - Deployed with units
AAI with Service Members and Veterans

- Historical use of AAI/T in military system
  - 2007
    - PT dog also provided emotional support
AAI with Service Members and Veterans

- Historical use of AAI/T in military system
- Brook Army Medical Center-first Garrison research
  - Beck et al
    - Mood, Stress, Fatigue,
    - Resilience, daily function
    - Life transition
AAI with Service Members and Veterans

• Historical use of AAI/T in military system
  • 1990’s – to date
    • WRMMC
      • Therapy dogs
      • Service Dogs (SDs)
      • Today....
AAI with Service Members and Veterans
AAI with Service Members and Veterans
AAI with Service Members and Veterans
AAI with Service Members and Veterans

PTSD...mTBI

- ~8.7% lifetime prevalence

- 3-6% in military without trauma exposure; following deployment.....33-50% resulting in harm to SM, unit, command, and family

- Hoge (n=2525) found SM 3-4 month post-deployment 5% reported loss of consciousness & 44% met criteria for PTSD

- DVBIC reports 307,000 cases TBI. much overlap with PTSD

- Since 2011, over 3000 active duty SM treated for PTSD have participated in a SDTP

- Symptoms – varied
AAI with Service Members and Veterans

PTSD...

- Symptoms – varied
  - Hypervigilance and exaggerated startle response
  - Irritability or angry outbursts
  - Nightmares & trouble falling or staying asleep
  - Emotional numbness; lack of interest in activities; difficulty in feeling love & joy
  - Avoiding thoughts and situations that are reminders of traumatic event
AAI with Service Members and Veterans

PTSD…therapies

• Medications

• Counseling

• Adjunctive
  • Yoga, life skills, exercise, SDTP, Art,
  • Music, SDTP

Since 2011, over 3000 active duty SM treated for PTSD have participated in a SDTP

• Next steps in Research…
Overview

This multidisciplinary, collaborative project between National Intrepid Center of Excellence (NICoE), Walter Reed National Military Medical Center (WRNMMC), Uniformed Services University (USU), Fort Belvoir Community Hospital (FBCH), Georgetown University Medical Center (GUMC) University of Maryland (UMD), Virginia Commonwealth University (VCU), Warrior Canine Connection (WCC), and Walter Reed Army Institute of Research (WRAIR) will evaluate the biopsychosocial efficacy of service dog training program (SDTP) on Service Members within three populations: NICoE, WRNMMC, and FBCH. These three sites have been chosen to study as they have large populations of Service Members being treated for PTSD. We will utilize expertise from members at NICoE, WRNMMC, USU, GUMC, UMD, VCU, WCC, and WRAIR.
Big Dog Aims

- **Aim 1**: Evaluate the biological efficacy of SDTP as an adjunct therapy to MTF standard of care for individuals with post traumatic stress disorder (PTSD) symptoms (with or without traumatic brain injury [TBI])

- **Hypothesis 1**: Service Members who receive SDTP will have improved biochemical profiles including:
  
  - 1a. hypothalamic-pituitary-adrenal axis stress hormones (*e.g.*, cortisol, DHEA, oxytocin, vasopressin);
  - 1b. “social bonding”-related neuropeptides (*oxytocin, vasopressin, and other HPA hormones*);
  - 1c. “resilience”-related neuropeptides (*BDNF, NPY*);
  - 1d. decreased inflammatory biomarkers (*CRH, cytokine and chemokine profile*).
Big Dog Aims

- **Aim 1:** Evaluate the biological efficacy of SDTP as an adjunct therapy...

- **Hypothesis 2:** Service Members who receive SDTP will have **improved Autonomic Nervous System regulation** (BP, HR, and HRV/RSA)

- **Hypothesis 3:** Service Members who receive SDTP will have different genetic expression profiles including:
  - 3a. DNA methylation, mRNA/gene expression profiles (*to include genes related to endocrine, neuropeptide, and inflammatory activity – hormones/cytokines and their receptors*), and micro RNA (miRNA) expression;
  - 3b. telomere lengths and telomerase;
  - 3c. genetic predisposition/DNA SNP profiles (*to include genes related to endocrine neuropeptide, and inflammatory activity – hormones/cytokines and their receptors*).
Biological Effects

- Stress response systems (HPA and ANS) hormonal impacts
- Social bonding related neuropeptides (OT, vasopressin)
- Resilience related neuropeptides (BDNF, NPT)
- Inflammatory markers
- ANS regulation (BP, HR, HRV)
- Genetic expression profiles
Aim 2: Evaluate the psychological efficacy of SDTP as an adjunct therapy to current MTF standard of care for individuals with PTSD symptoms (with or without TBI).

Hypothesis 1: Service Members who receive SDTP will have improved behavioral health including:

- 1a. fewer PTSD symptoms (using Demographics Questionnaire, Posttraumatic Stress Checklist – 5 [PCL-5], Generalized Anxiety Disorder-7 item [GAD-7], and Life Events Checklist);
- 1b. fewer symptoms of depression (using PHQ-9);
- 1c. better sleep hygiene (as measured by polysomnography, Pittsburgh Sleep Quality Index [PSQI]);
- 1d. lower levels of stress (using Perceived Stress Scale [PSS]);
- 1e. less pain (using Defense and Veterans Pain Rating Scale [DVPRS]);
- 1f. greater resilience (using the Connor-Davidson Resilience Scale [CD-RISC]).
Big Dog Aims

- **Aim 2:** Evaluate the psychological efficacy of SDTP

- **Hypothesis 2.** Service Members who receive SDTP will have **fewer post-concussive symptoms** (using *Neurobehavioral Symptom Inventory [NSI]*).

