Leveraging the Human-Animal Bond for care access in the unhoused population: A One Health Study

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Abstract

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There is extensive research about the benefits of the human-animal bond on different health outcomes through a variety of animal assisted interventions. A population with strong connection to their companion animals, and well-documented health disparities is youth and young adults experiencing homelessness or housing insecurity. The purpose of this paper is to examine several integrated care model interventions for this population and their companion animals, and evaluate how they can be used to potentially improve health outcomes. This study utilized 2019 One Health Clinic data, and survey data from a pilot dog training study to characterize the experience of the participants through descriptive statistical analysis. Multiple logistic regression analyses were also performed to assess the relationship among One Health Clinic clients, Emotional Support Animal (ESA) status, human mental health diagnoses, and the relationship between ESA and housing status. The three most common reasons for seeking human healthcare over the total number of visits (n=95) were mental health (34.7%), contraception (22.1%), and substance use (15.8%). 30.5% of the animals seen in 2019 were considered ESAs, and 72% of the ESAs were dogs. With each additional psychiatric diagnosis, the odds of having an animal considered to be an ESA decreased by 83.3% (PR: 0.167, CI: 0.0192, 0.764). Individuals who have an ESA have a 5.5% (PR: 0.945, CI: 0.152, 5.87) lower odds of being homeless compared to those who identify as housed. No significant changes were found in Dog Parkour Training Study data. These findings support that there is a relationship between human mental health, companion animals and housing status in the unhoused population. Additional research is needed to further investigate the direction of these relationships and confirm the effectiveness of the interventions. However, the results also show that One Health Clinic models provide a unique opportunity for insight into this population through an animal assisted intervention.

Introduction

Companion animals play an important role in many people's lives. The human-animal bond is defined as "the dynamic relationship between people and animals such that each influences the psychological and physiological state of the other"[1]. There is clear evidence and years of research that shows the benefit of the human-animal bond on physical and emotional human health. Pet ownership has been associated with increased physical activity[2] and decreased cardiovascular disease risk[3]. Along with that, animals have been shown to decrease loneliness and depression in a variety of populations[4]. A recent study has also shown that during a crisis, owners can seek increased social support from their dogs as they are more available than other forms of human support[5]. Because of these benefits, animals have been used as a therapeutic tool in a variety of settings, with results showing outcome improvements throughout different populations. Animal Assisted Interventions can be used to enhance the health of individuals facing challenges or impairments such as psychiatric disorders, illness, and hospitalization[4] as several examples. Furthermore, companion animals can be trained to provide specific support for their owners with documented disabilities. According to the ADA, a Service Animal is an animal "that is individually trained to do work or perform tasks for the benefit of an individual with a disability, including a physical, sensory, psychiatric, intellectual, or other mental disability"[6]. An Emotional Support Animal (ESA), on the other hand, is an untrained companion animal that provides support to their owners with a mental disorder[6]. ESAs do not have the same protections under the law as Service Animals, although a letter is needed from a medical professional to receive ESA status[7].

A specific population that has shown benefit from owning a companion animal are individuals experiencing homelessness or housing insecurity. Previous literature has shown that pets provide security and unconditional love in a very isolating environment[8–12]. According to Rhodes et al.,pet owners experiencing homelessness or housing insecurity surveyed in Los Angeles reported less symptoms of depression and loneliness compared to non-pet owners[9]. This is an important benefit of the human-animal bond for this population, especially since evidence shows that individuals experiencing homelessness or housing insecurity have a high prevalence of mental health disorders[13]. Depression, anxiety and psychosis disorders are commonly reported, and coincide with comorbidities such as substance use disorders[13,14], and other physical health problems[14].

Furthermore, youth experiencing homelessness or housing insecurity have higher rates of mental illness and substance use compared to the general population[15] and are less likely to seek health care for themselves[16]. However, while the human-animal bond has a lot of positive aspects for this population, there are negative implications as well. Pet ownership can be a barrier to a variety of services including housing and shelter resources, job-seeking services, and healthcare[9]. Along with that, although in the general population ESAs have become more common[17], there are significant gaps in knowledge regarding the utilization of ESA status in the unhoused population.

While there have been many studies assessing the relationship between homeless individuals and their pets, there has been little research examining the use of animal assisted interventions in this population. The purpose of this paper is to explore potential ways to leverage the human-animal bond to improve access to services for this population, which would potentially improve health outcomes. This paper will discuss two interventions that aim to leverage the human-animal bond for health care access for youth and young adults experiencing homelessness in Seattle, Washington. First, clinical data provided by the One Health Clinic, which created a clinic model that provides integrated human health care and veterinary care for this population will be evaluated. Second, an intervention to provide animal behavior training and evaluate the impact on mental health status of the animal owner will be explored.

This study has three specific aims. The first aim is to characterize the clinical experience of providing integrated medical and veterinary medical care to individuals and their animals at the Seattle One Health Clinic. The second aim is to assess the relationship among One Health Clinic clients between having a designated Emotional Support Animal (ESA) and human mental health diagnoses. Along with that, the relationship between having a designated ESA and housing status will also be assessed. The final aim of the study is to describe a pilot intervention among clients recruited from the One Health Clinic that involves participation in an animal behavior training program, and to assess any evidence of impact on mental health outcomes for the animal owner. Our working hypothesis is that there will be a positive change in measurable mental health outcomes and animal behavior among this population after participating in the program.

Methods

One Health Clinic

Intervention Design

The One Health Clinic designed and implements an interdisciplinary clinic model that includes human healthcare providers and veterinarians working collaboratively to treat the human-animal unit[18] (*onehealthclinic.org/about*). The health care providers focus on the individual care of the human and animal, but address intersections of human and veterinary health care. These intersections include zoonotic diseases potential, behavioral health and the human animal bond, nutrition and prescription management for people and animals. The clinic occurs bi-weekly hosted in a local youth homeless shelter/day center, (New Horizons Ministries) and serves individuals between the ages 13-26. This clinic is a One Health collaboration between the University of Washington Center for One Health Research and School of Medicine, Washington State University's School of Veterinary Medicine, and Neighborcare Health.

Population and Data Collection

The study population includes individuals experiencing homelessness or housing insecurity between the ages of 13-26, with a companion animal who sought care at the One Health Clinic in the calendar year of 2019. Clinical data were abstracted via human medical records and veterinary records, and combined with Navigation forms. The Navigation form collected general information about the client, pet, their environment and reason for visit to the clinic. The key

inclusion criteria for data analysis was the presence of at least two out of the three forms for each visit record. Visits that only had human medical records or veterinary records associated will be excluded (See Figure 1a). This intervention did qualify as human-subject research according to the Institutional Board of Review (IRB), and therefore did require approval which was received prior to the start of the study (STUDY00005322).

Exposures and Outcomes

This study investigated two different variable relationships through statistical modeling. The first model focused on mental health diagnoses and whether or not the animal was considered to be an Emotional Support Animal (ESA). Mental health conditions noted in the medical chart included depression, bipolar, schizophrenia, PTSD, schizoaffective, anxiety, paranoia, stress reaction/adjustment disorder, unspecified but connected with mental health services, as well as total number of diagnoses. Charts were reviewed by a clinician and presumptive diagnoses were coded into an Excel spreadsheet. Individuals who were not assessed or did not have a human medical record were excluded from analysis.

Animals with a “yes” response to the ESA status variable or mention in either the medical or veterinary chart were categorized as “ESA” while animals with no clear assessment or a “no” response to the ESA status variable were assigned as not an ESA. Each animal in the study only received one assignment. It is important to note that the reference group for this variable is still an owned animal, just not a registered ESA.

The second model assesses the relationship between Emotional Support Animal (ESA) status and housing status. Housing status was categorized with the reference group (0) representing the least vulnerable status, housed, then couchsurfing (1), shelter (2) and finally the most vulnerable status as homeless (4).

Statistical Analysis and Confounders

To assess the statistical relationship of the variables listed above, binomial logistic regression and multivariate logistic regression were performed, with additional variables included in the models to control for confounding. Confounders in this study were assessed as causal, meaning the variables selected are potentially casually associated with both the exposure and outcome in the models, and are not on the causal pathway[19].

For the first model a binomial logistic regression was performed assessing the relationship between psychiatric diagnoses and ESA status. Possible confounders include gender, housing status and total number of visits in 2019. Gender was coded with individuals who identify as male as the reference group (0), individuals who identify as female as 1, and transgender individuals (both female and male) coded as the third (3) category. Gender was selected as confounder as a proxy for other social factors that contribute to individuals' societal experiences. Previous literature has shown in this population the experience of women and LGBTQ+ individuals can have significantly different challenges[20]. Housing status, which was coded as previously discussed, was selected as a confounder as previous literature has shown an

association between mental health being a factor in housing security as discussed earlier in this paper. The total number of visits in 2019 was assigned to each individual human client after summing the visits that met the inclusion criteria for the study. This variable was selected as a confounder as the amount of healthcare sought could relate to mental health status, ESA status and housing status. Finally, animal species was included as an interaction term to assess effect modification. Significant effect modification was determined qualitatively.

