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### Do Canine Companions Reduce College Stress?

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## Introduction

Rates of mental health concerns among college students are rising. A recent World Health Organization Survey of ~14,000 students revealed clinically concerning scores on anxiety, depression and substance use disorder for 31% [2][3]. With these high levels of clinically concerning scores in college students, great amounts of stress are the result, which have been negatively correlated with greater feelings of loneliness and lower hedonic well-being (satisfaction in life), without proper social support [6][10]. We explored potential mental health benefits of canine companions in the college setting by collecting psychosocial measures from both dog-owners and non-dog-owners assessing their levels of anxiety, loneliness, and hedonic well-being. We also explored how the dimensions of dog cognition look when correlated with their owners' scores on measures assessing their mental health. We assessed these levels of dog cognition through *The Dognition Assessment*, a web-based assessment for dog cognition and reasoning. *Dognition* measures levels of canine empathy, communication, as well as cunning (Figure 3). *Dognition* has been found to produce very similar results whether performed in a laboratory or in a home as citizen science [9].

## Hypotheses

- Hypothesis 1: Students living with dogs ( $n = 20$ ) will have lower anxiety and loneliness and higher satisfaction with life in comparison with a matched group of students not living with dogs ( $n = 17$ ; Arrow #1, Figure 1).
- Hypothesis 2: Among the student-canine dyads, canines with higher scores on empathy, communication, and cunning—measured via *The Dognition Assessment*—will have human partners with lower anxiety and loneliness and higher satisfaction with life (Figure 2).

