Time is TikToking: User perceptions of primate videos on one of the fastest growing social media platforms

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Time is TikToking: User perceptions of primate videos on one of the fastest growing social media platforms

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Abstract

Introduction: With billions of social media users, platforms have a powerful influence on user perceptions of and behaviour toward wild animals. TikTok is known for its large and young user base <-30 years old and focus on entertainment, but we currently have no knowledge of what primate content is posted, its popularity, and whether video characteristics negatively influence user perceptions of primates.

Methods: A pilot study showed that searching for 'monkey' resulted in videos of monkeys, apes and strepsirrhines. I collected data on the number of hearts, views and account followers, video and account types, comment and video activity themes, genus, primate infant and human presence, human-primate proximity, primates in clothes, presence of pet primates and domestic pets, human-primate behaviour, video setting, context, and barrier presence from 1104 videos, using the search terms 'monkey' (n= 759) and 'zoo monkey' (n= 345).

Results: Primate videos received millions of views and hearts, indicating that they are very popular. Almost all videos were entertainment focused. Setting (zoo vs. non-zoo) had a significant effect on video popularity, suggesting that primates in zoos were least enjoyable to watch compared to in non-zoo settings. Zoo primates provoked significantly fewer comments about wanting a primate pet than in non-zoo settings, suggesting that zoos make them appear more dangerous than non-zoo settings. When videos included written context promoting primate pet-keeping, users were significantly more interested in pet primates than videos without this context. Direct human-primate contact resulted in significantly more users wanting pet primates than videos showing humans within arm's reach of primates, but not touching them. Videos including infants received significantly more comments referring to 'cuteness' and comments expressing a desire for a pet primate than videos without infants did.

Discussion: To minimise the negative effects on user perceptions of primates, TikTok uploaders should educate users in written format and avoid posts featuring primate infants and direct human-primate contact. I propose a 'positive input - positive output' hypothesis, which addresses how posting entertaining conservation videos could increase content popularity and public awareness and thus improve pro-conservation behaviours by users online.

Table of contents

Acknowledgements **1**

Abstract **2**

Table of contents **3**

List of figures **5**

List of tables **7**

Appendix content **8**

Chapter 1: Introduction **9-23**

1.1 Factors influencing the popularity of primate imagery and desire for pet primates .. 11

1.2 TikTok 20

1.3 Study aims and hypotheses 20

1.4 Thesis structure 23

Chapter 2: Methods **24-59**

2.1 Ethics implication and approval 24

2.2 Pilot study 24

2.3 Main methods 35

2.4 Statistical analyses 56

2.5 Data storage 59

Chapter 3: Overview of primate videos on TikTok **60-75**

3.1 Uploaders of primate content 60

3.2 Video outcomes 62

3.3 Video content 63

Chapter 4: Results of hypothesis testing 76-86

4.1 Hypothesis 1 76

4.2 Hypothesis 2 77

4.3 Hypothesis 3 80

4.4 Hypothesis 4 81

4.5 Hypothesis 5 83

4.6 Hypothesis 6 86

Chapter 5: Discussion 87-101

5.1 Summary of key findings 87

5.2 Primate videos on TikTok 87

5.3 Factors influencing the popularity of primate videos 90

5.4 Desire for primates as pets 96

5.5 Limitations of the study 99

5.6 Future research 99

5.7 Recommendations for posting primate videos on TikTok 101

5.8 Conclusion 102

References 103-109

Appendix 110-114

List of figures

Figure 2.1 Screenshot of TikTok logo shown when opening the app 24

Figure 2.2 Example of a video shown on the 'ForYou' home page and its features 25

Figure 2.3 A word cloud created using all hashtags (n= 475) found on videos collected during the pilot study 30

Figure 2.4 Videos (%) coded by themes (n= 60 videos) 31

Figure 2.5 Number of pilot videos by primate genus (n= 60). 32

Figure 2.6 Number of pilot videos by video setting (n= 60)..... 32

Figure 2.7 Number of pilot videos by video activity theme (n= 60) 33

Figure 2.8 Number of pilot videos by minimum human-primate proximity (n= 60) 33

Figure 2.9 Example figure to demonstrate saturation of themes after the 10th comment..... 37

Figure 2.10 Frequency of videos reaching an asymptote by comment position..... 38

Figure 2.11 Number of themes by comment position. 38

Figure 3.1 Videos with and without a pro-primate pet-peeing context ('monkey data set, n= 759)..... 61

Figure 3.2 Word cloud based on all hashtags found on videos in the 'monkey' data set 61

Figure 3.3 Videos by primate genus ('monkey' data set; n= 759) 63

Figure 3.4 Videos by primate genus ('zoo monkey' data set; n= 345)..... 64

Figure 3.5 Videos by primate infant presence 65

Figure 3.6 Videos by pet primate presence ('monkey' data set, n= 759) 65

Figure 3.7 Videos by the presence/absence of domestic pets ('monkey' data set, n= 759), showing a significant difference..... 66

Figure 3.8 Videos by primates with and without clothing ('monkey' data set, n= 759)..... 67

Figure 3.9 Videos by setting ('monkey' data set, n= 759)..... 67

Figure 3.10 Videos with and without showing a barrier between humans and primates ('zoo monkey' data set, n= 345)..... 68

Figure 3.11 Videos showing primates with and without humans in frame 69

Figure 3.12 Videos by human-primate proximity (within or further away than arm's reach) ('monkey' data set, n= 759) 70

Figure 3.13 Videos by human-primate proximity (within or further away than arm's reach) ('zoo monkey' data set, n= 345) 70

Figure 3.14 Videos of primates in direct contact with humans by setting ('monkey' data set, n= 759) 71

Figure 3.15 Videos with and without primates as pets by human-primate proximity ('monkey' data set, n= 759) 72

Figure 3.16 Number of videos by video activity theme 73

Figure 3.17 Videos with and without human-primate interactions ('monkey' data set, n= 759) 73

Figure 3.18 Videos with and without natural primate behaviour ('zoo monkey' data set, n= 345) 74

Figure 3.19 Videos for each type of human-primate behaviour ('monkey' data set, n= 759) 75

Figure 4.1 Mean percentage of 'cute-type' comments by primate infant presence ('monkey' data set, n= 759) 78

Figure 4.2 Mean percentage of 'want primate' comments by primate infant presence ('monkey' data set, n= 759) 79

Figure 4.3 Mean percentage of 'want primate' comments by primate pet-keeping context ('monkey' data set, n=759) 81

Figure 4.4 Mean percentage of 'want primate' comments by human-primate proximity (0m vs. AR) ('monkey' data set, n= 604) 82

Figure 4.5 Mean percentage of 'want primate' comments by zoo/non-zoo setting ('monkey' data set, n= 759) 84

Figure 4.6 Mean number of hearts by zoo/non-zoo setting ('monkey' data set, n=759). 85

Figure 5.1 A positive input-output hypothesis 101

List of tables

Table 2.1 Variables recorded during the pilot study 26

Table 2.2 Comment themes used to code comments collected during the pilot study 28

Table 2.3 Total number of views hashtags had received on 15.01.2021 35

Table 2.4 Number of views zoo-type hashtags had received on 02.04.2021 36

Table 2.5 Minimum sample sizes for each prediction based on effect sizes estimated from the literature and a standardised small effect size (Cohen's f^2) 40

Table 2.6 Variables collected per video, their descriptions and relevance to hypotheses 49

Table 2.7 Description of statistical analyses used to test my predictions 56

Table 3.1 Percentage of comments by comment themes 63

Table 4.1 Model 1, a multiple linear regression model based on the 'monkey' data set (n= 759) testing P1abc, P3b and P5b 76

Table 4.2 Model 2, a bootstrap regression model based on the 'monkey' data set (n= 759) testing P2b 78

Table 4.3 Model 3, a bootstrap regression model based on the 'monkey' data set (n= 759) testing P2c, P3a, P4ac 80

Table 4.4 Model 4, a bootstrap regression model based on the 'monkey' data set, which excludes videos of humans and primates further away than arm's reach (n= 604), testing P4b 83

Table 4.5 Model 5, a bootstrap regression model based on the 'monkey' data set (n= 759) testing P5a 84

Table 4.6 Model 6, a zero-inflation negative binomial model account for overdispersion and observed inflation of zeros ('zoo monkey' data set, n= 345) 86

Table 5.1 TikTok's top markets and the countries' legal restrictions for keeping pet primates 88

Table 5.2 Summary of results by hypothesis-testing 91

Appendix

1.0 Ethics approval form 110

1.1 Example: Data coding (pilot study) 111

1.2 Example: Main data collection form 114

Chapter 1: Introduction

More than 6.2 billion people use social media around the world (Chaffey, 2022), making these platforms a powerful tool to influence public perceptions of and behaviours toward wild animals. Animal videos and photographs (imagery) can help to educate the public, increase environmental sensitivity and promote changes in human behaviours (Bergman *et al.*, 2022; Lenzi *et al.*, 2019; Nekaris and Campell, 2012; Barbas *et al.*, 2009). For example, a YouTube video showing an olive ridley sea turtle (*Lepidochelys olivacea*) having a plastic straw removed from its nostril raised awareness about the global plastic crisis and has contributed to the prohibition of single-use plastics (Figgener, 2018). Waters and El-Harrad (2013) used Moroccans' high use of Facebook to educate them about the issues Barbary macaques (*Macaca sylvanus*) face and allow users to anonymously report animals being held illegally. However, when imagery shows animals anthropomorphised (e.g. wearing clothes), outside their natural habitat, or close to humans, it may induce misconceptions about the animals' welfare, conservation status and suitability as pets (Spooner *et al.*, 2021; Grasso *et al*., 2020; Lenzi *et al.*, 2019; Vail, 2018; Ross *et al*., 2011), and promote exploitation (Bergman *et al*., 2022). For example, a YouTube video of a pet pygmy slow loris (*Nycticebus pygmaeus*) being tickled by its owner went viral, and one in four users expressed a desire for a pet slow loris in the comments section during the initial months after the video was posted (Nekaris *et al*., 2013). Since then, extensive survey data from Indonesia has showed that the demand for pet slow lorises and selfies has increased (Nijman *et al*., 2017). This is extremely worrying, because the species is Endangered (Blair *et al.*, 2021), and non-human primates are not suitable as pets due to welfare, health, and environmental concerns (RSPCA, 2016; Soulsbury *et al.*, 2009). Another example is that of people taking selfies with brown-throated three-toed sloths (*Bradypus variegatus*). Tourists handling sloths resulted in animal behaviours that may be indicators of distress (Carder *et al.*, 2018). However, lay people encountering sloth-selfies online may be unaware of such welfare concerns and potentially seek a similar experience in the future.