For the second model assessing ESA and housing status, possible confounders include gender, total number of visits in 2019, and animal species. Both gender and total number of visits are discussed in the previous paragraph, and animal species was selected as a confounder for this model as different types of animals can be better suited for ESA status, and can affect housing status as many types of housing institutions have breed restriction or no pet policies. For this analysis, animal species were coded as a binary variable of whether the animal was a dog, with the reference group (0) being species other than dogs.

Dog Parkour Training Study

Intervention Design

This intervention was a One Health Clinic model incorporating human mental health professionals and animal behaviorists in the context of a dog training class. The dog trainer and human mental health professional lead the class together side-by-side, practicing different skills tied together with a common theme for the human and their dog. Each class session was 8 weeks long, with one hour classes. A survey tool was developed by an interdisciplinary team prior to the start of the study to collect information on human mental health, animal behavior, and human-animal bond metrics. The survey assessment consisted of a pre-intervention/baseline survey, mid-point (week 3, 4 and 6) surveys and a post-intervention survey. This intervention also qualified as human-subject research according to the Institutional Board of Review (IRB), and therefore did require approval which was received prior to the start of the study (STUDY00005322). Incentives provided for participants in this intervention. Participants received monetary compensation for attending the training sessions, with increasing individual value over time, along with provided meals before each training session, and bus passes if assistance with transportation was needed. Recruitment was conducted between July 2021 and January 2022, and was done by flier distribution and word of mouth within the population and other service organizations.

Population and Data Collection

Two 8 week sessions occurred between September 2021 and March 2022. The human inclusion criteria for participation in this study were the individual must currently be experiencing homelessness or at risk of homelessness, have a dog, be between 13-40 years old, attend a One Health Clinic with their dog or show proof of up-to-date vaccinations, and have the ability to fill out a short survey each session. The age range for this intervention was expanded out of the One Health Clinic range (13-26 years old) as enrollment in this age range was low at the start of the recruitment process. The final age range for study participation was 13-40 years old. The main inclusion criteria for the dogs in this study was being deemed appropriate by the animal

behaviorist and veterinarian to participate in the training activity. Dogs with dog-dog or human aggression were excluded due to the close nature of other dogs and people in class sessions, and dogs with medical conditions that prevent them from doing training activities without pain were also excluded. While all individuals with a pre-intervention survey were included in participant demographics and human-animal bond characteristics, to be included in analysis of human mental health, animal behavior and changes in human-animal bond outcomes, participants must have completed the pre- and post-intervention survey at minimum. If they did not, they were considered lost to follow up and excluded from data evaluation.

Trends
The survey sections were scored according to the validated survey instrument guidelines[21–25]. The scores were compared across baseline, midpoint (if applicable) and post-intervention. Due to the small sample size of this pilot intervention, only descriptive analysis was performed to generate hypotheses and assess feasibility of the intervention.

Results

One Health Clinic Record Review

Of the 150 clinic records, we had 2 out of 3 charts on 95 visits, representing 49 unique humans and 59 unique animals and overall 61 individual human-animal units. The average age of the human individuals who attended the One Health Clinic during 2019 was 22 years old, and over half (55. 6%) only attended once (Table 1a). The three most common reasons for seeking human healthcare over the total number of visits (n=95) were mental health (34.7%), contraception (22.1%), and substance use (15.8%).

44.2% of the population reported being homeless as their primary housing status, which includes couchsurfing and staying in a shelter, compared to 25.3% that indicated being housed and 35.8% missing a housing status.

The majority of individuals in this study population with mental health assessment data in their chart had at least 1 mental health diagnosis (71.1%, 28.9% missing). Depression was the most common diagnosis (40%) in the total population (n=45), with a higher burden among women (57.9%). Anxiety, PTSD and Bipolar disorder were the next most reported mental health diagnoses (Table 1a).

Of the study population companion animals that were seen at the One Health Clinic in 2019 (n=59), 55.9% were dogs, 42.3% were cats, and 1.7% were other species (ferret) (Table 1b). The majority of these animals were not altered (61%) and attended the clinic once (67.8%). 30.5% of the animals were ESAs, with 72% of ESAs being dogs, and the remainder being cats.

During the total number of visits over 2019 (n=95), vaccines and deworming were the most common veterinary services provided. 61% of the animals had not been spayed or neutered. According to veterinary records, the most common reason for owning an unaltered animal was

financial barriers (21.1%). 21.1% of the population accepted spay/neuter vouchers provided at their visit. The other most common reasons were intention to breed, and personal preference.

Information about Environmental stressors was collected for both human personal concerns and animal concerns (Table 1a and 1b). Food security and cold were the highest reported environmental concerns at visits during 2019 (Table 1a & Table 1b) for both humans (food security: 7.4%, cold: 6.3%) and their pets (food security: 7.4%, cold: 7.4%) . Conflict with other animals was the second most common reported concern for animals (7.4%) (Table 1b). Finally, the main pet ownership barrier reported was access to housing (12.6%), and the highest reported benefit was psychological (21.1%).

One Health Clinic Regression Models

Associations Between ESA and Mental Health Diagnoses

With each additional psychiatric diagnosis, the odds of having an animal considered to be an ESA decreased by 83.3% (PR: 0.167, CI: 0.0192, 0.764) (Table 3). The following results are not statistically significant, but represent point estimates that are inconsistent with the absence of an effect. Individuals with a bipolar diagnosis had 4.5 (PR: 4.51, CI: 0.485, 56.4) times higher odds of having an ESA compared to those without this diagnosis. Along with that, individuals with depression have 1.49 times higher odds of having an ESA (PR: 1.485, CI: 0.384, 6.23). Individuals with anxiety had a 79% lower chance of having an ESA (PR: 0.207, CI: 0.0201, 1.37), and individuals with PTSD had a 65.7% (PR: 0.343, CI: 0.0337, 2.37) lower odds. No significant effect modification was seen by animal species in any of the models.

Associations Between Housing and ESA

Individuals who have an animal with ESA status have a 5.5% (PR: 0.945, CI: 0.152, 5.87) lower odds of being homeless compared to those who identify as housed. Along with that, Individuals who have an animal with ESA status have 16.7% lower odds of couchsurfing (PR: 0.833, CI: 0.047, 14.7) compared to those who identify as housed. Finally, individuals with an animal with ESA status have a 1.97 (PR: 1.974, CI: 0.330, 11.8) higher odds of identifying as staying in a shelter compared to identifying as being housed. No significant effect modification was seen by animal species in this model.

Dog Parkour Training Study

Demographics

8 individuals with dogs took part in the Dog Parkour Training Study. 4 individuals completed the full course of 8 sessions. 4 individuals did not complete the post assessment (see Figure 1b). In the Dog Parkour Training study, 50% of the study participants reported living in transitional housing, and 50% had a dog that was considered an ESA (Table 2a). 50% of the population also indicated that their dog makes it harder to stay in a shelter, and makes it harder to get housing (Table 2b).

Impact of Training on Outcomes

No clear trends were seen in the human mental health metrics of self-esteem, self-efficacy, resilience between baseline and post-assessment. 75% of participants had an overall increased trend in anxiety and depression metrics between baseline and post-assessment (Figure 2). Anger metrics for all participants trended downwards with an overall decrease in scores between baseline and post-assessment (Figure 2). The only participant who had all surveys completed across the intervention (#1006) had an overall decrease of anxiety, depression, anger metrics and an increase in self-esteem metrics. Animal behavior metrics for fear, stress and anxiety were also assessed. There were no clear changes in the following assessments: stranger-directed fear, nonsocial fear, dog-directed fear, touch sensitivity, and training difficulty. A decrease in scores for attachment and attention seeking behaviors was assessed as a trend in baseline and post-intervention surveys (Figure 3). Finally, there were no changes and trends seen in the scores for the validated human-animal bond tool metrics, or the perceived confidence in communication and understanding their dog's needs (Figure 4a). There was a potential upward trend of the owner perceiving the dog as understanding their needs. Finally, by week eight of the intervention, 100% of participants indicated that these metrics had changed over this time period (Figure 4b).

Discussion

This study of animal ownership among persons experiencing homelessness or housing insecurity who attended a One Health Clinic found there is a potential relationship between mental health and ESA status, and ESA status and housing status. This relationship could be a result of several factors at play, but further research is needed for confirmation. The One Health Clinic results also revealed the care priorities of the individual participants and their pets, which provides support to the body of literature about the importance of mental health services for the most vulnerable and low barrier housing policies. The results of the Dog Parkour Training study showed several areas of interest for future assessment in human mental health and animal behavior outcomes, as well as the feasibility of the overall intervention.

Mental Health

Since previous research has shown that individuals experiencing homlessness and housing insecurity have higher rates of mental health disorders and are strongly bonded to their companion animals, this study aimed to investigate the relationships between these components. First of all, mental health was the number one most captured care sought for clients of the One Health Clinic in 2019. Additionally, the results indicate that those with multiple mental health diagnoses were less likely to have an animal with ESA status compared to individuals with a singular diagnosis. Along with that, differences in the odds of having an animal with ESA status varied across diagnosis, with bipolar and depression being the two with higher likelihoods. Individuals with anxiety and PTSD all were all less likely to have an ESA. While these assessments were not statistically significant, they did have wide precision estimates, indicating that future studies should investigate this relationship further. Anxiety is an especially common mental health diagnosis for this population[26], therefore it is interesting this subset were not the individuals more likely to have ESAs. One possible explanation for this is that individuals

with PTSD and anxiety are either not seeking the regular mental health care needed to have their companion animal registered as an ESA, or do not feel they need this certification for their circumstances.

