From Clever Hans to Bunny the TikTok Dog: An Exploration into Animal-to-Human Communication

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Abstract

Clever Hans was a German horse who, around the turn of the twentieth century, would perform in shows where he would answer math problems by tapping his hoof. While he wasn't 100% accurate, he caught the attention of spectators and scientists alike. Upon investigation and testing, it was revealed that while Hans was not clever enough to do math, he was clever enough to pick up on unintentional cues from his questioner. More contemporary examples of animal-to-human communication, specifically seen in Koko the Gorilla, Alex the Parrot, and Bunny the Dog, also catch the attention of spectators and scientists, though it is unclear whether the animals truly know what they are saying. Through an examination of these animals' relationships with their handlers, it is evident that regardless of the animal's language capabilities, communication with an animal still plays a valuable role in the animal-to-human bond and that it is worth studying for its potential to revolutionize veterinary care.

Keywords: Animal Cognition, Human-Animal Communication, Clever Hans, Animal Training, Linguistics

Introduction

Bunny the Dog is one of video-sharing site TikTok's biggest stars. Not only is the Sheepadoodle adorable, but she can communicate using a soundboard — an Augmentative Alternative Communication (AAC) device created by FluentPet (King5 Evening, 2020, 3:02). Inspired by speech-language pathologist Christina Hunger, Bunny's owner, Alexis Devine, teaches Bunny words and communicates with her using the buttons on her AAC device that are organized into hexagon-shaped groups for subjects, verbs, objects, and places, for example (Mashable, 2020, 6:24). Still, one of Bunny's biggest skeptics is her owner — she is not certain that she has taught Bunny language (King5Evening, 2020, 1:43). Though not a scientist herself, Devine understands that there is little data to support the idea that dogs and other animals understand what they or their owners are saying, and she has informed her audience of theories of language acquisition as well as a phenomenon called the Clever Hans Effect (Devine, 2020, "Catch 22").

The Clever Hans Effect is named after a German horse who appeared to add, subtract, multiply, and solve a variety of other math problems, and he expressed his answer by tapping his hoof. Oskar Pfungst, a German biologist and psychologist, was skeptical of this crowd-drawing horse's abilities, so he investigated Hans and discovered that Hans would tap his hoof enough times if the person asking the question knew the answer and was physically near him. Otherwise, Hans was incredibly inaccurate (de Waal, 2016, 46). This is because Hans could pick up on subtle, unintentional body language cues such as a release in tension when he tapped his hoof enough times (de Waal, 2016, 46-47). While it certainly took some intelligence on Hans's

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part to recognize and derive meaning from the questioner's body language, Hans was not intelligent enough to do math (Schmidjell, 2012).

Decades later in the 1970s, animal psychologist Dr. Francine "Penny" Patterson began teaching modified American Sign Language (ASL) to Koko the Western Lowland Gorilla, and she had a working vocabulary of about 450 words (National Geographic, 2018, 7:34). At the same time, animal psychologist Dr. Irene Pepperberg began teaching English to Alex the African Grey Parrot, and he could answer questions about an object's color, shape, size, number, and material (National Science Foundation, 2011, 2:31).

Due to the close social relationship between the aforementioned animals and their handlers, it is difficult to eliminate the Clever Hans Effect in animal-to-human communication studies. The Clever Hans Effect reveals the importance of a social relationship in communication while making it difficult to measure communication ability concretely. Through an analysis of Koko the Gorilla, Alex the Parrot, and Bunny the Dog, the Clever Hans Effect's influence on the integrity of each case study and the ability of the animals to understand what they and their handlers are saying will be examined.

Koko the Gorilla

Koko the Western Lowland Gorilla was born in 1971 in the San Francisco Zoo. At the age of six months, she was separated from her mother and group of gorillas and raised by a human family who exposed her to spoken English. Then she was exposed to ASL when she was one year old (Patterson, 1990, p. 98). Days after beginning her ASL instruction, Koko signed "food" for the first time when she was offered fruit (Patterson, 1990, p. 102). Seeing the potential in Koko to learn more, her care team decided to expose her to at least one signing human for five

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hours each day for the next eleven months. After the first two years of teaching Koko ASL, she received eight and a half hours of ASL instruction daily (Patterson, 1990, p. 98). Spoken English words also accompanied the signs her handlers used during all of Koko's ASL instruction so that she was able to associate the English word with a concept. During her lessons, the techniques of molding, shaping Koko's hands to form the correct sign, and imitation, Koko watching her instructor sign and replicating it, were used as well (Patterson, 1990, p. 99).