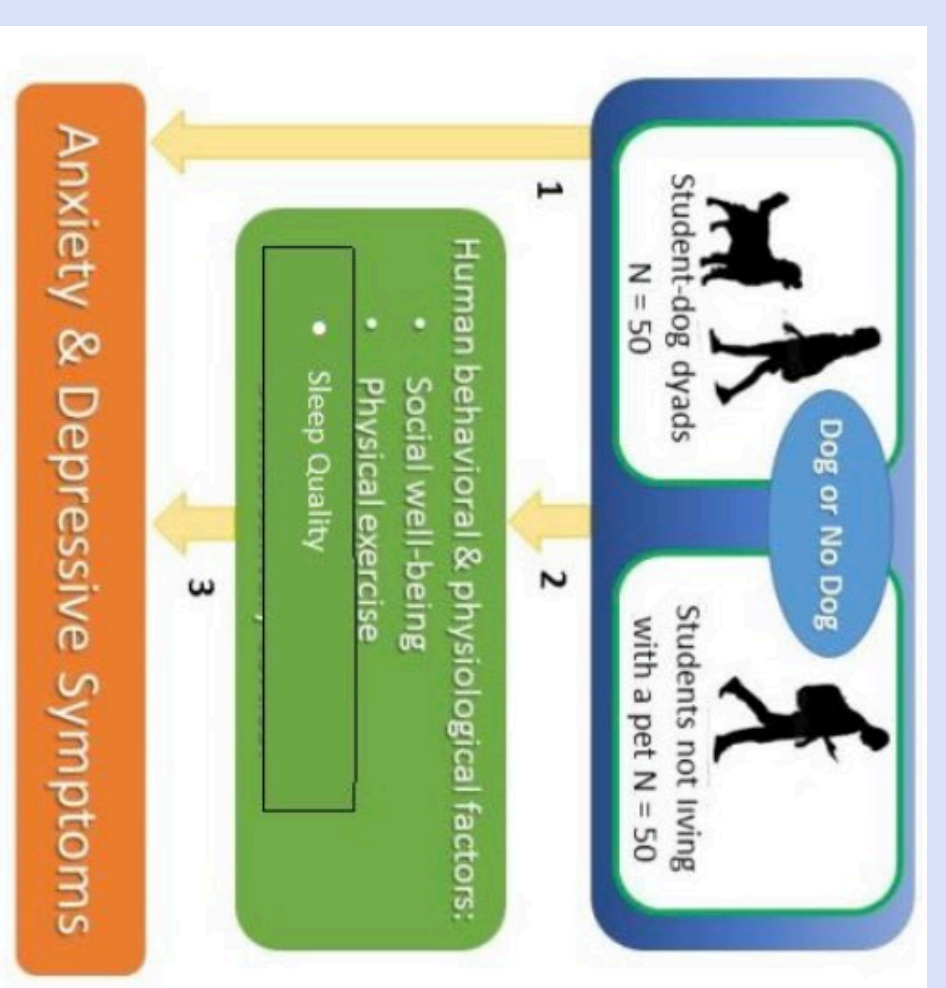


Fig. 1

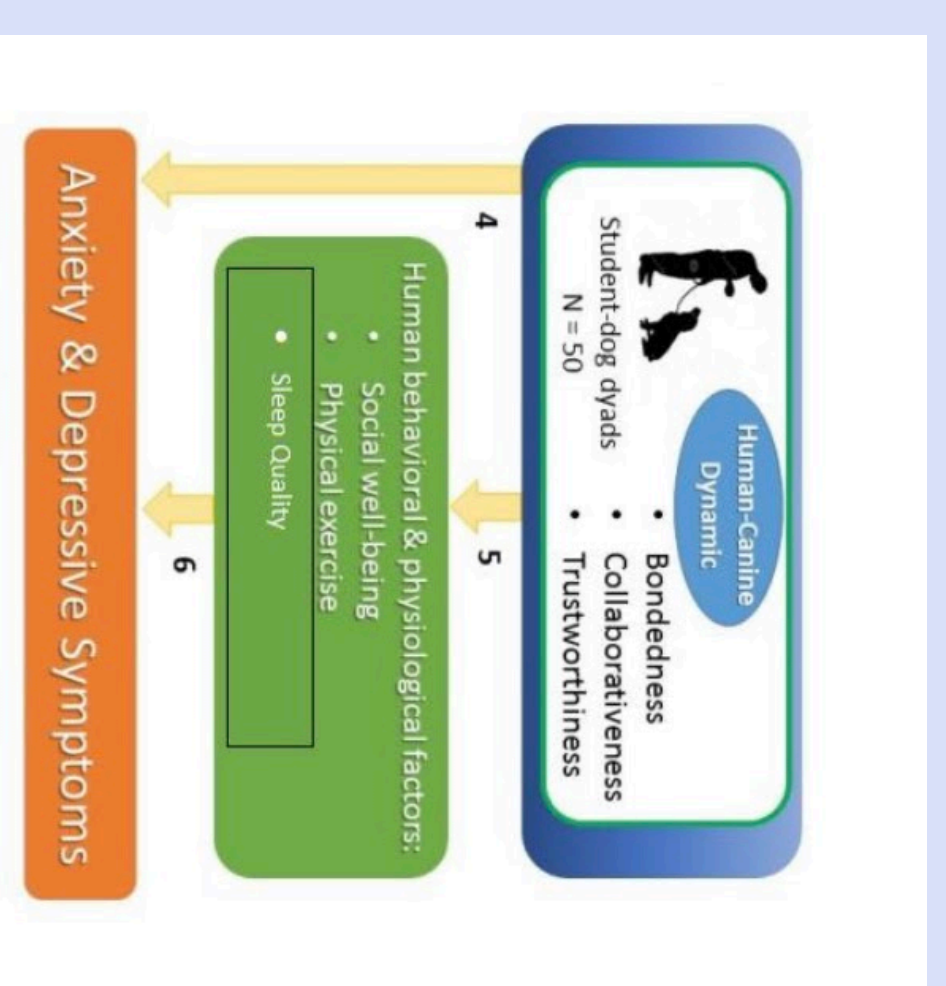


Fig. 2

## Methodology

- We recruited 20 student-dog dyads and 17 students not living with dogs through the University of Louisville's Sona System.
- All participants reviewed an IRB-approved unsigned consent form and selected a period of time to begin and complete their home-based data collection of psychosocial measures through REDCap. Dog-owners also completed an online "Dognition" test with their dog.
  - REDCap Questionnaires
  - REDCap (Research Electronic Data Capture) is a secure web application for managing online data.
  - Questionnaires will be used to collect data on the participant demographics as well as their anxiety symptoms, loneliness, and hedonic well-being. The measures utilized in this study were the GAD-7 [8], the UCLA Loneliness scale [7], and the SWLS [4].
  - Dognition Test
    - A web-based assessment for dog cognition and reasoning, called the "Dognition" test.
    - Includes clear instructions guided by video that allow a dog owner (together with an assistant) to complete a series of five science-based games.
    - These games assess the following core dog cognition characteristics: empathy, communication, and cunning. (Figure 3).