Similarly, since ESA status likelihood increases with an increase in total number of diagnoses, it is possible that individuals with more mental health diagnoses are not seeking care associated with ESA evaluation. This could mean that more severely mental ill individuals are not participating regularly in healthcare or mental health services, where ESA evaluations can be recommended and occur. Previous literature does concur that individuals experiencing homelessness or housing insecurity with more severe mental health disorder are less likely to seek care, and that the most successful programs for them are assertive community treatment programs[27].

However, it is also possible that reverse causation could account for these findings. The causal model that is discussed in this study represents different and total psychiatric diagnoses as the predictor for having an animal with ESA status. This approach uses ESA status as more of a proxy for the effectiveness of healthcare systems in place for this population, where they would be able to register and receive a formal ESA recommendation. In a reverse causal model, animals with an ESA status could potentially be working to reduce the number of psychiatric diagnoses that an individual is experiencing. This could be indicative of the success of the animal itself, and that having an animal which meets the ESA support qualifications is beneficial to the owner in assisting with mental health. Although previous literature has found that most, if not all, animals owned by individuals experiencing homelessness or housing insecurity provide some type of emotional support, it is hard to definitively say the role of ESA status. The findings in this study support this notion as well, as no effect modification was seen by animal species. Overall this relationship should be further explored to assess implications of these findings. Future studies should also consider gender differences for transgender and LGBTQ+ individuals as priority as well, since the sample size in this population was too small to provide insight and previous studies have shown that sexual and gender minorities are impacted differently by homelessness and mental health outcomes[28].

Housing Status and ESA

Animals with an ESA status were more likely to be owned by individuals who were housed compared to individuals identified as homeless. This was similar for individuals who identified their housing status as couchsurfing. However, individuals with an animal with ESA status had a higher odds of identifying as staying in a shelter compared to being housed. Both of these results could possibly be attributed to historical housing programs and shelter facilities that have strict policies regarding companion animals. Many are not pet-friendly, and only allow animals to stay with their owners if they are registered as a service animal or an ESA. This means that in order for individuals to gain access to housing or a shelter bed, they must have an animal that is registered as an ESA. Furthermore, individuals who are moving between housing statuses that interact with these policies likely have more concerns about either denial of entrance to the programming or loss of their pets, so ESA status provides a protective quality for their animals. These findings are consistent with other studies that indicate that pet ownership is a barrier for housing in this population, due to restrictive policies. ESA certification provides an opportunity to

seek more stable housing, and access shelters more easily. Further investigation should be done to determine statistical significance of these relationships, and also explore other drivers more in depth contributing to individuals who identify their status as homeless.

Environmental Stressors to Humans and Animals

Data was collected on environmental stressors, and according to the results food security and cold were the most common environmental concern for both humans, and their animals. Previous studies assessing the human-animal bond in the unhoused population have shown that owners will prioritize their pets' needs first when it comes to food[9]. Since these findings from this study indicate that this is a concern for both the owner and pet, this represents a potential area of opportunity to explore another integrated care model. In the Seattle area, many human food banks carry pet food, and there are animal welfare organizations that specifically provide pet food pantries. It would be interesting to assess the resource uptake if pet food and supplies were leveraged to assist with human food distribution. Along with that, the environmental concern of cold for both humans and their pets provides additional support for the importance of pet-friendly emergency shelters. If these individuals are not able to take their companion animals into a shelter with them, they will likely choose to sleep on the streets. This occurring during freezing temperatures is a dangerous health hazard to the human-animal unit. This is also supported by the main barrier in pet ownership reported, which was access to housing. The environment of individuals experiencing homelessness or housing insecurity cannot be left out of the discourse when talking about the human-animal bond, and should continue to be assessed in future interventions to look for additional insight.

Human-Animal Bond and Dog Parkour Training Study

From the data in the total 2019 One Health Clinic visits and the Dog Parkour Training Study it is clear that the human-animal bond is a strong driver for these populations. Both interventions yielded results that owners perceive their pets as having a psychological benefit to them. As the training survey data indicates, their companion animals make them feel loved, give them someone to love, keep them company and make them feel protected. Although the results from the Dog Parkour Training Study did not provide significant data for the survey metrics due to the small sample size, there are several areas of interest that could provide insight for future studies and suggest that this type of intervention will be beneficial to this population and their companion animals, and act as another integrated care model that leverages the human-animal bond.

Human mental health metrics saw no clear trends except for anger, anxiety and depression. Anger trended downward over, while anxiety and depression scores trended upwards. This was an unexpected finding for these two measures, but because of the subjective nature of the survey measures at this point, it cannot be attributed to the intervention. Along with that, the participants in this study have many extenuating life circumstances, which could account for this increase in anxiety and depression over the eight week sessions. However, it is also worth noting that one participant had decreases in all of these scores, in addition to an increase in self-esteem, with the most consistent attendance compared to the other participants. Future studies should assess consistency as a factor contributing to potential outcomes. A downward

trend in attachment and attention seeking behavior was the only change seen in animal behavior. Attachment behaviors are connected to relationship stability[29], and a lower score could potentially indicate a more stable relationship. In addition, this could be a potentially positive result as attachment behaviors can lead to separation anxiety behaviors, which can be a challenge for this population. Since many unhoused individuals are with their animals a majority of their time, a lower score could indicate a more stable relationship with easier separation for periods of time. Individuals in this population already feel that their bond with their dog is the strongest it could be, which explains the potential reasoning as to why no substantial changes were seen in the human-animal bond metrics between baseline and post-intervention. Despite the lack of trends in this data, there was a clear indication that this program was beneficial to the participants and their dogs, as 100% of participants reported a change in their communication, understanding of their dogs' needs and perceived that their dogs were understanding their needs over the eight week intervention.

As mentioned, this version of the Dog Parkour Training Study was not powered to show a difference in pre- and post-intervention metrics, rather it can serve as a feasibility study. While the intervention itself was well received by the participants, several adjustments should be made to improve feasibility for future attempts. First of all, location and time of day for the session should be adjusted. Providing the training at a central, easily accessible location could potentially improve retention. Recruitment resources to increase the initial number of participants should also be a priority, as it will likely be impossible to eliminate all loss to follow up in this population. As discussed throughout this paper, individuals experiencing homelessness or housing have significantly challenging life circumstances. This can interfere with the follow up for a longitudinal study, which has been shown in other larger scale studies following this population. A study by Strehlau et al. assessing a housing first intervention, enrolled 500 homeless individuals and lost 20% to follow up by the end of their program[30], but maintains that logintitunal studies in this population are feasible with flexibility and culturally competent strategies[30].

Strengths and Limitations

The main strength of this study is the combination of data that the One Health Clinic represents. The ability to match human medical and veterinary records to assess overall visit outcomes is a unique design and allows for new insights to this population. However, this design is not without its limitations. The clinical data for humans was merged into a new online management system in 2019, and there was potential for previous record loss. Along with that, since the original data source was collected by clinicians and clinic volunteers, there is significant potential that not all of the data of interest was captured at each visit. As previously mentioned, many initial records did not meet the inclusion criteria for this study and had to be removed for missingness as a result. This resulted in a small sample size, which limits finding generalizability and power. Similar challenges were faced in the Dog Parkour Training Study. Since over half of the participants were lost to follow-up, the survey results cannot be analyzed to say anything significant about the intervention. Retention within this population for a multi-week intervention was a concern, and needs to be addressed prior to additional implementations of this design. Finally, both of the results from this intervention may be subject to bias. In the Dog Parkour

Training Study, staff interviewers conducted the surveys verbally with participants which may have led to social desirability bias in the survey responses. In the One Health Clinic data, there is also a chance that the potential missingness in the medical records and navigation forms is not random. Bias could be present in the data collection of the clients who attended multiple times throughout the year compared to the clients who only have one visit, which could have affected the data analysis.

Conclusion

The One Health Clinic and Dog Parkour Training Study are interventions that provide a unique opportunity to assess the connection between human and companion animal health, and how the human-animal bond can be utilized to increase access to care for a vulnerable population, while also collecting data on environmental concerns. They both implement a One Health framework that recognizes the interconnection between humans, animals and their environment, and embody this in their design and integrated interdisciplinary team approach. The findings from this specific study reveal that there is a clear connection between number and type mental health diagnoses and ESA status, and potential connection between ESA status and housing status. These results support why an intervention that focuses on human mental health for the most vulnerable, like the Dog Parkour Training Study, is needed in this population. If there is hesitancy to seek care for themselves, leveraging the desire for dog training is an opportunity to engage more individuals who need assistance, in a low pressure environment. Outside of this study, these findings will provide a foundation for future research into these care models, and provide information about types of care being sought to direct clinical priorities and areas for development. Overall, this study provides additional support to the existing literature that in the unhoused population the human-animal bond should be valued and respected, and should be considered when developing programs for mental health/health care access and housing policies.

