**Assessment of Personality in Pigs**

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**Abstract**

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**Table of Contents**

List of Tables 5

List of Figures 6

INTRODUCTION 1

Personality in Non-Human Animals 1

Personality in Pigs 5

Personality Assessment 6

Present Study & Hypothesis 7

METHODS 9

RESULTS 16

Preliminary Analyses 16

Primary Analyses 22

Additional Analyses 25

DISCUSSION 29

Study Findings 29

Theoretical Implications 33

Practical Implications 34

Limitations 35

Conclusion 37

REFERENCES 39

Appendix A 48

Pig Sample Description 48

Appendix B 50

Pig Personality Survey 50

Appendix C 53

Ethogram 53

Appendix D 56

Pig Personality Scores 56

List of Tables

Table 1 11

Table 2 12

Table 3 19

Table 4 21

Table 5 26

Table 6 26

Table 7 27

Table 8 28

List of Figures

Figure 1 17

Figure 2 18

Figure 3 20

Figure 4 22

Figure 5 23

Figure 6 24

INTRODUCTION

Even before the existence of psychology as a field, people have been fascinated by personality. Hippocrates thought that personalities could be explained by variations in body fluids. For example, he thought that an excess of black bile in the body leads to a sad, melancholic personality and that an excess of blood leads to a cheerful, sanguine personality (Jouanna, 2012). We now know this is not the case, but the mechanisms underlying variation in personality remain unclear. One avenue for understanding personality is to study personality in animals. Personality is not unique to humans. Recent research in non-human animal personality focuses on why and how personality differs between individuals, as well as how to effectively measure and quantify personality across a variety of species (Finkemeier et al., 2018).

Personality in Non-Human Animals

Why Study Animal Personality?

In the field of psychology, personality can be defined as individual differences in behavior that are consistent over time (Finkemeier et al., 2018). A wide variety of species have had their personalities studied, from dogs, to horses, to monkeys, to hyenas (Gosling, 2001). There are strengths to studying non-human animals that make their study uniquely valuable to help better understand personality in humans. For example, if researchers want to better understand how personality changes throughout the lifespan, they could study gray mouse lemurs (*Microcebus murinus*), which are small primates with lifespans of just 8-12 years (Languille, et al., 2012), instead of following a human cohort for 80 or more years. Similarly, if researchers want to see how the social environment affects personality, they could manipulate the social environment of a dog to observe how their personality changes, something that would be extremely difficult to achieve in human populations. Researchers have used animal personality research to provide insight into how personality can affect health outcomes (Weiss et al., 2013) and how genetic and environmental factors affect an individual's personality (Sinn & Moltschaniwskyj, 2006).

Studying personality in animals also has value outside of comparative psychology. For example, studying personality traits in captive animals has been used to improve their welfare. If caregivers know that a certain individual is generally sociable, then if one day the same individual starts acting aggressive, caregivers can know to look for signs of pain or other environmental changes that may be the cause for this sudden behavior change (Finkemeier et al., 2018).  In working animals, personality assessments have historically been used to help select individuals for certain roles, for example, to find out which dogs are most likely to become successful service dogs (Bray et al., 2019). This information has also been used to guide animal breeding decisions (Takeuchi, et al., 2009) since personality can be highly heritable (Briley & Tucker-Drob, 2014).

Methodological Issues in Animal Personality Research

Overall, the findings show that individuals in numerous species, including mammals, reptiles, and even fish exhibit considerable individual variation in personality (Gosling, 2001), and that personality across species can generally be measured across similar dimensions, such as extroversion, neuroticism, openness, and agreeableness (Gosling & John, 1999).

However, there is an overall lack of consistency, reliability, and validity in methods of measuring personality in non-human animals (Wilson et al. 2019). While a human can be given a written personality survey to fill out, researchers have had to find creative ways to assess the personality of an individual who cannot speak. Therefore, assessing personality in species other than humans is typically done in one of two main methods. The first method, “behavior observations”, is conducted by observing an individual’s behavior and coding relevant behaviors to use as a proxy for certain personality traits (e.g. an animal who bites another individual is recorded as being “neurotic”). The other method, “informant reports”, is conducted by having people who have known the animal for a long time (e.g. long-term caregivers) fill out a questionnaire that asks about the animal’s personality (Wilson et al., 2019).

In order to better assess variations in personality across species, there needs to be greater consistency in the wording of personality constructs (Sánchez-Tójar et al., 2022). For example, an animal biting another could be interpreted as “dominance” or “aggression” in one paper, but be considered to be “confidence” or “boldness” in another, depending on how they define the trait. Work also needs to be done in finding ways to be more consistent in how personality traits are assessed across different species, while also being mindful that traits are assessed in ways that are relevant and hold ecological validity for the species (Uher & Asendorpf, 2008). For example, orangutans are mostly solitary apes (Galdikas, 1985), compared to bonobos, which live in large social groups (Parish, 1996). Therefore, the range of extroversion in orangutans is likely to be different from the range of extroversion in bonobos. Additionally, different species may express their personality in different ways. While exploration in species with vision as their primary sense may result in highly explorative individuals exploring their environment using their sight, species with olfaction as their primary sense are more likely to explore their environment using their sense of smell.

Therefore, it is vital that future animal personality research is conducted in a way that emphasizes reliability, validity, and replicability so that findings from different researchers across different populations can be more easily compared.