Investigating the effects of non-human primate imagery on public perceptions of primates specifically is particularly interesting, because they are our closest living relatives, and because around 60% of primate species are now threatened with extinction (Estrada *et al*., 2017). Every

year, hundreds of thousands of live primates enter the global market, including as pets (Norconk *et al.*, 2019; Estrada *et al.*, 2018; Reuter *et al.*, 2016; Nijman *et al.*, 2011), with undocumented illegal trade taking place online, including on social media (RSPCA, 2016).

The IUCN Primate Specialist Group Section for Human Primate Interactions recently released best practice guidelines for responsible images of non-human primates (Waters *et al.*, 2021), and the Conservation Action Network (CAN) released a call for action on the same topic (Carlson *et al.*, 2021). The IUCN guidelines suggest that primate imagery should show primates alone or with conspecifics, and that humans should wear protective personal equipment when close to primates and regardless of proximity when in the wild. They also suggest that the risks of posting images outweighs any potential conservation benefits of raised awareness. Wildlife documentaries, like those featuring Sir David Attenborough, have had a great positive impact on people's wanting to conserve primates. Specifically, the release of the famous documentary featuring an encounter between the presenter and a group of mountain gorillas (*Gorilla beringei beringei*) in 1979 contributed to a major increase in conservation efforts, including carefully managed mountain gorilla tourism. Since then, the mountain gorilla population has steadily increased to more than 1000 individuals (Robbins, 2018). Some authors also suggest that it may be appropriate in some cases to show primates with humans, including keepers or practitioners to promote positive conservation outcomes (Spooner and Stride, 2021).

Carlson *et al*. (2021) provide information on how users can help to regulate and restrict the circulation of primate imagery by posting about petitions on social media. For example, the success of such petitions is reflected in 250 000 signs-ups to the World Animal Protection Wildlife Selfie Code, guidelines for taking selfies with wild animals. This resulted in Instagram adding a pop-up warning when users search for wildlife selfies, e.g., #lemurselfies, to raise awareness of wildlife exploitation (World Animal Protection, 2017). Although Instagram is the only social media platform to do this and there is no evidence for whether pop-up warnings have been effective, the action illustrates the importance of raising awareness, including research, to push best practices and change.

Despite these positive developments, several challenges remain: (i) Guidelines for taking and posting primate imagery online may only reach an audience who is already interested in or

invested in primate conservation efforts; (ii) Regulations for posting animal content on social media are limited to what violates animal welfare to a lay person's eye (e.g., TikTok, 2020); (iii) Guidelines cannot be legally enforced, making it difficult to hold social media platforms and users accountable; (iv) We do not know what type of primate content is effective at reaching a large audience *and* limits primates' attractiveness as pets at the same time, challenging the public outreach strategies of conservation organisations on social media (Freund *et al.*, 2021). To inform guidelines and develop strategies to promote primate conservation effectively online we urgently need studies of the primate imagery posted on social media platforms, and testing factors influencing people's perceptions of primate imagery.

1.1 Factors influencing the popularity of primate imagery and desire for pet primates

Publishing imagery online allows other users to react to it. On YouTube, for instance, users can leave a thumbs up or down, and leave comments below a video. On Instagram, users double-tap on imagery for a heart, and leave comments below, too. These responses, numbers of likes or hearts, or the frequency of certain types of comments, can be used to determine the popularity of content. The ways in which primates are presented in imagery may, furthermore, influence how viewers perceive the animals. Here, I review how imagery may influence primate video popularity and peoples' desire for primates as pets.

Anthropomorphism

Anthropomorphism refers to the attribution of human traits to non-human animals, and is common among pet owners (Serpell, 2003). Watching imagery of anthropomorphised primates may influence peoples' perception of primates, because people can identify common behavioural and physical traits, making them form a connection with the animals (Grasso *et al*., 2020; Batt, 2009; Serpell, 2003). For example, a monkey shown in a living room, dressed in human clothes, and playing with toys may resonate with users, because of the similarities to children. Additionally, observing familiar interactions (e.g., feeding, playing, talking) between humans and pet primates, and events (e.g., birthdays) may remind the online audience of more common human-animal relationships such as with cats and dogs (Serpell, 1996 as cited in Serpell, 2003).

Even if unintentionally, users posting humanised primate content may be using this concept of anthropomorphism to deliver powerful messages to the online world. Using the example above, these messages may be that monkeys are similar to children, monkeys make suitable pets, or monkeys are tame and safe to interact with. This is supported by several studies showing that anthropomorphised imagery of primates makes them appear harmless and increases primate pet desirability (Leighty *et al.*, 2015; Ross *et al.*, 2011).

This distortion of reality may be intensified by the amount of time users spend on social media, because, according to cultivation theory, people watching more television are more likely to confuse the unreal with the real world (Gerbner and Gross, 1976 as cited in Grasso *et al*., 2020). Hence, users spending more time on social media watching primate pet content may be more likely to overestimate the frequency of primates as pets, which may lead to its normalisation (Grasso *et al*., 2020). Nonetheless, the perception of animals may vary with users' own knowledge of the species (Batt, 2009). In addition, and perhaps non-mutually exclusive, interests in primates as pets may also occur if animals share similar characteristics to the viewer's own pets or common companion animals (e.g., cats and dogs), because the latter are often associated with positive attributes (Paul, 1996).

Human-primate proximity

Viewing animals close up often plays a key role in people's satisfaction with animal encounters (Barua and Sotechand, 2020; Cong *et al.*, 2014; Curtin, 2010; Schänzel and McIntosh, 2000; Hammitt, Dulin and Wells, 1993). Curtin (2010) hypothesised that close human-animal experiences may be particularly attractive to people, because (i) they watched close human-animal encounters in documentaries and wanted to replicate these, (ii) we have an "innate human fascination for the animal 'other', which renders close proximity a desired and highly memorable occurrence" (p. 162), and (iii) close encounters are particularly exciting and more intimate than experiences that are further away from the animal.

However, the 'closer the better' hypothesis may not always hold true (Verbos *et al.*, 2018). Studies of polar bear and whale watching experiences, for example, showed that proximity can be less important to tourists visiting these species than it is with other species (Lemelin and Smale, 2006; Finkler and Higham, 2004). This may be because these animals cannot be easily found in their natural inhabits, making a sighting special, regardless of the distance

between tourists and the animals. Closer proximity may become more important to tourists when species, including primates, are more common or accessible, suggesting that the setting and species may affect tourist expectations and satisfaction.

In zoos, visitors show a range of attention-getting behaviours to be close to primates, which include waving at the animals, making noises to get the animals' attention, and approaching the animals (Collins *et al.*, 2017; Snider, 2016). In the wild, human-primate encounters can be a great concern, because they induce increases in stress indicator in the target animals (gorillas: Shutt *et al.*, 2014), and due to the risk of disease transmission (Van Hamme *et al.*, 2021; Spelman *et al.*, 2013; Macfie and Williamson, 2010; Hanamura *et al.*, 2008). International guidelines for great ape tourism propose limiting the number of tourists, time of observation, number of tours per day, a minimum proximity of 7 m to the animals, and the wearing of face masks (Macfie and Willimson, 2010). The 7 m rule is based on experimental work measuring the travel distance of sneezed droplets, which can contain infectious diseases (Xie *et al.*, 2007). Due to the COVID-19 pandemic, the minimum distance between human and primates was increased from 7 m to 10 m (UWA, 2020). Before the pandemic, the 7 m distance appeared difficult for tourists to adopt and for staff to enforce. Tourists visiting mountain gorillas in Bwindi Impenetrable National Park, southwestern Uganda, got significantly closer to the animals than 7 m (mean = 2.76 m) (Sandbrook and Semple, 2006), a problem that persisted more than a decade later (Van Hamme *et al.,* 2021; Weber *et al.*, 2020). It will be interesting to see if tourist behaviours have changed after observing and experiencing the threat of COVID-19. Together, visitor behaviours observed in zoo settings and the difficulty of enforcing proximity rules in the wild clearly illustrate peoples' desire to be near primates.

Based on humans' desire to be near primates it is unsurprising that primate imagery featuring humans significantly influenced content popularity compared to imagery showing primates alone. Specifically, videos of humans and mountain gorillas received 10 times more likes than when gorillas were shown alone (Otsuka and Yamakoshi, 2020). Furthermore, videos showing humans in direct contact with a mountain gorilla received five times more likes than when the distance was greater than 7 m. Overall, the popularity of videos decreased as the distance between people and gorillas increased, suggesting that the popularity of primate imagery is related to human-primate proximity (Otsuka and Yamakoshi, 2020). The consequences of these findings for primate conservation efforts could be serious: Tourists sharing their close

human-primate experiences on social media may influence other users (potential tourists) to wrongly equate primate tourism with being able to closely interact with the animals and incite people to seek a similar experience and share it online. Otsuka and Yamakoshi (2020) refer to this as the 'negative spiral' hypothesis.