Table and Figures

Figure 1a: One Health Clinic Data Flow Diagram

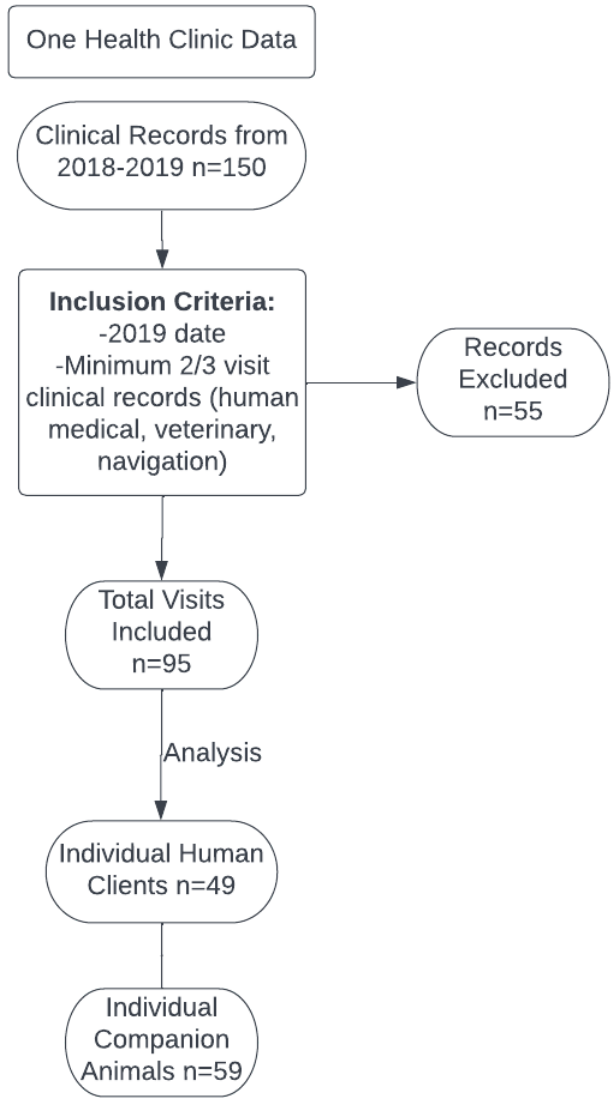

Figure 1b: Dog Parkour Training Study Flow Diagram

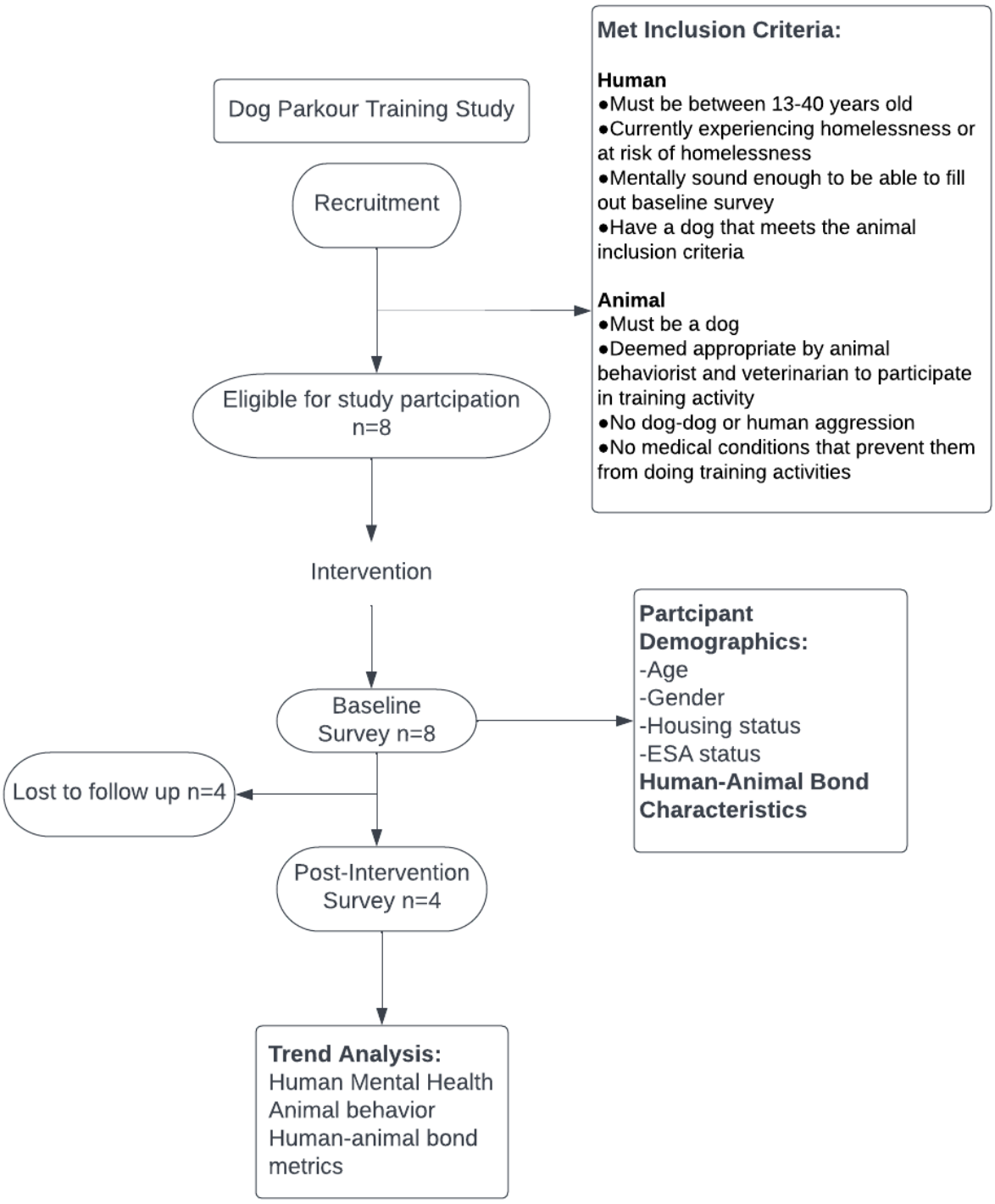

Table 1a: Individual demographic and care characteristics of One Health Clinic clients and total visits during 2019

	Female (N=19)	FTM Transgender (N=4)	Male (N=16)	MTF Transgender (N=3)	Unknown (N=3)	Total (N=45)
Average Age	21.9 (SD: 2.17)	22.1 (SD: 4.06)	23.7[1] (SD: 1.87)	22.67 (SD: 4.04)	22.5[1] (SD: 4.04)	22.6 (SD: 2.48)
Number of visits during 2019						
1	5 (26.3%)	3 (75%)	11 (68.8%)	3 (100%)	3 (100%)	25 (55.6%)
2-3	6 (31.6%)	1 (25%)	4 (25%)	0	0	11 (24.4%)
4-6	8 (42.1%)	0	1 (6.2%)	0	0	9 (20%)
Total Number of Psychiatric Diagnoses						
1	9 (47.4%)	2 (50%)	5 (31.2%)	1 (33.3%)	0	17 (37.8%)
2	7 (36.8%)	0	3 (18.8%)	1 (33.3%)	0	11 (24.4%)
3	0	1 (25%)	3 (18.8%)	0	0	4 (8.9%)
Missing	3 (15.8%)	1 (25%)	5 (31.2%)	1 (33.3%)	3 (100%)	13 (28.9%)
Psychiatric Diagnoses of Interest						
Anxiety	4 (21.1%)	1 (25%)	4 (25%)	1 (33.3%)	0	10 (22%)
Depression	11 (57.9%)	3 (75%)	4 (25%)	0	0	18 (40%)
Bipolar	1 (5.3%)	4 (100%)	0	0	0	5 (11.11%)
PTSD	2 (10.5%)	1 (25%)	4 (25%)	1(33.3%)	0	8 (17.78%)
	Female (N=59)	**FTM Trans (N=6)**	**Male (N=24)**	**MTF Trans (N=3)**	**Unknown (N=3)**	**Overall Person-visits (N=95)**
Care Sought						
Human Only	18 (30.5%)	1 (16.7%)	5 (20.8%)	0 (0%)	0 (0%)	24 (25.3%)
Animal Only	1 (1.7%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)
Both	14 (23.7%)	3 (50.0%)	10 (41.7%)	3 (100%)	0 (0%)	30 (31.6%)
Not Documented	26 (44.0%)	2 (33.4%)	9 (37.5%)	0 (0%)	3 (100%)	40 (42.1%)
Day Location						
Unemployed /walk around	7 (11.9%)	3 (50.0%)	4 (16.7%)	1 (33.3%)	0 (0%)	15 (15.8%)
Stably employed	14 (23.7%)	0 (0%)	4 (16.7%)	0 (0%)	0 (0%)	18 (18.9%)
Intermittent work	5 (8.5%)	0 (0%)	1 (4.2%)	0 (0%)	0 (0%)	6 (6.3%)

