THE ROLES OF LANGUAGE IN CHILDRENS SNAKE AVERSION AND CATEGORIZATION

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Denee Marie Buchko, candidate for the degree of Master of Arts in Experimental & Applied Psychology, has presented a thesis titled, *The Roles of Language in Children's Snake Aversion and Categorization*, in an oral examination held on August 13, 2019. The following committee members have found the thesis acceptable in form and content, and that the candidate demonstrated satisfactory knowledge of the subject material.

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Abstract
Snake aversion and vilification is widespread in human society, but does not reflect the danger that snakes typically pose to humans. Recent research indicates that snake aversion is likely not innate, but somehow learned. Language used to describe atypical animals often differs than language used to describe more typical animals. Parents are also more likely to use prohibitive language such as “Don’t get too close to that!” when referring to snakes but not to other animals like hamsters (even when the animal is enclosed). Since the language used to describe animals has been shown to change the way that children feel about and categorize them, this study examined how language affects young children’s snake aversion as well as their categorization of snakes as compared to other animals. The results of this study show that parent language, particularly objectifying and negative language about snakes, affected children’s categorization of humans and other animals when snakes were used as the basis for comparison. Children, showed a human exclusive pattern when performing judgements in induction tasks when human was not the base animal. Similar to results from other studies, younger children reported less aversion toward snakes than older children. Results also showed that an objectifying storybook about snakes slightly increased 3-year-old children’s reported aversion to snakes. Overall the language used about snakes, both objectifying and negative, seems to affect the way children conceptualize them and perhaps even how they feel about them. This helps to identify new factors (language) associated with children’s conceptualization of animals, and brings attention to a potential sensitive period of learning for children in regards to animal conceptualization. This could lead to better potential education surrounding atypical animals.
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Introduction: Literature Review

Humans and animals have a long, interrelated history filled with varying roles and relationships (Amiot & Bastian, 2015). Animals have often played an integral part in human development, be it for sustenance, clothing and shelter, work, entertainment, or companionship and comfort. Dogs were the first animals to become human companions, around 14,000 years ago (Serpell, 1996). This relationship was followed some time later by the domestication of farm animals used for both food and working animals. In modern day, many of these animals have preserved their places in the lives of humans both as companions and as work allies. Some dogs have even taken on jobs as service animals, as part of search and rescue teams, and even as police officers.

Humans have a tendency to pay greater attention to natural stimuli over manmade or other stimuli, a concept known as biophilia (Amiot & Bastian, 2015). This is true when comparing natural landscapes to manmade ones, but is especially true when referring to animal stimuli (New, Cosmides, & Tooby, 2007; Tennessen & Cimprich, 1995; van den Berg, Koole, & van der Wulp, 2003). People also have a consistent attentional preference to view animate stimuli over inanimate stimuli (even when the inanimate stimuli is matched for visual complexity), which has been observed both for still images and videos (DeLoache, Pickard, & LoBue, 2010; New et al., 2007). Biophilia is early emerging and is present even in infancy. For example, Deloache et al. (2010) presented 4- to 12-month-old infants with several videos of animals and inanimate but moving objects (e.g., car, helicopter). In a second experiment, infants were presented with still images of the same stimuli. Infants displayed strong preferences for the animal stimuli in both formats.
However, only a few species of animals that evolved alongside humans have been domesticated or have become human companions. There is another major category in human-animal relationships: that of fear and aversion. In general, the most commonly feared animals are snakes and spiders (Amiot & Bastian, 2015) and fifty-four percent of people report that snakes make them feel some level of anxiety (Davey, 1994). In many cultures, snakes are widely regarded as threatening animals, and are vilified in stories and media (LoBue, 2013). For example, in Christian beliefs, Adam and Eve were tricked by the Devil, who appeared in the form of a serpent. Modern examples include Indiana Jones and his intense fear of snakes, and the Harry Potter series in which the many villains come from the Slytherin house, who’s mascot is a snake. Tropes such as these have vilified snakes and led to a common perception that snakes in general are highly threatening.

Contrary to the perception of all snakes being dangerous, the reality is that only 15% of the 3000 snake species that exist are venomous (Bhatti, Satti, & Khalid, 2010). In all of North America 0.75-1.49 per 100,000 people a year will be bitten by a venomous snake, and of these less than 10 deaths a year will occur (Kasturiratne et al., 2008). Even in countries such as India, where venomous snakes and their bites are more prevalent, only 5 of the 52 venomous species there are responsible for most human mortality (Mathew & Gera, 2000). Further, of venomous snake bites that do occur 50% - 70% of the time there is no envenomation (World Health Organization, 2019). In a clinical review of snake bites in India with successful envenomation (where symptoms occurred as a result of the bite), with proper treatment 2 of 46 bites resulted in mortality (Bhatti et al., 2010). Further, an extensive review of snake bites around the world by the World
Health Organization (Chippaux, 1998) found that in Europe, of an estimated 25000 snake bites yearly, of which successful envenomation occurs in roughly 8000 of those cases, there are about 30 fatalities.

Alongside this overestimated threat potential, snake behaviour is also generally misrepresented. Snakes, contrary to popular belief, are not aggressive animals. Most bites occur as a result of fear or self defense on the part of the snake (Chippaux, 1998; Mathew & Gera, 2000). Snake bites most often happen because the snake was accidentally or intentionally stepped on or grabbed, not because they were seeking to attack a person (Mathew & Gera, 2000).

Another way to put the widespread misrepresentation of snakes in perspective is to compare the fear and vilification of snakes to that of other animals that pose a threat to humans, such as bees, horse, cattle, bears, elephants, and tigers (Herrero, Higgins, Cardoza, Hajduk, & Smith, 2011; “Ministry of Environment, Forest and Climate Change Government of India,” 2017; Forrester, Weiser, & Forrester, 2018). For example, in the United states within one year there are about 60 fatalities from bee or wasp stings, about 90 from cows and horses, and only 6 from snakes (Forrester, Weiser, & Forrester, 2018). Even in areas where snake bites are more pervasive, such as in India (Kasturiratne et al., 2008), snakes are not the only dangerous animals present. According to the Ministry of Environment, Forest, and Climate Change of the Government of India (2017), tigers and elephants are responsible for one recorded fatality every day. Despite the real threat that these other animals clearly pose, they are not treated with the same vilification and widespread aversion that snakes are. This is not to suggest that venomous snakes are not dangerous – they are. However, if the reason for widespread snake aversion were purely
based on danger-avoidant behaviour, then animals like horses should invoke the same kind of aversion that snakes do. In fact, the opposite is true considering many of these are often the animals that children’s toys and stories are modelled after.

Given that snake aversion is so common and that snake threat is so widely misrepresented, it may be that snake aversion is innate in humans and other primates. The basic idea behind such evolutionary perspectives is that primates evolved a fear of snakes to avoid death over a period in their evolutionary history in which they lived in close proximity to one or more species of venomous snake. It seems that there would be high value for an innate fear of creatures that are small, and thus difficult to observe, which may be accidentally encountered with potentially deadly results. Although there is no evidence for an innate fear of snakes in monkeys, there is evidence that monkeys may possess an innate propensity to learn to fear snakes. In a widely cited experiment, Cook, Mineka, Wolkenstein, and Laitsch (1985) allowed lab-reared rhesus monkeys with no fear of snakes (called naïve monkeys) to watch feral born rhesus monkeys react fearfully to snakes. A high proportion (7/10) of the naïve monkeys learned to display fear and avoidant behaviour (in some capacity) toward snakes, suggesting that the observation of fear behaviour was enough to condition such fear without direct personal experience. Importantly, this was more easily accomplished with snakes than for a comparison stimulus of flowers, where no fear was learned. This advantage to learn to fear snakes occurs regardless of the relation of the observed monkey to the observer monkey. However, since flowers are inanimate, they are a poor control stimulus, which brought a need for another experiment.
A follow-up study using more appropriate control stimuli found that rhesus monkeys learned to fear crocodiles and snakes but not rabbits and flowers through observational learning (Cook & Mineka, 1989). Some researchers use these findings to infer that reptilian predators might have some kind of innate fear-conditioning advantage in monkeys (Öhman & Mineka, 2003). However, it is also possible that this advantage may be based on an innate predator model, (predator being those animals that prey on other animals) which would include snakes and crocodiles but also jaguars, panthers, wolves, coyotes, cougars, and even other kinds of monkeys and apes. Unfortunately, there are currently no similar studies examining this phenomenon with these various predator species. Nonetheless, some researchers have used findings such as these to argue that a similar innate learning tendency is present in humans (Nelson, Shelton, & Kalin, 2003).

Evidence used to support the innate theory of snake aversion in humans is that humans have an advantage for the visual detection of snakes (LoBue & Rakison, 2013). This visual advantage is thought to occur because the human mind inherently views snakes as a threat, and thus they are detected more rapidly. For example, using pictures, when adults and children are asked to detect targets among an array of distractors, both age groups detected target snakes faster than benign targets like flowers and mushrooms (LoBue & DeLoache, 2008; Lobue & Deloache, 2011).

