

Interspecies Semiotics and the Specter of Taboo: The Perception and Interpretation of Dogs and Rabies in Bali, Indonesia

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ABSTRACT The anthropological fields of ethnobiology and ethnoscience, in their analysis of indigenous environmental knowledge, have largely focused on forms of conceptual knowledge such as biological terms and taxonomic categories. However, their examination of subjects' environmental knowledge does not explicitly address how subjects relate to their environment through varied cognitive and phenomenal mechanisms. By including other types of knowledge, such as perceptual acuity and interpretive range, differences in indigenous knowledge and the processes that shape such knowledge may be better understood. In this article, I report the results of experiments comparing the abilities of Hindus and Muslims in Bali to discern the differences in dog vocalizations and to diagnose the presence of rabies in dogs. The results highlight the importance of a negative symbolic association, the Muslim taboo on interaction with dogs, which constrains both perceptions of dogs and interpretations of the animal's behavior. Evidence for significant variation in a subject's perceptions of dog vocalizations provides greater context to prior studies that found a common ability to understand the vocalizations of dogs. Such differences, combined with the restriction of a subject's interpretative range and depth in analyzing the presence of rabies, illustrate how symbolic systems can induce a form of what psychologists refer to as "perceptual narrowing." [*taboo, knowledge formation, environmental anthropology, perception, human-animal interactions*]

RESUMEN Los campos antropológicos de la etnobiología y la etnociencia, en sus análisis del conocimiento ambiental indígena, por largo tiempo se han concentrado en formas conceptuales del conocimiento tales como términos biológicos y categorías taxonómicas. Sin embargo, su análisis del conocimiento ambiental de los sujetos no aborda explícitamente cómo los sujetos se relacionan con su ambiente a través de mecanismos cognitivos variados y fenoménicos. Al incluir otros tipos de conocimiento, tales como agudeza perceptual y ámbito interpretativo, las diferencias en el conocimiento indígena, y los procesos que estructuran tal conocimiento pueden ser mejor entendidos. En este artículo, presento los resultados de los experimentos que comparan las habilidades de Hindúes y Musulmanes en Bali para discernir las diferencias en las vocalizaciones de los animales y diagnosticar la presencia de hidrofobia en perros. Los resultados resaltan la importancia de una asociación simbólica negativa, el tabú musulmán en la interacción con perros, el cual constriñe tanto las percepciones sobre los perros como la interpretación de la conducta de los animales. Evidencia de la variación significativa en las percepciones de un sujeto sobre las vocalizaciones de los perros provee un mayor contexto a los estudios previos que encontraron una habilidad

común para entender las vocalizaciones de los perros. Tales diferencias, combinadas con la restricción del ámbito interpretativo de un sujeto y la profundidad en el análisis de la presencia de hidrofobia, ilustran cómo los sistemas simbólicos pueden inducir una forma de lo que los psicólogos denominan “estrechamiento perceptual.” [tabú, formación del conocimiento, antropología ambiental, percepción, interacciones humano-ambientales]

In their book, *The Native Mind and the Cultural Construction of Nature*, Scott Atran and Douglas Medin (2008) observe that conceptual knowledge, in particular biological terms and taxonomic categories, consists of cognitive representations and models of the environment. However, their analysis of subjects’ environmental knowledge does not explicitly address the question of whether individuals may relate to their environment using multiple or varied cognitive mechanisms. Focusing on one form of knowledge, such as taxonomy, is common to anthropological studies of indigenous knowledge, which concentrate on knowledge content but seldom address the processes by which individuals perceive stimuli from the surrounding environment, or what phenomenologists like Jakob von Uexküll (1957) termed the *umwelt*. Yet over the last 40 years, psychological studies of perception have shown that the same environmental stimuli can be perceived differently, reflecting variance in both perceptual skills and interpretive techniques (Berry 1966; Ji et al. 2000; Kitayama et al. 2003; Miyamoto et al. 2006; Nisbett 2003; Pontius 1997). The perceptual skills of certain communities, which have long mesmerized anthropologists (Lee 1979; Lévi-Strauss 1973; Turnbull 1961), can be based both on subjects’ ability to discern, for example, different species of beetle in an apparently homogeneous group or to recognize subtle interactions between environmental entities. But such skills are not merely realizations from a shared background knowledge of phylogenetic relationships. They also require active perceptual skills acquired through experience (Gibson 1979; Ingold 2000; Munroe and Munroe 1971), which may be sensitive to the effects of praxis and certain types of symbolic systems.

Both findings from cognitive science and ethnographic observations raise questions regarding perceptual knowledge of environments: Do significant differences exist in how people perceive environmental features? If so, what can account for these differences? Here, I report the results of experiments comparing the abilities of Hindus and Muslims in Bali to discern the differences in dog vocalizations and to diagnose the presence of rabies in dogs during an outbreak of the disease. The results highlight the importance of a negative symbolic association, the Muslim taboo on interaction with dogs, which constrains both perceptions of dogs and interpretations of the animal’s behavior. Evidence for significant variation in a subject’s perceptions of dog vocalizations contradicts prior studies that found a universal ability to understand the vocalizations of dogs.