Personality in Pigs

Why Study Pigs?

Pigs (*Sus domesticus*) were first domesticated during the beginning of the Holocene, making them one of humanity’s earliest domesticated animals (Evin, et al., 2017). Today, pigs are the most commonly eaten land animals in the world (Food and Agriculture Organization of the United Nations), with over 600 million pigs living on farms worldwide (U.S. Department of Agriculture, 2021). Additionally, pigs are becoming popular as companion animals, due to their intelligent and friendly nature (Newman, 2017).

Pigs have also been used extensively in biomedical research due to their similarities to humans (Douglas, 1972), with the world’s first pig-to-human heart transplant occurring in 2022 (Wilson, 2022). Pigs have also shown promise for use as a comparative model animal in psychology and neuroscience, due to them having remarkable similarities in brain structure (Gieling, et al., 2011) and, in many respects, cognition (Mendl, et al., 2010) to humans. Like humans, pigs live in complex social groups (Foister, et al., 2018), necessitating a diverse array of psychological characteristics. For instance, pigs have been shown to exhibit affective empathy (Goumon & Špinka, 2016) and can understand social cues such as pointing (Nawroth, et al., 2014). Since pigs are domesticated rather than wild animals, pigs are much safer to interact with than non-human primates, while also having an impressive repertoire of cognitive skills that can rival or surpass those of animals more commonly used in comparative psychology research, such as mice and even dogs (Marino & Colvin, 2015).

Overall, pigs’ ubiquity, docility, and convergence with humans make them an ideal behavioral research subject. In addition to their study being beneficial from a comparative psychological standpoint, knowing more about pigs from a personality standpoint can be used to improve their welfare. For example, personality test results could help determine appropriate social groups for laboratory pigs or could be used in a farm setting to be able to help predict which pigs are more likely to feel stressed or act aggressively (Finkemier et al., 2018).

Personality Assessment

Previous studies on pigs have used a variety of personality constructs and assessment methods. Like most animal personality research, there is a lack of consistency in how personality in pigs is assessed, what is being assessed, and how personality constructs are named (O’Malley et al., 2019). Therefore, replicability and validity need to be emphasized. Currently, there is no standardized pig personality assessment in use, though there are standardized personality assessments designed for use in dogs (Jones, 2008), humans (Fruyt, et al., 2004), non-human great apes (Uher & Asendorpf, 2008), and horses (Lloyd, et al., 2007). It is also still unclear what methods of personality assessment are the most accurate. Do self-reported and informant-reported personality surveys reflect how an individual actually behaves? Comparing survey data to behavior observations may be key to uncovering how accurate personality surveys really are at telling the story of one’s behavior.

Present Study & Hypothesis

The purpose of this study is to: (a) examine the degree of variation of personality in pigs using an informant report-based survey, and (b) evaluate the internal reliability of the personality measure. The results of this study can help give insight how personality varies between individuals in a population and provide information on the accuracy of personality surveys. Additionally, knowing how to assess personality in pigs can be used to help improve their welfare (Finkemier et al., 2018). For example, volunteers can better understand which pigs are more prone to stress and aggression.

Current pig personality research has mostly been conducted on infant and juvenile pigs under 6 months of age (O’Malley et al., 2019). However, this research will primarily be conducted on adult pigs. This may contribute to greater reliability because in humans personality becomes more stable once an individual reaches adulthood (Van Dijk, et al., 2020). This research will also be comparing two popular ways to assess personality: informant reports and behavioral coding.

I hypothesize that pig personality can be accurately and reliably measured using informant reports and that informant-reported data correlates with observable behaviors that the focal individual exhibits.

METHODS

Design

Data analyses assessed the reliability of the assessment measure, which utilized informant reports via assessments from long-term caregivers. Data analyses also compared the scores calculated from the measure with observable behaviors that the focal individuals exhibited.

Pig Sample

The study sample consisted of 20 domestic pigs (*Sus domesticus*) who live semi-free-ranging at the Central Texas Pig Rescue, a volunteer-run pig sanctuary located on the outskirts of Bastrop, Texas (centraltexaspigs.org). The pigs are housed in two separate living groups. Nine of them are large pigs (the size typically used for food production) living in a group called “Beautyberry Borough'', and 11 of them are small pigs (about the size of medium-sized dogs) living in a group called “Yaupon Canyon”. See detailed description of the pig sample in Appendix A.  The pigs from the Yaupon group that I chose for this study were selected to have sample diversity in both background and sex. The pig groups were selected with input from long-term volunteers, who discussed with me which groups they were most interested in having participate in the study. Since this project was a partnership between myself and the pig rescue, it was important to take the volunteers’ opinions into account when selecting which pigs to study.

Measure

This study introduces a novel for assessing personality in pigs: the Pig Personality Survey.

Pig Personality Survey

The Pig Personality Survey is a 35-item survey that asks pig caregivers to answer questions about the extent to which various traits and behaviors apply to the pig being evaluated. Each pig’s personality is graded under 4 main factors (Fearfulness, Aggression towards Humans, Activity/Excitability, and Aggression/Dominance towards Pigs). Each main factor is also split into 2-4 facets. See sample items on table 1. The full measure is available in Appendix B.