However, as stated earlier, appropriate comparison stimuli are a concern in some of these detection studies, as the comparison stimuli are often inanimate. As discussed previously, humans prefer to look at and seek out things that are naturally occurring or animate (Amiot & Bastian, 2015). Even though mushrooms and flowers are technically
alive, because they are not animate they are not typically as interesting as something that can move. When detection studies use more appropriate controls, conflicting outcomes emerge. When neutral animals (cats and horses), predatory animals (wolves and large cats), and fear relevant animals (animals that are commonly feared by humans; snakes and spiders) are compared using detection tasks, all are detected equally faster than flowers and mushrooms, but fear-relevant animals are not detected any faster than the others (Lipp, 2006; Lipp, Derakshan, Waters, & Logies, 2004). On the other hand, when snake, cat, bird, and fish images are intentionally blurred to imitate the camouflage that snakes generally have in their natural environment, snakes are more quickly detected than non-snake animals (Kawai & He, 2016). Some research suggests that the shape of snakes, a multitude of curvilinear lines, is an attention-capturing stimulus in itself (LoBue, 2014). This last finding is very ambiguous but is a potential contributor to explain the heightened attention to snakes without considering their biological identity.

These detection studies, though compelling in some ways, ultimately may not be good indicators of innate fear, as adults have had a lot of experience and time in which to have developed an aversion toward snakes that was not present innately. Even young children have likely had considerable exposure to negative information about snakes from their culture. The best possible way to reveal whether or not humans have an innate aversion towards snakes would be to examine the reactions of young infants, and whether or not they treat snakes as a fear stimulus. Since infants lack the verbal skills to acquire this from others, fear behaviour may indicate some kind of innate propensity toward snake fear or aversion.
Well-controlled studies with infants argue against an innate fear of snakes in humans. Infants ranging from 4- to 40-months-old show no physiological signs of fear or overt aversion behaviour when presented with live snakes, snake videos, or snake pictures (DeLoache et al., 2010; LoBue & Rakison, 2013). Instead, infants reached out and tried to grasp snakes from videos at a rate equal to that for the other animals. When presented with live, securely caged animals, children ages 11- to 40-months-old show equal interest in interacting with all of the animals, including the snakes (LoBue, Pickard, Sherman, Axford, & DeLoache, 2013). This suggests that at the youngest ages we can test for an innate fear of snakes, no natural fear is observably present.

Though it is not ethical to examine fear acquisition by conditioning infants to fear snakes, as has been done in rhesus monkeys (Cook et al., 1985), it is beneficial to examine whether or not young infants show physiological fear cues when presented with snake stimuli. Thrasher and LoBue (2016) examined these physical cues associated with fear, such as startle latency, startle magnitude, and heartrate in 6- to 9-month-old infants. Heartrate acceleration, faster startle latency, and larger startle magnitude were considered to be indicative of fear. These physical cues were examined while infants were startled as they viewed videos of snakes and elephants paired with neutral and fearful voices (a large bright stimulus served as the startle response). Infants did not show any physical indications of fear while watching the snake videos (e.g., crying, looking away). However, following the startle response infants showed a decrease in heartrate for snakes paired with fearful voices, which may be suggestive of an attention bias. Startle latency was also lower for this stimulus pairing, also indicative of an attention bias. However, startle magnitude was lower for snakes than elephants in both voice conditions. The
researchers noted that heartrate can sometimes be difficult to interpret when it comes to fear (heartrate can also slow when extreme fear is present). However, since the infants were not involved in circumstances of extreme fear and showed no other fear behaviour, their lower heartrate was not likely due to fear. Overall, these results are fairly ambiguous, and require further examination across a broader range of stimuli. But they are highly suggestive that a very strong factor in the development of snake aversion is exposure to negative information.

Although there are several ways to acquire a fear of an animal, one of the most effective models is through learning. This can be accomplished by observing fear behaviour in others (Kelly, Barker, Field, Wilson, & Reynolds, 2010), or by the presentation of negative verbal information about a stimulus (Field & Lawson, 2003). In humans, some research suggests that exposure to negative information is the largest contributor to fear/aversion acquisition. In a retrospective study, Ollendick and King (1991), found that 89% of participants attributed the acquisition of their fears, including those to animals, to verbal information. Experimental studies also support this finding. When 6- to 8-year-old children were presented with information by their mother regarding an animal, the emotional message conveyed affected the children’s willingness to approach the animal. Children were less willing to approach if the information was negative in comparison to neutral, and conversely more willing to approach if the information was positive (Field & Lawson, 2003). This conditioning of aversion to an animal does not extinguish immediately after the experiment. In a study using facial cues to convey negative emotion about an animal, children’s aversion persisted for as long as 3 months from one single instance (Askew & Field, 2007).
It seems possible that children learn an aversion to snakes based on the information that is presented about them, from their parents, culture, and media. In a study conducted by LoBue et al. (2013), parents and children were given access to live, securely-caged animals. The animals in the fear-relevant group were a snake and a spider, and the animals in the non-fear-relevant group were a hamster and a fish. Parents were as interested in interacting with the live animals as children were, however they tended to use prohibitive or negative statements such as “Don’t get too close to that!” for the fear-relevant group only. This was true even though all of the animals were securely caged and there was no way for the children to physically contact them. Naturally occurring interactions such as these may facilitate an aversion toward snakes.

If we can identify factors that contribute to snake fear and aversion, we can better combat or lessen this widespread phenomenon. This is important as it can potentially alleviate anxiety for some people, as well as enable humans to better protect snakes as a species. The popular hypothesis that snake fear is innate is highly questionable due to the reactions of infants to snakes and inconsistent findings in detection studies with adults. The learning of snake aversion early in development, from parents, the media, and culture more broadly, is possible. But regardless of whether snake aversion is entirely learned or only activated and increased, language could play a central role in this process; Children’s ideas and impressions about snakes may be shaped. Thus, one goal of the current research was to examine the role of language in snake aversion, in order to reveal possible pathways of reducing or preventing widespread snake aversion in children.

Pervasive snake aversion not only affects people, but also has consequences for snakes. The perceived threat of an animal is also positively related with the likelihood of
conflict with that animal (Miller, Jhala, & Schmitz, 2016). There are many instances of brutal violence directed toward snakes (Brulliard, 2016; Martin, 2017). For example, in 2018, a snake researcher from the University of Manitoba found that the snake den at his field site had been victimized: at least 50 harmless garter snakes had been bludgeoned with rocks, shot, decapitated, or cut apart, and heaped in a pile, with some of the mutilated snakes still alive (Martin, 2017). The researcher also noted that this den was likely targeted, as it was a long hike from the nearest roadway, so it was unlikely to have been accidentally discovered.

In general, threat perception has a positive relationship with fear (Rapee, 1997). Reducing threat perception diminishes some violence against that animal (Miller et al., 2016), and so it is important to realize the gap in perceived threat versus actual threat in regards to snakes (Kasturiratne et al., 2008). Encouraging a more realistic understanding of snakes and their actual threat levels in society should result in a reduction of snake-directed violence and may also result in lower aversion and fear overall.

Language may not only affect how children feel about snakes, but it may also have broader implications in relation to children’s conceptualization of snakes, on a cognitive level. Studies consistently show that language and categorization are fundamentally intertwined. Thus, another goal of the current study was to investigate the relationship between language and children’s categorization of snakes. I will first briefly review what is known about children’s categorization of animals before describing how language may play a role in snake categorization.

The category in which an animal belongs is dependent upon more than just its physical attributes. One of the most classic examples of this is that of whales, which look
like fish but are members of the mammal category. It is not the appearance of a whale that makes it a mammal, but rather its unobservable and less obvious properties: such as the fact that they are homeothermic, have mammary glands, and need to take in oxygen from the air. For many adults this is common knowledge, and we readily categorize animals based on such unobservable properties. But what about children? Originally, it was believed that children were very poor at categorizing based on unobservable properties, and that they based their choices largely on the perceptual cues available (Inhelder & Piaget, 1964). The tasks used to test such categorization, however, may have underestimated children’s abilities.

Gelman (1986) re-evaluated children’s categorization and found that they have similar capabilities as adults in regards to processing unobservable properties. Research on the development of children’s categorization of natural kinds (living things and elements) indicates that even children as young as 3 years of age possess complex mechanisms for categorization that go beyond visual cues (Gelman & Markman, 1987). Simply, it seems even children start out with the assumption that there are important, unobservable properties associated with natural kinds which are critical for conceptualization.

Induction tasks can be used to examine children’s deeper categorization of animals. Such tasks ask children to extend an unobservable novel property of one animal to other animals. For instance, in Gelman and Markman (1987) 3-year-old children were shown a picture of a target animal (cat) and told that animal has an unobservable property or quality (e.g., that it is able to see in the dark). The children were then shown four other animals: a perceptually similar animal in the same category (similar cat), a perceptually...
dissimilar animal in the same category (dissimilar cat), a perceptually similar animal in a
different category (skunk), and a perceptually dissimilar animal in a different category
(dinosaur). The children were asked to choose which animals they believed could also see
in the dark. In picture-label condition children were told the label of the animal (cat) and
saw a picture, in the label condition children only heard the label (picture of the target
withheld), and in a third condition they only saw a picture (no label).

In the picture-label condition, children used categorical membership (i.e., all cats
can see in the dark) to make these decisions 70% of the time on average. In the picture
condition children used categorical information and perceptual information about 50% of
the time each. In the label only condition, children made inferences based on category
information 73% of the time on average. Thus, children as young as 3 heavily rely on
categorical information to make inferences when labels are provided, and when they are
not provided, they continue to use categorical information but to a lesser degree.
Children, like adults, use category information first when grouping animals based on
unobservable properties.

