

THINKING PIGS:

COGNITION, EMOTION, AND PERSONALITY

An Exploration of the Cognitive Complexity of *Sus Domesticus*, The Domestic Pig

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THE SOMEONE
PROJECT



farm
sanctuary

Gonzalez strolls through the chamomile fields.

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Western popular culture has provided us with a variety of pig personalities. From the diva Miss Piggy to the smart and ambitious Babe to the deeply emotional Wilbur of *Charlotte's Web*, we have been taught to imagine that pigs have inner lives as diverse and rich as our own. Conversely, we have been conditioned to believe that farmed pigs are dirty, gluttonous creatures undeserving of compassion. References to road hogs, going whole hog or hog wild, and pigging out pepper our everyday language.

In the Chinese zodiac, the pig is also characterized both positively and negatively, symbolizing not only stupidity, clumsiness, greediness, and ugliness but also wealth and delicious food.¹ Likely as a result of the ancient history of pig domestication under the Shang dynasty, the Chinese character for home and family (家) is a pig (豕) under a rooftop.² Human lives have been intertwined with the complex lives of pigs for millennia.



Ami cools off with a dip in the pond.

But just who are pigs, *Sus domesticus*, who have lived closely with humans since the species was domesticated 9000 years ago? Today, the animal is found in our medical products and clothing and in our idioms and literature. What's more, humans consume over a billion pigs each year as food. But few of us have had more than a passing glimpse of an actual pig—perhaps at a country fair or a hog farm along the highway. In fact, most pigs today are locked away in factory farm warehouses in remote rural areas, far from view.

Talk with anyone who runs a sanctuary for farmed animals, and you're sure to hear tales of escape artists, charmers, rabble-rousers, and fiercely devoted mothers—tales of pigs as animals with keen intelligence and big personalities. In much of the world, however, the vast majority of these intelligent, feeling individuals spend their entire lives confined in the barren environment of industrial agricultural complexes.

Many people will tell you that pigs are smart, but what does that mean? What do we really know about the intelligence of pigs? Recent scientific studies of pigs not only lend support to our popular depictions and assumptions about pigs, but also demonstrate that pigs possess cognitive capabilities similar to dogs and young children, show a form of self-recognition, form likes and dislikes, enjoy creative play, and experience emotions not unlike our own.

Here we summarize the current scientific research on cognition, emotions, self-awareness, personality and social complexity in pigs based on Marino & Colvin (2015)³ and updated again in 2020. We seek to understand how pigs are like us and deserving of compassion, but also explore how pigs are intriguingly different from us and celebrate their diversity.



Von D shares a loving touch with her caregiver.

I. A Pig's World

A number of recent studies have investigated how pigs perceive and think about their physical environment. These studies examined problem solving, object discrimination, spatial cognition, learning and memory in the physical world, and time perception.



Charlie loves exploring the pasture with her friends.

II. Object Discrimination

The ability to discriminate objects—say, distinguishing a circle from a square or a blue circle from a red circle—is the foundation for more complex mental tasks, such as categorizing objects or understanding abstract concepts. Human and nonhuman animals use object discrimination with various levels of sophistication for everything from simple tasks, such as selecting an orange over a grapefruit or choosing the right tool for a job, to survival, such as recognizing a predator or distinguishing a venomous snake from a harmless one.

The ability to categorize objects, for example, might be demonstrated by having an animal put all items of the same color together regardless of the items' shapes. Understanding that there are more blue circles than red circles in a group of objects, or that there are no circles present at all, is an example of abstract thinking. Dogs can tell the difference between color photos of dogs and photos of landscapes. Rodents and primates are also skilled at discriminating objects. Pigs, too, are experts at distinguishing between objects.



Junip Sydney lovingly gazes at her caregivers.

Pigs have sophisticated abilities to distinguish objects in a range of situations that require robust memory. In one study, pigs were presented with objects familiar to them (such as a cereal box and plastic grocery bag) and novel objects (dish cloths and colored wooden spoons). After they were shown an object repeatedly over the course of two days, the pigs remembered that object for five days or more and showed a preference for novel, unfamiliar objects, clearly demonstrating that they have long-term memories.⁴ Later research corroborated this finding, but found that female and older piglets were better able to remember the novel objects for longer periods of time when compared to male and younger piglets.

Pigs not only remember but they also prioritize “important” memories. In food-searching tasks in which they could choose just one of two known food sources, the pigs remembered and preferred the site with more food. They used memories of food odors and color cues to navigate, using spatial features for reference, to a site that previously contained food.⁵ Pigs can also discriminate between food rewards of varying preference levels, and show some impulse control by waiting for the food they like the most, rather than just taking what’s immediately available. Pigs know what they like, and they will choose a smaller quantity of a preferred food (like apples) over a larger quantity of a less preferred food (penne pasta).⁶