For each item, participants graded how much they agreed with the statement (e.g. “Often investigates novel objects”) on a 7-point Likert-type scale (1= disagree strongly, 2 = disagree moderately, 3 = disagree slightly, 4 = neither agree nor disagree, 5 = agree slightly, 6 = agree moderately, 7 = agree strongly). The number (1-7) answered for each item is added to result in a total score for each personality factor/facet being studied, with lower scores reflecting lower expression of the personality factor/facet and higher scores reflecting higher expression of the personality factor/facet. The Pig Personality Survey was administered using the survey software Qualtrics so that the informants could complete it online. Each pig was evaluated by two different informants, resulting in a total of 2 completed Pig Personality Surveys for each pig.

Table 1

Sample Items Selected from Pig Personality Survey

|  |  |
| --- | --- |
| **Statement** | **Personality Facet** |
| Pig behaves aggressively in response to perceived threats from humans (e.g., being cornered, being reached at) | Aggression Towards Humans: Situational Aggression |
| Pig willingly shares resources (e.g. food, resting spots) | Aggression/Dominance towards Pigs: Dominance Over Other Pigs (reverse-coded) |
| Pig avoids other pigs | Fearfulness: Fear of Pigs |
| Pig seeks companionship with humans | Activity/Excitability: Companionability |

Behavior Observations

Behavioral observations were recorded based on an ethogram containing common behaviors that pigs exhibit. The full ethogram is available in Appendix C. Data was collected by myself and a research assistant using smartphones containing the app HanDBase, a flexible app designed for creating and monitoring inventories. Each pig’s observed behaviors could then be compared to the Pig Personality Survey scores to see whether their survey scores reflect their actual behavior.

Table 2

Sample Items Selected from Ethogram

|  |  |  |
| --- | --- | --- |
| **Behavior** | **Description** | **Behavior Category** |
| Tail between legs | Pig holds tail down so it is between their legs | Anxiety |
| Lay down touching conspecific | Pig lays down while touching other pig | Pro-Social |
| Bite | Pig bites at another pig | Give Aggression |

Procedures

Development of Pig Personality Survey

The survey was adapted from the short-form version of the Dog Personality Questionnaire (Jones, 2008), with some test items and personality facets altered or removed in order to be more ecologically relevant to pigs. For example, facet 5.1 “Prey Drive” was removed, as pigs are not predator animals. Similarly, the question “Dog works at tasks (e.g., getting treats out of a Kong, shredding toys) until entirely finished” under the Active Engagement facet was modified to say “Pig works at tasks (e.g. finding food on the ground, rooting) until entirely finished.

Administration of Pig Personality Surveys

Two long-term volunteers were first approached by email and asked if they wanted to take a survey that would be part of a research study about evaluating personality in pigs. The volunteers agreed to participate and were given a link to complete the Pig Personality Survey. The volunteers filled out the Pig Personality Survey by selecting the rating that best described the pig for each test item. Each pig was surveyed by two volunteers resulting in a total of two completed Pig Personality Surveys per pig.

***Behavior Observations***

A research assistant and I collected behavior observations for each pig in the study. The ethogram of behaviors was inputted into the app HanDbase on each person’s smartphone and the data was recorded directly from the app.

Each observer observed their focal pig from a distance of 1-2 meters away using continuous focal sampling (Altmann, 1974). Each focal pig was sampled for 5 minutes at a time. Observers recorded every behavior their focal pig performed as they occurred, noting the conspecifics when applicable. If an observer was approached by a pig, they were instructed to ignore the pig and move away if necessary.

Each pig was assessed by two total observers and were observed via continuous focal sampling over a 7-week period of weekly visits to the pig rescue (one week had to be skipped due to scheduling conflicts), totaling in 1 hour of observation time for each pig.

Once behavioral observations were completed, the behavior logs from HanDBase were converted into a .CSV file, which summarized the frequency of occurrences of the behaviors for each pig, and sorted behaviors into relevant categories relating them to personality (e.g. anxiety, aggression, and activity).

RESULTS

Preliminary Analyses

Background Information

The sample included 20 pigs, all of which were pre-selected to be part of this study. Of the pigs in the study, 50% were female and 50% were male. There were 9 pigs living in group 1, and there were 11 pigs living in group 2. 50% of the pigs in the study were identified as having a “traumatic background” (arriving to the pig sanctuary from an animal abuse or neglect case), and 50% were identified as having a “non-traumatic” background (not from an abuse or neglect case). This study was considered exempt by the University of Texas at Austin Institutional Review Board and Institutional Animal Care and Use Committee. A complete list of pigs in this study is available in Appendix A.

Survey Results Overview

There were 2 raters who scored each pig once using the Pig Personality Survey. I then calculated each pigs’ average scores for each personality factor and facet. See Appendix D for each pig’s personality survey results. Scores varied greatly between different personality facets. The greatest variation was in facet 1.1 “Fear of Humans” (SD = 5.90). The smallest variation was in facet 3.2 “Playfulness” (SD = 1.44). The average standard deviation between the facets was 3.421.

See summary of personality facet scores in Figure 1.