The above research tells us how children conceptualize basic level animals (i.e.,
genus, family, or species) but researchers have also investigated how children
conceptualize humans in relation to other animals in developing a superordinate category
of animal. Research suggests that young children often possess human centered
(anthropocentric) concept of animals. Herrmann, Waxman, and Medin (2010)
investigated this possibility in 3- and 5-year-old children by teaching children an
unobservable property for one species and testing whether children extend that property
to other species. Interestingly, when a human was used as the base in this induction task,
3- and 5-year-olds readily assigned the property to other animals, but when a non-human animal was used as the base 5-year-olds were less likely to generalize the property to other animals and humans (though see discussion for an alternative description of these findings). This asymmetry was not present in the 3-year-olds, suggesting that this human centered way of categorization develops or is learned sometime between ages 3 and 5. Related studies have found that this pattern is also more prominent in urban than in rural children (Ross, Medin, Coley, & Atran, 2003). It seems then that differences in children’s animal-related experiences may influence the development of the human centered categorization pattern.

Language can shift children’s perspectives on how humans relate to animals and how they categorize them. Waxman and colleagues (2014) found that anthropomorphism in language (attributing exclusively human qualities to non-human animals) promotes the human-centred pattern, while presenting biologically sound information about non-human animals can reduce it. In this study 5-year-old children were assigned to read either an anthropomorphizing story about bears (the Berenstain Bears) or a children’s encyclopedia containing biologically relevant information about bears. They then participated in a superordinate induction task, with either a human base or a dog base. Children in the anthropomorphizing condition displayed the human-centered pattern of categorization, in that they generalized properties from human to non-human animals and were less likely to generalize properties from the dog base condition to humans, while children in the encyclopedia condition were less likely to use the human-centered pattern of categorization.
Related research has shown that pre-school aged children extend anthropomorphized properties of unfamiliar storybook animals (e.g., that an animal can talk) to real-life versions of those same animals (Ganea, Canfield, Simons-Ghafari, & Chou, 2014) suggesting that anthropomorphism impedes a child’s ability to represent animals in a biologically realistic way. However, the degree of anthropomorphism could be critical in how it impacts children’s learning about animals. For example, language and pictures that are anthropomorphized but are biologically consistent (e.g., a butterfly with human-like eyes but possessing camouflage in patterning) could be considered a lesser degree of anthropomorphism than language and pictures that imbue biologically inconsistent human traits (e.g., a butterfly that drives a car and wears clothes). Geerdts, Van de Walle, and LoBue (2016) explored how this distinction affects children’s ability to generalize biologically relevant information from a storybook about two animals to a set of new animals. In this study, preschool children (ages ranging 3 – 5) read one of four books with the researcher about how animals possess camouflage, which crossed the presence of anthropomorphism in pictures (cartoon humanoid animals vs. realistic animals) with the presence of anthropomorphism in language (imbuing human psychological states vs. not). In general, all children could generalize camouflage knowledge regardless of book type, suggesting that the anthropomorphic information did not have any negative impacts on generalizing factual biological information. However, children who saw anthropomorphic pictures used more sophisticated explanations in explaining how camouflage works, indicating that they acquired a richer concept from the anthropomorphic picture book. Anthropomorphic language did result in children using more anthropomorphic language in their storybook recall, but not in their
camouflage explanations. This study shows that a lesser degree of anthropomorphism is inert for some aspects of learning and helpful in other aspects.

It may be that parents talk to their children differently about atypical animals, like snakes and spiders, than they do typical ones\(^1\). The trend to refer to some animals differently than others was found in a naturalistic study, in which child-guardian conversations about animals were observed at informal learning centres like museums and zoos (Geerdts, Van de Walle, & LoBue, 2015). These conversations formed a consistent pattern in which more atypical animals like insects were referred to with objectifying language: referring to the creature as “it” (instead of gendered pronouns) and never referencing psychological states such as emotion or intention in the animal. However, for more typical animals like penguins, guardians used gendered pronouns and did reference such psychological states. A similar pattern was also observed in a study where parents and 18- to 36-month-old children had direct access to live, securely-caged animals (LoBue et al., 2013). In this study, parents and children referenced more atypical animals like snakes and spiders with “it” instead of with a gendered pronoun. Another study that examined 3- to 5-year-old children’s reactions to degus and starfish found that starfish are less likely to be referred to with gendered pronouns than degus, even though the children categorized both animals as alive (Jipson & Gelman, 2007).

When parents use objectifying language while referring to animals it may affect children’s categorization of that animal in the superordinate category of animal. Children often base their conceptual ideas for unknowns upon reliable testimonial sources, like

\(^1\) The term atypical in this thesis is used as it is in the literature, and refers to those animals which are less commonly experienced and portrayed in culture. This contrasts sharply with a definition based on populations of animal taxa on Earth.
parents or teachers, including concepts about animacy (Gelman, 2009). This is especially true when the testimonial is about an unobservable property.

While to date there is a multitude of studies examining adults’ snake detection and adults’ and children’s snake aversion, there are no studies that have examined how language relates to children’s snake conceptualization. Thus, another goal of the current study was to explore children’s categorization of snakes in reference to humans and other animals, and how language and aversion relate to this process.

The Current Research

The current research examined, with four tasks, how language relates to animal categorization and snake aversion in 3- and 5-year-old children. First, parents’ language to children regarding snakes was assessed during parent-child conversations about two books: one composed of pictures of snakes and another composed of pictures of squirrels. From these conversations the proportion of negative and objectifying language was coded. This provided data on an individual parent’s style of talking about both snakes and animals in general, which was then examined in relation to their child’s snake aversion and conceptualization. Parents then completed the Short Snake Questionnaire (SNAQ-12, Zsido, Arato, Inhof, Janszky, & Darnai, 2018, see Appendix A) while their children completed the subsequent tasks described below. This allowed for an examination of parent language in relation to their own snake aversion, and to their children’s snake aversion.

Second, the experimenter read one of two stories to the child about a snake (between subjects). One book used objectifying language in reference to the snake, while the other book did not. The stories were carefully matched in all other aspects (overall
story line, pictures,) so that objectifying language was the only difference. This experimental manipulation was used to assess whether the objectifying language in the book impacted children’s snake aversion and categorization.

Following this, children engaged in an induction task and an animal aversion task. The induction task was highly similar to Waxman et al. (2014). Children were taught that an unobservable property is present in a base animal and asked to generalize this property to other animals. Humans and snakes were used as bases to evaluate the difference in categorization performance (between subjects) and both were included in the generalization test. Lastly, children took part in an animal aversion task, where they reported their feelings on different animals using a visual Likert scale. A snake and several other animals, were included.

Based on previous research, I predicted that 3-year-old children would exhibit less aversion toward snakes, and use a less human centered pattern of categorization in the induction tasks. I also predicted that negative language used in the picture book task would be positively correlated with how scary children consider snakes, in that the more negative language the higher children’s aversion would be. In terms of categorization, I predicted that the presence of objectifying language throughout the experiment (either from parents or from the book) would result in children being less likely to generalize an unobservable property from snakes to other animals, or from humans to snakes, showing a more human-centered pattern of categorization. Based on the current research, I had no predictions regarding how objectification would impact children’s snake aversion, or how negative statements would impact children’s categorization, but this design allows for an exploration of those effects.
Method

Participants

Participants were 96 children: 48 3-year-olds (22 female) and 48 5-year-olds (26 female). A power analysis revealed a medium effect size could be detected with $N = 92$ participants ($f^2 = .15$, $\alpha = .05$, power = .80), but 96 children were sampled to maintain balanced samples in all conditions. These ages were selected to enable comparison with existing research on children’s snake aversion and animal categorization. Ages 3 and 5 are good candidates for potential age-related differences in the two measures of this study, as this age span is where the human-centered pattern of categorization is possibly learned, and generally older children tend to show more fear of snakes than younger children. Children were recruited through a database maintained by the Early Cognitive Development Lab at the University of Regina of parents who are interested in participating in developmental research studies. An additional 25 children were recruited but replaced for the following reasons: could not complete one of the tasks ($n = 20$), parent spoke in French during the picture book task ($n = 1$), parent forgot to fill out the consent form ($n = 1$), camera issues ($n = 2$), and extra in one condition to result in even numbers in all conditions ($n = 1$).

Stimuli

Picture Book Task. This task included two picture books: one featuring photographs of squirrels and another featuring photographs of snakes. The animals were all depicted in their natural environments in non-threatening postures. The pages in the books were two-sided, and each book contained 30 pictures. Pictures were matched as best as possible for type of content (e.g., number of baby animals and adults).
**Storybook Task.** This task included two storybooks about a snake. The books used identical pictures (drawings), and general storyline, but one used objectifying language while the other did not (non-objectifying book). The objectifying book referred to snakes without gendered pronouns or realistic psychological states, while the non-objectifying book referred to snakes using gendered pronouns (e.g., she, her) and realistic psychological states (e.g., “…was frightened”). The books were matched in word count (within 3 words per page) and length. See Table 1 for a description of the story and example phrases from each book.

**Induction and Aversion Tasks.** Stimuli for the induction task included colouring outlines of a snake and a human, laminated photographs of a snake, human, horse, wolf, lizard, squirrel, bird, fish, flower, rock, and watch, and a pair of monster finger puppets. The aversion task used the same animal photographs from above in addition to a spider, ladybug, lion, tortoise, and housecat, and also made use of an alien hand puppet. It also included a graphic fear scale placard consisting of five cartoon faces. From left to right, the face in the 1\textsuperscript{st} position was happy, the face in the 3\textsuperscript{rd} position was neutral, the face in the 5\textsuperscript{th} position was scared, and the faces in the 2\textsuperscript{nd} and 4\textsuperscript{th} positions were blends from happy to neutral and neutral to scared, respectively.

**Design**

A 2 (storybook type: objectifying vs. non-objectifying) x 2 (base type: human vs. snake) between-subjects design was employed. All children participated in all tasks in a
fixed order (see Procedure below). Picture book order (snakes first vs. squirrel first) was counterbalanced between-subjects.

