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Juri Nakagawa

Tokyo University of Agriculture and Technology, s213560t@st.go.tuat.ac.jp

Naoko Koda

Tokyo University of Agriculture and Technology, koda@cc.tuat.ac.jp

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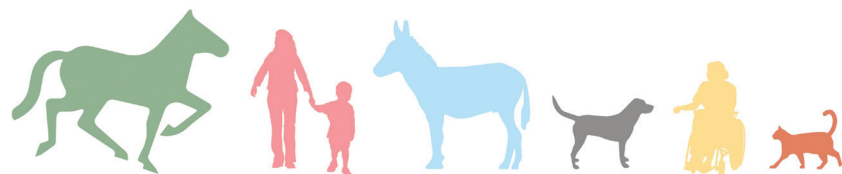
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Emotional Depictions of Dogs and Cats in Interactions with Humans in Picture Books

Juri Nakagawa¹ and Naoko Koda¹

Keywords: cats, dogs, emotion, human-animal interaction, picture books

Abstract This study quantitatively analyzed the depiction of dogs' and cats' emotions in picture books and discussed the effects on children's recognition of real dog and cat emotions. The stories depicted many basic emotional depictions of interest, joy, and surprise in dogs and cats, whereas the humans in the stories showed more varied, complicated emotions. Interest was most often caused by familiar humans in dogs, and by objects in cats. Joy was most often caused by familiar humans in dogs and cats, which would lead child readers to recognize that dogs and cats are friendly toward humans. There were depictions of dogs and cats being provoked to anger and disgust by human behaviors, which could affect children's recognition of inappropriate behaviors toward real dogs and cats. Threatening behaviors toward humans were performed by feral dogs, not household dogs, which would cause children to underestimate the potential danger of bite accidents by household dogs. The nature and domestication process of dogs and cats and the images held by the authors of the books are reflected in the depictions of emotions. Picture books are expected to contribute to establishing better human-animal interactions.

Introduction

Picture books are a familiar medium for children. Picture books help children learn language, biological facts and concepts, problem solving, and morality (Strouse et al., 2018); acquire empathy and consideration (Pan, 2019); and develop their personality and sociality (Legas, 2019). Compared with television,

which is also a familiar medium for children, picture books allow children to actively enjoy at their own pace, making it easier to expand their imagination and leading to intellectual and emotional development (Sato, 2004). Furthermore, the National Curriculum Standard for Kindergartens of the Ministry of Education, Culture, Sports, Science and Technology, Japan (2017) states that in the process of

(1) Tokyo University of Agriculture and Technology

communicating with teachers and friends, children become familiar with picture books and stories, and they acquire rich language and expressions, convey their experiences and thoughts verbally, listen carefully to others' stories, and enjoy verbal communication. This shows the importance of picture books in early childhood education.

Children are attracted to animals from an early age. Four-month-olds preferred visual stimuli of animals to objects (Deloache et al., 2011). Also, in experiments with animals and toys, young children preferred animals regardless of the species' threat (LoBue et al., 2012). Encounters between children and animals can be classified as direct or indirect. Direct examples include rearing animals at home and in places of education and observing and interacting with animals at zoos. Indirect examples include encounters through a medium (Shimatani & Koda, 2021). Many picture books depict animals, and they are one of the leading media that offer children indirect encounters with animals. In addition, dogs and cats are the most familiar companion animals. It is estimated that there are 8,797,000 dogs and 9,778,000 cats in Japanese households (Japan Pet Food Association, 2019). The number of dogs and cats is extremely large compared with other pet species (Cabinet Office, 2010). Keeping dogs and cats is beneficial in enhancing children's self-esteem, ability to empathize with others, and cognitive ability (Robinson, 1995), as well as promoting understanding of the importance of life (Koshimura, 2015). However, there are also problems such as bite accidents and animal abuse. There were 4,249 dog bites in fiscal year 2018 in Japan, most of which were caused by household dogs. Cat bites also occurred, although the number was small compared with dog bites (Ministry of the Environment, 2019). Most victims of dog bites are children (Horisberger et al., 2004). A cause of dog bites to children is the victims' inability to recognize signs of dog aggression, such as a low tail that is wagging being misinterpreted as a friendly sign (Mathews & Lattal, 1994). Children feel comfortable when they are with dogs and tend to think that dogs feel the same way; they may treat them in an inconsiderate way, which may cause