- **Hypothesis 3:** Service Members who receive SDTP will report **more emotional attachment** (using *Lexington Attachment to Pets Scale [LAPS]*) towards pets.
Big Dog---Psychological Effects

- Psychological Effects
  - Symptoms
  - Depression
  - Sleep
  - Stress
  - Pain
  - Resilience
  - Concussive effects
  - Attachment to SD
Big Dog Aims

- **Aim 3**: Evaluate the social efficacy of SDTP as an adjunct therapy of to MTF standard of care for individuals with PTSD symptoms (with or without TBI).

- **Hypothesis 1**: Service Members who receive SDTP will have **improved social function** including:
  - 1a. **higher couple relationship satisfaction** *(using Couples Satisfaction Index)*;
  - 1b. **more positive communication** and less negative communication in observed communication behavior *(using Marital Interaction Coding System – Global)* collected when the couple is instructed to have a 10-minute discussion of an issue in their relationship; this interaction also will serve as the “challenge” in which the Service Member’s psychophysiological responses to stress are measured;
Aim 3: Evaluate the social efficacy of SDTP as an adjunct therapy of to MTF standard of care for individuals with PTSD symptoms (with or without TBI).

- **1c. increased use of positive parenting behaviors** and decreased use of negative parenting behaviors (assessed with self-reports [using Parenting Practices Questionnaire] and during video-recorded interactions with his or her child [using Dyadic Parent-Child Interaction Coding System], when the parent is asked to have an interaction with the child, guiding the child in completing a structured task);

- **1d. improved communication and interaction skills** (using assessment of communication and interaction skill [ACIS]);

- **1e. more positive social interactions** (using ACIS) during public outings.

- **1f. Service Members who receive SDTP will demonstrate increased positive emotions** and decreased negative emotions toward the dog, spouse/significant other, and/or child (using self- reports of moods [Positive and Negative Affect Scales {PANAS}])
Big Dog Aims

- **Aim 3**: Evaluate the social efficacy of SDTP as an adjunct therapy of to MTF standard of care for individuals with PTSD symptoms (with or without TBI).

- **Hypothesis 2**: Service Members who receive SDTP will report greater quality of life *(using CDC’s Health-related quality of life instrument).*

- **Hypothesis 3**: Service Members who receive SDTP will have lower mental healthcare utilization *(number, frequency of visits, and diversity of specialty care) and use of medications*(to include antihypertensives, antidepressants, anxiolytics, and sedative/hypnotics medications).*
Big Dog---Social Effects

- Social Effects
  - Social interaction
  - Positive emotions
  - Quality of Life
  - Health care utilization &….
Big Dog---Social Effects

- Social Effects
- Mental healthcare utilization
- Stress
- Relationship satisfaction
- Positive communication
- Children’s Positive behavior
Big Dog Aims

- **Aim 4. Evaluate effects of SDTP on family members**

- **Hypothesis 1**: Families of Service Members who receive SDTP will have lower mental healthcare utilization (number, frequency of visits, and diversity of specialty care) and use of medications (to include antihypertensives, antidepressants, anxiolytics, and sedative/hypnotics medications).

- **Hypothesis 2**: Spouses/significant others of Service Members who receive SDTP will report lower levels of stress (*using Perceived Stress Scale [PSS]*).

- **Hypothesis 3**: Spouses/significant others of Service Members who receive service dog training will report higher couple relationship satisfaction (*using Couples Satisfaction Index*).
Aim 4. Evaluate effects of SDTP on family members

Hypothesis 4: Spouses/significant others of Service Members who receive service dog training, will exhibit more positive communication and less negative communication in observed communication behavior (using Marital Interaction Coding System – Global) when the couple is instructed to have a 10-minute discussion of an issue in their relationship.

Hypothesis 5: Children of Service Members who receive service dog training will demonstrate greater levels of verbal and nonverbal behaviors reflecting positive emotions and approach when interacting with the Service Member parent (coded from video recordings during structured interaction tasks, using Dyadic Parent-Child Interaction Coding System).
Big Dog---Family

- Effects on Family
- Mental healthcare utilization
- Stress
- Relationship satisfaction
- Children’s Positive behavior
- Couple relationship satisfaction
- Positive communication (under challenge)
- Positive parenting behaviors
- Communication and Interaction skills
Big Dog Aims

- **Aim 5.** Evaluate Service Members’ overall experience with and perceptions of SDTP using qualitative interviewing

- Hypothesis 1: Service Members who receive SDTP will perceive and react to SDTP differently than those that did not receive SDTP.

- Hypothesis 2: Service Members who receive SDTP will have different perceptions of their emotional state, cognitive state, and physical state than those that did not receive SDTP.
Big Dog Aims

- **Aim 5.** Evaluate Service Members’ overall experience with and perceptions of SDTP using qualitative interviewing.

- Hypothesis 3: Service Members who receive SDTP will have different perceptions of their work performance or responsibilities at home than those that did not receive SDTP.

- Hypothesis 4: Service Members who receive SDTP will have different interactions with others at home and work than those did not receive SDTP.

- Hypothesis 5: **Contextual factors** (e.g., in personal lives, at the SDTP site) will influence the Service Members’ experiences.
Big Dog

➢ Importance

PTSD
  • 8% population
  • 33-50% of military
  • Deployment of 2252 soldiers to Middle East
    – 44% met criteria for PTSD

Current Treatments
  – Cognitive Processing therapy
  – Prolonged exposure therapy
  – Pharmacologic Rx
  – Adjunctive therapies
A NICoE patient works with and trains a service dog to open a door.
Summary

Science is built up with facts as a house is with stones, but a collection of facts is no more science than a heap of stones is a house.

Jules Poincare
Dictum on Scientific Structure