**Procedure**

After parents provided consent and children provided verbal assent, the parent and the child engaged in the picture book task. They were given both books (snake and squirrel) and asked to look through the books one at a time with their child, for about five minutes per book. Parents were told to look at the books like they would look at any picture book at home.

Table 1

*Storybook Task Events and Example Sentences from Each Book Type*

<table>
<thead>
<tr>
<th>Storybook Events</th>
<th>Objectifying</th>
<th>Non-objectifying</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snake wakes up</td>
<td>“Then, it suddenly sees the shadow from a hawk flying”</td>
<td>“Then, she is suddenly startled by a hawk’s shadow from”</td>
</tr>
<tr>
<td>Snake basks and absorbs heat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snake searches for water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snake sees predator and hides</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snakes searches for food</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snake eats</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snake basks again to digest food</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snake goes to sleep</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Following this, children were seated at a table across from the experimenter and engaged in the storybook task. All attempts were made to have children sit by themselves with the experimenter in order to remove parents’ potential influence. However, some children required the parent to sit with them, and in such cases the parent was asked not to interfere. Parents answered the SNAQ-12 while children were read the story.

Immediately following this task children participated in the induction task at the same table. The experimenter showed the child two line drawings of the base animal (human or snake), one for the experimenter and one for the child. They were told “(humans/snakes) have andro. It’s green and round, and goes inside!” The experimenter then used a green crayon to draw a green circle inside of their picture to show the andro inside and said “I’m colouring andro inside of my (snake/human), can you colour andro inside of yours too?” The pictures were then put away and children participated in training trials with two finger puppets. They were told that sometimes the puppets say something that’s right, but sometimes they say something that’s really silly. The experimenter then told the children that it would be their job to decide which puppet was right, and which one was silly. The children were shown the picture of a snake or human (that they just colored), and one puppet said “That’s a snake/human” and the other puppet said “That’s not a snake/human!” Children were asked to choose which puppet was right. Then using the same picture, one puppet said “That’s a chair!” and the other puppet said
“That’s not a chair”. If a child chose incorrectly the training was repeated a maximum of three times. Only children who passed this training were included in the final sample.

Following the training, children were asked to quickly identify each of the eight laminated pictures to be sure they were familiar with them. If the child made a mistake, the researcher would correct them by calling the animal/object the correct term. To reintroduce the induction task, the researcher then said “do you remember when I told you about (humans/snakes) and how they have andro inside? Well some of these things also have andro. Can you help figure out which ones do?”. Then the induction trials started. Children were shown each of the eight laminated pictures, one by one (including the base animal), with each flanked by a pair of finger puppets\textsuperscript{2}. The researcher asked the puppets “Do [items] have andro inside?” and one puppet said “No, [items] do not have andro inside!” while the other puppet said “Yes, [animals] do have andro inside!” Children were tasked to decide which puppet was correct. This procedure was repeated for every animal. Puppet accuracy paired with spatial position (right or left) was fully counterbalanced. The order of the animals was pseudo-randomized for each participant, with the only constraint being that the human and snake were not present until the third trial or later.

Following this, children immediately participated in the aversion task at the same table. They were introduced to the alien puppet, and told “This is alien Zoop. Alien Zoop is from a planet far away, and doesn’t know earth animals like you do, so Zoop needs

\textsuperscript{2} After trialling this puppet method with 7 3-year-olds, it was found that using puppets caused confusion in many of these children, and likely caused them to fail the induction task. For this reason, I did not use puppets for the remaining 3-year-olds. In contrast, 5-year-olds did not have difficulty with the puppets, and so the puppets were used for the remaining 5-year-olds for consistency. Some 5-year-olds did not wait for the puppets to speak before simply choosing “yes” or “no” to the andro decision.
some help deciding how to feel about animals! Can you help Zoop?" Children were then introduced to the fear scale placard, and the experimenter told children what each face meant while touching it. Children were then asked to choose a face from the scale to show Zoop how to feel about that animal. Children were shown each animal one at a time and then asked to choose a face from the placard. Animals in this task included all of the animals from the induction task as well as four additional animals (see Stimuli). The order of the animals was randomized for each participant with the condition that human was always last, and snake was never first. This decision was made in order to avoid priming children with strong feelings about something that they are very familiar with like humans, or something that may potentially be fear provoking like snakes.

**Coding**

Sessions were video recorded for coding purposes. During the session the researcher recorded the child’s decisions regarding the induction task and the aversion task on paper.

All parent language in the picture book task was transcribed and coded. All language coding was conducted by two primary coders, and 20 videos (approximately 20%) were coded by a secondary coder for reliability. Reliability was high ($r > .93$ for every code).

Audio files were transcribed by an employed third party in which language was broken down into continuous speech without significant pause or interruption which contained one or more sentences on the same general topic. These were referred to as utterances and were identified as being parent or child utterances. Utterances were coded for the presence of two types of specific pronouns in reference to the animals:
objectifying pronouns such as “it” or “that”, and gendered pronouns such as “he/she”, “him/her”, “guy”, “mom”, “dad”, and variations or equivalents. Note that, although rare, a single utterance could contain both pronoun types.

Utterances were also coded for the presence of negative statements about the animal. Negative statements were any statement that referred to the animal as being dangerous, undesirable, gross, scary, or expressing fear toward or distain for the animal. For example, “That thing will bite you!” would be considered a negative statement, as would “The snake/squirrel is gross.”

Values used for analysis were the proportion of utterances that contained objectifying pronouns, gendered pronouns, or were negative, relative to the total number of utterances the parent contributed. Coding proportions rather than raw number of utterances helped control for individual variation with how much each parent talked.

Results

Preliminary analyses of the variables gender, picture book order, and several other non-hypothesized variables (e.g., interaction terms in regression analyses) determined they showed no significant effects. Since these were not variables of primary interest they were omitted from further analysis.

Parent Language

Parent pronoun use from the picture book task was examined using a 2 (animal: snake vs. squirrel) x 2 (pronoun type: objectifying vs. gendered) repeated measures ANOVA on the proportion of all utterances belonging to the target categories. Results indicated a main effect for animal, \( F(1,95) = 26.28, p < .001 \), a main effect for pronoun type, \( F(1,95) = 52.85, p < .001 \), and an interaction between the two variables, \( F(1,95) = \)
94.60, $p < .001$. Although parents used more gendered terms overall for both animals, they used more objectifying pronouns ($M = 0.14$, $SD = 0.09$) and less gendered pronouns ($M = 0.19$, $SD = 0.15$) for snakes as compared to squirrels ($M = 0.09$, $SD = 0.09$, and $M = 0.32$, $SD = 0.17$, respectively). A paired samples t-test also revealed higher negative language used in reference to snakes ($M = 0.024$, $SD = 0.034$) than to squirrels ($M = 0.002$, $SD = 0.009$), $t(95) = 6.61$, $p < .001$, Cohen’s $d = 1.36$.

**Induction**

In the induction task, a variable of target projection was created. Children were considered to have projected to the target animal if they gave *andro* to snake in the human base condition, and *andro* to human in the snake base condition. A logistic regression was employed to predict target projection, and the data was split by base animal (since the target was different for each base). Predictor variables in the model were age and storybook type (categorical), as well as the SNAQ, proportion of objectifying language, and proportion of negative language (continuous). The models for each base were significant (both $ps < .022$). For the snake base, significant predictors were the proportion of objectifying and negative language (details in Table 2). This indicated that a higher presence of both objectifying and negative language from parents in the picture book task.

Table 2

*Logistic Regression for Target Projection by Base*

<table>
<thead>
<tr>
<th>Base</th>
<th>Nagelkerke $R^2$</th>
<th>$\chi^2$</th>
<th>Age type</th>
<th>Storybook type</th>
<th>SNAQ</th>
<th>Objectifying language</th>
<th>Negative language</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Exponent $\beta$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
(independent of one another) predicted a lower projection of andro to humans. For the human base condition, age was the only significant predictor, indicating that 5-year-olds were more likely to credit the snake with andro than 3-year-olds.

To examine the projection of andro to the other animals in the induction task (excluding the base and target animals) a variable was created of overall projection to these animals (scores from 0-6), and a linear regression was conducted with the predictors age, storybook type, base animal, the interaction of age x base (all categorical), parents’ SNAQ scores, and parents’ objectifying language and negative language about snakes (all continuous). This model was significant ($p < .001$) with age and objectifying language as significant predictors (see Table 3).

This regression indicated that 5-year-olds were more generous than 3-year-olds with their willingness to attribute andro to animals other than the target in the induction task. It also revealed a small effect for objectifying language, in that a higher proportion of objectifying language about snakes resulted in a lower likelihood that children would attribute andro to other animals. A follow up correlational analysis revealed that this was largely driven by the snake base condition, $r(46) = -.299, p < .039$, and not the human base condition, $r(46) = -.007, p > .96$.