Bali provides a particular opportunity to test the effects of taboo on perception because dogs are a common

environmental entity that Muslims and Hindus experience in their daily lives in villages and urban areas. Although Muslim inhabitants are subjected to semiferal dogs and dog vocalizations, they have a strong taboo associated with dogs, while Hindus do not. Such symbolic variation, combined with recent discoveries (Molnár et al. 2010; Pongrácz et al. 2005) about what are believed to be innate abilities of people to understand the meaning of dog barks, allows for an examination of perceptual and interpretive knowledge. Because dogs are only partially a domestic and companion species for Hindu Balinese, the role of interactive experience in shaping perceptual knowledge can also be examined.

In this article, I show that experimental studies among both Hindu and Muslim communities in Bali demonstrate how cultural influences, such as taboo and interactive experience with dogs, affect an individual’s ability to interpret dog behavior and perceptual acuity with respect to their barks. A comparative analysis of the semiotic relationships between dogs and people in Bali demonstrates that taboo can alter a specific group’s interpretive range and perceptual abilities of a common environmental entity.

HUMAN-DOG SEMIOTIC INTERACTION

Over the last ten years, several studies have shown that the social affinity between people and domesticated dogs encourages a shared interest in and perceptual acuity for each other’s emotional realities. Studies conducted by ethologists have found that dogs use specialized perceptual techniques to observe human faces (Guo et al. 2009) and relate to human physiological states (Mascheroni et al. 2008). The range of this interspecies communication and the perceptual skills upon which it exists have been attributed to the early domestication of the dog, its evolved state as a highly social animal, and its status as a companion species that shares, to some degree, the social world of humans (Hare et al. 2010). Though a clearer picture of this interspecies semiotic interaction has emerged from such work, these studies are limited by their sole focus on dogs and people in Western societies. Such studies have rarely examined culture’s role in shaping people’s interaction and understanding the vocalizations of dogs.

Hungarian researchers have recently shown that interspecific communication between dogs and humans is a two-way street (Pongrácz et al. 2005). This groundbreaking study examined not only the meaning behind certain vocalizations of dogs but also the ability of humans to understand that meaning. The vocalizations of several Hungarian herding dogs were recorded during specific scenarios such as

playing with its owner, about to bite someone, witnessing the approach of a stranger, going on a walk, wanting a ball, and being left alone in a yard. The variation in scenarios produced consistently different vocalizations in the sound frequency and the inter-bark intervals. These vocalizations were played for the dogs' owners, owners of other dog breeds, and individuals who did not own a dog. The researchers demonstrated that individuals consistently found meaning and emotionality in the different types of dog barks that corresponded to levels of aggression and passivity. Additionally, individuals could discern the differences between the settings in which recordings were made based on the types of barks. Perhaps as intriguing, they found little or no difference in the accuracy of individuals choosing the setting, or meaning, of the dogs' barks between general dog owners, owners of the specific dogs whose barks were recorded, and non-dog owners. The lack of importance of prior exposure to the specific dogs used in the study or dogs in general diverges from some existing studies of the accuracy of placing domestic cat vocalizations in which participant's accuracy was positively correlated with exposure to cats (Nicastro and Owren 2003). Péter Pongrácz and colleagues (2005:143) theorize that one possible reason for the similar accuracy across participants, regardless of exposure to dogs, may be "because acoustic features affect homologous inborn human abilities." In support of this possible explanation, they reference Eugene Morton's (1977) work in ethology in which he theorized that a "structural convergence of many animals' sounds" may create a uniform system of signaling aggressive and docile behavior across mammalian and avian species.

The evidence that dogs are able to enter a social and emotional relationship with humans, and vice versa, raises the question of whether the nature of these interactions differ depending on cultural and social contexts. Human attitudes toward dogs and perceptions of them are remarkably varied (Friedmann and Son 2009; Kohn 2007), but studies of the perceptual and semiotic overlap between humans and dogs have mostly taken place in Western societies. In the following sections, I describe the relationship between people and dogs in Bali and report the findings from two experimental studies comparing Muslim and Hindu communities' abilities to perceive and interpret canine characteristics and vocalizations.

HUMAN-DOG CONTEXT IN BALI AMONG HINDUS AND METHODOLOGICAL OVERVIEW

The relationship between dogs and Hindus in Bali does not clearly fit the biological or ethological concepts of domesticated, wild, or feral. The first impressions many visitors have of dogs in Bali are their ubiquity, poor health, aggressiveness, and continual search for food on the side of the road and trash bins. In his early ethnography of Bali, Miguel Covarrubias (1999[1937]:57) expressed a sentiment shared by many visitors that "dogs were undoubtedly provided by the gods to keep Bali from perfection." The health status of

these dogs indicates an absence of the management of dogs at several biological levels. However, it does not necessarily mean that they are wild, feral, or without a home. Some dogs are homeless, but most are "owned" by Balinese Hindu households, where they sleep at night and for whom they provide warning of intruders.