Drop-in centers	1 (1.7%)	0 (0%)	0 (0%)	1 (33.3%)	0 (0%)	2 (2.1%)
Missing	32 (54.2%)	3 (50%)	15 (62.5%)	1 (33.3%)	3 (100%)	54 (56.8%)
Night Location						
Homeless	8 (13.6%)	0 (0%)	3 (12.5%)	1 (33.3%)	0 (0%)	12 (12.6%)
Housed	20 (33.9%)	0 (0%)	4 (16.7%)	0 (0%)	0 (0%)	24 (25.3%)
Shelter	11 (18.6%)	3 (50.0%)	4 (16.7%)	1 (33.3%)	0 (0%)	19 (20.0%)
Couchsurfing	3 (5.1%)	0 (0%)	2 (8.3%)	1 (33.3%)	0 (0%)	6 (6.3%)
Missing	17 (28.8%)	3 (50.0%)	11 (45.8%)	0 (0%)	3 (100%)	34 (35.8%)
Visit Care: Establish Care						
Yes	1 (1.7%)	0 (0%)	2 (8.3%)	0 (0%)	0 (0%)	3 (3.2%)
No	45 (76.3%)	5 (83.3%)	14 (58.3%)	3 (100%)	0 (0%)	67 (70.5%)
Missing	13 (22.0%)	1 (16.7%)	8 (33.3%)	0 (0%)	3 (100%)	25 (26.3%)
Visit Care: Pregnancy Test						
Yes	8 (13.6%)	2 (33.3%)	0 (0%)	0 (0%)	0 (0%)	10 (10.5%)
No	38 (64.4%)	3 (50.0%)	16 (66.7%)	3 (100%)	0 (0%)	60 (63.2%)
Missing	13 (22.0%)	1 (16.7%)	8 (33.3%)	0 (0%)	3 (100%)	25 (26.3%)
Visit Care: Mental Health						
Yes	19 (32.2%)	3 (50.0%)	10 (41.7%)	1 (33.3%)	0 (0%)	33 (34.7%)
No	27 (45.8%)	2 (33.3%)	6 (25.0%)	2 (66.7%)	0 (0%)	37 (38.9%)
Missing	13 (22.0%)	1 (16.7%)	8 (33.3%)	0 (0%)	3 (100%)	25 (26.3%)
Visit Care: Gender Affirming Care						
Yes	0 (0%)	4 (66.7%)	0 (0%)	2 (66.7%)	0 (0%)	6 (6.3%)
No	46 (78.0%)	1 (16.7%)	16 (66.7%)	1 (33.3%)	0 (0%)	64 (67.4%)
Missing	13 (22.0%)	1 (16.7%)	8 (33.3%)	0 (0%)	3 (100%)	25 (26.3%)
Visit Care: Contraception						
Yes	21 (35.6%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	21 (22.1%)
No	25 (42.4%)	5 (83.3%)	16 (66.7%)	3 (100%)	0 (0%)	49 (51.6%)
Missing	13 (22.0%)	1 (16.7%)	8 (33.3%)	0 (0%)	3 (100%)	25 (26.3%)
Visit Care: STI						
Yes	6 (10.2%)	1 (16.7%)	2 (8.3%)	1 (33.3%)	0 (0%)	10 (10.5%)
No	40 (67.8%)	4 (66.7%)	14 (58.3%)	2 (66.7%)	0 (0%)	60 (63.2%)
Missing	13 (22.0%)	1 (16.7%)	8 (33.3%)	0 (0%)	3 (100%)	25 (26.3%)
Visit Care: PrEP						
Yes	0 (0%)	0 (0%)	1 (4.2%)	1 (33.3%)	0 (0%)	2 (2.1%)
No	46 (78.0%)	5 (83.3%)	15 (62.5%)	2 (66.7%)	0 (0%)	68 (71.6%)
Missing	13 (22.0%)	1 (16.7%)	8 (33.3%)	0 (0%)	3 (100%)	25 (26.3%)
Visit Care: GI Symptoms						

Yes	5 (8.5%)	0 (0%)	2 (8.3%)	1 (33.3%)	0 (0%)	8 (8.4%)
No	41 (69.5%)	5 (83.3%)	14 (58.3%)	2 (66.7%)	0 (0%)	62 (65.3%)
Missing	13 (22.0%)	1 (16.7%)	8 (33.3%)	0 (0%)	3 (100%)	25 (26.3%)
Visit Care: Substance Use						
Yes	9 (15.3%)	0 (0%)	6 (25.0%)	0 (0%)	0 (0%)	15 (15.8%)
No	37 (62.7%)	5 (83.3%)	10 (41.7%)	3 (100%)	0 (0%)	55 (57.9%)
Missing	13 (22.0%)	1 (16.7%)	8 (33.3%)	0 (0%)	3 (100%)	25 (26.3%)
Visit Care: Zoonotic Disease Infection						
Yes	3 (5.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (3.2%)
No	43 (72.9%)	5 (83.3%)	16 (66.7%)	3 (100%)	0 (0%)	67 (70.5%)
Missing	13 (22.0%)	1 (16.7%)	8 (33.3%)	0 (0%)	3 (100%)	25 (26.3%)
Visit Care: Infection Diagnosis						
Yes	6 (10.2%)	0 (0%)	2 (8.3%)	0 (0%)	0 (0%)	8 (8.4%)
No	40 (67.8%)	5 (83.3%)	14 (58.3%)	3 (100%)	0 (0%)	62 (65.3%)
Missing	13 (22.0%)	1 (16.7%)	8 (33.3%)	0 (0%)	3 (100%)	25 (26.3%)
Visit Care: Animal Allergy						
Yes	0 (0%)	0 (0%)	0 (0%)	1 (33.3%)	0 (0%)	1 (1.1%)
No	46 (78.0%)	5 (83.3%)	16 (66.7%)	2 (66.7%)	0 (0%)	69 (72.6%)
Missing	13 (22.0%)	1 (16.7%)	8 (33.3%)	0 (0%)	3 (100%)	25 (26.3%)
Visit Care: Musculoskeletal						
Yes	7 (11.9%)	0 (0%)	1 (4.2%)	0 (0%)	0 (0%)	8 (8.4%)
No	39 (66.1%)	5 (83.3%)	15 (62.5%)	3 (100%)	0 (0%)	62 (65.3%)
Missing	13 (22.0%)	1 (16.7%)	8 (33.3%)	0 (0%)	3 (100%)	25 (26.3%)
Visit Care: Help with Social Situation						
Yes	2 (3.4%)	2 (33.3%)	2 (8.3%)	0 (0%)	0 (0%)	6 (6.3%)
No	44 (74.6%)	3 (50.0%)	14 (58.3%)	3 (100%)	0 (0%)	64 (67.4%)
Missing	13 (22.0%)	1 (16.7%)	8 (33.3%)	0 (0%)	3 (100%)	25 (26.3%)
Visit Care: Immunization						
Yes	1 (1.7%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)
No	45 (76.3%)	5 (83.3%)	16 (66.7%)	3 (100%)	0 (0%)	69 (72.6%)
Missing	13 (22.0%)	1 (16.7%)	8 (33.3%)	0 (0%)	3 (100%)	25 (26.3%)
Psychiatric Diagnosis						
Yes	46 (78.0%)	5 (83.3%)	16 (66.7%)	3 (100%)	0 (0%)	70 (73.7%)
Missing	13 (22.0%)	1 (16.7%)	8 (33.3%)	0 (0%)	3 (100%)	25 (26.3%)
Unspecified but connected with Mental Health Services						
Yes	1 (1.7%)	0 (0%)	1 (4.2%)	0 (0%)	0 (0%)	2 (2.1%)
No	45 (76.3%)	5 (83.3%)	15 (62.5%)	3 (100%)	0 (0%)	68 (71.6%)

Missing	13 (22.0%)	1 (16.7%)	8 (33.3%)	0 (0%)	3 (100%)	25 (26.3%)
Depression						
Yes	30 (50.8%)	5 (83.3%)	4 (16.7%)	0 (0%)	0 (0%)	39 (41.1%)
No	16 (27.1%)	0 (0%)	12 (50.0%)	3 (100%)	0 (0%)	31 (32.6%)
Missing	13 (22.0%)	1 (16.7%)	8 (33.3%)	0 (0%)	3 (100%)	25 (26.3%)
Anxiety						
Yes	11 (18.6%)	1 (16.7%)	4 (16.7%)	1 (33.3%)	0 (0%)	17 (17.9%)
No	35 (59.3%)	4 (66.7%)	12 (50.0%)	2 (66.7%)	0 (0%)	53 (55.8%)
Missing	13 (22.0%)	1 (16.7%)	8 (33.3%)	0 (0%)	3 (100%)	25 (26.3%)
Bipolar						
Yes	3 (5.1%)	0 (0%)	6 (25.0%)	0 (0%)	0 (0%)	9 (9.5%)
No	43 (72.9%)	5 (83.3%)	10 (41.7%)	3 (100%)	0 (0%)	61 (64.2%)
Missing	13 (22.0%)	1 (16.7%)	8 (33.3%)	0 (0%)	3 (100%)	25 (26.3%)
Schizophrenia						
Yes	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
No	46 (78.0%)	5 (83.3%)	16 (66.7%)	3 (100%)	0 (0%)	70 (73.7%)
Missing	13 (22.0%)	1 (16.7%)	8 (33.3%)	0 (0%)	3 (100%)	25 (26.3%)
Schizo-Affective Disorder						
Yes	2 (3.4%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (2.1%)
No	44 (74.6%)	5 (83.3%)	16 (66.7%)	3 (100%)	0 (0%)	68 (71.6%)
Missing	13 (22.0%)	1 (16.7%)	8 (33.3%)	0 (0%)	3 (100%)	25 (26.3%)
PTSD						
Yes	5 (8.5%)	1 (16.7%)	6 (25.0%)	1 (33.3%)	0 (0%)	13 (13.7%)
No	41 (69.5%)	4 (66.7%)	10 (41.7%)	2 (66.7%)	0 (0%)	57 (60.0%)
Missing	13 (22.0%)	1 (16.7%)	8 (33.3%)	0 (0%)	3 (100%)	25 (26.3%)
Paranoia						
Yes	1 (1.7%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)
No	45 (76.3%)	5 (83.3%)	16 (66.7%)	3 (100%)	0 (0%)	69 (72.6%)
Missing	13 (22.0%)	1 (16.7%)	8 (33.3%)	0 (0%)	3 (100%)	25 (26.3%)
Stress Reaction/Adjustment Disorder						
Yes	1 (1.7%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.1%)
No	45 (76.3%)	5 (83.3%)	16 (66.7%)	3 (100%)	0 (0%)	69 (72.6%)
Missing	13 (22.0%)	1 (16.7%)	8 (33.3%)	0 (0%)	3 (100%)	25 (26.3%)
Psychiatric Diagnosis Other						
Yes	7 (11.9%)	1 (16.7%)	3 (12.5%)	1 (33.3%)	0 (0%)	12 (12.6%)
No	39 (66.1%)	4 (66.7%)	13 (54.2%)	2 (66.7%)	0 (0%)	58 (61.1%)
Missing	13 (22.0%)	1 (16.7%)	8 (33.3%)	0 (0%)	3 (100%)	25 (26.3%)