Symbolic language

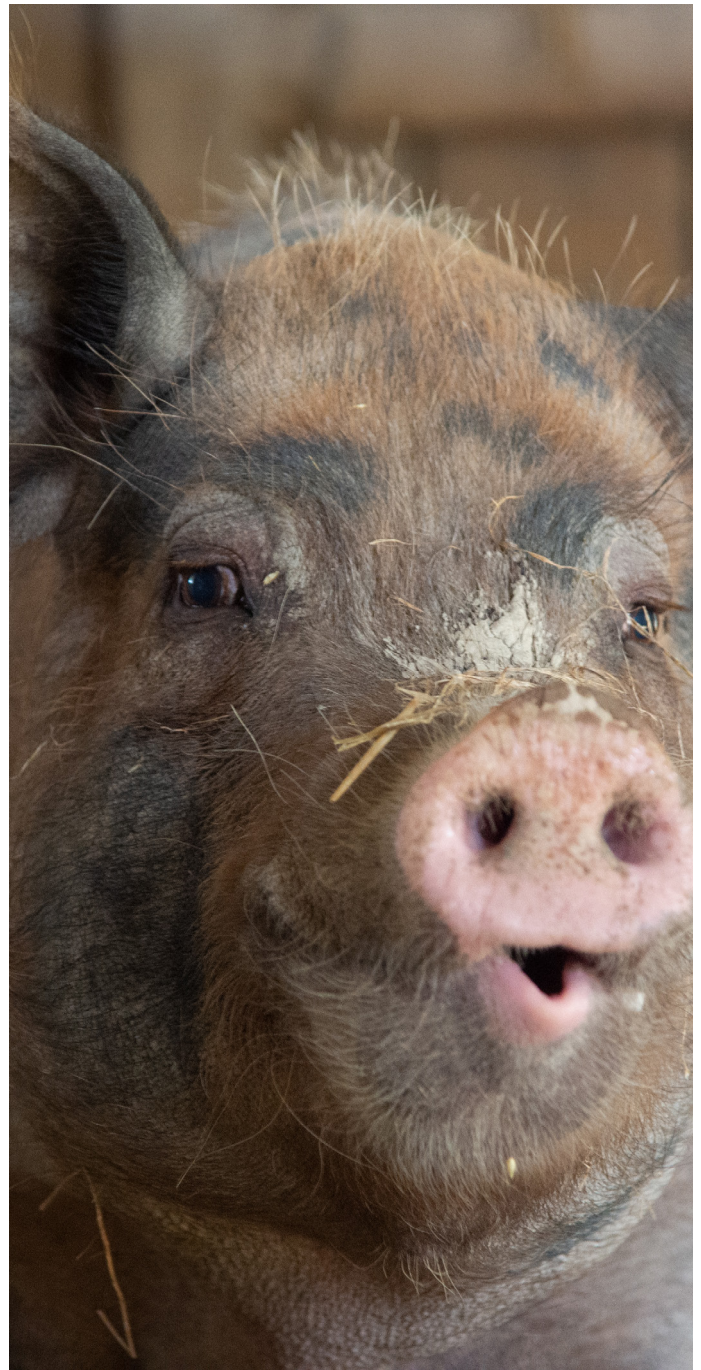
Like dolphins, chimpanzees, and other great apes, pigs possess symbolic language comprehension. In one particularly intriguing study, two pigs showed they understood gestures and verbal symbols that represent objects such as a frisbee, ball, and dumbbell, as well as actions such as sit, fetch, and jump. Not only were they able to distinguish among three items presented to them, but they also learned complex combinations of symbols for actions and objects, as in “fetch the frisbee,” and they performed the actions asked of them. Also, like dolphins and chimpanzees, pigs can make complex three-object choices: for example, they learned to fetch the ball on request when the ball and dumbbell were present. They can even complete three-object, one-action combination tasks as well, such as jumping over one of three available objects on request.⁷

III. Time Perception

Some animals demonstrate that they have a sense of time. For example, chimpanzees and other great apes can select tools (rope, rod, or a metal strip) as much as a day in advance to prepare for future events. Moreover, they remember specific details (what, where, and when) of events after hours, weeks, and even years have passed. This capacity is called episodic memory. These abilities to detect the passage of time, remember specific events in one's life, and anticipate the future allow for very sophisticated cognitive capacities, such as possessing a sense of self through time and planning for the future.

Pigs, too, have a sense of time. In one study, pigs could choose between two crates, each of which they had learned to associate with different lengths of confinement: 30 minutes versus 4 hours. The pigs showed a clear preference for being in the crates with the shorter confinement time, showing they could use their prior experiences to anticipate and make decisions about future situations.⁸

In another study—a good example of the difficulties researchers can face when designing species-appropriate experiments—six pigs



Bitsy joyfully burrows through her straw bedding.



Junip Sydney settles in for a nap.

were required to press a lever with their hooves for a specific number of seconds to obtain a food reward. When their hooves repeatedly slipped off the lever, many of the pigs persisted by trying to use their snouts instead, showing that they understood the overall goal of the task and its time requirements and demonstrating impressive functional flexibility.⁹

Pigs appear to anticipate whether positive or negative experiences might be imminent. In one study, different tones indicated whether the pigs would be able to enter a room that contained a bowl of popcorn (a positive outcome) or be required to cross a ramp over a visual simulation of a cliff (a negative outcome). The pigs indicated fear by vocalizing at high

frequency when they heard the tone for the ramp, suggesting that they were responding emotionally to an impending negative event.¹⁰

Can pigs track the passage of time in a way that allows them to know how much time has elapsed? One study suggests that they can. Pigs who were trained to expect a standard reward every second day and a high reward every fifth day were consistently more likely to choose the compartment with the standard reward on the second day and the compartment with the high reward on the fifth day.¹¹ These same pigs were unable to learn to estimate time in four, five, or six minutes. Given that they seemed able to estimate the number of days that had passed, this suggests that they may actually be counting the circadian cycles.