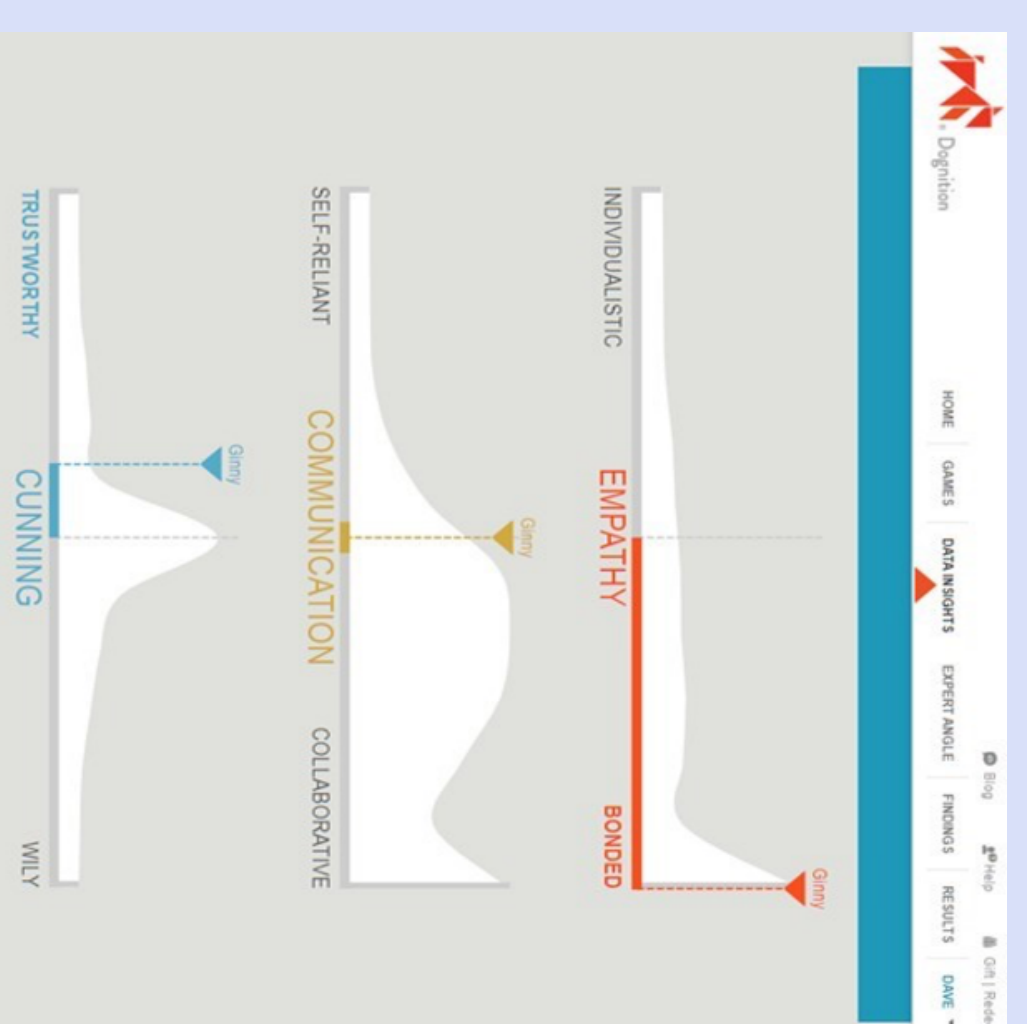


Fig. 3

## Analysis Plan

*Hypothesis 1 - Living with a dog is associated with human well being*

- Independent samples T-tests were used to examine for differences in demographic and academic variables between dog-owners and non-dog-owners. Variables that differ across the two groups will be adjusted in tests of hypothesis 1.
- GPA was confounded with dog-ownership: students living with dogs had significantly lower GPAs. Thus, with exploratory intent, we further explored hypothesis 1 after splitting the sample at the median GPA (3.5), yielding two separate groups: Those with a GPA of  $\geq 3.5$  ( $n = 19$ ) and those with a GPA  $< 3.5$  ( $n = 16$ ). Associations of dog ownership with anxiety, life satisfaction, and loneliness were examined separately in subgroups of high versus low GPA students using bivariate Spearman correlations.
- Among dog-owners, two-tailed bivariate Spearman correlations were used to tests for associations of Dognition variables, "Trust, Communication, and Cunning with measures of human well-being including anxiety (GAD7), loneliness (UCLA), and hedonic well being/satisfaction with life (SWLS).

## Results

- Dog-owners had significantly lower GPAs than non-dog-owning students. No other differences emerged in the total sample (Table 1).