Additionally, the proximity between humans and primates may influence whether people perceive primates as suitable pets. Two highly influential experimental studies tested whether the presence of a human within arm's reach, but not touching, and in direct contact with a primate affected people's perception of primates as suitable pets (Leighty *et al.*, 2015; Ross *et al.*, 2011). Ross *et al.* (2011) showed that, regardless of the image medium (photograph, cartoon, or pencil drawing) and whether a chimpanzee wore clothes (a white t-shirt), study participants were significantly (30%) more likely to consider chimpanzees as a suitable pet when they were shown within arm's reach of, but not touching a human than when they were shown alone. The authors proposed that viewing chimpanzees in the presence of humans may mislead people to consider chimpanzees as manageable as domesticated animals and that encounters are normal and safe (Ross *et al.*, 2011). Leighty *et al.* (2015) replicated and extended this study using animated images of ring-tailed lemurs (*Lemur catta*), squirrel (*Saimiri* sp.) and capuchin (*Cebus* sp.) monkeys, shown in a natural or an office setting, and alone or in direct contact with a human. This study also showed that participants were significantly (53%) more likely to find primates appealing as a pet in the presence of a human in an office environment, suggesting an interaction between closeness and setting (Leighty *et al.*, 2015).

Although these studies showed that humans close to primates, either within arm's reach, but not touching (Ross *et al.*, 2011) or in direct contact (Leighty *et al.*, 2015), significantly increased primates' appeal as pets, it is unclear whether there is a difference in the effect on people's perception of primates as suitable pets between the two close-contact variables (within arm's reach, but not touching vs. in direct contact). Furthermore, the studies equate close human-primate contact to human presence overall, although they did not test the effect of other distances between humans and primates. There is thus a need for a study that tests the difference between imagery showing humans and primates in close contact (within arm's reach including direct contact) and humans and primates not in close contact on people's perception of primates as suitable pets.

In contrast, a most recent study (not including primates) showed that participants had an overall weak desire for animals as pets when shown in direct contact with a human regardless of its setting (marketplace, zoo with keeper or visitor, wild with visitor) as well as when the animal was shown its own in the wild. However, the lowest desire for pets was when the animal was shown on its own in the wild (Spooner and Stride, 2021). Based on these findings the authors argue that animal imagery featuring zookeepers, who are wearing identifiable clothing, are of little concern to the pet trade and may be used to advertise the work of zoos (Spooner and Stride, 2021).

Human-primate interactions

Showing humans interacting with primates, physically or otherwise, may influence video popularity and people's perceptions of primates as suitable pets. Freund *et al.* (2021), who analysed YouTube videos uploaded by orangutan (*Pongo sp.*) rescue and rehabilitation organisations, found that the number of video views were significantly positively related to the length of interaction between humans and orangutans. A video showing human-primate interactions for the full length of the video received 142% more views than a video with no interaction. Furthermore, there was a significant negative relationship between human-orangutan interaction time ratio (human-primate interaction time divided by video length) and like ratio (total number of likes divided by the total number of views per video). Specifically, as the interaction time ratio increased from 0 to 1, this decreased the probability of a video receiving a like from a user by 50% (probability 0.01 to 0.005) suggesting that featuring human-primate interactions in videos attract views but do not increase likes (Freund *et al.*, 2021).

Although this study initially supports the idea of posting primate imagery showing human-primate interactions to attract viewership, videos showing interactions between humans and orangutans doubled the odds of receiving comments that are potentially negative for orangutan conservation (e.g., wanting to own a pet primate) than when a video showed no interaction (Freund *et al.*, 2021). Therefore, researchers advised to keep the time of human-primate interactions shown in videos to a minimum (Freund *et al.*, 2021). To test the generalisability of these findings, we must investigate the effect of videos featuring human-

primate interactions and videos that do not on people's desire to own a pet primate on other platforms.

Verbal and written context provided by uploaders

Uploaders of primate imagery may include additional context, verbally and as written context. Videos mentioning conservation threats to orangutans resulted in, although not significantly, fewer likes than videos that did not. If videos including conservation messages are less popular (less likes) than videos without conservation messages, this can influence, on YouTube at least, how many people see valuable educational content on the platform (Freund *et al.*, 2021). Nonetheless, primate imagery should include conservation messages, because videos with conservation messages (verbal and written) were significantly less likely to receive negative comments (29%) for orangutans (e.g., expressing a desire for orangutans as pets) than videos without (43%) (Freund *et al.*, 2021). To prevent primate imagery from being shared without context and conservation messages in the captions being missed by online users, Norconk *et al.* (2019) proposed that written context should be embedded in the imagery. However, the effectiveness of doing this has not yet been tested.

Other researchers have raised doubts about the effectiveness of written context on people's perception of primate imagery. Riddle and Mackay (2020) tested the effect of a pro- versus anti-primate pet keeping context on people's perception of primates as pets in the format of a fake Facebook post. Both scenarios showed an animated image of a cotton-top tamarin (*Saguinus oedipus*) sitting on an artificial branch, with a green enclosure wall in the background. The anti-primate pet trade narrative included 'Animal Freedom' as the name of the publisher, a title stating the unsuitability of monkeys as pets, and comments taking stands against the pet trade. The pro-primate pet trade narrative included 'Monkey Babies' as the publisher number, a title that encourages primate pet ownership, and comments such as "I want one". Surprisingly, the analysis, which controlled for age, gender, and education of study participants, revealed that the written context had no significant effect on whether the primate was perceived as a suitable pet. However, most participants (75%) did not want to own the animal as a pet, suggesting that primate imagery alone could play a greater role in influencing public perception of primates' pet suitability than added written context (Riddle and Mackay, 2020). The differences between this study and that by Freund *et al.* (2021) may

be due to differences in the study design. Hence, more studies with more diverse and subtle contexts, other primate species and social media platforms are needed.

Presence of primate infants

Konrad Lorenz, an Austrian ethologist, coined the term 'Kindchenschema', or 'baby schema', which refers to a set of infant-like features including a relatively large head, large eyes, high and protruding forehead, chubby cheeks (Lorenz, 1971). These make up the "loveable or cuddly appearance" (Lorenz, 1971, p. 155), or in other words: cuteness. The cuteness of human infants and other animals with similar characteristics, he argued, results in an innate care-giving response in adult humans (Lorenz, 1971), an argument that has since been supported (e.g., Glocker *et al.*, 2009). Human infant faces have also been linked to increased attention from the observer (Karreman and Riem, 2019; Nittono *et al.*, 2012; Sprengelmeyer *et al.*, 2009; Brosch *et al.*, 2007), and enhanced behavioural carefulness (Nittono *et al.*, 2012; Sherman *et al.*, 2009). These cuteness responses are evolutionarily advantageous, because they may increase the chances of infant survival (e.g., Morreall, 1991; Bowlby, 1969). Overall, the baby schema, where infants with more enhanced baby schema are considered cuter than infants with less enhanced baby schema, is well supported in humans (Lehmann *et al.*, 2013; Little, 2012; Luo *et al.*, 2011; Lobmaier *et al*., 2010; Glocker *et al.*, 2009; Sprengelmeyer *et al.*, 2009; Sanefuji *et al.*, 2007; Alley, 1981; Hildebrandt and Fitzgerald, 1979; Sternglanz, Gray and Murakami, 1977; Brooks and Hochberg, 1960).

People also consider more enhanced baby schema as cuter than less enhanced baby schema in other infant mammals including cats, dogs, horses, chicken, lions, elephants, and rabbits, as well as non-mammal infants (birds and reptiles) (Kruger and Miller, 2016; Borgi *et al.*, 2014; Golle *et al*., 2013; Lehmann *et al.*, 2013; Little, 2012; Archer and Monton, 2011; Sherman *et al.*, 2009). However, research on primate baby schema is limited. In a study by Sanefuij *et al.* (2007) significantly more participants perceived photographs of a chimpanzee at the ages of 3, 5, 7, and 11 months as cuter and fewer participants perceived photographs of the chimpanzee at 9, 13 and 15 months of age as cuter. Although the data set was relatively small and unrepresentative of the general public (undergraduate students), and the chimpanzee photographs were limited to one individual, the perceived cuteness ratings are similar to those

for human infants, which could be explained by similarities in baby schema (Sanefuji *et al*., 2007).

If infants are generally perceived as cuter than non-infants and people are attracted to cuteness, imagery of primate infants may be more popular than non-infants. This hypothesis is supported by a study showing that YouTube videos of infant orangutans were viewed the most compared to other age groups, but juvenile orangutans, were liked the most, closely followed by adults and infant orangutans. Like ratios between juveniles and adults did not differ significantly, however (Freund *et al.*, 2021). Videos of adult slow lorises were more popular than videos showing younger individuals (Nekaris *et al*., 2015). Perhaps study participants were more attracted to infant orangutans, because of human infants' greater physical similarities to infant orangutans compared to infant slow lorises. Overall, the contrasting findings suggest that not all infant primates can be considered cuter, and therefore more popular, than adult primates and future studies must account for this variation.

In addition to primate infant presence affecting the popularity of primate imagery, videos showing primate infants may also influence people's desire for primates as pets. More than 20 years ago, Archer (1997) hypothesised that the baby schema is a driver of human-pet relationships, specifically referring to selective breeding of dogs to retain 'cute' physical features in adulthood. Although cuteness is unlikely to be the only factor attracting pet owners (Archer, 1997), the presence of infant primates could affect people's perceptions of primates as cute and desirable as pets. YouTube videos showing infant orangutans had the highest probability (48.7%), and adult orangutans the lowest probability (9.5%) of receiving comments that were potentially negative for orangutan conservation (e.g., wanting the animal as a pet), suggesting that videos of adult primates may be more suitable to promote primate conservation messages than younger animals (Freund *et al.*, 2021). We do not yet know whether these findings translate to users watching videos of other primate species.

Setting

The settings in which primates are presented can also influence people's perceptions of primates, reflected in the popularity of primate imagery and their appeal as pets. For example, YouTube videos of slow lorises received significantly fewer thumbs up when showing the

animals in 'unnatural conditions' (natural substrate or vegetation not visible, inappropriate food shown) (Nekaris *et al.*, 2015). While this may suggest that people do not support primates held in 'unnatural conditions', this does not appear to be the case.