IV. Spatial Learning and Memory

A number of species use their sophisticated spatial abilities to forage, cache food, and navigate their environments. These behaviors involve learning, remembering, and applying information about the layout of their environments and location of objects. Dogs, for example, use mental maps to search for objects, formulating shortcuts based on their knowledge of previously used paths.¹²

Pigs, too, as foraging animals, are whizzes with mazes and tests that require locating desired objects. The holeboard procedure is one particularly effective method for studying spatial learning and memory in pigs and other animals. The holeboard is an open area in a large room with many holes, or wells, that can be baited with food. Pigs, then, can be observed as they forage with their snouts in the wells as they would by rooting in the ground in a natural setting.

Pigs, it turns out, are highly capable of locating food quickly and accurately in holeboard tests, and they remember the location, content, and relative value of food they've discovered. Following 10-minute and 2-hour waiting periods, pigs, like dogs, successfully returned to areas where food had been found earlier and avoided areas that did not contain food.¹³ Importantly, pigs raised in more complex, environments enriched with straw and toys were better able to remember where food is located, and to do so more quickly, than pigs raised in barren environments.¹⁴

In another foraging-type experiment, pigs chose to visit food sites that they knew contained larger amounts of food, indicating that they remember and discriminate among sites based on their value. Interestingly, this experiment also suggests that pigs may possess some level of “numerosity,” a basic sense of quantity.⁵

Finally, research suggests that pigs are able to use both direct and indirect visual cues to inform their foraging strategy. When confronted with two buckets, one of which is hiding food, pigs are able to remember the location of the food after both buckets are lifted for one second. But they can go one step further. When pigs were only allowed to see which bucket was NOT hiding food, they were able to use that indirect information to correctly infer that the other bucket did hide food.¹⁵



Ami (left) and Bruce enjoy noshing on fresh apples when they're in season!

V. Novelty Seeking, Inquisitiveness, and Play

Play, as we know, is critical to the healthy development of social mammals, and it's a marker of cognitive complexity. Primates, dolphins, dogs, and other cognitively complex mammals play.

If you've interacted with unconfined pigs, you know that pigs take their play seriously, so to speak! Pigs are inventive in their play, both with objects and with other pigs,¹⁶ carrying or shaking objects such as balls or sticks, or tossing straw.¹⁷⁻¹⁹ They push, chase, and engage in mock fighting with each other, similar to play in dogs and other mammals.²⁰ They scamper, jump, paw, pivot, run for fun, flop on the ground, and wave their heads in play.¹⁶ Pigs can be either initiators of play (those who are more solitary and play with objects more than with each other), joiners (those who were more social and likely to begin play because other pigs are playing), or a mixture of the two. Despite the differences in their individual play patterns, research suggests that pigs may use a democratic group decision making mechanism when deciding how to play as a group, taking account of everyone's opinion.²¹

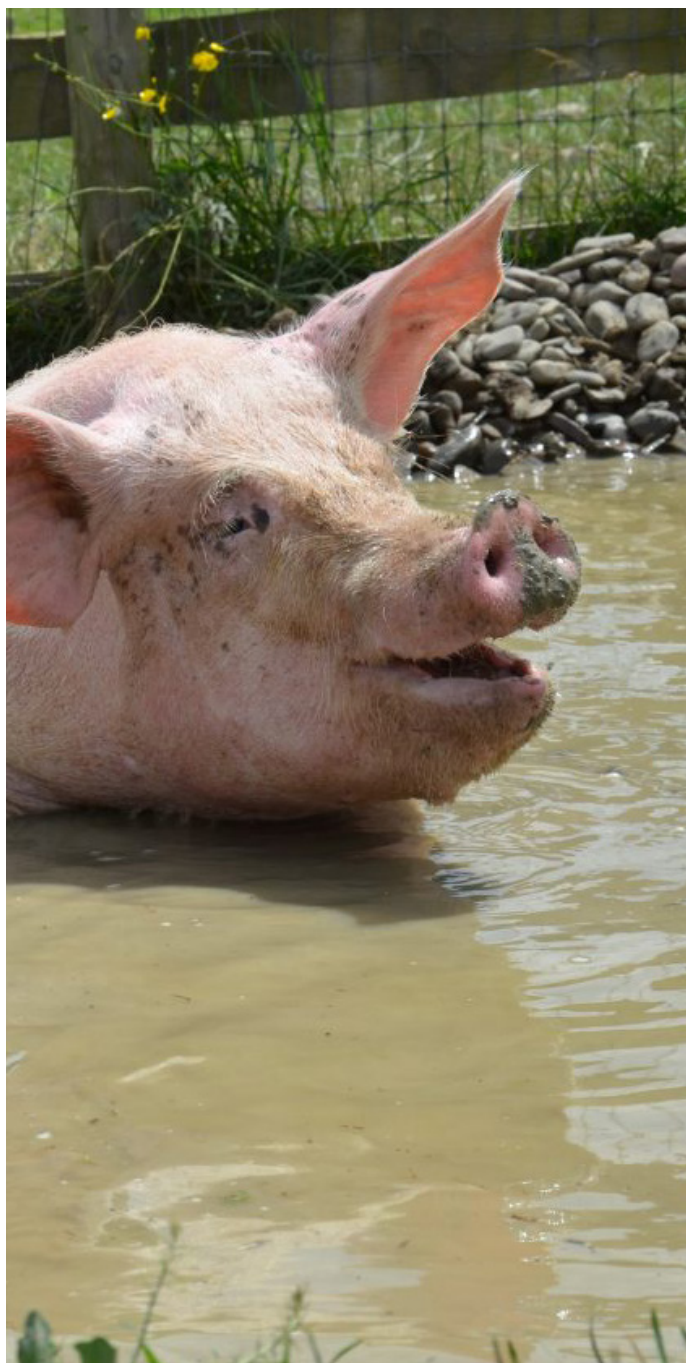
Play is so important in the development of animals that the lack of opportunity to play can lead to behavioral abnormalities.²²⁻²⁴ Young pigs reared in enriched environments where they can interact with objects and other pigs are more socially and cognitively developed than pigs raised in the crates used in production facilities.²⁰ Pigs in factory farms who have been handled gently, rather than not handled at all, are also more likely to play.²⁵ Finally, pigs at play exhibit increased tail movement, which other studies have linked to positive emotions.²⁶⁻²⁸ As we'd expect, play is fun!