the dog to bite the child. Bite accidents can cause physical and mental trauma to the victims (Schalomon et al., 2006). When children abuse animals, the relationships deteriorate. Among 105 arrested cases of animal abuse in 2019 in Japan, 27 were for dog abuse and 66 were for cat abuse (National Police Agency, 2020). Children's abuse of animals includes intentional violence and unintentional fear caused by the child's ignorance. Some cases of animal abuse by children may persist into adolescence (Rigdon & Tapia, 1977) and develop into interpersonal violence in adulthood (Ascione, 2005). Therefore, to reduce the risk of dogs or cats biting children and animal abuse by children, it is necessary to enhance children's understanding of dog and cat emotions.

Children develop their emotions in stages. Newborns feel comfort, distress, and interest; however, by about 3 months of age, joy is differentiated from comfort, and sadness and disgust are differentiated from distress. By about 6 months of age, anger and fear are differentiated from disgust, and surprise is differentiated from interest. At 1 year and 6 months of age, children are able to feel embarrassment, envy, and empathy. At 3 years of age, they acquire pride, shame, guilt, and more complex emotions (Lewis, 2000). Even newborns prefer visual stimuli related to faces (Valenza et al., 1996). Children aged 3 years and 6 months can identify facial photographs of six basic emotions (joy, surprise, sadness, anger, disgust, fear) accurately, and this ability develops with age (Boyatzis et al., 1993). Joy is the most recognizable emotion to children (Felleman et al., 1983), and negative emotions are less recognizable than positive ones (Camras & Allison, 1985). Children could correctly identify many facial expressions representing basic emotions in picture writings as well as in photographs (Oleszkiewicz et al., 2017). Thus, it is suggested that children can identify many expressions depicted in picture books and relate them to the actual expressions.

Research Question

The depiction of animals in picture books may affect children's image and knowledge of animals, which

are critical to the safety and benefits of both children and animals in their direct interactions. However, to our knowledge, there are no quantitative studies focusing on the depiction of animals' emotions in picture books. The purpose of this study was to quantitatively clarify the features of emotional depictions of dogs and cats in interaction with humans in picture books and to discuss the potential effects of picture books on children's understanding of the real emotions of dogs and cats. In other words, this study investigated how the emotions of dogs and cats were depicted in picture books and whether the depictions were in accord with the construction of positive relationships between humans and animals.

Methods

The subjects of this study were narrative picture books for children from 2 to 6 years old in the developmental stage of understanding of self and others' emotions, in which dogs or cats and humans appear, and in which their emotional depictions can be confirmed. These books were possessed by an ordinary family, who periodically subscribed to them. This system delivers picture books every month to the contracted home according to the child's age. The company has been operating for many years and is popular with families with children in Japan. There were 481 picture books; 461 books were delivered by the subscription system and 20 books were purchased or donated to the family. Among 481 picture books checked, dogs or cats and humans appeared in 165 books. Then, picture books with emotional depictions were extracted, and to avoid bias up to three books were randomly included as subjects if they were in the same series or produced by the same authors. Ultimately, 92 picture books were analyzed. Among them, 73 books (79.3%) were found on Ehon Navi (<https://www.ehonnavi.net>), the largest information website specializing in picture books and children's books in Japan, and all of them were highly evaluated with a rating of 3 or more out of 5 by customers. Thus, the books surveyed were considered familiar among Japanese children.

The following information was recorded.

1. Protagonists: species, age [juvenile/adult/unknown], and sex [male/female/unknown].
2. Dogs and cats: species, age, sex, role [protagonist/supporting character/background], and rearing condition [household/feral]. Roles were defined as follows: a character who was in the main flow of the story was defined as the "protagonist," a character who was not in the main flow of the story but appeared in the text was defined as a "supporting character," and a character who did not appear in the text but only in the pictures was defined as "background" (Shimatani & Koda, 2021). Rearing condition was judged by the description in the text or whether the animal was depicted with a collar or in a human house.
3. Emotional depictions of dogs and cats: type of emotion [synchronized/ individual], reason (situation) that the emotion occurred, and classification of basic emotions [interest/joy/surprise/distress/anger/disgust/contempt/fear/shame/guilt] (Izard, 1977). "Synchronized emotion" was defined as the dog/cat and human expressing the same emotion in the same scene. "Individual emotion" was defined as an unsynchronized emotion that either the dog/cat or human expressed in the same scene.
4. Humans with individual emotions: age, sex, and role.
5. Emotional depictions of humans with individual emotions: type of emotion, unsynchronized species, and reason for the emotional occurrence.