Any Substance Abuse						
Yes	36 (61.0%)	3 (50.0%)	11 (45.8%)	2 (66.7%)	0 (0%)	52 (54.7%)
No	10 (16.9%)	2 (33.3%)	5 (20.8%)	1 (33.3%)	0 (0%)	18 (18.9%)
Missing	13 (22.0%)	1 (16.7%)	8 (33.3%)	0 (0%)	3 (100%)	25 (26.3%)
Environmental Concerns: Heat						
Yes	2 (3.4%)	0 (0%)	3 (12.5%)	0 (0%)	0 (0%)	5 (5.3%)
No	37 (62.7%)	6 (100%)	17 (70.8%)	2 (66.7%)	3 (100%)	65 (68.4%)
Missing	20 (33.9%)	0 (0%)	4 (16.7%)	1 (33.3%)	0 (0%)	25 (26.3%)
Environmental Concerns: Cold						
Yes	4 (6.8%)	0 (0%)	1 (4.2%)	0 (0%)	1 (33.3%)	6 (6.3%)
No	35 (59.3%)	6 (100%)	19 (79.2%)	2 (66.7%)	2 (66.7%)	64 (67.4%)
Missing	20 (33.9%)	0 (0%)	4 (16.7%)	1 (33.3%)	0 (0%)	25 (26.3%)
Environmental Concerns: Rain						
Yes	2 (3.4%)	0 (0%)	1 (4.2%)	0 (0%)	0 (0%)	3 (3.2%)
No	37 (62.7%)	6 (100%)	19 (79.2%)	2 (66.7%)	3 (100%)	67 (70.5%)
Missing	20 (33.9%)	0 (0%)	4 (16.7%)	1 (33.3%)	0 (0%)	25 (26.3%)
Environmental Concerns: Food Security						
Yes	4 (6.8%)	0 (0%)	3 (12.5%)	0 (0%)	0 (0%)	7 (7.4%)
No	35 (59.3%)	6 (100%)	17 (70.8%)	2 (66.7%)	3 (100%)	63 (66.3%)
Missing	20 (33.9%)	0 (0%)	4 (16.7%)	1 (33.3%)	0 (0%)	25 (26.3%)
Environmental Concerns: Injury						
Yes	0 (0%)	0 (0%)	1 (4.2%)	0 (0%)	0 (0%)	1 (1.1%)
No	39 (66.1%)	6 (100%)	19 (79.2%)	2 (66.7%)	3 (100%)	69 (72.6%)
Missing	20 (33.9%)	0 (0%)	4 (16.7%)	1 (33.3%)	0 (0%)	25 (26.3%)
Environmental Concerns: Noise						
Yes	2 (3.4%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (2.1%)
No	37 (62.7%)	6 (100%)	20 (83.3%)	2 (66.7%)	3 (100%)	68 (71.6%)
Missing	20 (33.9%)	0 (0%)	4 (16.7%)	1 (33.3%)	0 (0%)	25 (26.3%)
Environmental Concerns: Interpersonal Conflict						
Yes	2 (3.4%)	0 (0%)	1 (4.2%)	0 (0%)	1 (33.3%)	4 (4.2%)
No	37 (62.7%)	6 (100%)	19 (79.2%)	2 (66.7%)	2 (66.7%)	66 (69.5%)
Missing	20 (33.9%)	0 (0%)	4 (16.7%)	1 (33.3%)	0 (0%)	25 (26.3%)

[1]: Missing 1 age data point for Males and 2 for Unknown.
FTM Transgender: Female to Male Transgender
MTF Transgender: Male to Female Transgender

Table 1b: Companion animal characteristics and One Health Clinic total Veterinary visit care characteristics during 2019

	Dog (n=33)	Cat (n=25)	Ferret (n=1)	Overall (n=59)
Spayed?				
Yes	**9 (27.3%)**	**7 (28%)**	**1 (100%)**	**17 (28.8%)**
No	**20 (60.6%)**	**16 (64%)**	**0**	**36 (61%)**
Missing	**4 (12.1%)**	**2 (8%)**	**0**	**6 (10.2%)**
ESA Status				
Yes	**13 (39.4%)**	**5 (20%)**	**0**	**18 (30.5%)**
No	**20 (60.6%)**	**20 (80%)**	**1 (100%)**	**41 (69.5%)**
Number of visits				
1	**21 (63.6%)**	**18 (72%)**	**1 (100%)**	**40 (67.8%)**
2-3	**9 (27.3%)**	**6 (24%)**	**0**	**15 (25.4%)**
4-6	**3 (9.1%)**	**1 (4%)**	**0**	**4 (6.8%)**
	Dog (N=57)	**Cat (N=37)**	**Ferret (N=1)**	**Overall Person-visits (N=95)**
Visit Care: Vaccines				
Yes	16 (28.1%)	13 (35.1%)	0 (0%)	29 (30.5%)
No	29 (50.8%)	11 (29.7%)	1 (100%)	41 (43.2%)
Missing	12 (21.1%)	13 (35.1%)	0 (0%)	25 (26.3%)
Visit: Ear Cleaning				
Yes	2 (3.5%)	2 (5.4%)	0 (0%)	4 (4.2%)
No	43 (75.4%)	22 (59.5%)	1 (100%)	66 (69.5%)
Missing	12 (21.1%)	13 (35.1%)	0 (0%)	25 (26.3%)
Visit Care: Deworming				
Yes	8 (14.0%)	3 (8.1%)	0 (0%)	11 (11.6%)
No	37 (64.9%)	21 (56.8%)	1 (100%)	59 (62.1%)
Missing	12 (21.1%)	13 (35.1%)	0 (0%)	25 (26.3%)
Visit Care: Microchip				
Yes	1 (1.8%)	1 (2.7%)	0 (0%)	2 (2.1%)
No	44 (77.2%)	23 (62.2%)	1 (100%)	68 (71.6%)
Missing	12 (21.1%)	13 (35.1%)	0 (0%)	25 (26.3%)
Why is your animal not altered?				
Financial Barrier				

Yes	9 (15.8%)	11 (29.7%)	0 (0%)	20 (21.1%)
No	48 (84.2%)	26 (70.3%)	1 (100%)	75 (78.9%)
Education: Unsure of Value				
Yes	0 (0%)	0 (0%)	0 (0%)	0 (0%)
No	57 (100%)	37 (100%)	1 (100%)	95 (100%)
Personal Preference				
Yes	7 (12.3%)	3 (8.1%)	0 (0%)	10 (10.5%)
No	50 (87.7%)	34 (91.9%)	1 (100%)	85 (89.5%)
Provides Safety and/or Security				
Yes	0 (0%)	0 (0%)	0 (0%)	0 (0%)
No	57 (100%)	37 (100%)	1 (100%)	95 (100%)
Intention to Breed and/or Provides Revenue				
Yes	9 (15.8%)	3 (8.1%)	0 (0%)	12 (12.6%)
No	48 (84.2%)	34 (91.9%)	1 (100%)	83 (87.4%)
Other				
Yes	24 (42.1%)	11 (29.7%)	0 (0%)	35 (36.8%)
No	33 (57.9%)	26 (70.3%)	1 (100%)	60 (63.2%)
Accepted Spay/Neuter Voucher				
Yes	9 (15.8%)	11 (29.7%)	0 (0%)	20 (21.1%)
No	48 (84.2%)	26 (70.3%)	1 (100%)	75 (78.9%)
Environmental Concerns: Heat				
Yes	4 (7.0%)	0 (0%)	0 (0%)	4 (4.2%)
No	41 (71.9%)	24 (64.9%)	1 (100%)	66 (69.5%)
Missing	12 (21.1%)	13 (35.1%)	0 (0%)	25 (26.3%)
Environmental Concerns: Cold				
Yes	4 (7.0%)	2 (5.4%)	1 (100%)	7 (7.4%)
No	41 (71.9%)	22 (59.5%)	0 (0%)	63 (66.3%)
Missing	12 (21.1%)	13 (35.1%)	0 (0%)	25 (26.3%)
Environmental Concerns: Rain				
Yes	3 (5.3%)	0 (0%)	0 (0%)	3 (3.2%)
No	42 (73.7%)	24 (64.9%)	1 (100%)	67 (70.5%)
Missing	12 (21.1%)	13 (35.1%)	0 (0%)	25 (26.3%)
Environmental Concerns: Food Security				