Junip Sydney snuggles in her cozy bedding.

Pigs are active and intelligent participants in their worlds in much the same way as other cognitively complex animals are. These studies reveal that pigs possess a sophisticated understanding of their physical surroundings, navigate efficiently, remember and anticipate experiences, and enjoy their world through play.

VI. The Social Pig



Julia savors a summer's day soak in the mud.

If you've spent time with pigs, you know that you want to stay on their good side. Pigs are notorious for rushing to greet and "talk" to their porcine and human friends, but ignoring, nipping, or pushing those they are not so fond of.

Primates, dolphins, whales, and other animals who live in socially complex groups have high-level cognitive capacities. According to current research, pigs are as socially complex as many other cognitively complex species, as evidenced by their social structure, keen ability to discriminate among individuals (both pigs and humans), and apparent awareness of the mindset of others—all markers of high cognitive social functioning.

VII. Discriminating Other Animals and Humans

The ability to tell individuals apart is the basis of all social relationships and is, of course, important in differentiating strangers from familiar individuals and family from non-kin. Dogs can distinguish between the barks of other dogs. Elephants are well known for their remarkable ability to recognize and remember individuals of their kind even over long distances and periods of time.

Like other socially complex animals, pigs prefer familiar individuals over strangers..²⁹⁻³¹ Pigs as young as six weeks can distinguish between two female pigs using sensory and social cues, and they can even differentiate between closely related individuals.²⁹⁻³¹



Julia teaches her piglets to wallow. Photo credit: Jo-Anne McArthur/We Animals

Young pigs can identify familiar and unfamiliar individuals based on urinary samples alone with their keen olfactory sense.³² Pigs also use auditory cues. When sows listened to recordings of piglet vocalizations, they responded more strongly to calls of their own piglets than to those of unfamiliar piglets.³³

Differentiating among individual members of another species may require even more sophisticated cognitive capabilities. Dogs can tell the difference between a smiling human face and a neutral expression, perhaps not surprising given their long history of domestication. Pigs can also distinguish familiar and unfamiliar human faces.^{34–35} Young pigs who were handled gently and fed treats for five weeks were then allowed to choose between the gentle handler and a stranger. They chose the familiar handler using olfactory, visual, and auditory clues.^{34–35} A later study supported this finding by demonstrating that piglets learn to avoid or approach individual humans depending on their past experiences with them.^{36–37} Piglets are able to remember an aversive handler for weeks after having a negative experience.³⁸ Poignantly, in commercial settings in which they are often handled roughly, pigs do not bother to discriminate between handlers, which may be their way of adapting to being treated the same by everyone.³⁹

In another study, when pigs were shown different people wearing the same clothes, they were able to tell humans apart based on their body size and facial characteristics, showing that they were not responding to superficial features such as clothing but were sensitive to features more consistent with personal identity.³⁴ Recent research confirms that pigs are able to use visual cues; they can discriminate between 2D images of the fronts and backs of human heads, with some pigs using facial features to discriminate individuals.⁴⁰

As do offspring in other social species, piglets learn from the older generation. Recent research suggests that piglets learn from their mothers and even their aunts. In one study, piglets who watched their mother or aunt push a bar to open a door to access food learned to do the same, and remembered this for at least one day.⁴¹

VIII. Perspective Taking

Perspective-taking is a very complex mental capacity involving putting oneself in the mental “place” of another individual and recognizing that their thoughts, intentions, emotions, and motivations may differ from one’s own. Pigs can take the perspective of other pigs, and they even use this information to manipulate each other.

In their foraging activities, pigs can be wily and competitive, clearly showing that they understand the intentions of other pigs. In one study pigs foraged for food in pairs. Only one pig was shown the location of the food. The uninformed pig followed the pig-in-the-know

to the food source and then took the food first. In response to this behavior, the informed pigs altered their behavior in later trials to reduce the chances that they would be followed and increased their foraging speed to stay ahead of their exploiters.⁴²

These types of strategies and counterstrategies are a complex form of perspective-taking called tactical deception, a capacity also observed in great apes and ravens. As Dr. Michael Mendl of Bristol University stated, “Our results suggest that pigs can develop quite sophisticated social competitive behavior, similar to that seen in some primate species.”³²



Ellen chomps down on a juicy watermelon.