TABLE 1: Demographic and academic variables

Variable	Entire Sample	Dog Owners	Non-Dog Owners
Age (Years)	$M = 23.1, SD = 9.16$	$M = 22.4, SD = 4.12$	$M = 24.1, SD = 12.9$
Gender	Male = 8, Female = 28	Male = 3, Female = 16	Male = 5, Female = 12
Credit Hours	$M = 7.30, SD = 4.34$	$M = 7.05, SD = 4.63$	$M = 7.69, SD = 4.09$
Enrolled	$M = 3.51, SD = 0.52$	$M = 3.11, SD = 0.69$	$M = 3.51, SD = 0.518$
Employment	Employed: 54.1%, Unemployed: 45.9%	Employed: 40.0%, Unemployed: 60.0%	Employed: 52.9%, Unemployed: 47.1%
Situation	Dom: 8.11%, Off-Campus Dom: 13.5%, Off-Campus Dom: 0.00%, Fair/Soro House: 0.00%, Apartment: 18.2%, House: 18.9%, With Parents: 43.2%	Dom: 5.00%, Off-Campus Dom: 5.88%, Fair/Soro House: 0.00%, Apartment: 15.0%, House: 25.0%, With Parents: 52.9%	Dom: 11.8%, Off-Campus Dom: 5.88%, Fair/Soro House: 0.00%, Apartment: 17.6%, House: 11.8%, With Parents: 52.9%

TABLE 3: Canine variables

Variable	Dog Owners
Empathy	$M = 1.58, SD = 3.91$
Communication	$M = 1.72, SD = 3.62$
Cunning	$M = 0.945, SD = 2.58$
Age (Years)	$M = 4.75, SD = 3.83$
Gender	Male: 44.4%, Female: 55.6%
Spayed/Neutered	Spay/Neuter: 83.3%, In Tact: 16.7%
Breed	Boston Terrier: 1 Bullmastiff: 1 Corgi: 1 German Shepherd: 1 Blue Heeler: 1 Golden Retriever: 1 Malamute: 1 Pincher: 1 Schauzer: 1 Shilzu: 1 Border Collie: 2 Labrador: 3 Yorkie: 3

TABLE 2: Psychosocial variables

Variable	Entire Sample	Dog Owners	Non-Dog Owners
GAD-7	$M = 7.76, SD = 5.13$	$M = 8.55, SD = 5.20$	$M = 6.92, SD = 5.07$
SWLS	$M = 25.5, SD = 7.53$	$M = 24.8, SD = 8.26$	$M = 26.5, SD = 6.69$
UCLA	$M = 23.1, SD = 13.8$	$M = 25.7, SD = 11.9$	$M = 20.2, SD = 15.4$

- Among students with GPAs below 3.5 those who owned dogs reported significantly more loneliness ( $r = -0.499, p < 0.05$ )
- Among dog owners ( $n = 20$ ), results of *The Dognition Assessment* showed
  - Dogs who measured high on Communication (high collaborative, low self-reliant) had humans with significantly LOWER life satisfaction ( $r = -0.673, p < 0.01$ ) (Figure 4).