To ensure that Koko knew a sign, researchers created a set of criteria. If two separate observers recorded that Koko used a sign "spontaneously and appropriately" at least fifteen days per month, it was officially part of Koko's vocabulary (Patterson, 1990, p. 99). A daily record of everything Koko said was kept, and notes described whether Koko's signs were "prompted, molded, or imitated" or if she used a sign correctly or incorrectly (Patterson, 1990, p. 100). Sixteen months into Koko's ASL instruction, Koko was videotaped and her words transcribed (Patterson, 1990, p. 101).

In a 1981 film by National Geographic, Koko displays her ASL abilities. Patterson, Koko's primary handler, asks Koko questions using reading readiness tests for human children (National Geographic, 2018, 3:54). When asked what is wrong with a picture, Koko identifies a square tire and a lady walking a tiger (National Geographic, 2018, 4:19). In response to critics' claim that Koko is "not creating true language, that it is merely mimicry or responses evoked by inadvertent cues" (which echoes the ideas of the Clever Hans Effect), Patterson responds by saying that since Koko signs to herself frequently and signs to a gorilla companion named Michael, she is doing more than mimicking her handlers (National Geographic, 2018, 4:43).

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Still, mimicry is a part of operant conditioning (OC), a technique that pairs a behavior with an outcome in an effort to increase or decrease the frequency of a behavior. In Koko's case, pairing the sign for water with receiving a drink of water will cause her to sign "water" regularly when she is thirsty. An article by Christopher B. Sturdy and Elena Nicoladis argues that research done on human infants and toddlers shows that while OC does not account for *every* aspect of language acquisition, it plays an important role (Sturdy, 2017, p. 1). While children will create their own phrases, they vary little from what they have heard before, and they "selectively imitate knowledgeable and trustworthy models" such as parents (Sturdy, 2017, p. 4). Koko behaves similarly.

Despite Koko's abilities to sign and answer questions, Koko's intelligence may be overexaggerated. Patterson has to interpret much of what Koko signs, and Patterson's social relationship with Koko may cause her to project a deeper meaning onto what Koko is literally signing. On April 27, 1998, Koko participated in an America Online (AOL) Live internet chat with Patterson interpreting for her. The moderator of the chat would ask questions that people submitted, and Koko would respond. Eventually, they got to the topic of a Maui preserve that would provide a gorilla sanctuary for Koko and her gorilla friends (Poulton, 2019). Patterson explained what the sanctuary would entail, and Koko signed "Obnoxious…fake" and "Frown red bad bad…red good give-me." Patterson's interpretation was that Koko was upset because she did not have a gorilla sanctuary (Poulton, 2019). The time Patterson spent with Koko may give her the ability to fill in gaps in Koko's communication, but because Patterson explained in sentences what Koko expressed in a few words, it is possible that, while Koko is still intelligent

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for learning hundreds of signs, Patterson's biases and expectations lead people to perceive Koko as more intelligent than she actually is.

Alex the Parrot

Alex the African Grey Parrot was hatched in 1976 and purchased at the age of one from a Chicago pet store. Dr. Irene Pepperberg began to teach Alex over 100 English words to "describe objects, shapes, colors, and materials" and to do simple math. He also understood the concepts of "none," "same/different," and "bigger/smaller" ("Home," Alex Foundation).

Pepperberg created a technique in the 1970s called the model/rival (M/R) system to teach Alex English. She used what she knew about "vocal learning in parrots (actually, not very much at the time), language acquisition in children, and psychological constructs of social learning in humans." She also applied methods "developed by Todt (1975) and Bandura (1971)," a zoologist and a psychologist whose theories emphasized social learning. Pepperberg knew that, like people, parrots rely on socializing to learn words (Pepperberg, 2019).

First, Pepperberg had Alex observe people speaking about items, asking questions about the items' color, shape, and material, for example. When the other human — the model for Alex as well as his rival for the attention of the trainer — answered the question correctly, they would receive praise and the object itself as a positive reward, and when the other human answered the question incorrectly, they would be scolded and lose the object from sight (Pepperberg, 2019).

This is indicative of OC — the human would receive praise and the object as positive reinforcement (adding a reward in an attempt to increase behavior) if they answered the question correctly, and the human would receive a scolding as positive punishment (adding

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aggressive language to decrease behavior) as well as the removal of the object as negative

punishment (subtracting the object from the situation to decrease behavior)

(Khanacademymedicine, 2013, 6:58). Eventually, Alex was included in these interactions, and

he was rewarded for correct answers and punished for incorrect answers in the same way as

the human model (Pepperberg, 2019).

Additionally, Pepperberg describes that "we *interchange* the roles of trainer and model,

and include the parrot in interactions." This taught Alex that he could "respond to, interact

with, and learn from any human" (Pepperberg, 2019). She states that control systems are in

place such as "different people training versus people testing" (National Science Foundation,

2011, 1:53). This counteracted a problem that the Clever Hans Effect addresses: the social

relationship as well as inadvertent cues between the handler and the animal can influence an

animal's response to a question. The trainers and testers were different people, reducing the

likelihood of Alex relying on body language cues for answers during testing. By teaching Alex

that he can learn from anyone, Pepperberg knowingly reduced the impact of the Clever Hans

Effect on examinations of Alex's intelligence.