Pigs also sense the “attention state of humans,” another indication of their perspective-taking abilities. In one study, young pigs were required to choose between two humans using only head cues to determine who was paying attention to them. The pigs easily selected the attentive humans. And, pigs pass the “pointing test,” meaning that they can locate a food reward using the cue of a human pointing to it.^{43–45} The pointing test, made famous by dogs outperforming chimpanzees and other great apes, evaluates an animal’s ability to respond correctly to the visual cue of a human pointing to an object. While this test is not strictly perspective-taking, it does indicate that the animal has some sense of the intentions of another.

Like dogs, pigs may look to humans for help when food is available and will initiate communication by facing and even nudging the human. But compared to dogs, when a task seems difficult, pigs are much more persistent and motivated to solve the task themselves.^{46–47}

Pigs are able to learn from humans using a combination of both auditory (human voice direction) and visual (pointing) cues. When looking to a human for help in finding a hidden food reward, those who paid more attention to the human giving directions had a better chance of finding the food reward.⁴⁸

The body of findings on pigs’ perspective-taking, sensitivity to attention state, and social preferences shows that they belong in a group of very sophisticated animals, such as great apes, ravens, and dolphins, all of whom possess a keen and nuanced understanding of their role in their social group.

IX. "I" Am Pig!

Self-awareness is the ability of animals to have a sense of themselves physically as well as awareness of their own thoughts and feelings, in other words, a sense of "I." Because humans and animals do not share a language, self-awareness is especially difficult, but not impossible, to study. Researchers traditionally use the mirror self-recognition (MSR) test—determining if an animal recognizes himself in a mirror—as a tool in understanding self-awareness. The test itself doesn't work for all species, and results can be less than conclusive, but animals do react in markedly different ways to mirrors.

In the mirror test, an animal is introduced to a mirror, often for the first time. Some animals react to the mirror as though it is another individual of their own species, sometimes even attacking the mirror. Others, however, start to use the mirror to investigate parts of their own body. When that happens, a mark is surreptitiously applied to a part of the animal's body that he or she cannot see without a mirror. The animal is reintroduced to a mirror and observed to see whether he uses the mirror to investigate the new mark on his body or whether he treats the image in the mirror as representative of another individual. Humans by age two and great apes demonstrate mirror

self-recognition in this way. European magpies show MSR by pecking at the mark on their body with their beaks, elephants by investigating the mark with their trunks, and dolphins by maneuvering in front of the mirror to expose the newly marked part of their bodies.



Von D loves spending her days relaxing in the pond.

The mirror test requires that an animal show curiosity

Or interest in a mark on her body in order for her experience in front of a mirror to be easily interpreted. But some animals show a different type of understanding of the relationship between their own body and the reflected image, whereby they utilize the mirror as a tool to solve a problem. In one study, seven out of eight pigs who already had experience with mirrors were able to quickly locate food visible only by viewing the mirror.⁴⁹ This study seemingly demonstrates that the pigs do understand something about their own body as it is reflected in the mirror in relation to the hidden food. A later study did not fully corroborate these results, as only three of 11 mirror experienced pigs used the mirror to find the hidden food bowl on their first try.⁵⁰ However, in a later control task designed to remove the ability of the pigs to use olfaction, seven of 11 pigs found the hidden food bowl. Perhaps these pigs just needed more time to learn? Future research should attempt to clear up any confusion, as pigs have also been observed making repetitive movements while appearing to watch themselves in a mirror for the first time.⁴⁹ This behavior, called contingency checking, is seen in some animals who eventually pass the mark test. Contingency checking, therefore, may indicate mirror self-recognition, but the evidence is not conclusive.

Another component of self-awareness is self-agency, the ability to know that one's actions cause change. One way to study self-agency is to see if an animal can use a joystick that controls a cursor on a computer screen. Pigs, like chimpanzees, understand that a joystick they control moves an on-screen cursor. In one study, pigs outperformed dogs in manipulating a joystick to move a cursor to hit an on-screen target. Despite the physical challenges the pigs faced when manipulating a joystick, all the pigs in the study successfully hit their targets.⁵¹

“Pigs could be as smart as chimpanzees and other nonhuman primates,”

explained Stanley Curtis, former professor of animal sciences at Pennsylvania State University. Curtis noted that the pigs learned to play games every bit as quickly as chimpanzees. In fact, “Hamlet and Omelette [the pigs in the study]



George takes a playful romp through the snow.

exhibited more interest in the task at hand than their primate cousin” Animal cognition researcher Dr. Sarah Boysen noted that “pigs are capable of focusing their attention with even more intensity than a chimp.”

The intriguing abilities pigs show with mirrors and video games call for further investigation in creative, noninvasive ways. The payoff may be a deepened understanding of what it is like to be a pig, from the pig's perspective.