The connections between dogs and Hindu households are formed early—from the time that dogs are puppies. A household typically adopts a puppy from someone with a recent litter in the village. Unlike adult dogs, puppies are consistently petted, spoken to, and fed table scraps (mostly rice) by the household. But as it ages, the puppy is handled less, and after it learns to walk effectively, but before it can run, it is usually tethered to a clothesline or post in the yard for parts of the day to keep it from being a nuisance during chores. Several changes in socialization patterns begin when an adolescent dog is able to run and shows interest in leaving the walls that enclose the household compound. The household now considers the dog responsible for its own provisioning, and it is no longer petted or tenderly spoken to as one would a child but, instead, is routinely chided.

For Balinese dogs, the absence of material provisioning and social interaction with people coincides with their entrance into relationships with other dogs on the street. Such interactions are cooperative, reproductive, and antagonistic. Unlike dog owners in the West, Balinese rarely interfere with these interactions that take place on the streets; they only become involved on the rare occasion that a neighborhood dog enters the compound. Balinese consider the involvement of people in the biological and social lives of adult dogs perverse.

For Balinese people, Westerners living in Bali provide an example of alternative relationships between dogs and people. Living with dogs indoors, speaking to them, feeding them, and walking them on leashes is viewed as depriving dogs of their own lives and crossing species boundaries. Balinese consider the spaying and neutering of dogs as inhumanely denying them fulfilling lives. Many Balinese commented that such desexing of dogs would be immoral in the context of human beings. In both their lack of provisioning and the importance given to intercanine social and biological interactions, Balinese relate to dogs as independent subjects in their own society and not subordinates in a dependent relationship with human beings. This perspective creates rural and urban environments full of dogs scavenging through neighborhoods for food in which antagonistic interactions are common for both other dogs and people along streets.

I conducted the fieldwork discussed in this article in Bali in 2010 and 2011. Individuals on urban and suburban streets in Muslim, Hindu, and commercial neighborhoods near the cities of Denpasar, Tabanan, and Ubud were given tests to examine their ability to perceive the differences between types of dog vocalizations and the presence of rabies from photographs of dogs. The test of auditory perception was adapted from an existing study conducted in Hungary (Pongrácz et al. 2005), while the test of interpretative

ability for the presence of rabies was created specifically for Bali. Although drawn from the same areas, individuals only participated in one of the experiments. The tests were conducted by the author as well as by research assistants from Bali who spoke, in addition to Indonesian, both Balinese and Javanese, which are the common first languages of Hindus and Muslims, respectively. All participants were adults over the age of 18 and had lived in Bali at least five years, although most were born in Bali. The test of perceptual abilities for dog vocalizations involved 61 Muslims and 80 Hindus. The experiment involving identifying markers of rabies in dogs comprised 21 Muslims and 32 Hindus.

INTERSPECIES SEMIOTICS, EXPERIENCE, AND TABOO

The first study investigated variation in subject's accuracy at interpreting dog barks. Within Balinese Hindu and Muslim communities, I conducted an experiment on auditory perception inspired by the study conducted by Pongrácz and colleagues (2005). The original Hungarian experiment used six different dog barks from which participants chose the settings in which the barks were made.¹ The complexity of this original design required a laboratory setting and considerable time for the participants to take the test. Such a design could not be undertaken in Bali for several reasons. Balinese have little experience with surveys or participating in cognitive science experiments, and the intricacy of the instructions was deemed overwhelming for potential participants. More importantly, the privacy required for laboratory conditions is, in most cases, uncomfortable and anxiety inducing for Indonesians for cultural and historical reasons. Additionally, to participate subjects would have to travel considerable distances to a laboratory site. Because of these reasons, the study was shortened to a forced-choice test in two conditions. The audio recordings were taken from Pongrácz and colleagues' (2005) original study. The majority of the dogs in Bali were a combination of native and mixed non-native breeds. The vocalizations used by Pongrácz and colleagues were from a European breed, but the findings in Bali suggest the vocalization patterns were commensurable with dog barks in Bali. Consultations with Balinese veterinarians, ethologists, and animal husbandry experts working on the rabies epidemic also confirmed that the vocalization patterns were quite similar if not exactly the same. Additionally, catching feral dogs and manipulating them into scenarios to record vocalizations, including several aggressive forms of behavior, was considered unethical during a rabies outbreak.

In this experiment, two sets of two different dog barks were played for participants. The barks and experiment's design were chosen to test two forms of social and semiotic interactions: one antagonistic and outside of a human–canine social relationship and the other affective and found within a social interaction between dogs and people. The first set contained a dog barking at a stranger approaching and a dog barking before it was about to bite. The second set included a dog barking while playing with a person and a dog barking

after being left alone by its owner. Nearly all inhabitants of Bali experience stranger and bite vocalizations because of the near ubiquity of feral dogs. However, it is unclear how often dog owners hear lonely and play vocalizations because adult dogs are not left at home but, instead, typically leave the household compound in the morning before their owners do. Each of the audio recordings lasted 20 seconds and was played just once for participants.

Participants consisted of 61 Muslims living in Bali and 80 Hindu Balinese from the cities and surrounding urban neighborhoods of Denpasar, Tabanan, and Ubud. These cities were chosen because of the presence of Muslim neighborhoods, the integration of those communities with Hindu ones, and the abundance of feral dogs. Participants were selected by canvassing larger roads running through these neighborhoods and major streets in these cities. Therefore, the sample avoided those neighborhoods with little or no contact with dogs, which may have been the case in sampling rural Muslim housewives (*ibu rumah tangga*) who rarely frequent areas with dogs. Individuals listened to the recordings on headphones that reduced ambient noise and cues from others around them. The experiment was explained to them in the language of their preference (Indonesian, Balinese, or Javanese). They were told that they would be listening to dogs barking in the following conditions: first, about to bite or seeing a stranger, and second, playing or being left alone. After each, we paused so that they could report the order in which they heard the vocalizations. The order of the vocalizations was randomized.