Figure 1

Summary of Personality Facet ScoresImage

Hypothesis 1 stated that pig personality can be accurately and reliably measured using informant reports. Unlike what was hypothesized, informant reports were not a reliable measure of personality, with a mean internal reliability of 0.168 and with a mean inter-observer reliability of 0.133

Internal Reliability

In order to see how well various test items assess the same construct, I calculated average inter-item correlations for personality test items that go within the same factor (e.g. items 9, 3, 10, and 13 all fall under the “Fearfulness” factor). Items were reverse-scored in advance, and each pig’s average score between the two observers was used. Correlation between items varied by personality factor, and had an average correlation of 0.168, which is considered to be low internal reliability. Factor 1 (Fearfulness) had very low internal reliability (0.083), Factor 2 (Aggression Towards Humans) had low internal reliability (0.398), Factor 3 (Activity/Excitability) had very low internal reliability (0.068), and Factor 4 (Aggression/Dominance Towards Pigs) had low internal reliability (0.124). Additionally, Cronbach’s α was calculated for each personality factor. Factor 1 (Fearfulness) was considered unacceptable (α = 0.47), Factor 2 (Aggression Towards Humans) was considered questionable (α = 0.75), Factor 3 (Activity/Excitability) was considered poor (α = 0.55), and Facet 4 (Aggression/Dominance Towards Pigs) was considered poor (α = 0.56). See Figure 2 for all inter-item correlations. See Table 3 for summary of inter-item correlations by personality factor.

Figure 2

All Inter-Item Correlations

Table 3

Summary of Inter-Item Correlations by Personality Factors

|  |  |  |
| --- | --- | --- |
| Factor | Mean Correlation | Chronbach’s α |
| 1: Fearfulness | 0.083 | 0.47 |
| 2: Aggression Towards Humans | 0.398 | 0.75 |
| 3: Activity/Excitability | 0.068 | 0.55 |
| 4: Aggression/Dominance Towards Pigs | 0.124 | 0.56 |

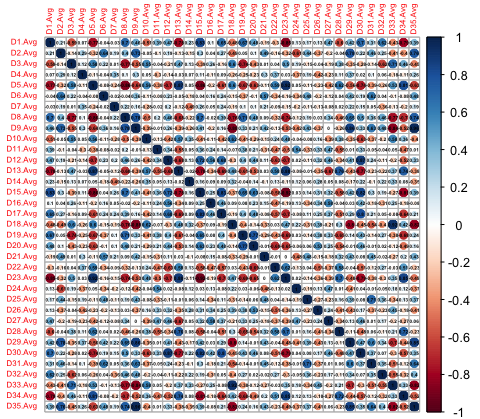
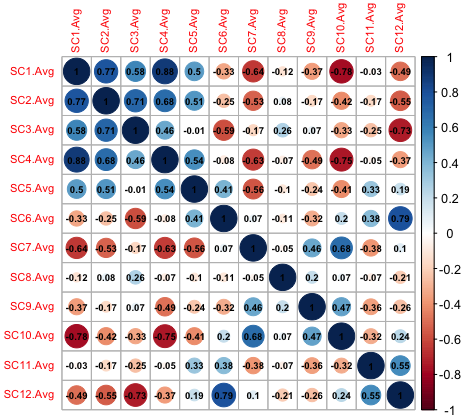
Inter-total correlations were calculated to see correlations between personality sub-categories (facets). Correlations ranged from -0.77 (between SC1 Fear of Humans and SC10 Companionability) to 0.88 (between SC1 Fear of Humans and SC4 Fear of Handling). See all inter-total correlations in Figure 3.

Figure 3

Inter-Total Correlations

Inter-rater Reliability

I also wanted to assess how similar the personality results were between the two raters, known as inter-rater reliability. Cohen’s Kappa was examined for the variation in facet scores for pigs between raters. Each facet score reflects a rater’s responses from 2-3 test items. Kappa scores varied between personality facets, ranging from -0.1320 for the “Excitability” facet to 0.2700 for the “Fear of Humans” facet. No Kappa scores were considered to be in the “moderate” (0.41-0.60), “substantial” (0.61-0.80), or “almost perfect” (0.81-1.00) agreement range, and the average inter-rater reliability between the personality facets was 0.133. Thus, raters appeared to have low agreement in their assessments. See full summary of Kappa scores in Table 4.

Table 4

Summary of Inter-Observer Reliability for Facet Scores

|  |  |  |  |
| --- | --- | --- | --- |
| Sub-Facet | Kappa | z | p-value |
| SC1 (Fear of Humans) | 0.2700 | 2.110 | 0.0349\* |
| SC2 (Nonsocial Fear) | 0.1670 | 1.440 | 0.1500 |
| SC3 (Fear of Pigs) | 0.0832 | 0.652 | 0.5150 |
| SC4 (Fear of Handling) | 0.2760 | 1.790 | 0.0736 |
| SC5 (General Aggression) | 0.2020 | 1.520 | 0.1280 |
| SC6 (Situational Aggression) | -0.0165 | -0.170 | 0.8650 |
| SC7 (Excitability) | -0.1320 | -0.939 | 0.3480 |
| SC8 (Playfulness) | 0.0446 | 0.304 | 0.7610 |
| SC9 (Active Engagement) | 0.1990 | 1.490 | 0.1370 |
| SC10 (Companionability) | 0.1300 | 1.080 | 0.2820 |
| SC11 (Aggression Towards Pigs) | 0.1010 | 0.688 | 0.4910 |
| SC12 (Dominance Over Other Pigs) | 0.2690 | 2.060 | 0.0391\* |

Primary Analyses

Hypothesis 2 stated that informant-reported data correlates with observable behaviors that the focal individual exhibits. I examined this question in a Pearson’s Correlation for various personality factors, facets and behaviors.