X. The Feeling Pig

Emotions are complex processes that involve an expressive component, a physiological component, and the subjective component felt by the animal. They are influenced by one's situation and even by the mood of others, and they affect a variety of abilities such as attention, decision-making, and memory. Studies of emotion in pigs reveal that they are sensitive and complex animals who feel a wide range of emotions expressed through behavior,⁵² vocalizations,^{53–56} facial expressions,⁵⁷ ear and tail movement,^{27–28–58} and possibly even chemically, through scent.⁵⁹ Pigs experience emotion physiologically through increased heart rate,⁶⁰ altered hormone levels,⁶¹ and changes in body temperature.⁶²

Pigs grunt a lot, and the acoustic features of those grunts vary with the emotional valence (positive vs. negative) that the pig is experiencing. Research has found that pigs experiencing positive emotions have shorter grunts with a lower frequency and less noise than pigs experiencing negative emotions.^{53–54} Piglets produced low frequency, shorter grunts when they anticipated the arrival of a conspecific, with higher frequency, longer grunts being produced when they anticipated the arrival of a human. Interestingly, the longer they had to wait for the arrival of a conspecific, grunt



Lola munches on a scrumptious grassy treat.

duration increased.⁶³ Another research group corroborated the finding that positively valenced grunts are shorter, but did not find differences in any of the other acoustic parameters.⁵⁵ However, the authors noted that the study design was very different from that employed in previous studies. Piglets express emotional distress by screaming when they are physically separated from their mothers but in visual contact, and grunting when they are completely isolated.²⁵ Finally, one study found that the way a pig responds vocally to a certain situation is consistent across time and related to their emotional reactivity or coping style, a measure of personality.⁵⁶

Like dogs, pigs are able to move their tails and ears, and research suggests the way they do so is influenced by the way they are feeling.⁶⁴ Pigs who are playing, and likely feeling positive emotions, wag their tails whereas pigs who experience negative emotions move their ears more.^{65–66} When pigs who live in barren environments are given straw, their ear movements decrease, indicating a reduction in negative emotions, but tail movements do not increase, indicating that straw does not increase positive emotions.⁶⁷ Finally, the most recent studies of pigs' tail and ear postures finds that in enriched environments, tails were most often curled up and ears directed forwards.⁵⁸ A review of the literature on tail position finds that there are four distinct tail positions associated with four quadrants of emotion: positive versus negative valence and

high versus low arousal. In general, a curled tail is associated with positive emotions of high arousal (e.g., excitement) and a relaxed hanging but loosely wagging tail is associated with positive emotions of low arousal (e.g., calm). Pigs who are experiencing negative emotions of low arousal (e.g., sadness) are likely to keep their tail tucked and motionless whereas those who are experiencing negative emotions of high arousal (e.g., fear or anger) will suddenly tuck their tail.⁶⁴



Wilbur relaxes in his warm straw bed.

The expressive component of emotion allows pigs to exhibit emotional contagion, a capacity thought to be the basis for empathy, or the ability to feel the emotional state of another.



Andy is all smiles for visits with friends!

Emotional contagion is the arousal of emotion in one individual when witnessing the same emotion in another individual. In one study, naïve pigs joined pen mates who had been trained to anticipate chocolate raisins and straw (a positive outcome) or social isolation (a negative outcome). The naïve pigs adopted the same emotional behaviors (ear and tail postures, increased stress hormone release) as the trained pigs, showing that pigs not only connect with the emotions of other pigs but also respond to pigs who are anticipating future events.⁶⁸

In a similar study of emotional contagion in pigs, researchers housed pigs in groups of six and trained two pigs from each group to anticipate food (a positive outcome) or social isolation (a negative outcome). Two pigs from each group learned to associate the music of Bach with food, and two others learned to associate social isolation with a military march. The music was played to two other pigs ("naïve" pigs), but without any positive or negative association. When the music was played in a group setting, a few of the trained pigs showed either "happy" behaviors (play behavior, wagging their tails) or stress behaviors (standing alert, laying their ears back, urinating, and defecating), depending on the music they heard. The researchers observed that when a naïve pig was near a trained pig who acted stressed, the naïve pig also became more alert and also laid her ears back. Interestingly, the "contagion" stress response happened to a much



George eagerly approaches a friend for attention.

greater degree when naïve pigs were paired with "happy" pigs as opposed to stressed pigs. Importantly, when music was played to the naïve pigs when they were apart from their group, it had no effect on their behavior at all.⁵⁹

Another study provided more evidence that pigs may be able to feel what their group mates feel. Piglets were placed in pairs, with one piglet being restrained while the other watched. The observer piglet exhibited signs of increased attention toward their conspecific and fear. The observer piglet looked at and stayed close to their conspecific, touched them with their snout, and exhibited reduced locomotion and increased freezing. During the second phase of the study, the observer piglet became the restrained, and as the new observer had already experienced restraint, their fear and attention to their restrained conspecific were even more pronounced, demonstrating perhaps that they understood the fear.⁶⁹



Joan Jett appreciates a tender touch while resting. Photo credit: Jo-Anne McArthur/We Animals

The emotions that pigs experience during positive or negative situations extend beyond the duration of the experience. “Test” pigs were exposed for four minutes to a positive (access to peat and straw with chocolate covered raisins hidden in it) or negative treatment (social isolation with restraint and loud, unpredictable noises) in a separate test room. After the first treatment, the pigs were returned to their social group of pigs who were naive to the treatments. Negative “test” pigs lay down more, walked less, and explored less during the five minutes after the treatment. Naive pigs in the group exhibited the same behaviors as the “test” pigs! After a positive treatment, naive pigs showed more nosing behavior, nose-nose, and nose-body contact with the “test” pig and played more! The “test” pigs seemed to stay in the negative or positive emotional state after the experience ended, and their pen mates exhibited signs of emotional contagion, despite having no exposure to the positive or negative treatment.⁷⁰