Images of chimpanzees in a zoos made chimpanzees appear significantly less (34-42%) appealing as a pet than when they were shown in other settings (office, jungle, and white/neutral background setting), regardless of the medium (photograph, cartoon, or pencil drawing) and whether the chimpanzee wore clothes (Ross *et al.*, 2011). Possibly, chimpanzees are least appealing and desirable as a pet in zoos because the setting implies that there is a potential for conflict (danger) and that separation between humans and primates is required for safety reasons (Ross *et al.*, 2011). Furthermore, the sight of chimpanzees in zoos is normalised in Western societies, which may also reduce the association between primates as suitable pets when shown in zoos (Ross *et al.*, 2011).

Additionally, participants were only 3% more likely to perceive chimpanzees in the office setting appealing as a pet than when they were shown in a jungle setting (Ross *et al*., 2011). Leighty *et al.* (2015), in contrast, found that participants viewing ring-tailed lemurs, squirrel, and capuchin monkeys pictured in a natural environment were significantly less (53-62%) likely to categorise the animals as suitable pets, regardless of whether a human was present, than in an office with a human present (but not without a human). These contrasting results suggest that peoples' perception of primates as appealing pets may vary by species. Future work would benefit from testing the effect of settings outside an experimental context to increase external validity, especially because an office setting is not a very realistic anthropomorphic setting. On the social media platform TikTok, for example, I have yet to come across a video showing a primate in an office (personal obs.).

Visible barrier

Most people in Western countries do not encounter non-domesticated mammals in their daily lives, allowing easily accessible and widely distributed content online to shape people's perception of and responses to the animals (van der Meer *et al.*, 2019). In gorilla tourism, people are often close to the animals and take photographs without a visible barrier between them (Otsuka and Yamakoshi, 2020; Shutt, 2014 as cited in Waters *et al.*, 2021). In zoo settings, people find chimpanzees least appealing as a pet compared to a human office, jungle (wild)

and neutral setting (Ross *et al.*, 2011). However, the likelihood of finding chimpanzees appealing as a pet increased when a human was present (Ross *et al.*, 2011). No studies have yet tested whether imagery showing a visible barrier between people and primates affects people's perception of primates as suitable pets, which was a specific concern raised during the production of the IUCN guidelines (Waters *et al*., 2021). Addressing this has the potential to inform visitor guidelines and the imagery zoos use.

1.2 TikTok

TikTok is a popular, social media platform, founded in 2016, with an estimated 800 million monthly active users (Sehl, 2020; SensorTower, 2020), ranking sixth on the list of most used social media platforms in the world (We Are Social and Hootsuite, 2020). Worldwide, most users (62%) are under the age of 30 and 57% are female, 40% are male and 3% are registered as 'other'. On average, users spend 52 minutes per day on the app (Iqbal, 2022). Outside China, where people use the Chinese version of TikTok called Douyin, the greatest TikTok markets are the US, Indonesia, and Brazil (Iqbal, 2022).

TikTok users can record videos of no longer than 60 seconds, add visual and sound effects, edit the video, and add music. Other users can react with a 'heart' to show they liked a video and post comments. Furthermore, the app includes tools allowing videos to spread easily without context. The 'duet' function, for example, allows users to create a new video showing their own screen and the screen of the initial video side by side in a square format. The most popular video category being entertainment (Shutsko, 2020; Statista, 2020), and the platform's goal to "inspire creativity and bring joy" (TikTok, 2020), suggesting that people primarily use TikTok for entertainment.

TikTok's large user base (Sehl, 2020; SensorTower, 2020) and characteristics have the potential to harm primate conservation efforts. If videos of primates reach a large audience who perceive primates as suitable pets, this could increase the demand for primates as pets. For example, the viral video of a pet slow loris received more than 9 million views on YouTube (Nekaris *et al*., 2013). Since then, the demand for pet slow lorises has increased (Nijman *et al*., 2017). However, to date, we have no overview of primate videos posted on TikTok and how video characteristics may influence people's perceptions of primates.

1.3 Study aims and hypotheses

The aims of this study are to provide an overview of primate imagery posted on TikTok and test the effects of video characteristics on video popularity (hearts) and users' desire for pet primates (as stated in the comments). Although the data are based on users' spontaneous responses to content (Toivonen *et al.*, 2019), my findings may reveal a more accurate picture of people's instant perceptions of primates, than data collected from participants recruited for an experimental study. My goals are to contribute to current guidelines for posting primate imagery online (Carlson *et al.*, 2021; Waters *et al.*, 2021) and provide a foundation for testing platform-specific strategies for conservation organisations to raise awareness, educate the public and promote pro-conservation behaviours more effectively in the future. I test the following hypotheses and predictions:

Hypothesis 1: Videos of humans and primates together, in close proximity, or interacting are more popular than videos showing primates alone, further away from humans or videos without human-primate interactions, because users may be familiar with close human-animal encounters in the media, have an "innate human fascination for the animal 'other', which renders close proximity a desired and highly memorable occurrence" (p. 162), and because close encounters are particularly exciting and more intimate to watch (Curtin, 2010).

P1a: Videos showing humans and primates together receive more hearts than videos showing primates alone.

P1b: The number of hearts increases as human-primate proximity decreases.

P1c: Videos showing human-primate interactions receive more hearts than videos showing no interactions.

Hypothesis 2: Primate cuteness influences video popularity and people's desire to own a pet primate, because people are attracted to infant-like features (baby schema) that result in an innate care-giving response (Glocker *et al*., 2009; Lorenz, 1971).

P2a: Videos showing primate infants receive more hearts than videos showing non-infant primates.

P2b: Videos showing primate infants increase the likelihood that users comment on how cute the video is compared to videos showing non-infant primates.

P2c: Videos showing primate infants increase the likelihood that users comment that they want a pet primate, compared to videos showing non-infant primates.

Hypothesis 3: Written pet-keeping context influences primate video popularity and people's desire to own a pet primate, because it alters how users perceive the content they are watching (Riddle and Mackay, 2020).

P3a: Videos including written context promoting primates as pets increase the likelihood that users comment that they want a pet primate, compared to videos without this written context.

P3b: Videos including written context promoting primates as pets receive more hearts than videos without this context.

Hypothesis 4: Videos showing close human-primate contact and interactions lead people to believe that primates are comparable to domesticated animals, and therefore suitable pets (Ross *et al.*, 2011).

P4a: Videos showing humans and primates within arm's reach receive more comments about wanting a pet primate than videos that show primates further away from humans.

P4b: Videos showing humans and primates in direct contact are more likely to receive comments about wanting a pet primate than videos that show humans and primates within arm's reach but with no direct contact.

P4c: Videos showing human-primate interactions are more likely to receive comments about wanting a pet primate than videos that show no human-primate interaction.

Hypothesis 5: Zoo settings make primates appear more dangerous and hence less popular and desirable as a pet than non-zoo settings (Ross *et al.*, 2011).

P5a: Videos showing primates in zoos are less likely to receive comments about wanting a pet primate than videos showing primates in non-zoo settings.

P5b: Videos showing primates in zoos receive less hearts than videos showing primates in other settings.

Hypothesis 6: Videos with a visible barrier between humans and primates imply that primates are dangerous and need to be kept away from humans, and do not make suitable pets (Ross *et al.*, 2011).

P6: Videos in zoos showing a visible barrier between humans and primates are less likely to receive comments about wanting a pet primate than videos in zoo settings showing no barrier between humans and primates.

1.4 Thesis structure

In Chapter 2 I outline my methods, beginning with a pilot study containing supporting evidence and justification for my aims and main methods. Chapter 3 is the first of two results chapters, providing an overview of primate content posted on TikTok. Chapter 4, the second results chapter, reports the results of hypothesis testing, and Chapter 5 contains the discussion of all my findings, limitations, avenues for future research and recommendations for posting primate content on TikTok.

Chapter 2: Methods

2.1 Ethical implications and approval

My data collection involved accessing publicly available videos on a social media platform. Based on digital data policies for online research (Franzke *et al*., 2020; Buchanan and Zimmer, 2016), this research project raised some ethical concerns. Users do not give consent that their content is being used for research purposes. However, content posted on social media platforms is intended for the public domain, unless the account is set to private. Nonetheless, I kept user account information confidential and anonymous. videos may show primates being handled incorrectly and/ or with signs of poor welfare. Although I could not avoid contributing to the number of views, and ultimately to the videos' popularity, I minimised my personal impact by not liking, commenting on, or sharing the videos. In addition, I reported videos showing primates being handled incorrectly (e.g., used as photo props), or kept as pets and any videos that violated TikTok community guidelines (TikTok, 2020) when I had completed my data collection.

This research project was approved by the Anthropology Ethics Chair at Durham University and the Animal Welfare Ethical Review Board (AWERB) (Appendix 1.0).

2.2 Pilot study

Aims

I conducted a pilot study from 17 to 21 December 2020 to (i) familiarise myself with the functions of the TikTok app (*Figure 2.1*), (ii) obtain general insights into the type of primate content posted by content creators and users' responses to it, and (iii) develop appropriate methods for my main data collection.

Figure 2.1 Screenshot of the TikTok logo shown when opening the app.

Familiarisation with TikTok

I created a TikTok account, using a new email and randomised username. After signing up and authorising my account, I skipped the first page, which asked me to select content preferences, to avoid biasing the content shown. This directed me to the 'ForYou' home page, which is the central feature of the app. I explored the app features by tapping on each icon (*Figure 2.2*).