RESULTS AND DISCUSSION

The results showed a statistically significant difference between Muslims and Hindus in the stranger or bite conditions (Figure 1). Hindus performed above chance (68% stranger–bite condition and 63% for play–lonely condition), while Muslims performed at chance in both conditions (52% and 48%, respectively). A chi-squared analysis showed that Hindus' responses for the stranger or attack vocalization were correct more often than chance (50% correct; $p < 0.05$), whereas Muslim respondents did not do significantly better than random. Though Hindus did perform at 60 percent for play and lonely, it was not statistically significant.

The most striking finding is the overall performance difference between Muslims and Hindus for both tests. A central finding in Pongrácz and colleagues' pioneering work (2005) is (a) that all groups can choose, above random chance, the contexts in which certain vocalizations occur and (b) their ability to do so is not affected by dog ownership or prior exposure to dogs. In an innovative study (Molnár et al. 2010), the ability of congenitally blind participants to successfully discern bark patterns and to match them to behavioral context also substantiates the view that these are innate abilities. However, my findings in Bali demonstrate that not all individuals or communities can discern the differences in dog vocalizations, and thus I present some of the limitations of studying the perceptual basis for human–dog

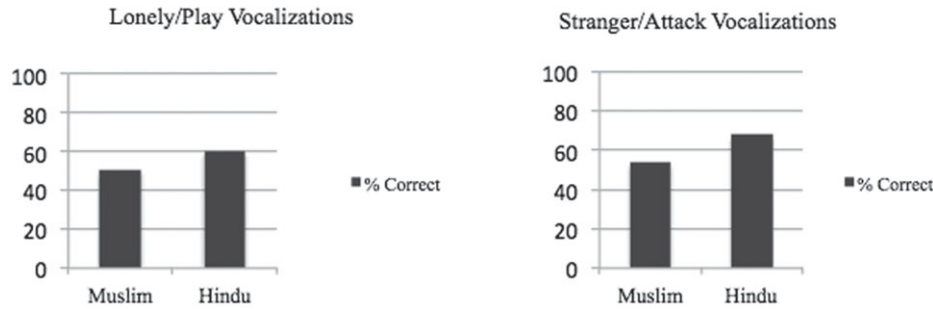


FIGURE 1. Muslims: 33 out of 61 correct on attack (54.1%) and 31 out of 61 correct on play (50.8%). Hindus: 55 out of 80 correct on attack (68.8%) and 48 out of 80 on play (60.0%). (Figure courtesy of author)

communication in a group with fairly homogenous views of dogs. The lesser ability of Muslims to interpret differences in dog vocalizations suggests that even if these abilities are innate, they are alienable and may be unlearned.²

Perhaps equally important, this first experiment shows the ability of certain forms of culture, most specifically taboo, to trump either an environmental experience or an innate capacity. It may appear that Muslims' inability to discern the differences between barks is solely the result of a lack of experience with dogs. If this experiment was conducted in some parts of the Arab world, such inexperience may account for the inability to distinguish these vocalizations. In Bali, this is not the case. Muslims in Bali regularly experience stranger and bite vocalizations in their own neighborhoods and as they walk down the streets of any urban area. Dogs are free to roam urban and rural communities in search of food because they are either feral or underfed by their owners and thus set out to scavenge both by day and night. In this context, the typical Balinese Muslim *kampung* (neighborhood), particularly in Tabanan, Ubud, and Denpasar, where these tests were conducted, is small enough that dogs from surrounding Hindu communities easily move through them like any other area searching for food. Unlike much of the Arab world, in Balinese Muslim communities, one can see packs of dogs in front of mosques at the call for prayer or even upturning garbage looking for rice next to Islamic festivals. Moreover, anyone walking the streets of Bali is barked and growled at by dogs that use both the stranger and bite vocalizations. Though Muslims do not typically own dogs or interact with them in ways in which they would receive play or lonely vocalizations, they are exposed on a regular basis several times a week to instances of stranger or bite barks.

It is difficult to discern the amount of exposure to stranger or bite vocalizations that Muslims experience compared to Hindus. Muslims may be in contact with dogs less, but because they are more likely to be unfamiliar to those dogs, there is a greater chance that the barks will be aggressive. This raises the question about whether or not there is a critical mass of exposure to dog barks for learning their meaning, and, if so, is the Muslim inability to perceive or interpret them the result of not reaching this threshold? This is unlikely for several reasons. The staggering number of stranger and bite vocalizations heard on a weekly basis

far exceeds the number experienced in Europe or North America, where listeners understand the meaning of such vocalizations. Moreover, an absence of interaction is unlikely to account for this inability because congenitally blind participants in Europe were able to discern vocalization differences (Molnár et al. 2010). These findings suggest that such auditory perception can exist without visually observing these behaviors to give context to vocal patterns.