Emotions were judged from facial expressions and gestures in pictures and descriptions in the text. Emotions not corresponding to basic emotions were recorded as others. Also, reasons for the occurrence of the emotions were judged from pictures, text, and the flow of the stories. When it was difficult to make a judgment, two judges consulted. A chi-square test was used for data analysis, and post-hoc analysis was performed using residual analysis.

Table 1. Frequency of Occurrences of Dogs' and Cats' Emotions

	Interest	Joy	Surprise	Distress	Anger	Disgust	Contempt	Fear	Shame	Guilt	Others	Total
Dog	37	124	60	1	4	2	0	3	0	0	18	249
Cat	48	74	27	3	7	6	0	3	0	0	26	194

The survey was conducted in 2020. There was no conflict of interest.

Results

Among 92 books analyzed, 86 books were drawn by Japanese and 6 books by foreign authors. The publication year ranged from the 1950s ($n = 1$), 1970s ($n = 3$), 1980s ($n = 2$), 1990s ($n = 42$), to the 2000s ($n = 44$). Of the 89 picture books, excluding 3 books with unknown protagonists, the protagonists consisted of humans ($n = 77$ books), dogs ($n = 3$), cats ($n = 3$), other animals ($n = 7$), and an object ($n = 1$). There were 60 books with juvenile protagonists, 18 books with adult protagonists, and 11 books in which the age was unknown. There were 53 books with male protagonists, 37 books with female protagonists, and 2 books in which the sex was unknown. Furthermore, 70 dogs and 62 cats appeared in the picture books. There were 3 stories where dogs were protagonists, 39 where dogs were supporting characters, and 28 where the dogs were in the background. In addition, there were 3 stories where cats were the protagonists, 32 stories where cats were supporting characters, and 25 stories where cats were in the background. Among them, 49 dogs (70.0%) and 38 cats (61.3%) were household animals.

Table 1 shows the frequency of occurrences of various emotions in dogs and cats in picture books. In dogs, joy was the most common, followed by surprise and interest. In cats, joy was the most common, followed by interest and surprise. These three emotions were predominant.

Table 2 shows the frequency of occurrences of synchronized emotions with humans and individual emotions among the top three common emotions in dogs and cats. In dogs, a chi-square test indicated

Table 2. Frequency of Occurrences of Synchronized Emotions and Individual Emotions among the Top Three Common Emotions in Dogs and Cats

		Synchronized	Individual
Dog	Interest	11***	26***
	Joy	111***	13***
	Surprise	38	22
Cat	Interest	13***	35***
	Joy	63***	11***
	Surprise	16	11

*** $p < .001$

a significant difference ($\chi^2 [2, N = 221] = 54.36, p < .001, V = .496$). Residual analysis revealed that interest appeared significantly more as an individual emotion and that joy appeared significantly more as a synchronized emotion ($p < .001$). Cats showed a similar tendency. A chi-square test indicated significant difference ($\chi^2 [2, N = 149] = 41.63, p < .001, V = .529$). Residual analysis revealed that interest appeared significantly more as an individual emotion, and that joy appeared significantly more as a synchronized emotion ($p < .001$).

Table 3 shows the frequency of humans categorized by age, sex, and role who were emotionally synchronized with dogs or cats. In terms of age, children were more likely to be synchronized with dogs and cats; in terms of sex, synchronization was almost evenly distributed; and in terms of the role, protagonists were most likely to be synchronized with dogs and cats. A chi-square test indicated a significant difference in role ($\chi^2 [2, N = 121] = 8.02, p < .01, V = .257$). Residual analysis revealed that background humans were significantly more likely to be synchronized with dogs, and less likely with cats ($p < .01$).

Table 4 shows the frequency of occurrences of the humans' individual emotions. Joy was the most common, followed by surprise, fear, and interest. The high number of emotional occurrences of interest, joy, and surprise was similar to that of dogs and cats.