Yes	5 (8.8%)	2 (5.4%)	0 (0%)	7 (7.4%)
No	40 (70.2%)	22 (59.5%)	1 (100%)	63 (66.3%)
Missing	12 (21.1%)	13 (35.1%)	0 (0%)	25 (26.3%)
Environmental Concerns: Injury				
Yes	1 (1.8%)	0 (0%)	0 (0%)	1 (1.1%)
No	44 (77.2%)	24 (64.9%)	1 (100%)	69 (72.6%)
Missing	12 (21.1%)	13 (35.1%)	0 (0%)	25 (26.3%)
Environmental Concerns:Noise				
Yes	0 (0%)	0 (0%)	0 (0%)	0 (0%)
No	45 (78.9%)	24 (64.9%)	1 (100%)	70 (73.7%)
Missing	12 (21.1%)	13 (35.1%)	0 (0%)	25 (26.3%)
Environmental Concerns: Conflict with People				
Yes	3 (5.3%)	0 (0%)	0 (0%)	3 (3.2%)
No	42 (73.7%)	24 (64.9%)	1 (100%)	67 (70.5%)
Missing	12 (21.1%)	13 (35.1%)	0 (0%)	25 (26.3%)
Environmental Concerns: Conflict with other Animals				
Yes	5 (8.8%)	2 (5.4%)	0 (0%)	7 (7.4%)
No	40 (70.2%)	22 (59.5%)	1 (100%)	63 (66.3%)
Missing	12 (21.1%)	13 (35.1%)	0 (0%)	25 (26.3%)
Environmental Concerns: Sanitation				
Yes	0 (0%)	1 (2.7%)	0 (0%)	1 (1.1%)
No	45 (78.9%)	23 (62.2%)	1 (100%)	69 (72.6%)
Missing	12 (21.1%)	13 (35.1%)	0 (0%)	25 (26.3%)
Barriers Related to Pet Ownership				
Access to Healthcare				
Yes	4 (7.0%)	1 (2.7%)	0 (0%)	5 (5.3%)
Missing	12 (21.1%)	13 (35.1%)	0 (0%)	25 (26.3%)
Access to Housing				
Yes	9 (15.8%)	3 (8.1%)	0 (0%)	12 (12.6%)
Missing	12 (21.1%)	13 (35.1%)	0 (0%)	25 (26.3%)
Pet Ownership Benefits				
Psychological				
Yes	13 (22.8%)	7 (18.9%)	0 (0%)	20 (21.1%)

No	32 (56.1%)	17 (45.9%)	1 (100%)	50 (52.6%)
Missing	12 (21.1%)	13 (35.1%)	0 (0%)	25 (26.3%)
Safety				
Yes	3 (5.3%)	2 (5.4%)	0 (0%)	5 (5.3%)
No	42 (73.7%)	22 (59.5%)	1 (100%)	65 (68.4%)
Missing	12 (21.1%)	13 (35.1%)	0 (0%)	25 (26.3%)

Table 2a: Dog Parkour Training Study Participant Demographic

	Overall (N=8)
Average Age	25.9 years
Gender	
Female	4
Male	2
Transgender-Nonbinary	2
Housing status	
Transitional Housing	4
Government funded housing	3
Lives in care	1
ESA Status	
Yes	4
No	4

Table 2b: Dog Parkour Training Study Human-Animal Bond Characteristics

My dog…	# of Responses (n=8)
Keeps me company	8 (100%)
Makes me feel loved	8 (100%)
Helps me feel safe	8 (100%)
Gives me someone to love	8 (100%)
Protects me	5 (62.5%)
Eats before I do	7 (87.5%)
Makes it harder for me to stay in a shelter	4 (50%)
Makes it easier to ask for money	1 (12.5%)
Makes it harder to ask for money	1 (12.5%)
Makes it easier to make friends	7 (87.5%)
Makes it harder to make friends	1 (12.5%)
Makes it harder to get housing	4 (50%)
Makes it harder to seek health care/help	2 (25%)