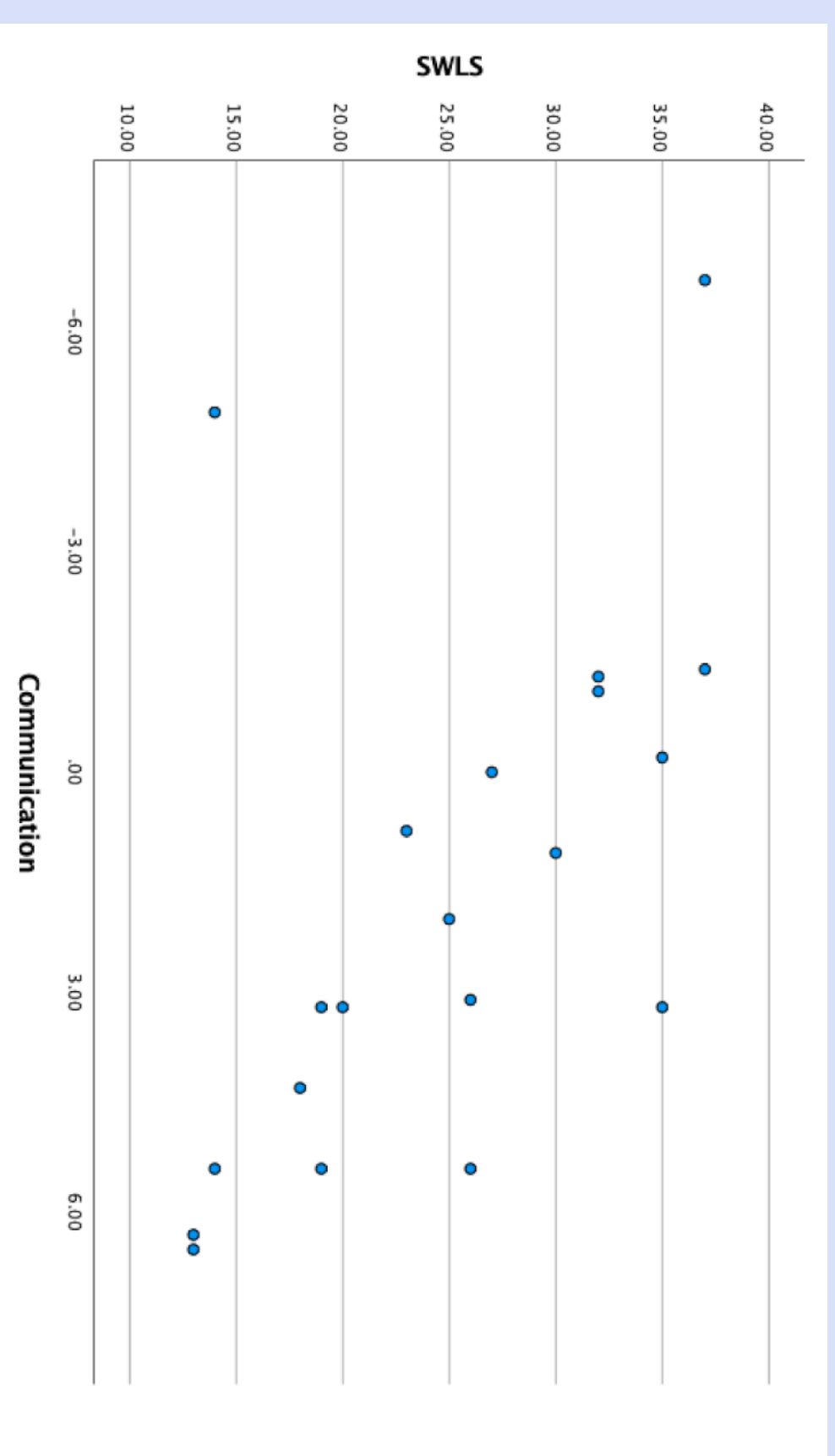


Fig. 4

- Dogs who measured high on communication (high collaborative, low self-reliant) had humans with higher levels of anxiety, however this was not statistically significant ( $r = 0.390, p > 0.05$ ) (Figure 5).