Given that Hindus and Muslims experience the stranger and bite barks, we can examine what are some elements that influence the ability to discern dog vocalizations. If the ability to understand dog vocalizations were innate and inalienable, then both Hindus and Muslims should not differ in their ability to discern the meaning of both conditions of barks. If exposure were the sole factor in determining the ability to discern the meaning behind dog barks, then Hindus would be able to do so above chance for both conditions and Muslims would also be able to discern the stranger and bite vocalization. The fact that Muslims are unable to recognize and understand the differences, regardless of exposure, suggests that experience is not a sufficient factor in determining the semiotic fidelity between dogs and people.

What is needed to understand dog vocalizations in Bali is a cultural value that does not induce what psychologists term “perceptual narrowing” (Lewkowicz and Ghazanfar 2006)—as taboo appears to do in this instance—and thus allows subjects to perceive, observe, and reflect on their own exposure to semiotic patterns in the environment. “Perceptual narrowing” describes the process of desensitization to an environmental stimuli. A descriptive term (Maurer and Werker 2014), it has been used to link multiple forms of sensory attunement such as discrimination of vowels (Polka and Werker 1994), lexical tone (Mattock and Burnham 2006), and the unique processing of human faces compared to other environmental objects (Kleiner 1993). Although the process of reduced sensitivity to environmental stimuli has been described, the mechanisms remain unknown (Maurer and Werker 2014). The results of this experiment suggest that the ability to perceive and interpret the meaning behind dog barks is neither inalienable nor independent of experience as recent studies in the West suggest; rather, it is the result of an interaction between inborn capacities, cultural beliefs, and experience.

THICK AND THIN DESCRIPTION OF ZONOTIC DISEASE AND ANIMAL BEHAVIOR

In October 2010, an additional experiment examining the effects of taboo on environmental knowledge was conducted within the same Hindu and Muslim communities used in the auditory tests described earlier. Different participants from those used in the study of dog vocalizations were given a selection of photographs of various breeds of dogs and mutts that were of varying ages, health conditions, and environmental contexts and that were displaying different forms of behavior. This test was designed to investigate how different communities understood the role of animals, and most specifically dogs, in spreading rabies. The test uncovered information suggesting that Muslim and Hindu communities in Bali had remarkably different ways of thinking about and interpreting dog behavior.

Individuals were shown a collection of 14 photos that were randomly placed on a table and from which they selected dogs they thought carried rabies. Participants were then asked why they thought certain dogs had rabies and other dogs were rabies free. The sample was composed of 32 Hindus and 21 Muslims, all of whom were either born in Bali or had lived there for more than five years.

The collection comprised photographs of (1) one dog with actual furious rabies³; (2) a dog with paralytic rabies⁴; (3) an adolescent pit bull; (4) an adult pit bull; (5) an adolescent golden retriever; (6) an adult golden retriever; (7) a street dog with mange; (8) a dog on the beach with mange; (9) a street dog without mange; (10) a street dog with a collar; (11) a wild dog; (12) a wild dog eating carrion; and (13) a Scottish Deerhound. The goal of this study was to better understand what evidence people used to decide whether or not a dog was carrying rabies or could possibly be carrying rabies. Though there were epidemiologically significant findings for this study, the results also showed a significant distinction between the ability of Hindus and Muslims to perceive and understand these images of dogs.

Hindu participants used multiple levels of analysis to determine, correctly or not, if a dog had rabies. Hindu participants picked dogs that they thought had rabies based on physical appearance, behavior, and ecological setting. They also offered long and detailed explanations for why a certain dog showed elements of rabies and another did not. For instance, many participants explained that dog (12), who was eating carrion, was a potential rabies candidate because rabies was spread through eating other animals.⁵ Many Hindu participants explained that the clean street dog (9) had his tongue hanging out and was looking away from the light of the sun. They not only describe this but also acted out the dog's avoidance of light while their tongue hung out. Additionally, they explained that people had been bitten by rabid dogs during twilight. This was the most animated that participants became regarding the behavior of dogs. Rabid dogs are known to become photophobic and lose control over their throat and mouth muscles (Hildreth 1963). However, their

description of this form of rabid behavior mirrors descriptions of demons in the Balinese supernatural cosmos, which are thought to be fanged entities with engorged tongues that hang from their mouths and who materialize at dusk (Covarrubias 1999[1937]). Through this description, the Balinese use their myths to understand a novel zoonotic disease while the West uses zoonosis (rabies) to make sense of zombies, a prevalent form of its contemporary mythic folklore.

Hindu descriptions of a dog's behavior, ecological context, health, and the interaction of these varying types of information could be viewed as an interspecies form of what Clifford Geertz (1973) termed "thick description." Hindu participants were able to provide narratives about both contextual and internal causes that made dogs perform certain actions or what the environmental context meant for their status as a rabid dog. Equally telling, Hindu participants described why certain dogs were believed to be free of rabies. The puppies were described as "cute" (in Indonesian and Balinese) and had eyes that were "innocent" and "pure" (using both *murni* in Indonesian and *nirmala* in Balinese). Dog breeds such as pit bulls and golden retrievers were described, with overtones of disapproval, as living in a close relationship to people and not other animals and thus not able to contract rabies from other dogs. Geertz (1973) famously described how social, phenomenological, and symbolic realities intertwined to give cockfighting in Bali its meaning to participants and observers. Balinese Hindus, to varying degrees, are able to form a social, phenomenological, and psychological interpretation of the behavior, environmental context, and health from an image of a dog.