Among human emotions, there were more occurrences of fear than interest, which was one of the top

Table 3. Distribution of Age, Sex, and Role of Humans Who Were Emotionally Synchronized with Dogs or Cats

	Dog	Cat
Juvenile	42	29
Adult	22	18
Man	35	27
Woman	35	25
Protagonist	37	36
Supporting character	17	14
Background	15**	2**

** $p < .01$

Table 4. Frequency of Occurrences of Individual Emotions in Humans

Interest	Joy	Surprise	Distress	Anger	Disgust	Contempt	Fear	Shame	Guilt	Others	Total
16	70	42	5	12	6	4	21	0	1	35	212

Table 5. Frequency of Occurrences of Individual Emotions among the Top Four Common Emotions in Humans

	Unsynchronized with	
	Dog	Cat
Interest	3*	13*
Joy	33*	52*
Surprise	27	21
Fear	20***	2***

* $p < .05$, *** $p < .001$

three common emotions in dogs and cats. Therefore, the top four emotions including fear were examined. Table 5 shows the frequency of occurrences of the top four common emotions in the humans' individual emotions that were unsynchronized with dogs and cats. A chi-square test indicated a significant difference ($\chi^2 [3, N = 171] = 25.85, p < .001, V = .389$). Residual analysis revealed that interest and joy were significantly more unsynchronized with cats and less with dogs ($p < .05$), and fear was significantly more unsynchronized with dogs and less with cats ($p < .001$).

Table 6 shows the frequency of the occurrence in age, sex, and role of humans with individual emotions who are unsynchronized with dogs and cats. There were no significant differences in age ($\chi^2 [1, N = 119] = .19, p > .05$), in sex ($\chi^2 [1, N = 119] = 2.54, p > .05$), and in role ($\chi^2 [1, N = 119] = 1.77, p > .05$).

Table 7 shows the distribution of reasons for the occurrence of the three most common emotions in dogs and cats: interest, joy, and surprise. The 10 categories were related to familiar humans (e.g., walking with the keeper), unfamiliar humans (e.g.,

Table 6. Distribution of Age, Sex, and Role of Humans in the Picture Book Who Expressed Individual Emotions

	Unsynchronized with	
	Dog	Cat
Juvenile	31	36
Adult	22	30
Man	38	38
Woman	15	28
Protagonist	21	32
Supporting character	24	22
Background	8	12

Table 7. Distribution of Reasons for Three Emotions in Dogs and Cats (Duplicate Count)

		Synchronized			Individual		
		Interest	Joy	Surprise	Interest	Joy	Surprise
Dog	Familiar human	4	71	2	9	8	9
	Unfamiliar human	0	9	1	1	0	0
	Nonhuman animal	3	15	17	4	0	8
	Imaginary creature	0	7	9	0	0	1
	Organisms other than animal	3	6	0	3	0	1
	Enemy	0	4	8	0	0	2
	Object	3	11	15	6	0	4
	Food and drink	0	10	0	9	4	0
	One's own condition	0	6	1	0	1	0
	Others	0	0	0	0	0	0
Cat	Familiar human	2	32	0	12	3	2
	Unfamiliar human	0	8	0	0	3	1
	Nonhuman animal	2	11	5	6	2	4
	Imaginary creature	0	0	3	0	0	2
	Organisms other than animal	2	4	1	2	0	0
	Enemy	0	0	3	0	0	2
	Object	8	5	6	15	2	2
	Food and drink	0	10	0	5	1	1
	One's own condition	0	8	1	0	1	0
	Others	0	0	0	0	1	0

watching a festival), nonhuman animals (e.g., riding on a horse), imaginary creatures (e.g., seeing an angel), organisms other than animals (e.g., finding a mushroom), enemies (e.g., repelling a thief), objects (e.g., watching a balloon), food or drink (e.g., eating a doughnut), one's own condition (e.g., becoming able to walk bipedally), and others. A familiar human was defined as a human with a close relationship with the dog/cat, such as their keeper, whose closeness was clearly depicted in the pictures or texts.

In dogs, interest and joy were most often caused by familiar humans, whereas surprise was most often caused by animals. Comparing synchronized

emotions and individual emotions, interest was more common as an individual emotion rather than a synchronized emotion, especially in relation to food and drink. Joy was more common as a synchronized emotion rather than an individual emotion, especially in relation to familiar humans, animals, and objects.