“Fearfulness” Score Versus “Fearful Behaviors”

The personality factor Fearfulness (predictor) was compared to the number of time an individual pig performed “anxious" behaviors (dependent variable). Unlike what was hypothesized, higher Fearfulness scores were associated with slightly lower numbers of anxious behaviors by an individual

 (c*or* = -0.1384581, *t* = -0.59314, df = 18, *p* = 0.5605). Figure 4 graphically depicts the negative association between Fearfulness score and number of times the pig performed a “fearful” behavior.

Figure 4

“Fearfulness” Score Versus “Fearful “BehaviorsImage

“Activity/Excitability” Score Versus “Activity”

The personality factor Activity/Excitability (predictor) was compared to the number of time an individual pig performed “active” behaviors (dependent variable). As hypothesized, higher Activity/Excitability scores were associated moderately higher numbers of active behaviors by an individual

 (c*or* = 0.3857312 , *t* = 1.7738, *p* = 0.09302). Figure 5 graphically depicts the negative association between Activity/Excitability score and number of times the pig performed an “active” behavior.

Figure 5

“Activity/Excitability” Score Versus “Active” BehaviorsImage

“Aggression” Score Versus “Aggressive Behaviors”

The personality factor Aggression/Dominance towards Pigs (predictor) was compared to the number of time an individual pig performed aggressive behaviors (dependent variable). Unlike what was hypothesized, higher Aggression Towards Pigs scores were associated with slightly lower numbers of aggressive behaviors by an individual

 (c*or* = -0.1326601, *t* = -0.56785, *p* = 0.5772). Figure 6 graphically depicts the negative association between Aggression/Dominance towards Pigs score and number of times the pig performed an aggressive behavior.

Figure 6

“Aggression/Dominance Towards Pigs" Score Versus “Aggressive” BehaviorsImage

Additional Analyses

Comparing Demographic Factors to Personality Scores

I also compared each pig’s average personality scores from the survey measure to various demographic factors of the pigs: sex, group, and presence/absence of traumatic background using a Pearson’s product-moment correlation.

Biological Sex Versus Personality Factor Scores

I compared biological sex to each personality factor. In order to run this test, “male” was inputted as the number 1, and “female” was inputted as the number 2. Differences were only significant for the “Aggression Towards Humans” factor, with male pigs on average scoring a 16.6 and female pigs on average scoring an 11.5.

See results in Table 5.

Table 5

Biological Sex Versus Personality Factor Score

|  |  |  |  |
| --- | --- | --- | --- |
| Personality Factor | cor | t | p-value |
| Fearfulness | -0.2600817 | -1.1428 | 0.2681 |
| Aggression Towards Humans | -0.5578186 | -2.8515 | 0.0106\* |
| Activity/Excitability | 0.3940262 | 1.8189 | 0.08561 |
| Aggression/Dominance Towards Pigs | -0.03191228 | -0.13546 | 0.8938 |

Living Group Versus Personality Factor Scores

I then compared the pig’s living group to each personality factor. In order to run this test, group “Y” was inputted as the number 1, and group “B” was inputted as the number 2. Differences were not significant for any of the personality factors. See results in Table 6.

Table 6

Living Group Versus Personality Factor Scores

|  |  |  |  |
| --- | --- | --- | --- |
| Personality Factor | cor | t | p-value |
| Fearfulness | -0.1386652 | -0.59405 | 0.5599 |
| Aggression Towards Humans | 0.0670556 | 0.28513 | 0.7788 |
| Activity/Excitability | 0.4273089 | 2.0052 | 0.06022 |
| Aggression/Dominance Towards Pigs | -0.05269143 | -0.22386 | 0.8254 |

Background Versus Personality Factor Scores

I then compared the pig’s background to each personality factor. In order to run this test, abuse/neglect backgrounds were inputted as the number 1, and other backgrounds were inputted as the number 2. Differences were only significant for the “Aggression Towards Humans” factor, with pigs from known abuse/neglect backgrounds on average scoring a 15.65 and pigs without known abuse/neglect backgrounds on average scoring a 12.45. See results in Table 7.

Table 7

Background Versus Personality Factor Scores

|  |  |  |  |
| --- | --- | --- | --- |
| Personality Factor | cor | t | p-value |
| Fearfulness | 0.2759403 | 1.218 | 0.2389 |
| Aggression Towards Humans | -0.3500038 | -1.5852 | 0.1303\* |
| Activity/Excitability | 0.05084209 | 0.21598 | 0.8314 |
| Aggression/Dominance Towards Pigs | -0.3783884 | -1.7343 | 0.09995 |

Comparing Length of Time Informant Has Known Pig to Survey Scores

Since the volunteer informants have known some pigs for longer than others, I also ran Pearson’s product-moment correlations between the average time the volunteers had known each pig for with their personality factor scores. Differences were only significant for the “Aggression/Dominance Towards Pigs” factor, with pigs that volunteers had known for longer scoring higher on the “Aggression/Dominance Towards Pigs” factor. See results in Table 8.