For Balinese Hindus, a picture of a dog is worth many words and ideas. In stark contrast, for Muslims in Bali such photos are only worth two: "dirty" and "biting" (*reged* and *nyokot*, respectively, in Javanese). Muslim participants almost solely use the action of biting and the existence of mange to determine if a dog has rabies. With the same set of photographs, Muslims nearly exclusively chose dogs with skin disease. The one exception was their choice of the rabid dog (1), which was showing its teeth. When asked why they chose dog (1), they said that the dog looked like it was about to bite and that you get rabies from dog bites. Even though they are, in fact, describing a behavior (biting), unlike Hindu participants, Muslims did not ascribe a mental or emotional condition such as the dog was angry or crazy but, rather, gave the "thin" description of the act of "biting." They lacked the ability or interest to read the behavioral cues given by dogs in all but the most obvious ways (teeth showing), and when they did read behavioral cues, they were at the level of "thin" description rather than a "thick" description that contained varying levels of causal elements and their psychological states. All Muslims responses centered around one aspect of the dog photographs. They were adept at quickly finding which dogs had mange and referred to such dogs as "dirty" (*reged* in Javanese and *kotor* in Indonesian).

Although taboo can have the profound effect of narrowing the perceptual and interpretative abilities of a subject, the causal mechanisms may be remarkably elegant. As described earlier, Balinese Muslims do not own or care for dogs, yet they experience them in their daily lives. The restricted kinds of experiences with dogs are combined with a limited yet uniform thought and expression about them. They repeatedly used the Javanese adjective *reged*, meaning “dirty,” when talking about dogs in any capacity. When asked about dogs as a presence in their neighborhoods, they commonly responded in Javanese, “Asu kuwi reged” [the dogs are dirty]. In daily life and while examining photographs during the rabies experiment, parents explained to their children or any children present that dogs are dirty. When asked what they say to their children about dogs, they replied that they did not like talking about dogs, but when they had to, they used the same pattern with little variation in Javanese: “Awake dhewe mulangna marang anak-anak menawa asu kuwi reged” [we teach our children that dogs are dirty]. It is not surprising that given the monotony of this description of dogs, the interpretative range for rabies would be limited to that they are “dirty.”

Overall, Figures 2 and 3 show that Hindus use multiple indicators in discerning whether a dog has rabies, while Muslims focus on just a few. Hindus discriminate the presences of rabies by using categories such as hygiene, ecological setting, and behavior. For Muslims, there is less variation in which dogs are chosen, with only three dogs comprising over 90 percent of the total selections. Of these three dogs, two have mange and one is shown in the act of biting.⁶

Is the Islamic taboo on dogs the reason for these differences? It could have these effects either by reducing interactions between Muslims and dogs or through the proscription that one should not think about, or even perceive, dogs. The difference between these explanations has implications that were foreshadowed by Claude Lévi-Strauss in his analysis of the impulse that creates totemism and by extension other social and ecological relationships:

The animals in totemism cease to be solely or principally creatures which are feared, admired, or envied: their perceptible reality permits the embodiment of ideas and relations, conceived by speculative thought on the basis of empirical observations. We can understand, too, that natural species are chosen not because they are “good to eat” but because they are “good to think.” [1966:89]

For Muslims, dogs are not only bad to eat or be near, they are also bad to think about. Thinking about dogs and their actions, motivations, and realities is a prohibited cognitive activity. This is not to be confused with having a negative view of dogs. For instance, many people have negative views of snakes, but this attitude does not result in an inability to describe a snake’s behavior or elaborate on its actions. Snakes may be thought to be sneaky, malevolent, dangerous, and repulsive creatures, and a good deal of time, as anyone with a phobia knows, may be spent thinking about them in vivid

detail. To be clear, it is not that for Hindus in Bali dogs are embodiments of positivity. Hindu Balinese have a rich view of dogs in their cosmic ordering of the natural world that, in many contexts, places them among evil entities. The fanged dog that emerges at twilight to bite village inhabitants while returning from bathing in the stream is a negative creature and idea. However, for Muslims, dogs are not something good to think negatively about. Rather, they are, in fact, simply not good to think about.