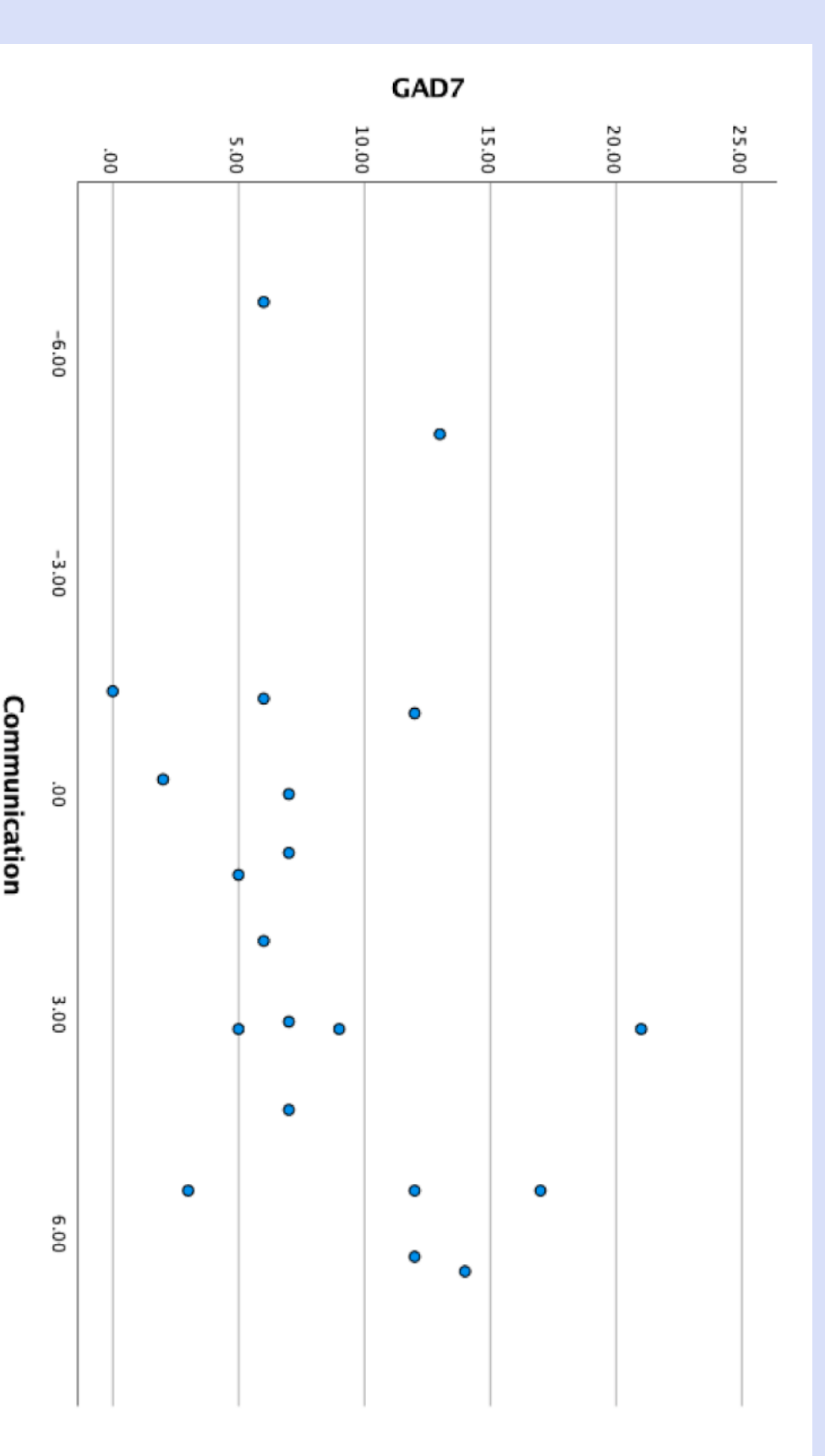


Fig. 5

## Conclusions

- Before any conclusions can be made, we need to address a huge factor that is affecting every single person in this study, as well as around the globe. That factor is COVID-19. All data was collected from participants during the COVID-19 pandemic, and most participants' data was collected during when many states, including Kentucky, were under a quarantine. All of our psychosocial variables could have been greatly affected by this.
- We believe that the dog owners who had scored significantly higher on the UCLA loneliness measure than non-dog owners, may be displaying the **mental state during quarantine of the owner**, rather than an effect of dog ownership.
  - Most public places during data collection were either shut down or restricted to a very limited capacity. Many friends and family have been separated for an extended period of time due to the pandemic
  - Future longitudinal studies should explore how UCLA scores appear when the COVID-19 pandemic is over.
- While Dognition may be designed to assess the cognition of dogs, it may also give insight into the mental state of the dog's owners and how their dogs have developed to react to the owner's actions that are a result of their mental health.
  - There is a moderate positive correlation between participant's anxiety levels and their dogs' communication assessment.
  - There is a statistically significant negative correlation between the participant's satisfaction with their lives and their dog's communication assessment at the 0.01 level.
  - A low SWLS score would indicate that one is not seeing their current life situation as meaningful, fulfilling, or manageable.
  - We know that dogs can detect emotion in their human counterparts [1] and theories of dog domestication have suggested that dogs adapted to a mutualistic relationship between themselves and humans [5]. Could this be a continuation of this adaptation?
    - Dogs may see these elevated feelings of meaninglessness, anxiety, or loneliness in their owners and adapt to this by seeking to comfort them by being highly communicative with them.
    - The dog receives positive reinforcement for the interaction it would give.
    - Our data suggests that these owners are people who desire comfort, and as their dogs realize this, they will seek to be more collaborative with their owners, not only for the owner's benefit, but their own as well.
    - Future research needs to explore more of how dog owner's mental health may mold their canines' cognition, to be able to say anything conclusive about any of this.

## Future Research

Future research needs to explore the differences in GPA between dog owners and non-dog-owners, how interspecies (human and another animal) may affect human anxiety, feelings of loneliness, and hedonic well-being; how an owner's mental health may mold a dog's cognition and problem-solving strategies. Future longitudinal studies should explore what results this study would find whenever the COVID-19 pandemic is no longer present.

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