A study on the emotional reactivity of piglets to positive and negative experiences with humans demonstrates that the effects are long-lasting, with piglets who were roughly handled exhibiting fear for at least five weeks after the experience and those who were gently handled and given food approaching humans for at least five weeks after the experience.³⁷

Scientists seeking to understand emotions in animals sometimes present the animals with a judgment bias task that measures optimism or pessimism.⁷¹ Animals are trained to associate one stimuli (e.g., a certain tone) with a large reward (e.g., four treats) and to associate a distinct stimuli (e.g., a different tone) with a smaller reward or a negative experience (e.g., a single treat or a sudden noise). The animals learn that if they choose wrong, they get no treat at all. After they learn the rules, the animals are then presented with an unambiguous stimuli (e.g., a novel tone in between those associated

with the larger and smaller reward) and are asked to choose between the locations. Animals who consistently choose the location with the larger reward are thought to have an optimistic bias, while those who consistently choose the location associated with the smaller reward are thought to have a pessimistic bias. These biases are thought to be associated with mood, with animals who are optimistic being thought of as experiencing a positive emotion state. As happens to humans, pigs' moods are affected by their environment and their interactions with humans. Pigs who lived in a more enrichment environment showed an optimistic bias when presented with unambiguous stimuli,⁷²⁻⁷³ as did pigs who experienced gentle handling.⁷⁴ Housing environment can also impact risky behavior. When given the choice between smaller, more frequent rewards or larger, less frequent rewards, pigs housed in barren environments are less likely to gamble. They play it safe by choosing the smaller, more frequent rewards.⁷⁵ Judgment bias in pigs is unrelated to sex⁷⁶ or individual cognitive capacity, but is influenced by personality.⁷³

Pigs are playful creatures, and it is likely that playing with objects and some forms of social play are indicators of happy emotions. Studies show that pigs play more when they are anticipating positive events.

Emotions may be challenging to study and interpret, but the emotional experiences of pigs are clearly evident in their play, fear and stress responses, and their sensitivity to the emotions of their companions.

XI. Personality and the Pig

Personality is a set of enduring and consistent emotional, cognitive, and behavioral traits of an individual, and personality is displayed in a range of nonhuman species. Personality is something individuals possess, and when animals manifest personality characteristics, they demonstrate that each of them is an individual, not just a generic member of a species. To assess personality in pigs, researchers examined their behavior in response to various situations. In one study, researchers found that when pigs were put in a competitive group-feeding setting, individual levels of aggression emerged as a stable personality feature of female pigs.⁷⁷ In another illustrative example, researchers examined how piglets respond to different situations (being held down for several seconds, social isolation, contact with an unfamiliar piglet, and the introduction of novel objects), and they measured various behaviors, including vocalization, aggression, and their willingness to approach others. The study found that piglets display individuality along at least three personality dimensions: aggression, sociability, and exploration.⁷⁸ Such aspects of personality correlate closely to the human characteristics of agreeableness, extraversion, and openness.⁷⁹ Some of these personality traits, namely aggression and exploration, have also been identified in adult, female pigs.⁸⁰

The proactive-reactive personality axis, also referred to as the boldness-shyness axis, has been used to describe repeatable behavioral differences in a growing number of species, from sharks⁸¹ and waxbills⁸² to humans⁸³ and now pigs.^{73,84–88} An individual pig's propensity to be either proactive (fast explorers, bold, and aggressive) or reactive (shy, slow to explore, less aggressive) is linked to their propensity to be either optimistic or pessimistic,⁸⁴ with proactive pigs being more optimistic. Reactive pigs' optimism is influenced by their environments, with pigs in enriched environments being more optimistic and pigs in barren environments being more pessimistic. A pregnant pig's level of optimism or pessimism changes through the course of her pregnancy, with pig's becoming more pessimistic as gestation progresses. Proactive pigs experienced a larger change in mood.⁸⁹

The physiological response of proactive vs. reactive pigs to stress also differs, with proactive pigs having higher noradrenaline and glucocorticoids whereas reactive pigs have elevated oxytocin.⁸⁵

These studies reveal that individual pigs each have behavioral traits that reflect complex personalities, just like those seen in other animals, including humans. The study of personality in pigs is critical to our understanding of "who" they are.



Russell relaxes in nature.

XII. How are pigs unique?

A scent recognition.⁹⁰ They have a secondary olfaction system, called the vomeronasal organ. Abundance of scientific research demonstrates that pigs are similar in many ways to humans. They have personalities and emotions. They can understand time and play creatively. But they are also intriguingly different. Their sense of smell is far more acute and discerning than our own. After pigs nuzzle plastic playing cards and deposited their snout scent, they are able to pick those same cards out of a deck, simply through, that allows them to utilize pheromones in communication, especially when trying to attract one another for mating.⁹¹ Pigs use nine separate glands to deposit scent that communicates important information to their herd mates. They have glands on their feet, forelimbs, genital area, chin, mouth, and eyes.⁹² But despite all of these glands, pigs are missing the glands that allow them to sweat! Being so attuned to utilizing the scent of hormones in communication, wild truffles evolved alongside pigs, synthesizing a chemical copy of 5-alpha-androstol, the testosterone normally secreted by a boar's salivary glands during the mating season. This amazing instance of co-evolution means that a sow is able to sense the hormone coming up through the soil, triggering her to dig in search of a mate, only to find a delicious delicacy, releasing its spores into the air while enjoying a snack.⁹²



Russell strolls through a lush, grassy pasture.