The difference between something that is bad to think about and something that is good to negatively think about is all the more apparent in the context of rabies. Despite the fact that dogs in Bali spread the deadly disease of rabies and are considered *haram* (taboo) by Muslims, the elaboration on dogs in general and rabies specifically appears to be also *haram*. The scant attention given to a tabooed species and the diseases that it carries may seem to be a common pattern of thought toward such diseases and animals. However, it is precisely the opposite of how zoonotic illnesses carried by a negatively viewed animal are thought about in other settings. During the 2009 and 2010 outbreak of bedbugs in New York, which combined the urban aversion to bugs and the abhorrence of having one’s blood sucked at night by nearly invisible creatures over which one has little control, people were able to elaborate at great lengths about how the bugs reproduced in hordes, were present at theaters and fancy hotels, and were capable of biting you throughout the night in sensitive places.⁷ Exactly because bugs are gross and bedbugs did gross things to people meant they were thought a great deal about, unlike other zoonotic diseases such as cat scratch disease (see the New York Bedbug Registry).⁸ Among Muslims in Bali, a seemingly similar situation has occurred whereby a novel and gross disease is carried by a traditionally dirty animal; however, there is not a burgeoning of elaboration, information, or “thinking” about this dynamic or the actors involved. The implication of this divergence is that taboo has levels of significance beyond giving a subject an extremely negative view of an object. It alters the perceptual, interpretive, and cognitive experience of the subject. It is not the presence of a negatively viewed object in a symbolic ecology of other objects. Instead, it is a negation of the existence of an object at all but the most basic level—that it exists—yet even its existence should not be the object of thought, perception, or interpretation.

Edmund Leach, in *Anthropological Aspects of Language: Animal Categories and Verbal Abuse* (1964), approaches both cognitive and linguistic origins of taboo and its effects on knowledge systems from a structuralist perspective. In it, he famously describes taboo as the category that does not fit into categories or, as he puts it, the areas of the environment that exist between “named ‘things’” (Leach 1964:35)—a designation more thoroughly elaborated on by Mary Douglas (1966). This may explain what is considered taboo⁹ and the distribution of proper taxonomic names within a certain society, but it also can be partially mapped onto the level

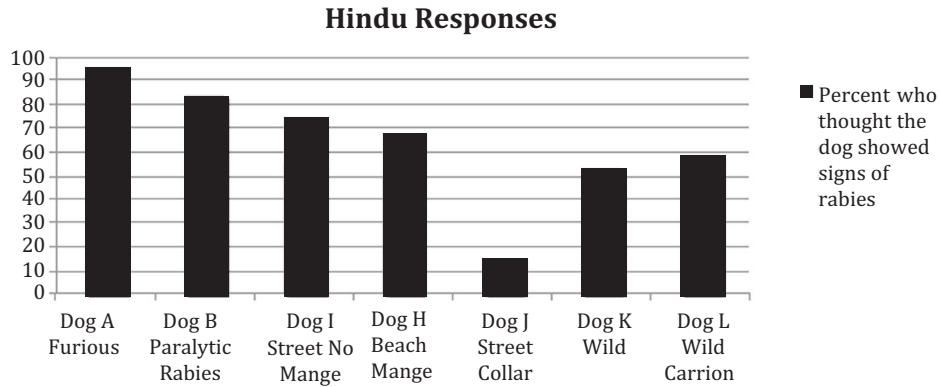


FIGURE 2. Hindu selections of dogs thought to have rabies. (Figure courtesy of author)

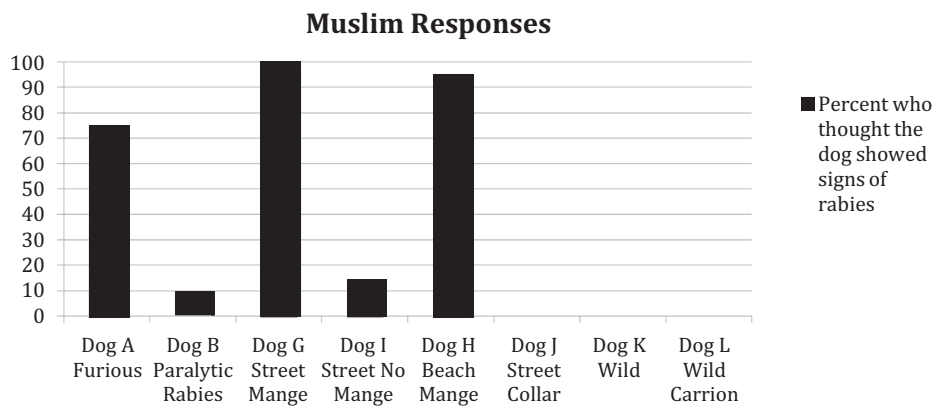


FIGURE 3. Muslim Balinese selections of dogs thought to have rabies. (Figure courtesy of author)

of perception. For Balinese Muslims, dogs are best thought about by not thinking about them.

CONCLUSION

The differences in the abilities of Balinese Muslims and Hindus to perceive and interpret both dog vocalizations and the presence of rabies in dogs suggests that taboo affects individuals in ways not yet accounted for within anthropology, such as perceptual narrowing. In *The Forest of Taboos*, Valerio Valeri (2000) examines the uses of taboo in the formation of subjects among the Huaulu, a comparatively isolated society in the forests of Seram, Indonesia. Valeri builds his analysis of how taboo constructs a subject distinct from the surrounding natural world by demonstrating that taboo is qualitatively different from how Leach formulates it in two regards. Leach aggregates numerous cases in which there are prohibitions toward an object or act. For instance, although Muslims and the English both do not eat dogs, the reasons behind this shared prohibition are significantly different (Valeri 2000:62). A similarly specious association might be made between the negative view of dogs by Muslims and of bedbugs by New Yorkers and the diseases both carry. However, as previously illustrated, they result in exactly the opposite forms of elaboration toward these animals. New

Yorkers have a staunchly negative view of bedbugs, which results in extreme elaboration on bugs' behavior, while Muslims negate and occlude as much knowledge of dogs as they can. It is here where Valeri's next criticism exists: Leach positions taboo as the method of bordering the known world, while Valeri contends that the most precise definition of taboo involves not bordering but negating a symbolically and psychically threatening aspect of the world. Valeri's work stands at the end of a long anthropological tradition that focuses on why taboo exists and what social functions it serves (Douglas 1966; Kroeber 1920; Lévi-Strauss 1969; Radcliffe-Brown 1952[1929]). However, Valeri's research also marks a departure from much of the existing literature on taboo because of his analysis of how taboo alters the experience of reality of its followers by making the world coherent.