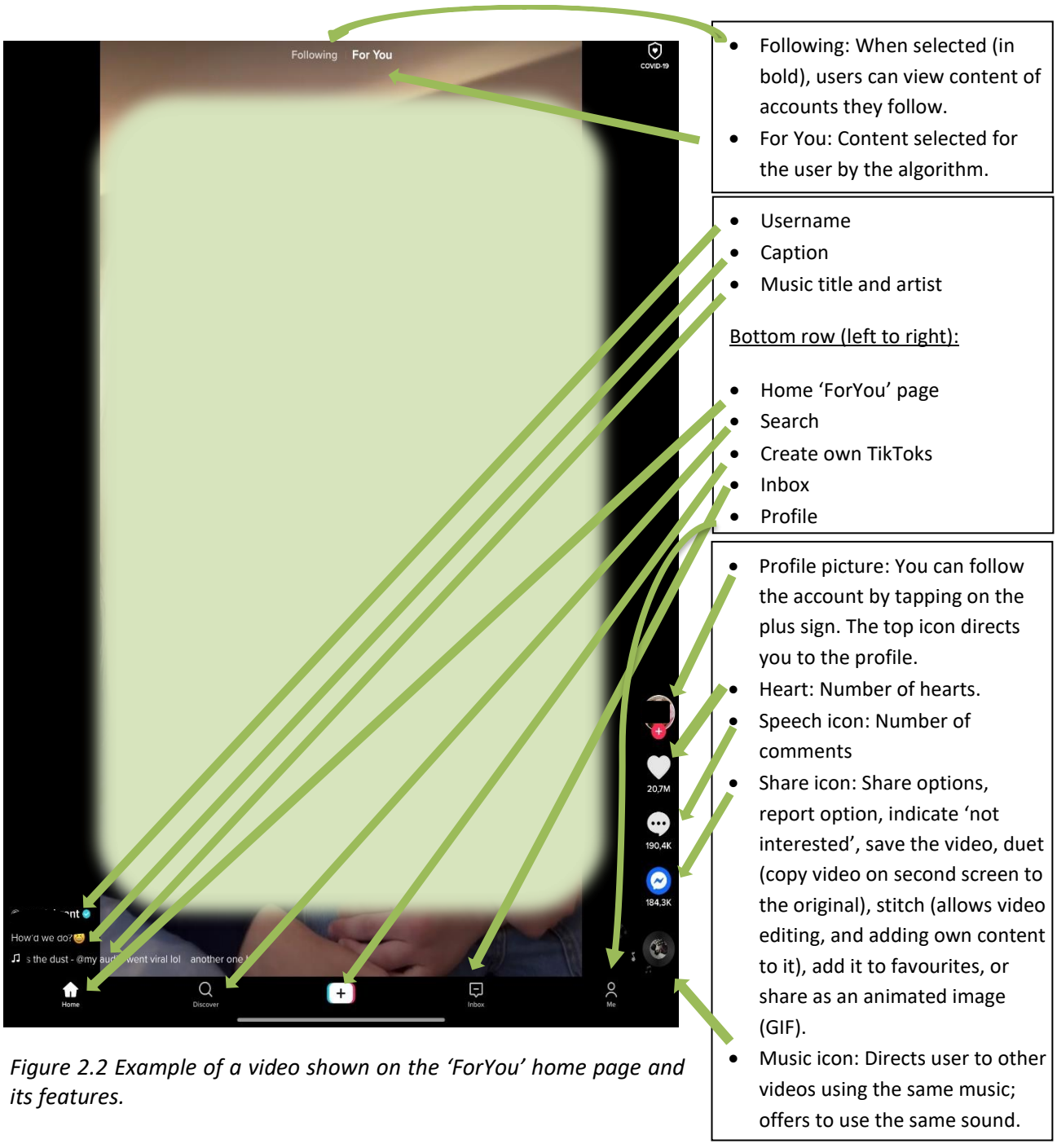

Figure 2.2 Example of a video shown on the 'ForYou' home page and its features.

Search term selection

The search tab enables users to search for content by the categories: top, users, videos, sounds and hashtag. I searched for general primate terms (singular and plural) in the video search tab to see what type of content came up: monkey, monkeys, ape, apes, primate, and primates.

Data collection procedure

I recorded data from the first 10 videos for each search term, excluding videos that did not show live primates (*Table 2.1; Table 2.2*).

Table 2.1 Variables recorded during the pilot study.

Variable	Description
Username	Name of the account
Caption	Description of the video provided by uploaders
Date of upload	Date video was uploaded
Hashtags	Words starting with a hashtag (#)
Number of hearts	Number of hearts ('likes')
Genus	Genus of primates in the video
Barrier	Presence of any type of visible barrier between human(s) and primate(s)
Number of comments	Number of comments. If comments were disabled, I excluded the video from the study
Account type	Categorised as private, a non-governmental organisation (NGO), a zoo/sanctuary; or other, based on video content, username, and user profile.
Video type	Categorised as educational if the video included information on primates (e.g., behaviour, diet, habitat, conservation issues), non-educational if the content had an entertainment value, or both.
Number of account followers	Number of people following the account at the time of data collection

Video activity themes	Activities, which were mutually exclusive, noted as: • Human-primate interaction: Videos showing humans and primate directing behaviour at one another • Natural primate behaviours: Feeding, socialising (grooming, playing with conspecifics), vocalising, aggression, locomotion and resting • Inter-species interaction: Any interactions between a primate species with another animal species (excluding humans) • Primate directing behaviour towards human environments/objects. Includes performance acts (e.g., cycling, dog riding).
Video setting	• Human indoor environments: Indoor living spaces in human houses/flats, as well as cars • Human outdoor environments: Urban outdoor spaces • Zoos/sanctuaries: Indoor and outdoor facilities • Non-human outdoor environments: Natural places without visible human structures (houses, streets) • Any other settings: Other
Primates in clothes	Video with primate(s) wearing clothes, including diapers and leashes.
Human-primate proximity	Estimated distances between human and primates (0 m; AR = within arm's reach, but not touching; < 7 m; > 7 m), regardless of whether a person is behind the camera or in frame.
Comment themes	Noted themes for the first 20 comments of each video, excluding comments by the video uploaders and comment replies. I translated non-English comments within the app by tapping on the comment for 2 seconds and selecting 'Translate'. Comments often included emojis, which often highlighted the meaning of the comment. These can be

	interpreted subjectively, so I only included them in the coding process when their meaning was obvious (e.g., 'cry-laughing', 'heart-eyes' emojis clearly are expressions of entertainment). See *Table 2.2* for more details.
Report	I reported videos showing primates being handled incorrectly (e.g., used as photo props), as pets and/or if TikTok community guidelines (TikTok, 2020) were violated by tapping on the video screen for 2 seconds and selecting the report option.

Table 2.2 Comment themes used to code comments collected during the pilot study.

Comment themes	**Examples**
Summarising users' reactions to video	"How everyone on here is saying they want one"
Asserting meaning	"Look at its eyes, you can see he loves his owner so much!!"
Requesting more videos	"Please show him play with a ball!"
Pointing out primates' intelligence	"They are so intelligent", "So smart!"
Tagging other users	"@username"
Criticising content	"They should be in the wild", "Monkeys are not pets"
Describing content objectively	"Their shoes and tracksuit"

Defending video uploader	"You can clearly see how well the owner is looking after X, stop pretending you are a vet"
Unrelated	"Give me a follow"
Commenting on human-like features	"I cannot believe how similar their hands are"; "She can behave better than my own children!!"
Interested in a pet primate	"I want one"; "Where did you get one? Can you explain the process to me?"; "How much was he/she?"; "Is it legal in X? I have wanted one forever"
Interested in viewing/interacting with primate in real life	"I want to cuddle her so bad!"
Asking primate-related question	"What do they like to eat?"; "What is this species called?"
Cute-type comment	"Cuuuuuuuute"; "This is so adorable"; "Sweet"
Expression of entertainment	"hahaha"; "this is funniest thing I have ever seen"; "lol"

Results

60 videos were published between 14 October 2019 and 15 December 2020, of which 57 were uploaded by private users, only two by NGOs and one by a zoo. I categorised all videos as non-educational. The number of account follower ranged from 4727 to 21.4 million with a median of 279 100 (IQR = 93 900 – 2.05 million).

Accounts used a range of hashtags to describe their videos. I created a word cloud from all hashtags used in the pilot data set, using the 'Word Cloud Pro' from the Microsoft Word Add-ins, which showed that 'monkey' was the most common hashtag (*Figure 2.3*).

Figure 2.3 Word cloud created using all hashtags (n= 475) found on videos collected during the pilot study. The larger the font size the more frequent the word occurred.

The number of hearts per video ranged from 773 to 5.8 million, with a median of 297 500 (IQR = 54 400 – 621 800). The number of comments per video ranged from 9 to 95 700 comments with a median of 2152 (IQR = 448 – 6845).

Comments on all videos suggested that were entertaining (*Figure 2.9*). 90% received cute-type comments (e.g., cute, aww, sweet, adorable). 72% of videos made users ask questions about the content. More than half resulted in users pointing out the animals' physical and/or behavioural similarities to humans (53%), expressing an interest in viewing or interacting with primates in real life (60%), and owning a pet primate (55%).