Table 8

Time Informants Have Known Pig for Versus Personality Factor Scores

|  |  |  |  |
| --- | --- | --- | --- |
| Personality Factor | cor | t | p-value |
| Fearfulness | -0.2299766 | -1.0026 | 0.3294 |
| Aggression Towards Humans | 0.2382787 | 1.0409 | 0.3117 |
| Activity/Excitability | -0.3782225 | -1.7334 | 0.1001 |
| Aggression/Dominance Towards Pigs | 0.6135358 | 3.2963 | 0.004014\* |

DISCUSSION

The purpose of this study was to evaluate the degree of variation of personality in pigs using informant reports, and to determine the reliability and validity of the personality measure. I also conducted additional analyses where I compared personality factors to various pig demographics. I found that while the survey results showed large variation in personality between the different pigs, with some personality traits exhibiting greater variation than others. Internal and inter-rater reliability with the survey measure were low, and there was inconsistency on whether personality factors from the survey correlated with various pig behaviors and demographics. These findings extend to a greater understanding of behavior variation, and demonstrate both the value of and problems with utilizing “personality tests”, and other forms of informant reports as psychometric measures.

Study Findings

The largest degree of variation was within the Fear of Humans facet (SD = 5.90). The smallest degree of variation was within the Playfulness facet (SD = 1.44).

Internal reliability, determined by the degree to which different test items for the same personality factor correlate, was low. The highest correlation was in the “Aggression Towards Humans” factor (cor = 0.398, α = 0.75), and the lowest correlation was in the “Fearfulness” factor (cor = 0.083, α = 0.47). This was lower than other personality tests I looked at, such as the Dog Personality Questionairre (Jones 2008), and a survey for evaluating personality in hyenas (Gosling, 1998). However, it is overall uncommon for researchers to report the internal reliability of their personality measures (Jones 2008). For example, the Great Ape Personality Inventory (Uher & Asendorpf, 2008) does not report internal reliability. Therefore it is difficult to assess how the Pig Personality Survey compares to other measures of personality in terms of internal reliability.

Inter-rater reliability for the two survey informants was low. None of the Kappa values had moderate or better agreement, and only the “Fear of Humans” and “Dominance Over Other Pigs” facets had statistically significant correlations. This is lower than most of the inter-rater reliability scores I found in the literature, including the Dog Personality Questionnaire (Jones 2008) and Great Ape Personality Inventory (Uher & Asendorpf, 2008). However, informant-reports as a whole tend to exhibit wide discrepancy in ratings (De Los Reyes, et al., 2013), so it may be the style of psychometric used, rather than the survey itself that lead to the lack of inter-rater reliability.

In order to assess the validity of the survey measure, I compared survey data to observable behaviors. I found that personality survey scores appear to have little to no correlation with the behaviors an individual exhibits. None of the correlations I ran between survey scores and observed behaviors were statistically significant. However, I was not able to find any previous studies comparing personality survey scores to behavior, so it is unknown whether or not the Pig Personality Survey correlates to behavior in similar ways to other measures of personality. Future research on personality should consider comparing personality survey scores to behavior as a way to assess validity of the measure.

Biological sex did not correlate with the majority of the personality factors in the survey This finding is consistent with the literature, which shows that personality overall does not correlate with biological sex (Harrison, et. al., 2022). However, biological sex did significantly correlated with the “Aggression Towards Humans” factor, with male pigs scoring higher than females. Similarly, male dogs are reported to have higher rates of aggression than female dogs (Mikkola, et al., 2021).

Similar to biological sex, presence or absence of abuse/neglect also only significantly correlated with the “Aggression Towards Humans” factor. Current literature suggests that in humans, early exposure to abuse and neglect correlates with exhibiting more aggressive behaviors throughout the lifespan (Ran, et al., 2022) (Bland, et al., 2018).

Living group did not significantly correlate with any of the personality factors. While geographic differences are associated with personality variation in humans (Rentfrow, 2008), the living groups of the pigs may not have been distinct enough to lead to variation in personality.

Theoretical Implications

This study brings forward many issues present with personality tests, and other versions of informant reports. While survey data did appear to show variation in personality between different pigs, and even some correlations between personality and demographic factors, the reliability and validity of the survey measure is questionable.

According the the survey measure used, pigs to appear to exhibit variation in personality. Neither the Dog Personality Questionnaire nor the Great Ape Personality Inventory report standard deviations in personality traits for their study (Jones 2008) (Uher & Asendorpf, 2008). However, a hyena personality survey reported smaller standard deviations for every trait measured (min 0.58, max 1.01) (Gosling 1998). This suggests that pigs have exhibit greater personality variation between individuals than hyenas.

However, the personality survey scores of the pigs in this study did not significantly correlate with their actual behaviors. Therefore, the way an individual perceives another’s personality may not accurately reflect the behaviors they exhibit. Thus, personality tests relying on informant reports that are not behavior-based may not be a very scientific way to categorize individuals. If these surveys do not reflect the pigs’ behaviors, what are they reflecting? Additionally, this brings a new question to the use of informant reports. The diversity in pig personality ratings between the two informants may suggest that the pigs may behave very differently based on who they are around.

Practical Implications

The personality survey results can be used by Central Texas Pig Rescue to provide them with information on the personalities of the pigs they care for. The survey measure used could also be utilized by other pig sanctuaries and by additional researchers conducting research on personality in pigs.