By comparing how Muslims and Hindus in Bali perceive and interpret auditory and visual stimuli in the form of barks and photographs, there is a shift, similar to that made by Valeri, from the question of why taboo exists to the effect of taboo on one's experience of the environment at the level of perception, or *umwelt*. Because existing studies of the semiotic interaction of dogs and people have been within European and North American societies, the importance of culture or symbolic systems for understanding this perceptual interaction has been limited. From such studies,

researchers in the field of human and canine interspecies semiotics have suggested that the perceptual abilities of humans to understand the context of dogs' vocalizations is not influenced by prior exposure and thus is possibly innate (Pongrácz et al. 2005). The inability of Balinese Muslims to distinguish the difference between the stranger and attack vocalizations compared to Hindus who are able to do so demonstrates that such perceptual skills, if innate, are alienable. Furthermore, because Balinese Muslims cannot discern the differences between barks they often hear, the ability of symbolic systems—in this case, taboo—is shown to restrict what is knowable and thus produces what psychologists have termed “perceptual narrowing” (Lewkowicz and Ghazanfar 2006).

Taboo not only alters perceptual abilities, it can also narrow interpretative range and depth. Balinese Hindus use several types of information when assessing the presence of rabies from photographs of dogs, such as the ecological setting in which the dog lives, the action of the dog (biting, foaming at the mouth, eating carrion, etc.), the presence of mange and other markers of disease, and the breed of the dog. Balinese Muslims only use the evidence of a skin disease and whether or not the dog is about to bite, which they know from the Indonesian media is the action by which rabies is spread. It may seem to be common sense that a disease associated with an unclean animal would be sparsely elaborated on by individuals. However, the treatment of bedbugs in New York shows the exact opposite to be sometimes true: that grotesque animals associated with disease are often thought about and attempted to be understood, even though they are feared and thought to be repulsive. Following its effect on narrowing perception, taboo also restricts the interpretative range of participants.

These studies also demonstrate how certain forms of environmental knowledge emerge. At the surface, both the Balinese and Javanese (the language of most Muslims in central Bali where these experiments were conducted) languages have the same word for dog, *asu*, and categorize it as a type of mammal.¹⁰ If one collected the traditional form of environmental knowledge such as the nomenclature of species in Bali or the corresponding taxonomic systems of Balinese Muslims and Hindus, little difference in environmental knowledge would be found. But by including auditory perception and interpretation as forms of environmental knowledge, new shades of variation between Balinese Hindus and Muslims become apparent, which are overlooked by purely taxonomical studies of environmental knowledge. Moreover, the importance that a symbolic system can exert on what can be learned from experience becomes clearer. Though Balinese Hindus learn from their experience with dogs, Balinese Muslims, despite exposure to stranger and bite vocalizations, do not. Taboo, or *haraam*, not only instructs a Muslim what he can eat or bring into his home but also what environmental stimuli can be actively listened to, learned from, and accepted as potentially carrying semiotic content. In this regard, the examination of perception

and interpretation highlights the ability of symbolic systems to restrict or allow for types of knowledge and experience to emerge.

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NOTES

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1. The barks were drawn from the following conditions: seeing a stranger, about to bite, playing, watching their owner with a ball, going for a walk, and being left alone.
2. Although rarely acknowledged in anthropology, the ability of inborn capacities to be lost in certain environments has been established for several decades in the field of developmental psychology (see Aslin and Pisoni 1980; Gottlieb 1976; Maurer and Werker 2014).
3. Symptoms of rabies involving hyperactivity and aggression.
4. Symptoms of rabies associate with paralysis of muscles.
5. It is spread through contact with the saliva of a rabid animal, which can be spread by eating such an animal but not solely through eating its flesh.
6. Though there are differences in the interpretative range that Muslims and Hindus demonstrate regarding dog behavior and rabies, it is unknown if this variation causes proportionally larger numbers of cases of Muslims being bitten by rabid dogs.
7. Another example of this obsession was the escape of a cobra from the Bronx Zoo in 2010.
8. Moreover, there was particular emphasis placed on how dogs, our companion and “non-gross” species, were able to help fight against bedbugs. See <http://bedbugregistry.com/metro/nyc/> (accessed in 2010).
9. Though Leach makes a remarkably cogent case for the association of taboo with liminal objects in the social and natural worlds, he does not explain why dogs are *haraam* in certain societies and not others.
10. Most Muslims in central Bali speak Javanese even if they were born and raised in Bali.

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