In cats, interest was most often caused by objects, joy was most often caused by familiar humans, and surprise was most often caused by animals. Comparing synchronized emotions and individual emotions, interest was more common as an individual emotion rather than a synchronized emotion, especially in relation to familiar humans, and joy was more common

Table 8. Distribution of Reasons for Four Individual Emotions in Humans (Duplicate Count)

	Interest	Joy	Surprise	Fear
Human	5	29	4	4
Dog and cat	6	12	25	14
Nonhuman animal other than dog and cat	0	14	8	2
Imaginary creature	1	1	6	1
Organisms other than animal	0	6	2	0
Enemy	1	0	11	6
Object	7	16	5	5
Food and drink	2	8	2	0
One's own condition	0	4	0	1
Others	0	0	0	0

as a synchronized emotion rather than an individual emotion, especially in relation to familiar humans.

Although the total occurrence was low in dogs, one out of three cases of individual anger was due to the keeper's behavior such as taking a toy possessed by the dog. In cats, overall occurrence was also low, but one out of four cases of individual anger was due to the keeper's behavior such as scolding the cat; moreover, four out of five cases of individual disgust were due to the child's behavior such as chasing the cat.

Table 8 shows the distribution of 10 categories of reasons for the occurrences of the four most common individual emotions in humans: interest, joy, surprise, and fear. Interest was most often triggered by objects, joy was most often caused by humans, and surprise and fear were most often caused by dogs and cats. In addition, there were 14 cases of fear related to dogs and cats of which 10 cases were caused by the dog attacking, and 1 case was caused by the sudden appearance of a cat. All the dogs that showed threatening behavior toward humans were depicted as feral.

Discussion

In picture books, dogs and cats often displayed 3 of the 10 basic emotions (Izard, 1977): interest, joy, and

surprise. Joy was the most common emotion. Young children are most likely to perceive joy (Felleman et al., 1983) and less likely to perceive negative emotions in basic emotions (Camras & Allison, 1985). Joy is positive, whereas interest and surprise are neutral emotions. There are fewer depictions of negative emotions in picture books. When *Grimms' Fairy Tales* were published as children's picture books, the elements of cruelty and sorrow were often excluded (Yamada, 2004). Probably, most adults want children to read joyful books, and the contents of many picture books are positive stories designed to suppress negative emotions in child readers.

The most common factors that triggered interest were those related to a familiar human in dogs and related to objects in cats. Many dogs were household animals in the picture books, and many of the depictions showed interest toward things related to their keepers. Dogs are social animals that communicate with humans in complex ways (Serpell, 1995) and that have acquired high levels of social cognition during the domestication process like humans (Hare & Tomasello, 2005). Thus, it is reasonable to assume that there were many depictions in picture books of dogs that were interested in the behavior of their keepers. On the other hand, cats control the time in their interactions with humans (Turner, 1991). Cats

have the image of being free and autonomous, and there were more depictions in which they were interested in their surroundings because of their own curiosity, regardless of the interests of the humans around them. Interest also occurred more often in dogs and cats as an individual emotion rather than a synchronized emotion. This was related to the occurrence of emotions of interest triggered by food and drink in dogs and triggered by familiar humans in cats. In dogs, all scenes in which food and drink were the reason occurred in their keepers' absence. Keepers consider that dogs are more responsive to food than cats are (Konno & Nihei, 2007), and the authors of the picture books also likely had such an image. On the other hand, cats displayed all their interest in the presence of familiar humans. The cats' interest as an individual emotion was related to familiar humans such as when the cat watched the keeper.

The most common reasons for joy were related to familiar humans in dogs and cats. Joy occurred more as a synchronized emotion than an individual emotion. The occurrence of joy was related to familiar humans, nonhuman animals, and objects in dogs and related to familiar humans in cats. Dogs can distinguish facial expressions of unfamiliar humans, but the facial expressions of humans who are a different sex from their keepers are more difficult to distinguish from those of humans of the same sex (Nagasawa et al., 2011). Cats also identified joy and anger in their keepers more than in strangers (Galvan & Vonk, 2016). These studies suggest that dogs and cats are more likely to identify and empathize with the emotions of close humans such as their keepers. Many of the books in this study were stories about dog and cat keepers and their friends interacting and sharing experiences with the dogs and cats. Therefore, dogs and cats often shared their joy with close humans and were portrayed with synchronized emotions. In dogs, since many of the reasons related to animals and objects were duplicated with the reasons related to close humans, the number of occurrences of joy was higher in synchronized emotions than in individual emotions.