Additionally, the results from this study demonstrate the necessity of reporting the reliability and validity of personality tests used in research. Due to the fact that so many animal personality studies fail to report the validity and reliability of their assessment measures, it is possible that informant report-based surveys are not a good way to measure an individual’s personality. Outside of personality, informant reports are also sometimes used in clinical settings to assess individuals for mental health conditions or to conduct assessments for access to mental health-related services, and contain similarly questionable accuracy (De Los Reyes, et al., 2022). Therefore, it is vital that informant report-based measures are thoroughly researched to ensure that they provide reliable, valid information.

Limitations

This study involved a small sample size of 20 individuals. Additionally, there was limited data available about the background of the different pigs. For example, most pigs in the study were of unknown ages and breeds.

Due to the limited time frame this study was conducted on, each pig was only observed for a total of 60 minutes each. Therefore, it is possible that the behavioral observations I collected do not reflect the pigs’ typical behavior. If larger numbers of observational data had been collected, it’s possible that the correlations between personality survey scores and observed behaviors could have been higher. Also, the pigs might have behaved differently around the behavior observers than they do around their usual caregivers. Future studies could involve usual pig caretakers as observers to collect behavioral data. I was also only able to survey two informants, which many have limited the accuracy of the survey results.

The measure I used was also a limitation. Due to the absence of pig personality surveys in the literature, I adapted the Dog Personality Questionnaire (Jones, 2008) to use for pigs. While pigs are similar to dogs in many ways, it is possible that the pigs have personalities that fall across different factors and facets than dogs. Also, the fact that there were not pre-existing pig personality surveys meant that I was unable to test convergent validity of the measure used in this study. Future research could work on refining the measure used to improve reliability and validity.

Additionally the results from this study might not be generalizable to other species or even other populations of pigs. This study relied on informant reports, but studies on humans tend to instead use self-reported data. While informant-reported data tends to have greater reliability than self reports (Balsis, et al., 2015), it is still unknown whether informant reports or self reports have higher validity. The environment the pigs in the study were living in was an enriched, semi-free-ranging environment. This very different from how most pigs in the United States live, which often have low welfare (Grandin, 2018). It’s possible that living in an enriched, social environment may have allowed these pigs personalities to develop differently than a pig living in an environment that’s more typical for pigs.

Conclusion

The present study shows the variation present personality in pigs and demonstrates the many challenges with using informant reports as a proxy for understanding behavior. The study found that pigs appear to exhibit highly variable personalities that can be reflective if both biological and environmental factors. Future research should build on creating personality assessment measures that demonstrate high reliability and validity. These findings also offer important implications on the use of informant reports as a psychometric measure, and demonstrate how issues in psychological research are not only applicable to research on humans, but to other research involving species as well.

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Appendix A

Pig Sample Description

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Group** | **Sex** | **Abuse/Neglect Background** | **Background Description** |
| Atlas | Y | M | Yes | Cruelty Seizure (Bastrop) |
| Bates | Y | M | No | Born at sanctuary. Bates's mother Cora was pregnant with him when she arrived |
| Bianca | Y | F | Yes | Cruelty Seizure (Bastrop) |
| Dahlia | B | F | No | Was being raised for food but brought to sanctuary due to being sick after giving birth to Molly |
| Dora | Y | F | Yes | Cruelty Seizure (Bastrop) |
| Eleanor | Y | F | No | Owner Surrender. Bought off of Craigslist and kept as a pet before arriving to sanctuary |
| George | B | M | Yes | Cruelty Seizure (Westport) |
| Georgie | Y | F | Yes | Cruelty Seizure (Bastrop) |
| Hank | B | M | Yes | Neglect |
| Horatio | Y | M | No | Born at sanctuary. Horatio's mother Juliet was pregnant with him when she arrived |
| Imogen | Y | F | No | Born at sanctuary. Imogen's mother Juliet was pregnant with her when she arrived |
| Kitty | B | F | Yes | Cruelty Seizure (Westport) |
| Loretta | B | F | Yes | Neglect |
| Molly | B | F | No | Born at sanctuary. Molly's mother Dahlia was pregnant with her when she arrived to the sanctuary. |
| Pixie | B | F | No | Raised for Future Farmers of America program but brought to the sanctuary because the family didn’t want her to be killed for meat. |
| Raymond | B | M | No | Owner Surrender. Lived at a previous sanctuary but transferred to CTPR for being too high energy |
| Rebel | Y | M | Yes | Cruelty Seizure (Bastrop) |
| Thomas | Y | M | No | Born at sanctuary. Thomas's mother Cora was pregnant with him when she arrived |
| Wilbur | Y | M | No | Owner Surrender. Was raised as a pet. |
| Willie | B | M | Yes | Cruelty Seizure (Westport) |

Appendix B

Pig Personality Survey

|  |  |
| --- | --- |
| Name of pig: |  |
| Name of rater: |  |
| Date: |  |
| How long have you known this pig for? (closest estimate): |  |

Here are a number of personality traits and behavioral descriptions that may or may not apply to this pig. Please write a number next to each statement to indicate the extent to which you agree or disagree with that statement. You should rate the pig on their general, overall behavior.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Disagree strongly | Disagree moderately | Disagree slightly | Neither agree nor disagree | Agree slightly | Agree moderately | Agree strongly |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