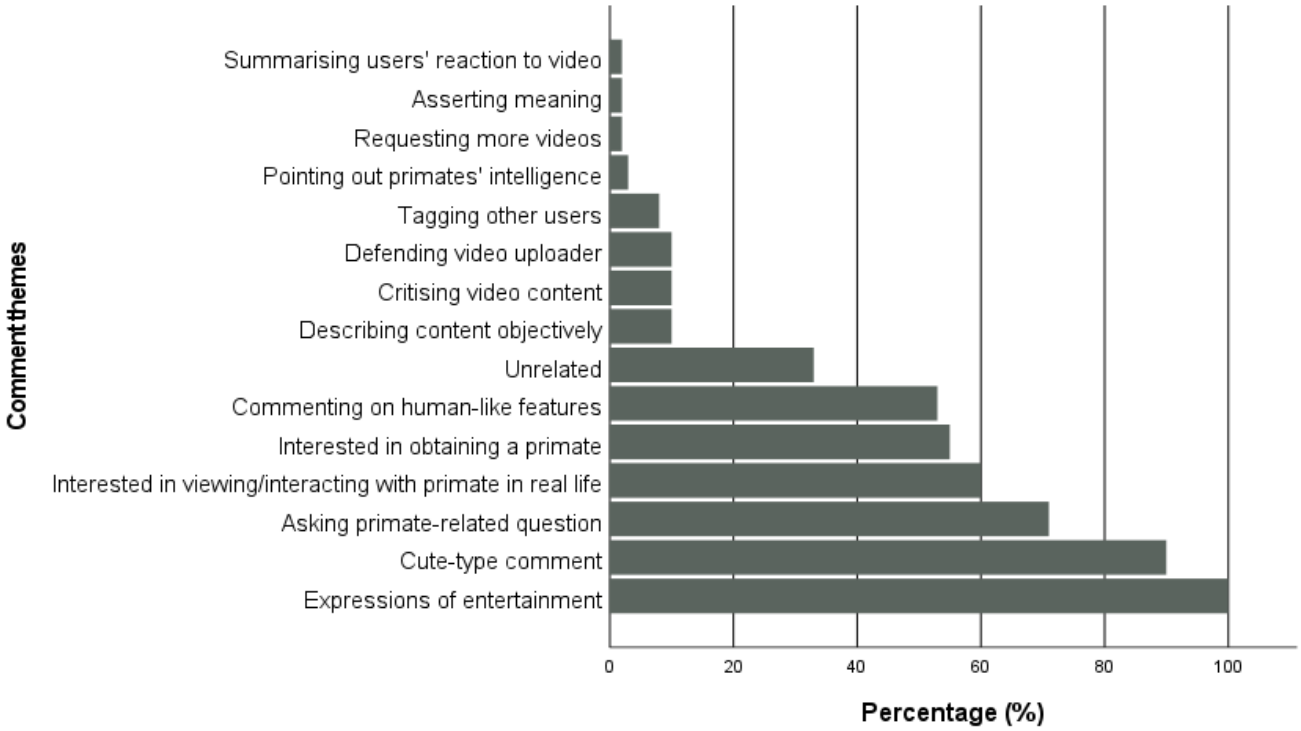

Figure 2.4 Videos (%) coded by themes (n=60 videos).

The most common primate genera were *Pan* (30%) and *Cebus* (32%) (*Figure 2.5*). 37% of all primate videos showed primates wearing clothes. Videos (43%) most frequently showed primates in human indoor environments (*Figure 2.6*). Hence, it was unsurprising that most videos (8%) did not show a physical barrier between humans and primates. 50% of all videos showed humans interacting with primates (*Figure 2.7*), with most videos (40%) showing humans in direct contact with primates (*Figure 2.8*).

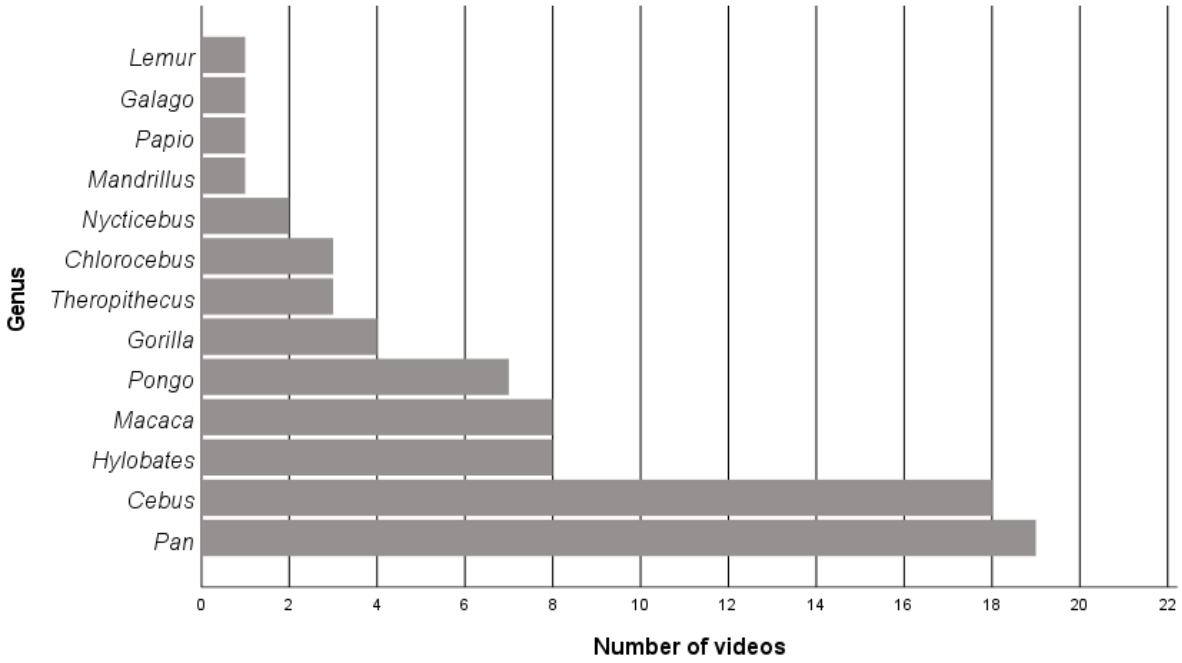

Figure 2.5 Number of pilot videos by primate genus (n=60).

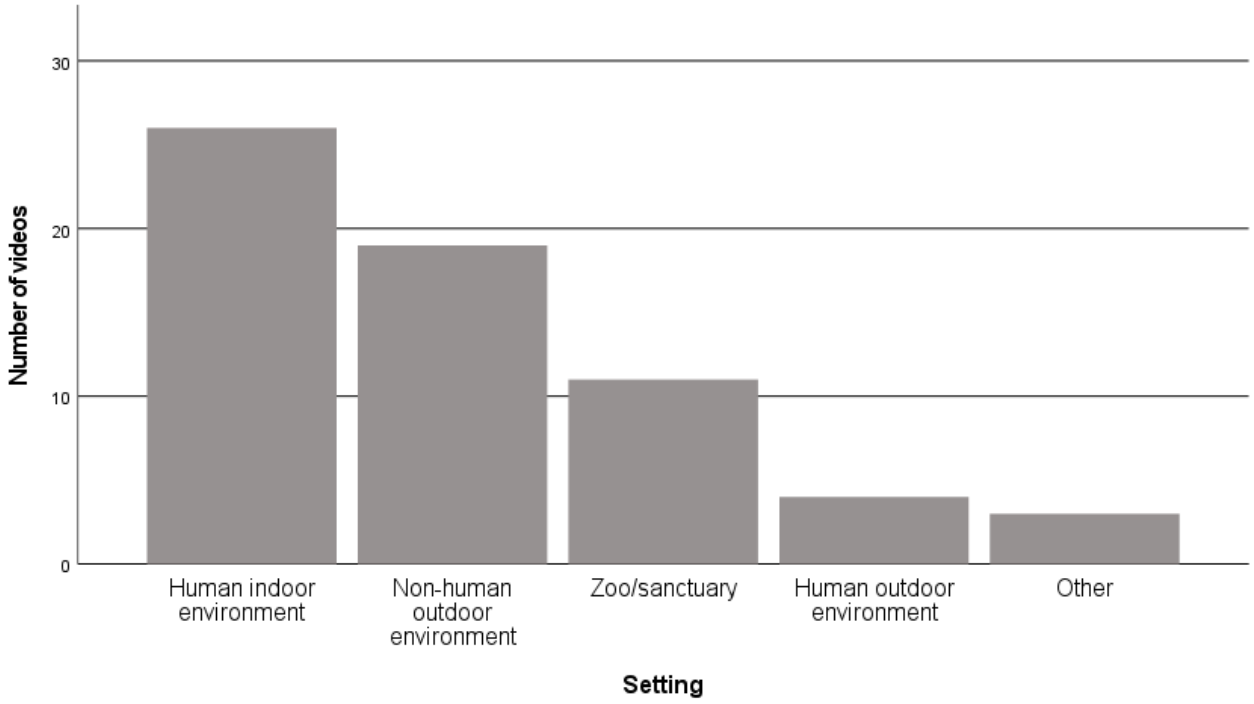

Figure 2.6 Number of videos in the pilot videos by setting (n=60).

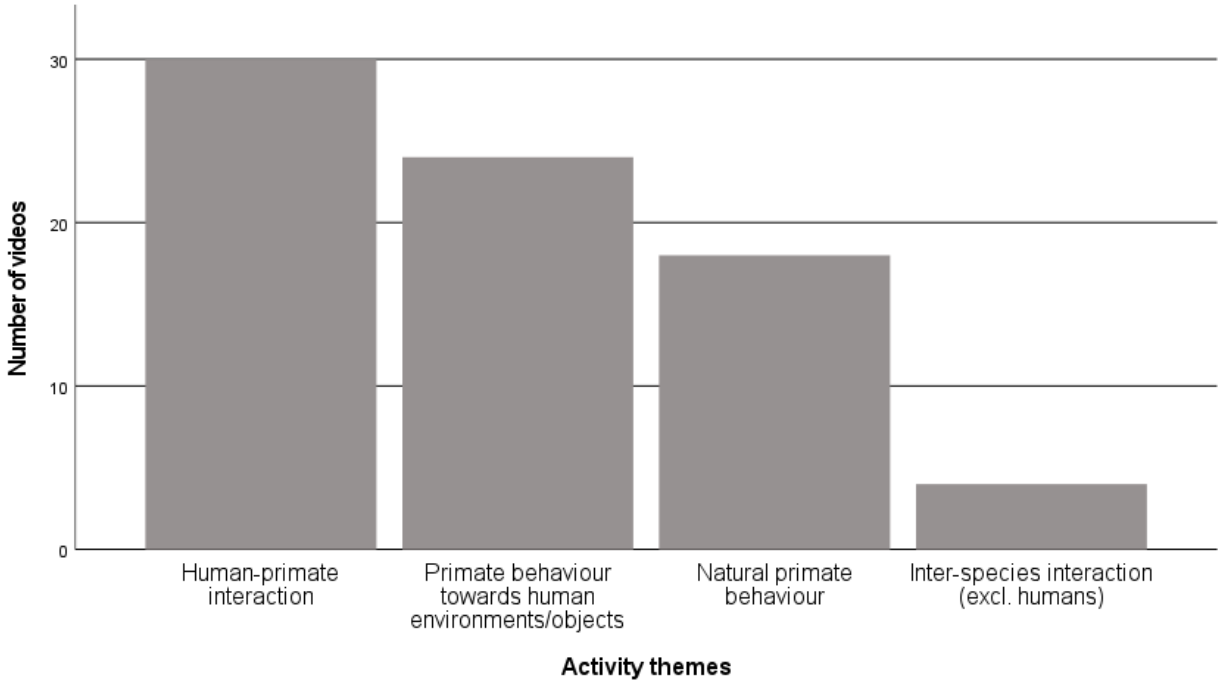

Figure 2.7 Number of videos in the pilot videos by activity theme (n=60).