Figure 2: Dog Parkour Training Study Human Mental Health Metric Trends

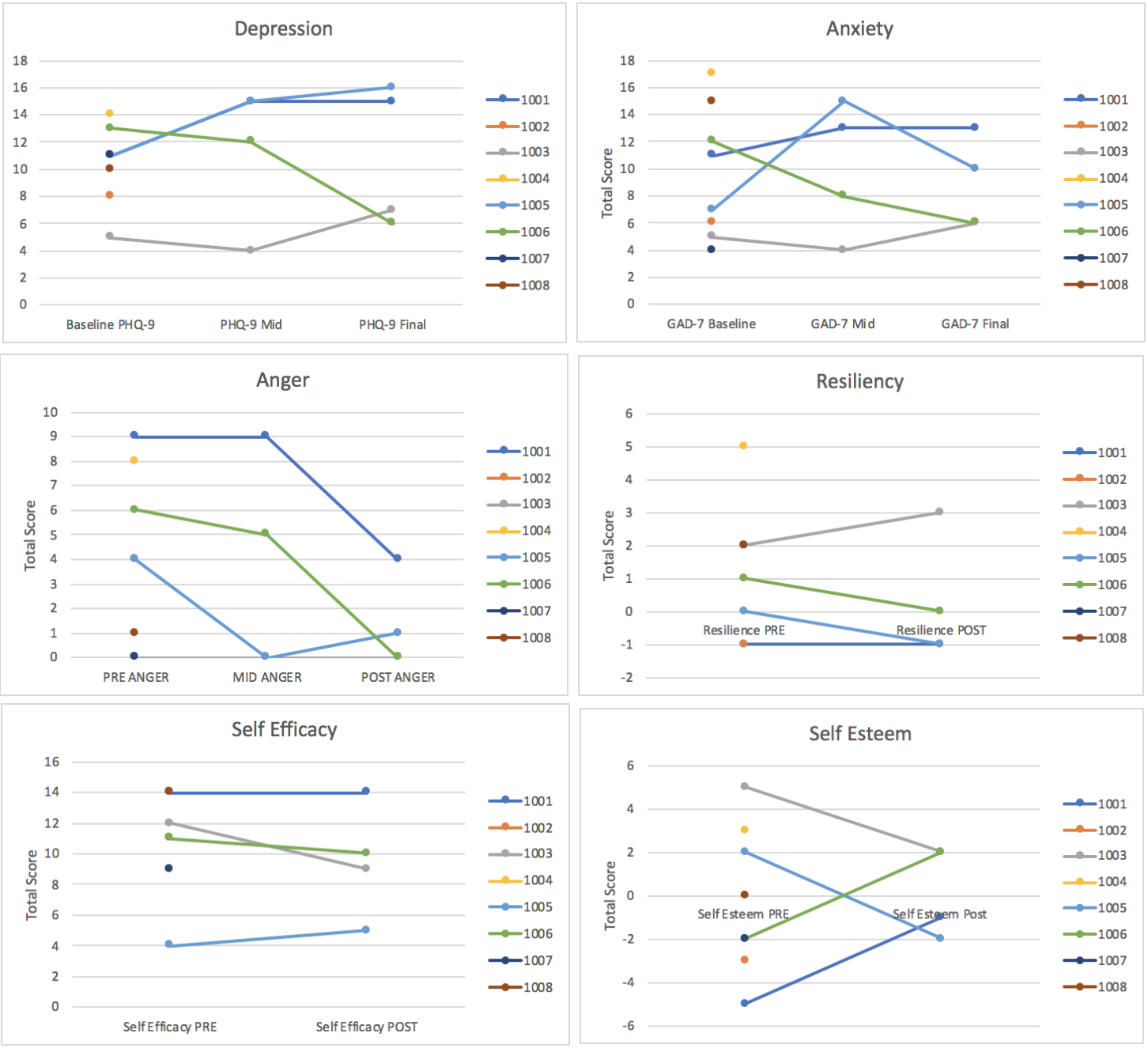

Figure 3: Dog Parkour Training Study Animal Behavior Metric Trends

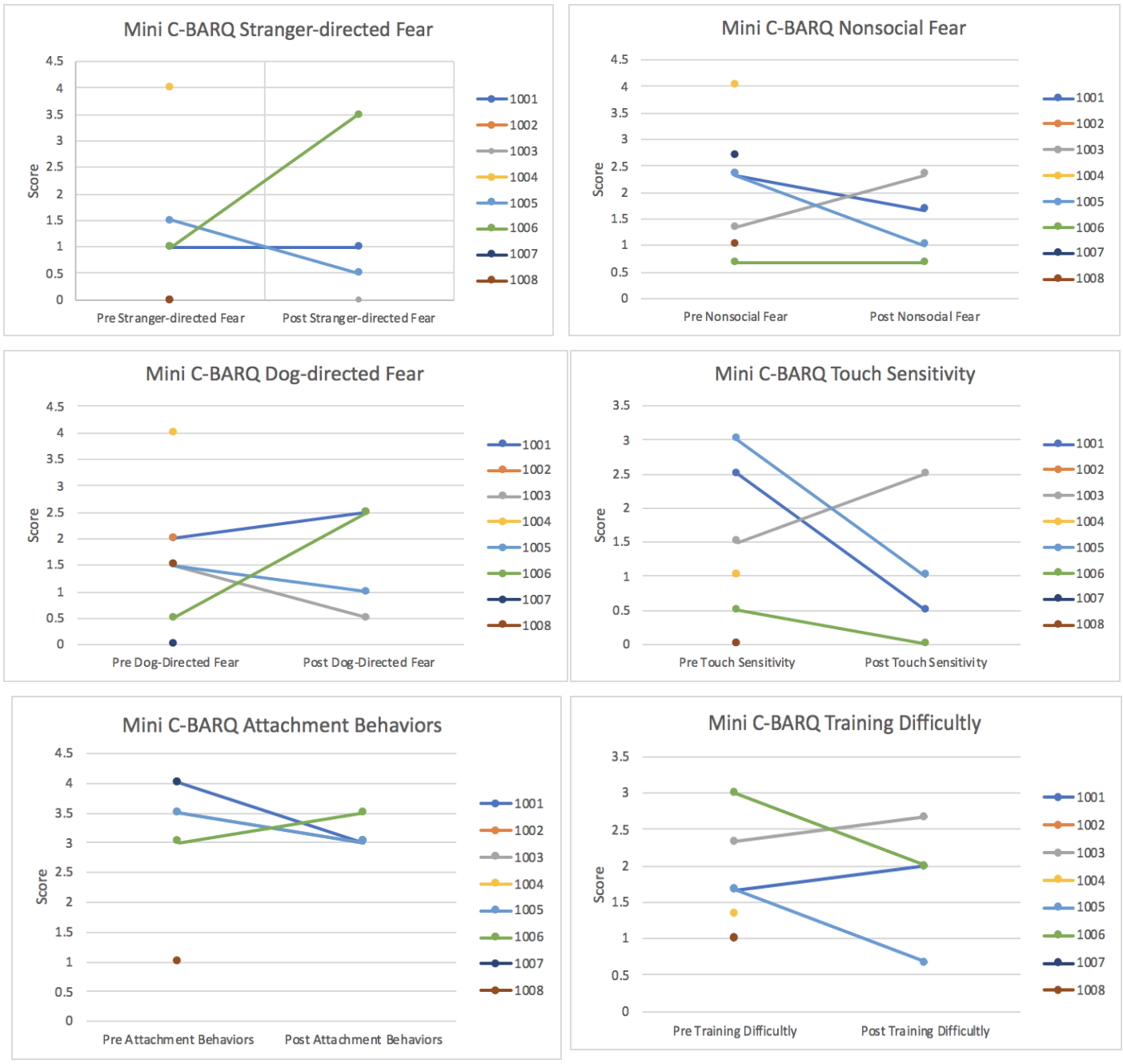

Figure 4a: Dog Parkour Training Study Human-Animal Bond Metric Trends

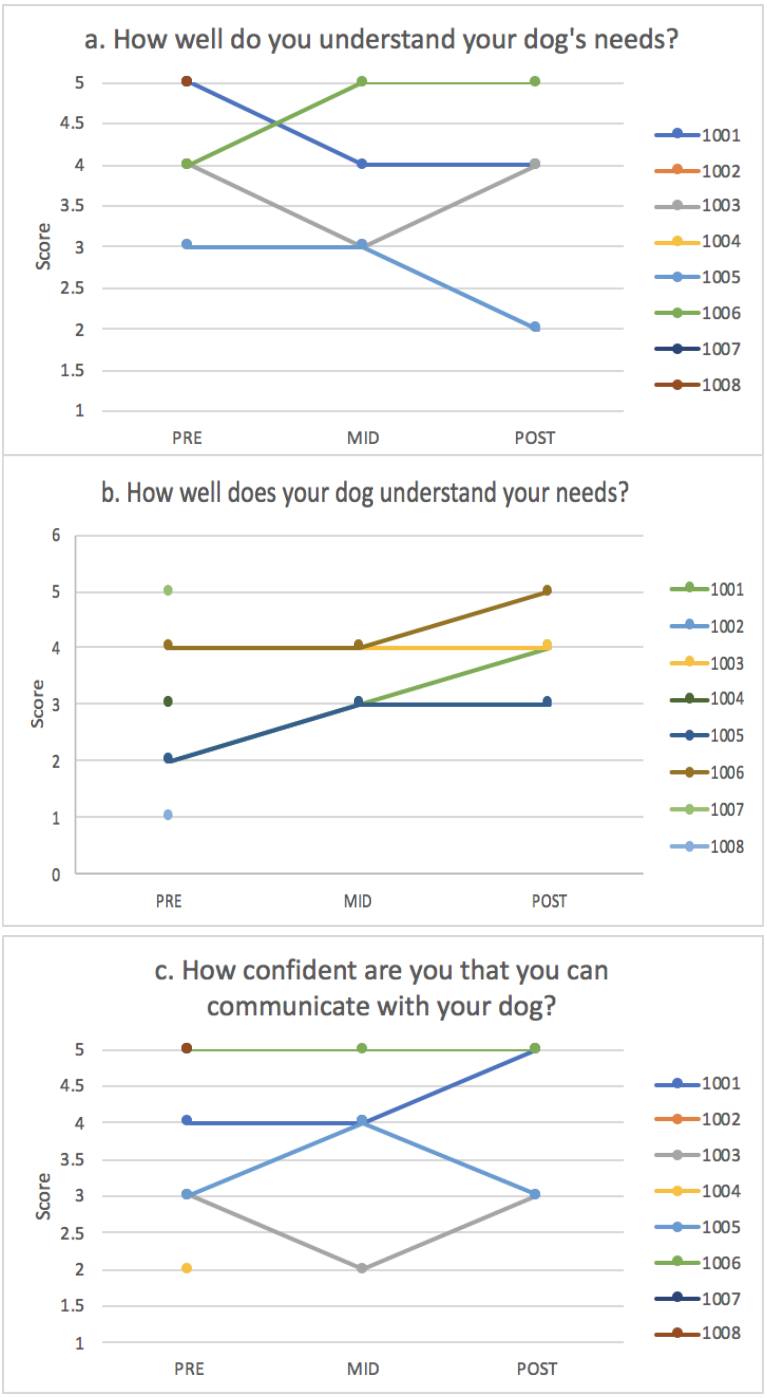

Figure 4b: Human-Animal Bond Metrics Changes Over Intervention

	% of participants with YES response	
Has this changed at all over the last 3/8 weeks?[1]	**3 weeks (n=4)**	**8 weeks (n=4)**
a.How well do you understand your dog's needs?	75%	100%
b.How well does your dog understand your needs?	50%	100%
c.How confident are you that you can communicate with your dog?	100%	100%
[1]**:** Secondary part of question a, b and c: Has this changed at all over the last 3/8 weeks? Yes/No -> If Yes,how much: Extremely (4) Very (3) Moderately (3) Slightly (2) Not at all (1) Surveyed at week 3, and post-intervention		

Table 3: Regression Models: Relationship Between Psychiatric Diagnosis, ESA Status and Housing Status

Total Psychiatric Diagnoses ~ Emotional Support Animal			
Predictors	*Prevalence Odds Ratio*[1]	*CI*	*p*
Total Psych Dx	0.167	(0.0192, 0.764)	**0.047***
Observations	40		
R2 Tjur	0.196		
Anxiety ~ Emotional Support Animal			
Predictors	*Prevalence Odds Ratio*[1]	*CI*	*p*
Anxiety	0.207	(0.0201, 1.37)	0.131
Observations	43		
R2 Tjur	0.120		
Depression ~ Emotional Support Animal			
Predictors	*Prevalence Odds Ratio*[1]	*CI*	*p*
Depression	1.485	(0.384, 6.23)	0.573
Observations	43		
R2 Tjur	0.077		
Bipolar ~ Emotional Support Animal			
Predictors	*Prevalence Odds Ratio*[1]	*CI*	*p*
Bipolar	4.51	(0.485, 56.4)	0.199
Observations	43		
R2 Tjur	0.113		
PTSD ~ Emotional Support Animal			
Predictors	*Prevalence Odds Ratio*[1]	*CI*	*p*
PTSD	0.343	(0.0337, 2.37)	0.308

Observations	43		
R2 Tjur	0.095		
ESA ~ Housing Status			
Predictor: ESA	*Prevalence Odds Ratio*[2]	*CI*	*p*
Couchsurfing	0.833	(0.047, 14.7)	0.901
Shelter	1.974	(0.330, 11.8)	0.463
Homeless	0.945	(0.152, 5.87)	0.952
Observations	43		
R2 / R2 adjusted	0.023 / 0.005		

1: adjusted for Gender, Housing Status, Animal Species and total number of visits in 2019
2: adjusted for Gender, Animal Species and total number of visits in 2019
Notes: *Statistically significant at p=0.05

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