Still, Pepperberg's work is not without its criticisms, specifically from psychology

professor Dr. Herbert Terrace. In the 1970s, he performed studies on a chimpanzee named Nim

Chimpsky in which he taught him hand signs. Interestingly, Terrace rejected his own study

because while Nim appeared to sign complete sentences, he was actually imitating his

instructor. Nim mainly asked for food and rarely discussed other concepts, which makes sense

because Terrace relied heavily on OC (de Waal, 2016, p. 99). Once again, OC does not account

for every aspect of language acquisition, and Terrace's work is a prime example (Sturdy, 2017,

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p. 1). Too much positive reinforcement can skew the validity of human-to-animal communication, reducing the signs or utterances into mere requests for rewards — especially if the positive reinforcement for signing "food" and an unrelated word such as "today" are both food (de Waal, 2016, p. 99). Pepperberg deliberately controlled for this in her work with Alex, using "only *intrinsic reinforcers*" instead of extrinsic rewards such as food to avoid "confusing the label of the targeted item or concept being trained with that of the food reward" (Pepperberg, 2019).

Upon learning about Pepperberg's study, Terrace described that while "Alex is a smart bird," he is thinking "minimally," and that Alex's words are a "rote response" and "not language." Nevertheless, Pepperberg never claimed that Alex's vocalizations were an example of language, which is an important clarification when describing human-to-animal exchanges (Smith, 1999). Primatologist and ethologist Frans de Waal describes that language transcends the "here and now" (de Waal, 2016, p. 107). It is more "symbolized" and "flexible" than the communication that occurs between animals who wish to express intentions to each other or manage group behaviors (de Waal, 2016, p. 106).

Instead, Pepperberg labelled Alex's vocalizations as an example of two-way communication, which a Penn State College of Communications article describes as a process in which, "the receiver not only hears the message, but also listens to it, interprets it and responds to the sender" (WPSU — Penn State Public Media). Alex did just this: he and his handlers were able to convey information to each other and respond appropriately, so this two-way communication label that Pepperberg used is a more accurate description of the exchanges she and Alex had. Nevertheless, her work with Alex, whether unintentional

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deception or genuine communication, is still respectable because Alex surpassed the scientific

community's low expectations at the time for "a nonmammal, nonprimate, with a brain the size

of a walnut" (Smith, 1999). Pepperberg and Alex demonstrated that resemblance to the

mammalian cortex that humans possess is not a requirement for intelligent communication —

advanced cognition comes in a variety of shapes and sizes (de Waal, 2016, p. 98).

Bunny the Dog

Bunny the Sheepadoodle — a cross between an Old English Sheepdog and a Poodle —

was born in July 2019 and at the age of eight weeks was adopted by Alexis Devine (FluentPet,

2020, 4:51). Inspired by speech-language pathologist Christina Hunger's Instagram

(@hunger4words) in which she posts videos of her dog Stella communicating with a board of

buttons, Devine immediately began teaching Bunny words one at a time, with the first word

being "outside" for house-training purposes (FluentPet, 2020, 0:11). Just a few weeks into

teaching, Bunny used the word "outside" for the first time on her own (Mashable, 2020, 1:28).

Devine describes:

> Anytime she wanted to go outside or I was planning on letting her outside, I would say
>
> the word 'outside,' I would press the 'outside' button, and then I would let her outside.
>
> And then when she came back in, I would say, 'All done outside,' and press the 'outside'
>
> button again (King5Evening, 2020, 1:04).

Using modeling techniques, repetition, and positive reinforcement, Bunny learned to associate

pressing her 'outside' button with the experience of going outside (King5Evening, 2020, 1:15).

As of August 31, 2020, Bunny's soundboard had over fifty words (FluentPet, 2020, 0:11).

To organize all of Bunny's buttons, Devine uses hexagon shaped tiles created by FluentPet and

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arranges them according to the Fitzgerald Key, a system in which words are grouped onto tiles

based on their part of speech (FluentPet, 2020, 3:32). This soundboard is an AAC device, a

"communication device used to help nonverbal people communicate" (Mashable, 2020, 1:01).

Similar to nonverbal people with AAC devices, Bunny uses her buttons to communicate

her needs and desires — she lets Devine know when she wants to go for a walk, to go outside,

to play, and to be pet (King5Evening, 2020, 1:32). To track Bunny's progress, Devine started a

TikTok account (@what_about_bunny), and her Instagram goes by the same username. In

addition to expressing needs, Bunny can also ask and answer questions. For instance, she

pressed the "?" button — a "hmm" sound with a rising intonation — replied with "yes" when

Devine asked her if she had a question, pressed "bear, Dad," and played with her bear toy with

her dad when Devine led her to him (Devine, "The cuteness *crying face emoji*," 2020).