XIII. Who is the domestic pig?

And so, who is the domestic pig? The scientific research on pigs to date tells us that they



1. Have excellent long-term memories



2. Understand symbolic language



3. Have a sense of time, remember specific episodes in their past, and anticipate future events



4. Are excellent at navigating mazes and other spatial tasks



5. Play creatively



6. Live in complex social communities and easily distinguish other individuals, both pigs and humans



7. Have an understanding of the perspective of others as shown in their ability to use tactical deception



8. Are emotional and exhibit emotional contagion



9. show a form of self-recognition and self-agency in their abilities to manipulate joysticks and use mirrors to find food



10. have distinct personalities

Research on cognition, emotion, and personality in pigs and other farm animals is still in its infancy in comparison with studies of other cognitively complex animals. Each new study seems to reveal just how much we still need to learn. These charismatic and intelligent animals have shared our lives since ancient times. Through respectful noninvasive study, we may come to realize that pigs are not very different from the dogs and cats we share our homes with. They may even be not very different from ourselves.

"We have shown that pigs share a number of cognitive capacities with other highly intelligent species such as dogs, chimpanzees, elephants, dolphins, and even humans. There is good scientific evidence to suggest we need to rethink our overall relationship to them."

~ Dr. Lori Marino



Best friends Emmett and Wyatt spend much of their time side by side.

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Lola uses her snout to explore the fallen snow.

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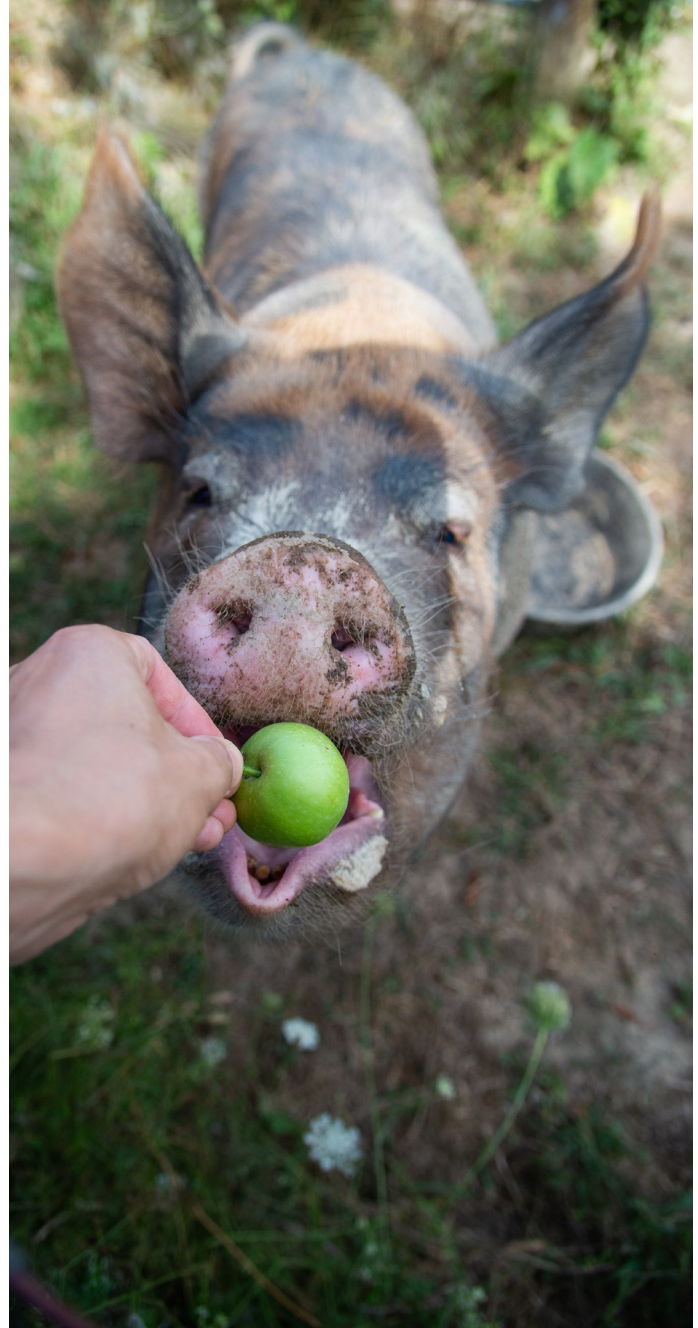
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Bitsy eagerly accepts a fresh-picked apple from the farm.

The Someone Project is a joint undertaking by the Kimmela Center for Animal Advocacy and Farm Sanctuary to compile, review, and publish scientific evidence for cognitive and emotional complexity in farm animals and to support promising research in these areas.

Farm Sanctuary advocates observational and cooperatively designed studies with pigs in a sanctuary setting to build upon existing research and to elevate awareness and respect for the magnificent beings they are.

Visit farmsanctuary.org/education to learn more.

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