Table 3

<table>
<thead>
<tr>
<th></th>
<th>Snake</th>
<th>16.70</th>
<th>2.17</th>
<th>2.37</th>
<th>1.10</th>
<th>1.12*</th>
<th>1.6*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human</td>
<td>.341</td>
<td>13.13</td>
<td>.057*</td>
<td>1.26</td>
<td>1.10</td>
<td>1.05</td>
<td>1.02</td>
</tr>
</tbody>
</table>

* $= p < .05$

*Linear Regression for the Projection of Andro to Other Animals*
Overall patterns of induction for each age in each base condition were analyzed using a series of one-sample $t$-tests, testing against chance performance, see detailed table of means (Table 4). With the snake as the base, 3-year-olds were at chance for projecting to the non-human animals and the flower, but were significantly below chance for the human, rock, and watch. With the human as the base, 3-year-olds were at chance for all non-human animals, the flower, and the rock, but significantly below chance for the watch. With the snake as the base, 5-year-olds projected greater than chance for all non-human animals, but were at chance for the human (and the flower) and significantly below chance at projecting to the rock and watch. Lastly, with the human as the base, 5-year-olds yielded results significantly above chance with all non-human animals, and significantly below chance for flower, rock, and watch. In short, 5-year-old children were more methodical in their attributing of andro in the induction task, while 3-year-old children did not differ from chance in many instances, suggesting they may not have fully formed concepts on how to categorize animals when in either base condition. However, all children showed what I will refer to as a “human exclusive pattern”: projecting the unobservable property more readily to all animals except humans (this will be discussed in more detail in the discussion).
Table 4

Mean Projection Values Per Condition

<table>
<thead>
<tr>
<th></th>
<th>3-year-olds</th>
<th>5-year-olds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Base: Snake</td>
<td>Base: Human</td>
</tr>
<tr>
<td>Snake</td>
<td>--</td>
<td>0.46</td>
</tr>
<tr>
<td>Human</td>
<td>0.25</td>
<td>--</td>
</tr>
<tr>
<td>Bird</td>
<td>0.33</td>
<td>0.46</td>
</tr>
<tr>
<td>Fish</td>
<td>0.42</td>
<td>0.46</td>
</tr>
<tr>
<td>Lizard</td>
<td>0.54</td>
<td>0.50</td>
</tr>
<tr>
<td>Horse</td>
<td>0.54</td>
<td>0.50</td>
</tr>
<tr>
<td>Squirrel</td>
<td>0.42</td>
<td>0.50</td>
</tr>
<tr>
<td>Wolf</td>
<td>0.46</td>
<td>0.42</td>
</tr>
<tr>
<td>Flower</td>
<td>0.38</td>
<td>0.33</td>
</tr>
<tr>
<td>Rock</td>
<td>0.17</td>
<td>0.33</td>
</tr>
<tr>
<td>Watch</td>
<td><strong>0.21</strong></td>
<td><strong>0.25</strong></td>
</tr>
</tbody>
</table>

Note. Bolded values indicate a significant departure above/below chance ($p < .038$).

Aversion

Based on previous behavioural research with children (LoBue, Pickard, Sherman, Axford, & DeLoache, 2013), I predicted that younger children would report less aversion to snakes than older children. This was supported in this sample with 3-year-olds reporting significantly lower aversion ($M = 3.00$, $SD = 1.45$) than 5-year-olds ($M = 3.75$, $SD = 1.55$), $t(92) = 2.42$, $p < .017$, Cohen’s $d = 0.50$. A preliminary regression analysis on children’s snake aversion was not significant, and revealed no significant effects of any continuous predictors (e.g., the SNAQ, language measures). Thus, children’s snake aversion was examined using two factorial ANOVAs, one for each age group (3 and 5), each with a 2 (storybook type) x 2 (base animal) design. Results for 3-year-old children showed a main effect of storybook type, $F(1,45) = 4.41$, $p < .043$, a main effect of base, $F(1,45) = 4.24$, $p < .047$, and no significant interaction, $F(1,45) = 0.19$, $p > .66$. This indicates that 3-year-olds who were read the objectifying book reported significantly
more snake aversion ($M = 3.42, SD = 1.35$) than those who were read the non-objectifying book ($M = 2.54, SD = 1.43$). This also reveals that 3-year-olds in the snake base condition ($M = 3.41, SD = 1.33$) reported higher snake aversion than those in the human base condition ($M = 2.6, SD = 1.44$). Results for 5-year-old children showed no significant main effects or interaction (for all $F$s $p > .28$). It is possible that 5-year-old children are less impressionable, or have already formed an opinion on snakes, and thus were not influenced by any of the experimental manipulations.

**Discussion**

The general aversion towards snakes is a widespread phenomenon (in this study, 65% of parents reported at least some anxiety about snakes), and either because of this, or perhaps preceding this, they are consistently vilified in North American culture. While some research speculates that snake aversion is innate (LoBue, 2013; Öhman & Mineka, 2003), young children and infants show no behavioural cues of fear toward snakes (LoBue, et al., 2013) suggesting that this aversion develops in childhood. However, the catalyst or contributing factors for this development has yet to be carefully examined. This research was designed to help shed some light on how parents talk about snakes, and how this relates to children’s categorization of snakes in relation to other animals and their aversion to snakes. In doing so it also tested new boundaries of children’s induction capabilities by comparing a snake as a base for categorization alongside a human, which has never been done before. This allowed for a comparison to other animals often used in induction tasks (like dogs).

Overall, the language parents used to talk about snakes with their children was more objectifying in nature than the language parents used to talk about squirrels, and
also more negative. While children generally seem to conceptualize a snake as a typical animal, these two properties of language regarding snakes reduced children’s projection of an unobservable property to a human from a snake, and parent objectifying language about snakes also reduced children’s projection of this property to other animals from a snake. Somewhat surprisingly, no parent measures (language or fear) related to children’s aversion of snakes. Replicating previous findings, 5-year-olds showed greater aversion to snakes than 3-year-olds. However, the 3-year-old’s aversion was somewhat increased by the experimental manipulation of objectification (the storybook) and also in thinking about snakes in the prior induction task.

**Parent Language**

Research on parent language about animals shows a trend for atypical animals like stick insects to be referred to in a more objectifying way than more typical animals like penguins (Geerdts et al., 2015). Snakes have never been specifically examined in this line of language research, making the current study new and relevant. Like this previous research, the current research demonstrated that parent language tends to objectify the atypical animal (snake) more than the more typical animal (squirrel). This is the first evidence of a vertebrate animal being referenced in a more objectifying way than another vertebrate. It is possible snakes are referred to in this way because they are too unlike humans and other mammals with more familiar physical appearances (e.g., legs). This may reflect that snakes are represented in a different kind of animal category, the specifics of which are difficult to determine given multiple possibilities. For this reason, it is important to know if the same language pattern is used for other reptilian species that share characteristics with typical mammals (e.g., legs), such as lizards. Or if the pattern
extends to mammalian species that look physically dissimilar to humans (e.g. whales). It is also possible that referring to snakes with objectifying language is in some way related to their negative reputation, in that perhaps being portrayed as villainous invites people to speak about snakes differently than less vilified animals. Perhaps it is simply about being disliked, since it is something found in other animals that are generally less admired like insects. It would thus be helpful to find out if other vilified animals are also spoken about in a more objectifying way than non-vilified animals.

Parents also used more negative language about snakes than they did with squirrels, often overstating the danger of snakes (e.g., “Don’t put your finger by his mouth! He might bite you!”) or a general disdain of snakes (e.g., “Baby snakes, yuck!”). The overstatement of biting is especially interesting in comparison to squirrels, as this is a very real possibility with these animals. The significantly higher proportion of negative language used with snakes likely reflects the widespread bias against snakes that exists in North American culture. Still, it is always possible there is an underrepresentation of negative language in the current sample due to parents heightened awareness that they were being recorded. Parents were also specifically asked to talk about (not just go through) the animal pictures with their children, which may have brought attention to the language they were using.

**Categorization by Induction**

A widely influential study by Carey (1985) on children’s categorization of animals was the first to identify what would be later referred to as the human-centered pattern. This pattern of categorization has two features: 1) the tendency for children to readily assign a novel unobservable property from humans to a non-human animal but
not from a non-human animal to a human, and 2) the tendency for a human to serve as a superior base for induction to additional non-human animals relative to a non-human animal. This pattern is said to be present in 5-year-old urban children, and has been described as being absent in 3-year-old urban children (Herrmann et al., 2010). In the current research I found evidence for 1) but not for 2), and instead found what appears to be more accurately described as a human exclusive pattern of categorization, that is strongly present in the 5-year-olds and present in a smaller way in the 3-year-olds.

Specifically, children included humans in the category “animal”, but only when they were the inductive base; when humans were not the inductive base, they were excluded from the animal category. While this pattern is observed in other research, it is not identified or explained as such by the authors (e.g., Herrmann et al., 2010). For the 5-year-olds, this differs from the human-centered pattern in that children readily attributed the novel property from the snake to the other non-human animals, but were at chance at extending this to the human. The present study indicates that 5-year-old children are capable of using the human-inclusive concept of animal when drawing comparisons between humans and other animals, but do not need a human to be present to include all other animals – even the snake – in a human-exclusive animal category. Thus, 5-year-olds consider snakes to be similar to, or at least belonging in the same category as, other non-human animals, unlike what the human-centred pattern would suggest. The 3-year-old children in the current research also showed this human exclusive pattern, as they were significantly below chance for extending to the human with the snake base. However, they were not significantly different from chance, with the snake or human base, for attributing the property to other non-human animals. I take this finding as
evidence that 3-year-old children generally do not use a definitive animal concept when drawing comparisons between animals. The best explanation of 3-year-olds method of categorization is that it is idiosyncratic, relying on each individual’s experiences or knowledge.

What is the source of this human exclusive pattern? One potential reason for this is that there are two definitions of the term *animal* that exist in many human cultures (Medin, Anggoro, & Waxman, 2010): one that includes humans (e.g., “Humans are the only *animals* that use language”) and another which specifically excludes humans (e.g., “Don’t eat like an *animal!*”). It may be that when humans are used as a base, this cues children to think of the human inclusive term *animal*, and when a non-human animal is used as the base, they are cued to think of the human exclusive *animal*. It is possible that if children were given a human base induction task, and then immediately given a non-human animal base induction task, this human exclusive pattern would be eliminated in the latter task, as the human-inclusive term would have been primed.