Most usefully, Bunny can tell Devine when she is in pain. In one TikTok, Bunny pressed

"Help, ouch" and presented her paw to Devine when asked "Where ouch?" Devine found a

foxtail awn in Bunny's paw — if Bunny did not alert her, surgery might have been necessary to

remove the barbed needle (Devine, "Ouch," 2020). This explicit, specific expression of pain

demonstrates that the board of buttons shows promise in advancing veterinary care.

Still, Bunny communicates more with "Mom" than "Dad," and, due to the coronavirus

pandemic, she has had few opportunities to use her sound board with other people. The social

relationship Bunny has with Devine could mean that she derives more meaning from Bunny's

babbling than what she is actually trying to say. Devine could give Bunny inadvertent cues that

could influence what buttons she presses. However, due to Bunny's lack of socialization, it

would be difficult to remove Devine from an experiment to see how Bunny would perform in a controlled laboratory — she could be too scared to communicate with a stranger.

The bias that comes from a social relationship with Bunny is most apparent in the following interaction. Bunny lives in Washington, and in early September 2020 the sky was cloudy and the sun was concealed due to smoke from wildfires. On September 19, 2020, Devine posted an IGTV video to Bunny's Instagram in which Bunny looked out the window and then pressed, "Is…went." Devine asked, "What is went?" and then Bunny looked out the window and pressed, "Ouch." Since that was the first time they saw the sun in a week and a half, Devine — who admitted that it was completely possible that she was projecting — interpreted Bunny's words as Bunny being happy that the smoke that hurt their eyes and lungs was gone (Devine, "*shocked face with exploding head emoji,*" 2020). Due to Bunny's limited vocabulary, Devine cannot conclusively say that this is what Bunny intended, but due to their social relationship, this was the most logical initial conclusion for Devine to make.

Currently, cognitive scientist and professor Federico Rossano at the University of California San Diego is conducting a study based on Bunny and her buttons. The study is not solely about Bunny — it is an open study, so dog-owners who are trying to teach their dogs how to communicate can contribute. Rossano is interested in discovering the impact of breed, age, sex, and human involvement on canine language learning (Needles, 2020). In Bunny's case, three cameras face her soundboard at all times to record every time she communicates (King5Evening, 2020, 2:00). Bunny's exploration of past, present, and future makes this all the more interesting, especially with de Waal's description of language — something that transmits "information that transcends the here and now" — in mind (de Waal, 2016, p. 107). Since there

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is such little research on canine communication with AAC devices and non-human

understanding of time, the results of this study could be helpful for defining language and

making more accurate and data-based conclusions about animals' linguistic capabilities.

Conclusion

As of October 2020, Bunny's vocabulary had expanded beyond expressing basic needs

and extended into asking "Why?," so there is a trend on TikTok where people tag their videos

with #bunnythedog and jokingly pretend that they are Bunny having an existential crisis or

discussing a topic like class struggle (Smith, 2020). It is *highly* unlikely that Bunny will ever be

able to discuss such complex topics — there are some limits to the amount of buttons Bunny

can have and what animals like Bunny can communicate.

Still, since the days of Clever Hans, the study of animal intelligence and communication

has captivated both scientists and general audiences, and there are numerous occurrences

where handlers have developed a method of communication with their animals. Patterson

taught Koko the Gorilla to sign by molding Koko's hands and exemplifying ASL for Koko to

imitate; Pepperberg taught Alex the Parrot to speak words using her model/rival technique;

and Devine taught Bunny the Dog to use a soundboard using modeling, repetition, and positive

reinforcement.

In each of these examples, the animals have a close relationship with their handlers,

making it difficult to conclude whether the animals truly understand what they and their

handlers are saying or whether the animals are picking up on their handlers' body language

cues. A social relationship is necessary for communication, but that same social relationship can

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make the data and conclusions less reliable due to biases and projecting meaning onto the animal's words.

   With more research involving numerous animals such as the study occurring at the University of California San Diego, scientists will be able to draw more accurate conclusions about animal communication and cognition for the species as a whole rather than specific individuals, aiding in understanding the evolutionary origins of language, reevaluating the definition of language, and improving veterinary care so that animals can communicate to caretakers when they are sick and express their needs and desires. Regardless of the results, finding ways to communicate with an animal — whether that be through ASL, spoken language, buttons, or simply being more in tune with how the animal naturally prefers to communicate — can deepen the bond between human and animal and make the connection more fulfilling. Though this intelligent communication and cognition might not always be verbal, animals are speaking in their own way, and humans must be willing to listen.

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