1. Pig is relaxed when greeting humans
2. Pig behaves aggressively toward pigs
3. Pig is anxious
4. Pig is lethargic
5. Pig is shy
6. Pig behaves aggressively towards unfamiliar humans
7. Pig gets bored in play quickly
8. Pig is confident
9. Pig is dominant over other pigs
10. Pig avoids other pigs
11. Pig works at tasks (e.g. finding food on the ground, rooting) until entirely finished
12. Pig is boisterous
13. Pig behaves fearfully when being seen by the veterinarian/farrier
14. Pig enjoys playing with objects
15. Pig is friendly toward unfamiliar humans
16. Pig is playful with other pigs
17. Pig seeks companionship with humans
18. Pig behaves submissively (e.g. avoids eye contact, moves out of the way) when greeting other pigs
19. Pig adapts easily to new situations and environments
20. Pig is curious
21. Pig behaves aggressively in response to perceived threats from humans (e.g., being cornered, being reached at)
22. Pig is aloof
23. Pig behaves fearfully towards unfamiliar humans
24. Pig willingly shares resources (e.g. food, resting spots)
25. Pig behaves aggressively when being seen by the veterinarian/farrier
26. Pig seeks constant activity
27. Pig is friendly toward other pigs
28. Pig exhibits fearful behaviors when restrained
29. Pig aggressively guards coveted items (e.g. treats, favorite resting spot)
30. Pig is affectionate
31. Pig shows aggression when nervous or fearful
32. Pig tends to be calm
33. Pig behaves fearfully toward other pigs
34. Pig behaves fearfully when groomed (e.g. hooves trimmed)
35. Pig is assertive or pushy with other pigs

|  |  |
| --- | --- |
| **Factor**  Facet | Item number on form  (R indicates the test item is reverse-coded) |
| **Factor 1 - Fearfulness**  Facet 1 - Fear of Humans (SC1)  Facet 2 - Nonsocial Fear (SC2)  Facet 3 - Fear of Pigs (SC3)  Facet 4 - Fear of Handling (SC4) | R1, 5, 23  3, R8, R19  10, 18, 33  13, 28, 34 |
| **Factor 2 - Aggression towards Humans**  Facet 1 - General Aggression (SC5)  Facet 2 - Situational Aggression (SC6) | 6, R15, 31  21, 25, 29 |
| **Factor 3 - Activity/Excitability**  Facet 1 - Excitability (SC7)  Facet 2 - Playfulness (SC8)  Facet 3 - Active Engagement (SC9)  Facet 4 - Companionability (SC10) | 12, 26, R32  R7, 14  R4, 11, 20  17, R22, 30 |
| **Factor 4 - Aggression/Dominance towards Pigs**  Facet 1 - Aggression Towards Pigs (SC11)  Facet 2 - Dominance Over Other Pigs (SC12) | 2, R16, R27  9, R24, 35 |

Appendix C

Ethogram

(Not all of these behaviors were observed to have been performed by the pigs during the duration of this study)

|  |  |  |  |
| --- | --- | --- | --- |
| **Behavior** | **Abbreviation** | **Definition** | **Category** |
| Approach Observer | Approach.obs | Pig approaches an observer (without displaying signs of aggression such as raising hackles) | Pro-Social (Pro.social) |
| Attempt displacement | Attempt.disp | Pig gets other pig to move | Give Aggression (G.Agg) |
| Co-feed | Co-feed | Pig eats alongside other pig | Pro-Social (Pro.social) |
| Contagious yawn | Contaig.yawn | Pig yawns after another pig yawns | Pro-Social (Pro.social) |
| Follow | Follow | Pig follows another pig | Pro-Social (Pro.social) |
| Gets displaced | Get.disp | Pig gets moved by conspecific | Recieve Aggression  (R.Agg) |
| Lay down touching conspecific | Lay.touch.consp | Pig lays down while touching other pig | Pro-Social (Pro.social) |
| Nip | Nip | Pig bites at another pig | Give Aggression (G.Agg) |
| Nudge Ground | Nudge.ground | Pig uses snout to push at ground | Activity/Exploration (Activity) |
| Pick up object | Pick.up.obj | Pig picks up object in environment with mouth | Activity/Exploration (Activity) |
| Raise hackles | Raise.hackl | Hair on pig’s back stand up | Anxious |
| Rest in proximity | Rest.proxim | Pig lays with other pig | Pro-Social (Pro.social) |
| Rub Face | Rub.face | Pig rubs face against object such as a branch | Grooming |
| Sniff conspecific | Sniff.consp | Pig sniff another pig | Pro-Social (Pro.social) |
| Sniff object | Sniff.obj | Pig sniffs object in environment (not another pig) | Activity/Exploration  (Activity) |
| Snout touch | Snout.tch | Pig touches other pig with their snout | Pro-Social (Pro.social) |
| Squeal | Squeal | Pig makes squealing noise | Anxious |
| Tail between legs | Tail.btwn.legs | Pig moves tail so it hangs between their legs | Anxious |
| Travel | Travel | Pig moves from one location to another | Activity/Exploration  (Activity) |
| Wag tail | Wag.tail | Pig’s tail moves from side-to-side | Activity/Exploration  (Activity) |
| Yawn | Yawn | Pig yawns NOT in response to another pig yawning | Anxious |

Appendix D

Pig Personality Scores