Interestingly, how parents talked about snakes reduced children’s willingness to project novel properties from them to other animals, at both ages. Higher negative and objectifying language from parents seems to strengthen children’s urge to exclude humans in the snake base condition. Higher objectifying language also reduced children’s willingness to project the property to non-human animals in this condition. Interestingly, the negative language did not reduce the projection to other animals, possibly because children only consider this information to be relevant to humans (e.g., that humans should stay away from snakes), and thus fail to consider in the presence of other animals. This is the first evidence to indicate that the way that animals are referred to, even subtly, may
impact how children conceptualize them as compared to other animals (though see Waxman et al., 2014). The language used about snakes seems specifically to affect their suitability as a good basis for comparison to other animals. It is possible that when divergent language is used for snakes, children may unconsciously put snakes into some kind of ‘other’ category of animal which is distinct from other animals (threatening, lower level, etc.). Further research should examine which other animals are referred to by parents in negative and objectifying way, and if they are treated similarly to the snake by children in subsequent categorization tasks (e.g., spider). It would be beneficial to isolate the effects of objectifying and negative language, perhaps by using a high threat, higher level animal (lion; expect more negative language) and comparing that to a low threat, lower level animal (starfish; expect more objectifying language). This could help us understand if it is objectifying language, negative language, or a combination of the two that affects children’s categorization of animals.

Taken together, these results seem to suggest that children’s categorization of animals may have a different explanation: one of experience/knowledge. It seems that with relatively little experience with animals, urban 3-year-old children do not have a reliable concept of animal, other than that it excludes humans. Older 5-year-old urban children have more experience with and knowledge about animals, and for this reason may be better at categorizing them. It is possible that rather than starting with no human centered pattern, learning it, and then loosing it again, children’s categorization of animals is better explained as a gradient of learning about the general concept of animal. But as the present data indicates that parent language influenced children’s categorization, these ideas are still open to experience at this age. Children seem to be
looking for information about these two animal terms, and are sensitive to how their parents talk about animals in the construction of these concepts. This line of thinking is consistent with research on rural and first nations populations, that also suggested experience with nature and animals affects children’s categorization of animals (Ross et al., 2003).

Children’s Aversion

As predicted, 3-year-olds reported an overall neutral opinion of the snakes, while 5-year-olds reported higher aversion. Surprisingly, parent language (objectifying or negative) and fear (SNAQ score) were not related to children’s reported aversion, not even to a small degree. One possible explanation for this is that parents most scared of snakes may be very aware of it, and in not wanting to pass this on to their children make a concerted effort to avoid negative language about snakes. Indeed, in casual conversation with parents during the debriefing several parents explicitly made statements to this effect. The fact that 5-year-olds showed higher aversion towards snakes and seemed uninfluenced by their parent’s language and fear may indicate that snake aversion is learned largely through culture and experience with other peers/adults. All things being equal, 3-year-olds would have less experience with the culture that vilifies snakes and 5-year-olds would have more exposure. While some other animals may have negative reputations in live encounters (i.e., a lion or a wolf), unlike these animals, snakes are not commonly used as protagonists, or even neutral characters in children’s media (or adult media, for that matter). This means children do not have any information or exposure to counter the negative reputation that is freely available on snakes. On the other hand, it remains possible that the general aversion towards snakes is still an innate
process in humans, the development of which is just delayed until the child is somewhat older. Without the ability to remove children from their culture, this is a challenging idea to address with research.

Interestingly, the current research revealed that the non-objectifying storybook appeared to reduce 3-year-old’s reported aversion toward snakes. It is possible that since the snake in this storybook has experiences not unlike those of the children themselves (i.e. feeling hungry or afraid), this helps children relate to them through analogy (countering the emerging aversion). It is also possible that the objectifying language in the book presents snakes as different than other animals, having children perceive them as different, and scarier as a result (increasing the emerging aversion). A very different possibility is that just reading any neutral book about snakes, objectifying or not, reduces aversion and this modest effect is a result of one type of book being only slightly more effective (since 3-year-olds tended to be fairly neutral about the snake). Since we did not have a no book condition, it is impossible to know for sure which of these explanations is the most reasonable. One complication pertaining to explanations regarding the non-objectifying book is that the snake was always referred to with female pronouns. It is unknown whether employing a female snake could evoke gender stereotyping in young children, downplaying her “threatening” status. Only research that compared male vs. female pronouns could address this issue. No such effect of storybook type was observed in the 5-year-old children, suggesting again that 3-year-olds relative lack of experience with culture might make them more malleable in their opinions of animals, and that they may always be looking for information to form ideas or opinions about them. This is the first research to suggest that widespread snake aversion may be the result of the
reputation they hold in culture in general, and that it may develop with age rather than be innate. It is also the first research to suggest that this aversion is possibly malleable through language and education at a young age.

Having the snake as the base animal also associated with higher snake aversion for 3-year-olds. One possible explanation for this result could be related to children’s human exclusive pattern in the induction task when snake is used as the base. It is possible that excluding humans from being similar to snakes in a categorization task immediately before the aversion task primed children to report them as scarier in the aversion task. Future research could address this by having children categorize animals as similar or dissimilar to humans, and observe how this affects their reported fear of those animals afterwards.

It is important to note that the 3-year-old children (but not 5-year-old children) seemed to struggle with the aversion task. A simpler scale (maybe a binary like/dislike) may be more appropriate for future studies with such young children. Observing their behaviour toward real animals may be the best measure of their aversion toward them, though live animal research is far more complex and inconvenient. Still, 3-year-olds reported aversion in this task remained semi-reliable through the noise of their responses, especially regarding highly aversive animals (like the spider). However, it would be prudent to conduct further research with young children using simpler aversion measures, or by observing children’s behaviour toward live snakes, to examine any effects of language about snakes.

Conclusion
Early childhood appears to be a critical time for contributing to how children build categories and concepts of animals, and where they place animals amongst these varying ideas. How parents speak about snakes, both in subtle pronoun choices and in more explicit negative comments, contributes to how children relate humans (and themselves) to these animals. This is thus a time when an opportunity can be taken, and the information given to children at this age examined. Although beyond the scope of this study, I believe more exposure to neutral or positive snake characters in media, education, and books may help combat some of this differential language, and perhaps even aversion. A predisposition for snake aversion may not be innate, given that 5-year-olds were more afraid of snakes, and that the objectifying storybook slightly increased 3-year-olds aversion (though innate hypotheses are not ruled out entirely). It is likely that the exposure to negative information about snakes, and their general villainous status in culture has at least some impact on the development of snake aversion. Perhaps it is an accumulation of culture, media, and parent/role model impact rather than just one of these individually. Making an effort to improve public understanding of these often-misunderstood animals could reduce the alienation of snakes, which could lessen the harm snakes face as a species, and potentially alleviate anxiety on the part of humans as well.
References


https://doi.org/10.1037/1528-3542.3.1.3


Appendix A

SNAQ-12

Please work through the next 12 statements. For each statement, indicate whether you rather agree or rather disagree. If you agree with the statement answer with YES, if you disagree with the statement answer with NO. Do not think too much about it – your initial responses are usually the best. Thank you.

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>I would feel some anxiety holding a toy snake in my hand.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>2</td>
<td>If a picture of a snake appears on the screen during a motion picture, I turn my head away.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>3</td>
<td>I dislike looking at pictures of snakes in a magazine.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>4</td>
<td>I am terrified by the thought of touching a harmless snake.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>5</td>
<td>If someone says that there are snakes anywhere about, I become alert and on edge.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>6</td>
<td>When I see a snake, I feel tense and restless.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>7</td>
<td>I feel sick when I see a snake.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>8</td>
<td>The way snakes move is repulsive.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>9</td>
<td>If I came upon a snake in the woods I would probably run.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>10</td>
<td>I'm more afraid of snakes than any other animal.</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>11</td>
<td>I would prefer not to finish a story if something about snakes was introduced into the plot</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>12</td>
<td>Even if I was late for a very important appointment, the thought of snakes would stop me from taking a shortcut through an open field.</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
Appendix B

Ethics Application and Approval Certificate

Application for Behavioural Research Ethics Review

Evaluating Applications
The matters of greatest concern to the Behavioural Research Ethics Board (Beh-REB) are the issues of informed consent of participants, voluntary participation, protection of individual privacy (confidentiality and anonymity), and safeguarding participants from any harmful results due to participation or non-participation in the proposed investigation or research project. Our evaluation of an application is based on the degree to which each of these concerns are satisfied; when filling out the application, researchers are urged to consider these points, and to explain to the Beh-REB the steps they will take to address the concerns. Researchers are also urged to consult the Tri-Council Policy Statement 2 for more information and guidance.

The Beh-REB acknowledges the variety of paradigms and methodologies currently available to researchers, and that each of these paradigms entails its own particular ethical issues. Thus, there may be more than one way to address an ethical issue. Researchers should feel free to suggest alternative approaches or to explain why a particular requirement is not appropriate in the context of a given project.