The most common reasons for surprise in dogs and cats were related to nonhuman animals. Unlike

anger or sadness, surprise is an instantaneous emotional response to a sudden increase in stimuli (Yamane, 2005). In many books in this study, the humans interacted and shared experiences with their dogs and cats. The dogs and cats were surprised by occurrences such as the unexpected appearance of other characters.

Regarding the human individual emotions, four basic emotions were prevalent: interest, joy, surprise, and fear. Only fear was uncommon in dogs and cats. In addition, humans expressed a greater variety of emotions, including emotions such as contempt and guilt that did not occur in dogs and cats, and emotions that did not fall into the 10 basic categories. Animals have joy and other basic emotions (Boissy et al., 2007); however, it has not been proved that animals have complicated emotions such as jealousy (Fukuda, 2005). On the other hand, humans generally assume that their dogs and cats have complex emotions, such as jealousy and compassion, in addition to their basic emotions, due to their strong attachment to them (Su et al., 2018). In picture books for children, who are at the developmental stage of understanding others' emotions, emotions other than the basic emotions of animals were rare, and a variety of the emotions were expressed in the human characters.

Interest and joy were frequent unsynchronized emotions in cats and infrequent unsynchronized emotions in dogs. Dogs are descended from gregarious wolves (Vilà et al., 1997) and have high social cognition (Hare & Tomasello, 2005). This may be related to the need for dogs in the history of domestication to share emotions and facilitate interaction with humans when working together. On the other hand, cats are descended from the solitary Libyan wildcat (Driscoll et al., 2007), and their history of domestication is shorter (Turner & Bateson, 1998). Thus, there were fewer descriptions of dogs having emotions that were unsynchronized with humans than cats. On the other hand, fear occurred more often in unsynchronized emotions with dogs and less often in unsynchronized emotions with cats. The most common reasons for human fear were related to dogs and cats such as being attacked or barked

at. In picture books, dogs were often described as larger and their vocalizations as being louder compared with cats; moreover, there were cases when the sight of a dog provoked fear in children. In fact, dog bite incidences occur more frequently than cat bites (Ministry of the Environment, 2019); however, in the picture books, all the dogs that directly showed threatening behavior toward humans were feral. Therefore, the authors did not reflect the risk of dog bite incidences happening in household dogs.

Humans in the background synchronized emotions more with dogs and less with cats. When dogs synchronized their emotions with the humans in the background, they often synchronized with several humans simultaneously such as watching a circus with large audience. Dogs are descended from gregarious wolves (Vilà et al., 1997) and maintain high sociality (Thorne, 1992). Thus, the authors likely had an image that dogs could share activities and emotions with many others.

This study confirmed that there were characteristic emotional depictions that may affect children's recognition of the emotions of dogs and cats. Most books depicted dogs and cats that showed an interest in their keepers, enjoyed interacting with humans, and played with children; thus, this may promote the ability of children to recognize dogs and cats as being fundamentally friendly toward humans. There were depictions of feral dogs threatening humans; however, actual bite incidences are overwhelmingly caused by household dogs (Mathews & Lattal, 1994; Ministry of the Environment, 2019). Thus, these depictions may make it difficult for children to learn about the possible dangers of household dogs while recognizing the dangers of feral dogs. In addition, there are depictions of dogs and cats that were provoked to anger and disgust by human behaviors such as when their keepers took their toys away or when children chased them. Such depictions may help children learn the behaviors that make dogs and cats uncomfortable and develop good interactions with them by refraining from such behaviors. Animals that are of interest to children (Deloache et al., 2011; LoBue et al., 2012) often appear in picture books as anthropomorphized and in humanized forms (Hara

& Koda, 2020). It is plausible that emotional depictions of animals are not only for animals but also include elements of human emotions. The present study suggests that depictions of dog and cat emotions in picture books may affect the understanding of others' emotions and expression of emotions in actual social situations in psychologically and socially developing child readers. Picture books could contribute to enriching children's lives by helping them interact appropriately with dogs, cats, and others and promoting their sound lifelong development.

This study focused on four common emotions: interest, joy, surprise, and fear in picture books. Other emotions did not occur sufficiently to be analyzed; however, these emotions are also important in the recognition of emotions; thus, future studies are necessary with more picture books. In this way, the effects of picture books on children's understanding of the emotions of dogs and cats will be clearer, which will contribute to establishing better human-animal interactions.