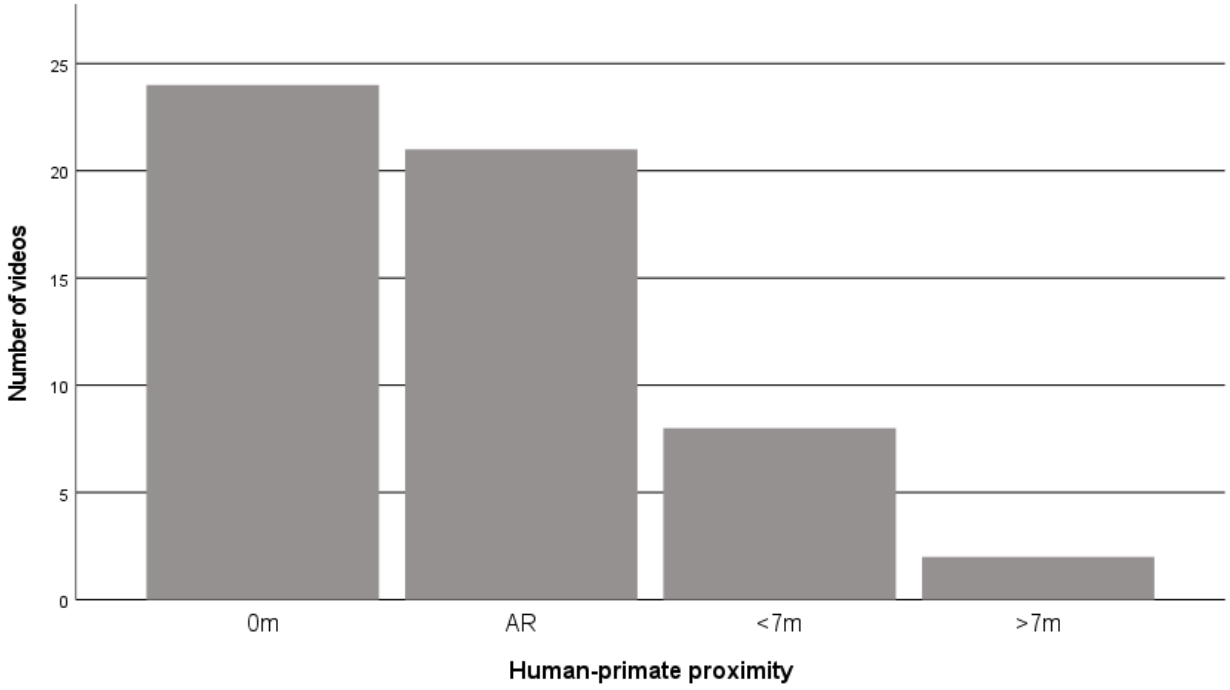

Figure 2.8 Number of videos in the pilot study by minimum human-primate proximity (n= 60). AR= arm's reach, but not touching.

When I reported a video, for example because a primate wore clothes, TikTok rejected the report because no violations of their guidelines were detected. I was also informed that less similar content will be shown to me in the future.

Discussion

Primate content on TikTok appears to have a large follower base with many users responding to videos with a heart or commenting, suggesting that primate videos are popular, and supporting the need to further investigate video characteristics and their effect on TikTok users.

Many videos showed animals from the genera *Pan* and *Cebus*, which may be related to the search terms used. Uploaders most frequently posted videos of primates in human indoor environments and without a visible barrier between humans and primates, although the latter was likely to be due to the small number of videos set at a zoo. A separate data set, using a search term more tailored to finding primate videos set in zoo environments, would be useful to address the effect of a physical barrier between humans and primates on people's perception of primates.

Because many videos were set in indoor environments and there was no barrier between humans and primates, many videos showed humans interacting with or in direct contact with primates. These insights are of great concern, as previous experimental work showed that primate images with a human present made participants more likely to want a pet primate than when a primate was shown alone (Leighty *et al.*, 2015; Ross *et al.*, 2011).

Most videos were categorised as non-educational, raising concerns that primate videos on TikTok do not benefit primate conservation efforts. This is supported by the most popular comment theme in the data set being expressions of entertainment and few videos including critical comments. These comments of concern were often criticised by other users who defended the video uploaders with why or under what circumstances it was okay to own a pet primate. Besides a lack of awareness among users, these observations shed light on the difficulty of correcting other users' impressions of videos. In other words, the context in which primates are presented can be highly misleading and suggest that primates make suitable pets. It is hence unsurprising that more than half of the videos led viewers to express a desire to own a pet primate.

The analysis of hashtags and reporting process helped to shape my main data collection methods. The 'monkey' hashtag was used the most and videos labelled with this hashtag

showed apes, monkeys and strepsirrhines, although the latter were only shown in a small number of videos. It may be that lay people use 'monkey' as a loose term to describe all primates. However, using this search term means that my findings reflect mainly anthropoid primates.

I found that reporting videos immediately after viewing a video could bias data collection. Hence, I only reported videos after completing the project.

Although the pilot data were based on a small sample, the above insights provide (i) a strong case for investigating people's perception of primate content on TikTok and (ii) useful information to improve the methods for my main data collection.

2.3 Main methods

I deleted the TikTok account used for my pilot study to avoid the algorithm affecting the search results of my main data collection. I then created a new account with the same email address. I collected data for the main part of my study from 14 April to 13 May and 17 May to 21 May 2021.

Search term selection: Hypotheses 1 - 5

My pilot data showed that the 'monkey' hashtag was used most by primate content uploaders and that videos showed apes, strepsirrhines as well monkeys. I also compared the number of total views of different primate hashtags, to identify major differences in public exposure to or consumption of primate content. Content with the hashtag 'monkey' was viewed more than content with any other hashtag (*Table 2.3*). Based on these findings, I used 'monkey' as a search term to test hypotheses 1-5.

Table 2.3 Total number of views TikTok hashtags had received on 15.01.2021.

Hashtags	Number of views (millions)
Monkey	7200
Monkeys	533
Ape	214
Apes	69

Primate	61
Primates	3

Search term selection: Hypothesis 6

In my pilot study, only a few videos included a barrier between humans and primates. Hence, I used an additional search term to find primate videos in zoo environments to test the effect of a physical barrier between humans and primates on peoples' perception of primates.

To choose the term, I compared the number of views for various hashtags and found that the 'zoo' hashtag received the highest number of views (*Table 2.4*). Because of the high viewership of both the hashtag 'monkey' and 'zoo', I assumed that using the search term 'zoo monkey' would find the most primate content in captivity. I used the general search tab, because the hashtag search tab did not allow me to search for videos containing #monkey AND #zoo at the same time. Using the hashtag search tab would have limited the results presented.

Table 2.4 Number of views zoo-type hashtags had received on 02.04.2021.

Hashtags	**Number of views (millions)**
Zoo	2500
Aquarium	1400
Sanctuary	167.3
safaripark	57.9
Zoosafari	2.4

Sample size of comments per video

Videos can receive thousands of comments each. I used 'inductive thematic saturation' to determine the number of comments I needed to sample per video until no new themes emerged (Saunders *et al.*, 2018; Vasileiou *et al.*, 2018). To do this, I coded comments by theme (*Table 2.2*). For example, "Awww I want one so baad!", "Can we get one???" and "Where can I buy one??" all express an interest in a pet primate. In other words, I looked for the start of an asymptote as an indicator of data saturation *(Figure 2.9*).

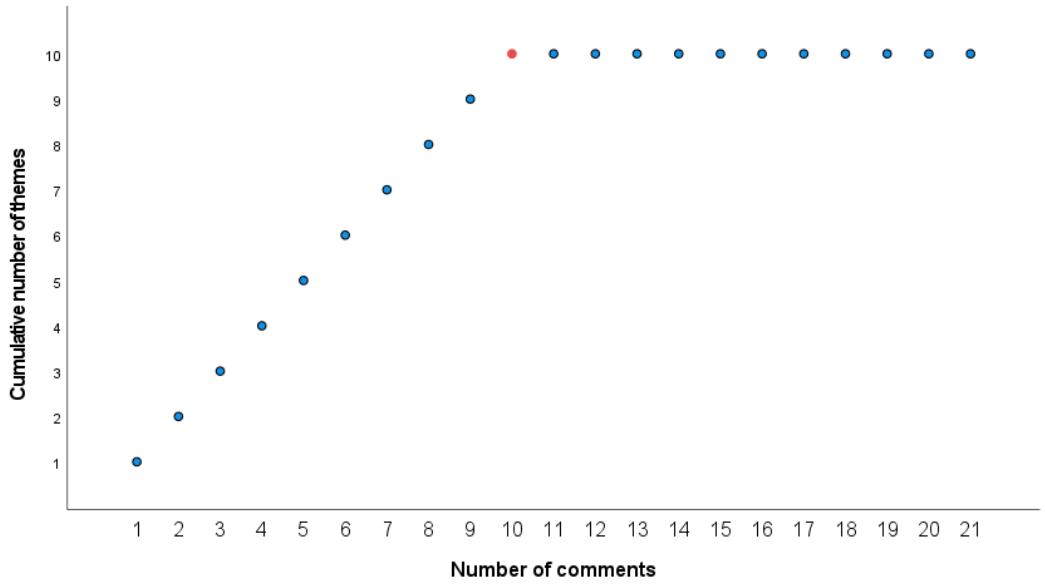

Figure 2.9 Example figure to demonstrate saturation of themes after the 10th comment. Red point= start of asymptote.