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<table>
<thead>
<tr>
<th>PART 1: IDENTIFICATION</th>
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<tbody>
<tr>
<td><strong>1.1</strong> Project Title</td>
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<tr>
<td>Children's feelings and categorization of animals</td>
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<tr>
<td><strong>1.2</strong> Principal Investigator</td>
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<tr>
<td>Full Name:</td>
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<tr>
<td>Mailing Address:</td>
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<td>Email:</td>
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<tr>
<td>Phone:</td>
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<tr>
<td>NSID number (U of S faculty only):</td>
</tr>
<tr>
<td><strong>1.3</strong> University/Institutional Affiliation of Principal Investigator</td>
</tr>
<tr>
<td>Position:</td>
</tr>
<tr>
<td>Department:</td>
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<tr>
<td>Division:</td>
</tr>
<tr>
<td><strong>1.4</strong> If this is a student/graduate/resident project, please provide the following information:</td>
</tr>
<tr>
<td>a) Student Name(s) and Student ID or NSID (s):</td>
</tr>
<tr>
<td>b) Supervisor Name:</td>
</tr>
<tr>
<td><strong>1.5</strong> Project Personnel (include graduates/post graduates/residents):</td>
</tr>
<tr>
<td>Full Name:</td>
</tr>
<tr>
<td>Project Position/Role:</td>
</tr>
<tr>
<td>University/Institutional Affiliation:</td>
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<tr>
<td>Email:</td>
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<tr>
<td>Phone:</td>
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<tr>
<td><strong>1.6</strong> Primary Contact Person for Correspondence (if different than Section 1.2)</td>
</tr>
<tr>
<td>Full Name:</td>
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<tr>
<td>Mailing Address:</td>
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<tr>
<td>Email:</td>
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<tr>
<td>Phone:</td>
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</table>
### PART 2: CONFLICT OF INTEREST

#### 2.1 Is there any real, potential or perceived conflict of interest (any personal or financial interest in the conduct or outcome of this project)?

No

#### 2.1.2 Will any of the researcher(s), members of the research team and/or their immediate family members:

- Receive personal benefits in connection with this project over and above the direct costs of conducting the project, such as remuneration or employment?
- Receive significant payments of other sorts from the sponsor such as grants, compensation in the form of equipment or supplies or retainers for ongoing consultation and honoraria?
- Have a non-financial relationship with a sponsor (such as unpaid consultant, board membership, advisor or other non-financial interest)?
- Have any direct involvement with the sponsor such as stock ownership, stock options or board membership.
- Hold patents, trademarks, copyrights, licensing agreements or intellectual property rights linked in any way to this project or the sponsor?
- Have any other relationship, financial or non-financial, that if not disclosed, could be construed as a conflict of interest?

Yes ☐ No ☒

### PART 3: BRIEF OVERVIEW OF RESEARCH PROJECT

**Briefly describe the project, its objectives and potential significance (250-500 words):**

The fear of snakes has long been believed to be a result of an evolutionary adaptation, to avoid danger and ultimately pass on one's genes. In this way, snake fear has been thought to be purely innate, leaving little to no room for experience to change it.

However, recent research into the behaviour of children toward snakes points to another conclusion, with young children consistently showing no fear behaviour or physiological signs of fear toward snakes, until they are about 4 to 5 years-old. This observation suggests that while snake fear is common, it does not appear to be innate, or even present in children until they reach a certain age, or more likely, experience level. Much research suggests that language and exposure to negative information about an animal affects the way that children feel about that animal. Since children base their opinions about unknown entities on trusted sources like parents, it is likely that they do this for their feelings about animals as well as how they categorize them. For these reasons I am proposing a study to examine how parent language (e.g., negative language) affects children's snake aversion and snake conceptualization.

In this study, 3- and 5-year-old children will come into the lab with their parent or guardian and will go through some animal
picture books with their parents, including a book about snakes. They will then read a snake storybook with the researcher, which will vary in the use of language regarding snakes. After this they will participate in an induction task, in which they will categorize different animals. Finally, they will be shown pictures of animals and asked how afraid a third party (puppet) should be about them.

This research will improve our understanding of snake aversion, how it is developed, and how language effects the way that children categorize snakes.

### 3.2 Provide a description of research design and methods to be used: GN 3.2
Stimuli will include a snake and a squirrel picture book, two snake storybooks, finger and hand puppets to help keep children interested and engaged in the tasks, and several laminated pictures of various animals and objects. The snake storybooks will tell a simple child friendly story about a snake, and vary in the kind of language used regarding the snake (one will use a gendered pronoun such a "he" or "she", while the other will use "it").

**Procedure**
Parents will first be provided with a snake picture book and a squirrel picture book, they will be asked to go through each book with their child for about 5 minutes. Children will then be read one of two story books about a snake by the researcher. While this is happening, parents will fill out a brief 12-item snake fear questionnaire. Children will then participate in two tasks which are game-like and child friendly. The first will be an induction task, in which they will be shown a picture of a human or a snake and told it has some unobservable property, such as that it has "andro" inside of it. Children will then be shown pictures of other objects and animals and asked if they also have andro inside of them. The second will be children will be shown pictures of numerous animals and asked to rate how a puppet should feel about these animals on a scale of 5 faces, from happy (1) to neutral (3) to very scared (5). The entire session will be video recorded.

### 3.3 Provide details regarding the duration and location of data collection event(s): GN 3.3
Data collection will take place in the Early Cognitive Development Lab on the U of R campus. Each data collection event will take approximately 60 minutes.

- [x] Questionnaire
- [ ] Individual Interviews
- [ ] Group Interview
- [x] Video/audio recording
- [ ] Home Visits
- [ ] Other: ______________________

- [x] Participant Observation
- [ ] Focus Groups
- [ ] Non-invasive physical measurements
- [ ] Secondary use of data or analysis of existing data
- [ ] Ethnography

### PART 4: PROJECT DETAILS

#### 4.1 Will you have any internet-based interaction with participants? GN 4.1
- [ ] Yes  [x] No

#### 4.2 Will your research involve Aboriginal Peoples including First Nations, Inuit and Métis peoples? GN 4.2
- [ ] Yes  [x] No

#### 4.3 Will the project involve community-based participatory research? GN 4.3
- [ ] Yes  [x] No

#### 4.4 Will deception of any kind be necessary in this project? GN 4.4
- [ ] Yes  [x] No

**Indicate how the participants will be debriefed following their participation (if applicable), and describe how the information on the results of the research will be made available to participants once the study has ended. Debriefing is particularly important if deception has been used. GN 4.5**

Parents of participants will be verbally informed of the study's design and hypotheses following their participation. They will be given the contact information of the Dr. Jeff Lucks' lab web site, both verbally and on the consent form, and will be told that publication of the results may be available on the site at a future date.

#### 4.6 Will participants be compensated? GN 4.6
- [x] Yes  [ ] No

**Please include details:**
Child participants will be compensated with a small toy (approximately $5.00 value). Parents of participants will also be reimbursed for their parking fees.

### 4.7.1 Will participants be anonymous in the data gathering phase of the study? (Anonymous means that no link can be established between the participant and the research - no one including the researcher knows who has participated in the research):

- [ ] Yes
- [x] No

### 4.7.2 Will the confidentiality of participants and their data be protected? (Confidentiality means that no link can be established between the collected information and the participant's identity)

- [x] Yes
- [ ] No

### 4.7.3 If yes, are there any limits to confidentiality:

- [ ] Limits due to the nature of group activities (e.g. focus groups): the researcher cannot guarantee confidentiality
- [ ] Limits due to context: individual participants could be identified because of the nature or size of the sample or because of their relationship with the researcher.
- [ ] Limits due to selection: procedures for recruiting or selecting participants may compromise the confidentiality of participants (e.g. participants are referred to the study by a person outside the research team)
- [ ] Other:

---

### PART 5: ESTIMATION OF RISKS AND BENEFITS

#### 6.1.1 Do you consider this project to be: GN 6.1

- [x] Minimal Risk
- [ ] Above Minimal Risk

#### 6.1.2 Indicate if the participants might experience any of the following:

- **Risk of psychological or emotional harm or discomfort (e.g. trauma, anxiety, stress)**
  
  No anxiety is expected from children given previous research that indicates children have no natural aversion to snakes. A minor amount of parents may be discomforted by pictures of snakes, but they will be made aware of the snake pictures prior to consent and will be able to discontinue viewing the pictures at any time.

- **Legal repercussions for participating in the study (e.g. possibility of being sued, charged with criminal activity, disclosure of past or future criminal activities, etc.)**
  
  No.

- **Social repercussions (e.g. ostracized, being negatively judged by peers or employer, fired from your job)**
  
  No.

- **Risk of physical harm or discomfort (e.g. falling, muscle pain, tiredness, weakness, nausea)**
  
  No.

#### 6.1.3 Describe how the risk will be managed (including an explanation as to why an alternative approach could not be used). If appropriate, identify any resources, e.g. physician or counselor, to which participants can be referred. GN 6.1.3

#### 6.1.4 If above minimal risk, what are the likely benefits of the research to the researcher, participant, the research community and society that would justify asking participants to participate? GN 6.1.4

---

### PART 6: PARTICIPANT RECRUITMENT

#### 6.1 Describe the participants and the criteria for their inclusion or exclusion. Indicate the number of participants and a brief rationale for the intended number of participants: GN 6.1

Children between the ages of 3 and 5 will be included. Children whose native language is not English will be excluded from participation. 120 participants total will be needed in order to achieve desired power. More will likely be recruited because some children may not complete all tasks.
### 6.2.1 Provide a detailed description of the method of recruitment. **GN 6.2**

Parents of child participants will be contacted from the Early Cognitive Development Lab’s developmental database. This is a secure electronic database, hosted on one of the lab’s research computers, which contains a list of names and contact information of interested parents in the community who would like to potentially participate in one of the lab’s studies.