Summary for Practitioners

Picture books are a familiar medium for children and have various benefits for their development. Many picture books depict animals and provide children with indirect encounters with animals. Dogs and cats, the most familiar companion animals, bring various benefits to children through child-animal interactions. On the other hand, there are problems such as bite accidents and animal abuse. One of the causes is the children's lack of understanding of dog and cat emotions. Picture books depict various emotions of the characters. Children who are at the stage of developing their own emotions and understanding others' emotions see these depictions daily. This study quantitatively clarified the depictions of dog and cat emotions in interaction with humans in 92 picture books and discussed the effects of picture books on children's understanding of real dog and cat emotions.

In dogs and cats, the most frequently depicted emotions were interest, joy, and surprise. The most

common reasons that triggered interest were familiar humans for dogs and objects for cats. Dogs and cats were likely to express interest as individual emotions that were unsynchronized with human emotions. Interest was associated with food and drink in dogs, such as eating a doughnut, and with familiar humans in cats, such as looking at their keeper. Joy was related to familiar humans for dogs and cats. Dogs and cats were likely to synchronize their joy with familiar humans, such as joy felt when walking with their keeper. The most common reason for surprise was associated with nonhuman animals.

Humans displayed more kinds of emotions compared with dogs and cats. The most common emotions were interest, joy, surprise, and fear. The interest and joy of humans tended to be unsynchronized with cats. Fear tended to be expressed independently with dogs. Humans in the background more frequently synchronized emotions with dogs.

The common emotions of interest, joy, and surprise being found in dogs, cats, and humans may be attributed to the fact that children are likely to perceive joy and less likely to perceive negative emotions. Positive or neutral basic emotions could be easily conveyed to children. Another reason is that there are many positive stories in picture books for children.

Regarding interest, dogs have the ability of complicated communication with humans, and there are many depictions of dogs paying attention to their keepers' conditions. People think that dogs are more responsive to food and drink than cats; thus, there are also many depictions of dogs showing interest in food and drink as an individual emotion in the absence of their keepers. On the other hand, the image of autonomy in cats was depicted as cats paying attention to things, including familiar humans, because of their curiosity. Regarding joy, dogs and cats were likely to synchronize their emotions with familiar humans, and the picture books were likely to depict stories in which dogs and cats acted with familiar humans and shared experiences. There were many depictions of surprise that was provoked by others' behaviors in dogs and cats.

Because humans have more complex emotions than animals, many kinds of human emotions are

depicted in picture books. In addition, dogs have a long history of domestication and have acquired high social cognitive abilities as a result of their interactions with humans. In picture books, dogs also synchronized their interest and joy with humans more than cats did. On the other hand, fear was often depicted as the result of the threatening behavior of feral dogs. The authors depicted feral dogs as having a dangerous aspect, but household dogs were not depicted as being dangerous. In addition, since dogs are highly social animals, the authors often depicted them as sharing activities and emotions with many others.

Emotional depictions may have an effect on children. Depictions of dogs and cats that have an interest in their keepers and enjoy interacting with children trigger children to believe that dogs and cats are fundamentally friendly to humans. Depictions of threatening behaviors by feral dogs help children understand the danger but make it difficult to recognize the possible danger of household dogs. Moreover, depictions of dogs and cats being provoked to anger and disgust through human behaviors, such as chasing, provide children with the opportunity to learn the behaviors that make dogs and cats feel uncomfortable and may provoke a dangerous response.

The results of this study suggest that emotional depictions in picture books have various effects on interactions between children and dogs and cats. In early childhood education in Japan, teachers encourage children not only to become familiar with picture books, but also to cultivate the feelings of preciousness of life and compassion through direct interactions with animals, such as rearing companion animals (Ministry of Education, Culture, Sports, Science and Technology, 2017). Therefore, it would be useful for adults to produce synergies between children's indirect and direct interactions with animals. When parents and educators give children picture books, it would be effective to select picture books by focusing on emotional depictions as one of the criteria. Furthermore, parents and educators read these books to children as a scaffolding to build good relationships with animals. This study also

contains useful information for authors and publishers who want to publish better picture books. When authors and publishers make picture books, it is important to pay attention to emotional depictions in the books and whether the depictions of animal emotions promote appropriate behaviors in children for better human-animal interactions.

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