From this database, parents who have children that are of an eligible age for one of the studies will be contacted, by telephone or email, and asked if they would like to participate in the study. They will be told about what they and their child would be asked to do in the study, how long the study will take, and what kind of compensation is available. Parents will be reminded during this conversation that they are in no way obligated to participate.

### 6.2.2 How will prospective participants be identified?**

Prospective participants will be identified from the database as families that have children that are of an appropriate age for one of the studies.

### 6.2.3 Who will contact prospective participants? Describe the source of the contact information, how they will be contacted and as applicable, who originally collected the contact information. Ensure any letters of initial contact or other recruitment materials are attached, e.g. advertisements, flyers, telephone script, etc.

The principal investigator will contact prospective participants via telephone or email.

### 6.3 In cases where the research involves special or vulnerable populations, distinct cultural groups, or in cases where the research is above minimal risk, the researcher should describe their experience or training in working with the population. If none of these criteria apply, this section may be omitted. **GN 6.3**

The principal investigator has 3 years experience working with children and at-risk youth at the Ranch Ethnic Society.

### 6.4 Where relevant, please explain any relationship (pre-existing, current or expected to have) between the researcher(s) and the researched (e.g. instructor-student, manager-employee, co-workers, family members/intimate relationships, etc.). Please pay special attention to relationships in which there may be a power differential. Describe any safeguards and procedures to prevent possible undue influence, coercion or inducement. **GN 6.4**

There will be no pre-existing relationship between the principal investigator and families.

## PART 7: CONSENT PROCESS

Describe the process that will be used to obtain informed consent. Please note that it is the content of the consent, not the format that is important. If the research involves collection of personally identifiable information from a research participant or extraction of personally identifiable information from an existing database, please describe how consent from the individuals or authorization from the data custodian will be obtained. If there will be no written consent, please provide a rationale for oral or implied consent (e.g., cultural appropriateness, online questionnaire, etc.) and explain how consent will be recorded.

### 7.1 Describe the consent process. **GN 7.1**

Parents and their children will be brought in the lab reception area. The child will be entertained by a trained graduate student or undergraduate research assistant while the principal investigator does informed consent with the parents. Parents will be given background about the rationale for the study, and will be told what they and their child will be doing during the study. They will be told that they will be present during all study sessions, and will be able to observe all of their child’s behaviour during the study. They will also be told that they or their child can discontinue participation at any time. All of this information will be on the written consent form, but will also be explained to the parents verbally. Verbal assent will also be obtained from child participants.

### 7.1.2 Who will ask for consent?

The principal investigator.

### 7.1.3 Where, and under what circumstances will consent be obtained?

Consent will be obtained in the Early Cognitive Development Lab.

### 7.1.4 Describe any situation in which the renewal of consent for this research might be appropriate and how this would take place (e.g. longitudinal studies, multiple data collection events, etc.).

If any or all of the participants are children and/or are not competent to consent, describe the process by which capacity/competency will be assessed, the proposed alternate source of consent - including any permission/information letter to be provided to the person(s) providing the alternate consent - as well as the assent process for participants. **GN 7.2**

After parents provide consent, the principal investigator will seek verbal assent from children. Children will be asked if they want to read books with their parent, and the principal investigator, and play games with the principal investigator as well. They will be told any way they want to read and play is okay, and that they can stop whenever they want.

### 7.3 Describe your plans for providing project results to the participant. **GN 7.3**

During informed consent as well as during debriefing, parents will be given the address of the lab’s web site, where research
7.4 How and when are participants informed of the right to withdraw? What procedures will be followed for participants who wish to withdraw at any point during the study? **GN 7.4**

Parents will be told during informed consent that they may withdraw at any time point during the study, even partway through the study procedures. This point will be clearly emphasized, since children more often than adults sometimes choose to quit participation. When a parents wishes to withdraw, they will be given the option to have their data removed from the study. Participants will still be compensated (parking reimbursement and the child’s small gift) if they withdraw from the study early.

### PART 8: DATA SECURITY AND STORAGE

Indicate the procedures you plan to implement to safeguard and store the data. Identify the person who will be assuming responsibility for data storage (University policy requires the researcher or the supervisor, in the case of student research, to securely store the data at the University for a minimum of five years upon the completion of the study. For more information see **U of S Responsible Conduct of Research Policy** or **U of R Records and Information Management Policy**.

#### 8.1 Who will conduct the data collection? **GN 8.1**
The principal investigator

#### 8.2 Who will have access to the original data of the study? **GN 8.2**
The principal investigator, the faculty supervisor, and research assistants in the Early Cognitive Development Lab.

#### 8.3 How will confidentiality of original data be maintained as well as preserving or destroying data after the research is completed. For all data (e.g. paper records, audio or visual recordings, electronic recordings), indicate the: **GN 8.3**

<table>
<thead>
<tr>
<th>Subsection</th>
<th>Details</th>
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<tbody>
<tr>
<td>8.3.1</td>
<td>Person responsible for data storage: The principal investigator and faculty supervisor</td>
</tr>
<tr>
<td>8.3.2</td>
<td>Data security during transportation from collection site: n/a</td>
</tr>
<tr>
<td>8.3.3</td>
<td>Means and location of storage (e.g. a locked filing cabinet, password protected computer files, encryption): Consent forms will be kept in a locked file cabinet in the lab. Data codes linking data to a particular participant will be stored separately from the consent forms, also in the lab. The video and computerized data collected from participants during the task will be housed on non-networked computers in the lab.</td>
</tr>
<tr>
<td>8.3.4</td>
<td>Time duration of storage (Must be &gt; 5 Years): Unlimited</td>
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<tr>
<td>8.3.5</td>
<td>Final disposition (archive, shredding, electronic file deletion): When data is finally disposed, consent forms and data codes will be shredded securely, and video and computerized data will be deleted.</td>
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</table>

#### 8.4 Indicate how the data collected is intended to be used (thesis, journal articles, conference presentation, media, etc.). **GN 8.4**
The data for this project is mainly intended for the completion of a masters thesis, and for potential publication and conference presentation.
PART 9: Declaration by Principal Investigator (or Supervisor for student projects)

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<th>Project Title</th>
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<td>Children's feelings and categorization of animals</td>
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- I confirm that the information provided in this application is complete and correct.
- I accept responsibility for the ethical conduct of this project and for the protection of the rights and welfare of the human participants who are directly or indirectly involved in this project.
- I will comply with all policies and guidelines of the University and Health Region/affiliated institutions where this project will be conducted, as well as with all applicable federal and provincial laws regarding the protection of human participants in research.
- I will ensure that project personnel are qualified, appropriately trained and will adhere to the provisions of the REB-approved application.
- I certify that any significant changes to the project, including the proposed method, consent process or recruitment procedures, will be reported to the Research Ethics Board for consideration in advance of its implementation.
- I certify that a status report will be submitted to the Research Ethics Board for consideration within one month of the current expiry date each year the project remains open, and upon project completion.
- If personal health information is requested, I assure that it is the minimum necessary to meet the research objective and will not be reused or disclosed to any parties other than those described in the REB-approved application, except as required by law.
- I confirm that adequate resources to protect participants (i.e., personnel, funding, time, equipment and space) are in place.
- I understand that if the contract or grant related to this research project is being reviewed by the University or Health Region, a copy of the ethics application inclusive of the consent document(s), may be forwarded to the person responsible for the review of the contract or grant.
- I understand that if the project involves Health Region resources or facilities, a copy of the ethics application may be forwarded to the Health Region research coordinator to facilitate operational approval.

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<thead>
<tr>
<th>Signature of Principal Investigator and/or Supervisor</th>
<th>Printed Name of Principal Investigator and/or Supervisor</th>
<th>Date (MM/DD/YY)</th>
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<th>Signature of Student Investigator</th>
<th>Printed Name of Student Investigator</th>
<th>Date (MM/DD/YY)</th>
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Department Head (UofS and RQHR only): The signature/approval of the Department/Administrative Unit acknowledges that he/she is aware of and supports the research activity described in the proposal.

<table>
<thead>
<tr>
<th>Signature of Department Head</th>
<th>Printed Name of Department Head</th>
<th>Date (MM/DD/YY)</th>
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Research Ethics Board
Certificate of Approval

PRINCIPAL INVESTIGATOR: Denée Buchko

DEPARTMENT: Psychology Department

REB#: 2018 078

SUPERVISOR: Dr. Jeff Loucks

TITLE: Children’s feelings and categorization of animals

APPROVED ON: May 8, 2018

RENEWAL DATE: May 8, 2019

APPROVAL OF:
Application for Behavioural Research Ethics Review, Assent Script for Children, Consent Form, SNAQ-12, Brief Participant Information Form

Full Board Meeting □ Delegated Review ☑

The University of Regina Research Ethics Board has reviewed the above-named research project. The proposal was found to be acceptable on ethical grounds. The principal investigator has the responsibility for any other administrative or regulatory approvals that may pertain to this research project, and for ensuring that the authorized research is carried out according to the conditions outlined in the original protocol submitted for ethics review. This Certificate of Approval is valid for the above time period provided there is no change in experimental protocol, consent process or documents.

Any significant changes to your proposed method, or your consent and recruitment procedures should be reported to the Chair for Research Ethics Board consideration in advance of its implementation.

ONGOING REVIEW REQUIREMENTS
In order to receive annual renewal, a status report must be submitted to the REB Chair for Board consideration within one month of the current expiry date each year the study remains open, and upon study completion. Please refer to the following website for further instructions: http://www.uregina.ca/research/for-faculty-staff/ethics-compliance/human/forms1/ethics-forms.html.

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