Specifically, I used 'monkey' as a search term in the video tab. I noted user comments in a Microsoft Excel Spreadsheet, starting from the top of the comments, but excluding comments by the video uploaders. I allocated each comment to a theme in a separate column (Appendix 1.1). I collected comments from each video until no new theme arose and the point of data saturation (the asymptote), was obvious. I completed this process for 20 videos. I then transferred the data to SPSS and summarised the frequency of asymptotes across the video sample.

The points of saturation ranged from comment position 2 to 45 (mean = 21.8; sd = 12.56) (*Figure 2.10*). As indicated by the large standard deviation, using the mean number of comments would risk missing a significant number of themes. For example, the second video I collected comments from peaked at 11 themes, with the asymptote starting at comment position 45 (*Figure 2.11*). If I had only coded 22 comments (the mean), I would have missed 5 themes. To minimise the loss of themes during my main data collection, I added one standard deviation (SD) to the mean number of comments at which an asymptote was reached (21.8 + 12.6 = 34.4). Applying this to the same example as above: If I had collected 34 comments, I would have missed 3 themes, instead of 5.

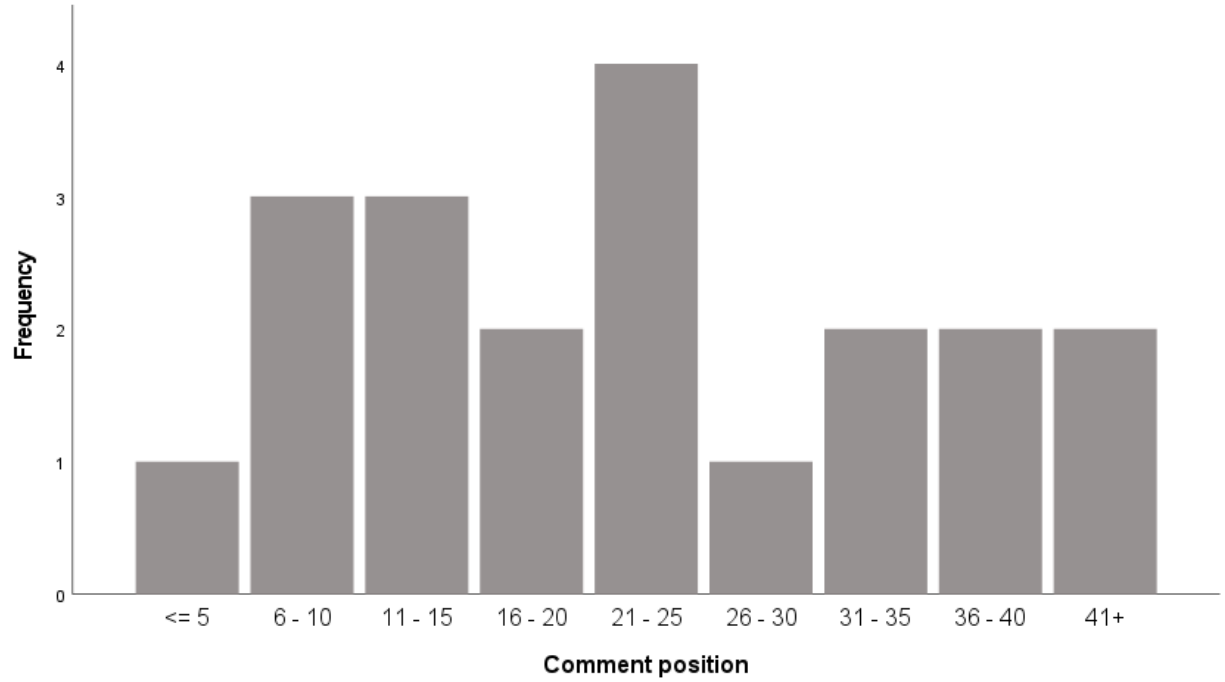

Figure 2.10 Frequency of videos reaching an asymptote by comment position (n= 20 videos).

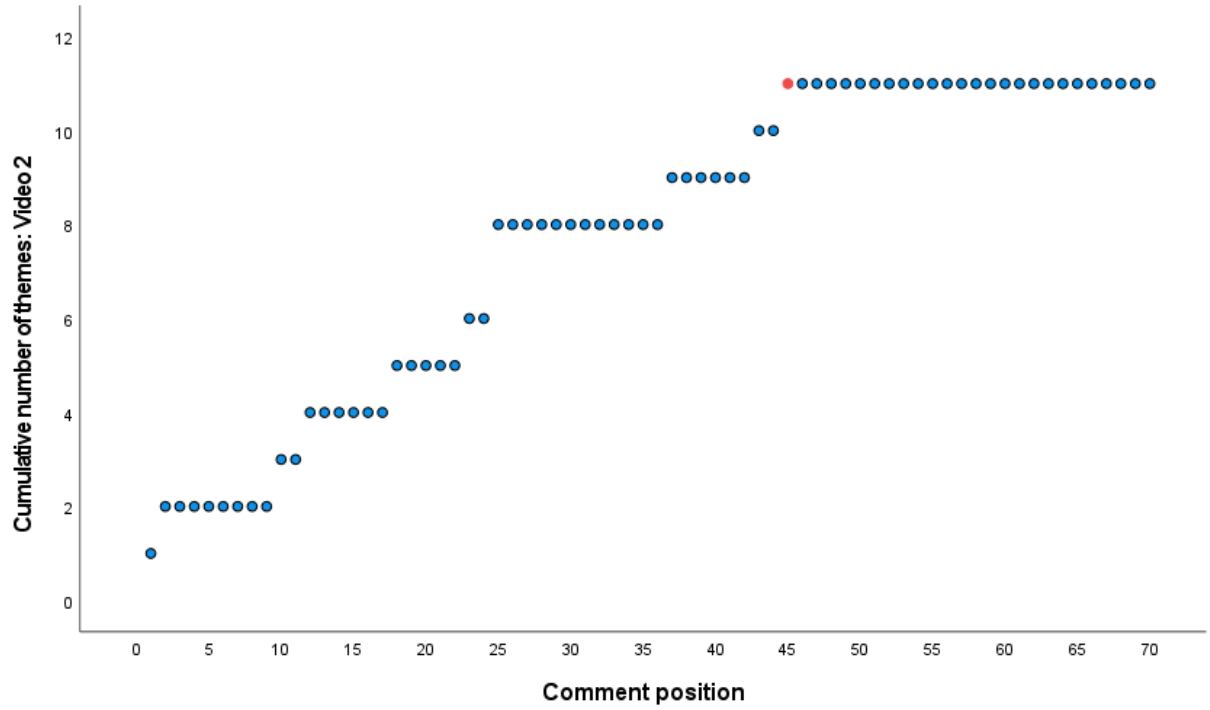

Figure 2.11 Number of themes by comment position from one of the 20 videos used to determine how many comments to sample per video for the main data collection. Red point= start of asymptote (no new themes from this comment onwards).

Video sample size selection

I used the software G*Power to estimate effect sizes from previous studies and determine appropriate sample sizes to test my hypotheses (*Table 2.5*). I conducted all power analyses based on multiple linear regression analyses, the conventional p-value of 0.05 and power of 0.8.

Table 2.5 Minimum sample sizes for each of my predictions based on effect sizes estimated from the literature and a standardised small effect size (Cohen's f^2).

Predictions	**Studies used to estimate (*infer) effect sizes**	**Cohen's f^2 (previous studies)**	**Min. sample size using Cohen's f^2 (previous studies) and my predictor variables**	**Predictor variables (*= Key predictor variable)**	**Min. video sample size, using a small, standardised effect size (Cohen's f^2 = 0.02), and number of predictor variables**
P1a: Videos showing humans and primates together receive more hearts than videos showing primates alone.	Otsuka and Yamakoshi (2020)	1.08 (large)	23	• Human presence* • Human-primate proximity • Human-primate interaction • Days since upload • Genus • Primate infant presence • Pet-keeping context • Setting • Presence of domestic pets • Primates in clothes	759

P1b: The number of hearts increases as human-primate proximity decreases.	Otsuka and Yamakoshi (2020)	0.01 - 0.18 (small - medium)	92-1510	• Human-primate proximity* • Human-primate interaction • Human presence • Days since upload • Genus • Primate infant presence • Pet-keeping context • Setting • Presence of domestic pets • Primates in clothes	759
P1c: Videos showing human-primate interactions receive more hearts than videos showing no interactions.	Otsuka and Yamakoshi (2020)*; Curtin (2010)*	0.02 (small)	759	• Human-primate interaction* • Human presence • Human-primate proximity • Days since upload • Genus • Primate infant presence • Pet-keeping context	759

				• Setting • Presence of domestic pets • Primates in clothes	
<u>P2a:</u> Videos showing primate infants receive more hearts than videos showing non-infant primates.	Golle *et al.* (2013)*	0.35 (large)	52	• Primate infant presence* • Human presence • Human-primate proximity • Human-primate interaction • Days since upload • Genus • Pet-keeping context • Setting • Presence of domestic pets • Primates in clothes	759
<u>P2b:</u> Videos showing primate infants increase the likelihood that users comment on how cute the video is compared to	Golle *et al.* (2013)*	0.35 (large)	52	• Primate infant presence* • Days since upload • Genus • Primates in clothes • Primates with domestic pets	759

videos showing non-infant primates.				• Close human-primate contact • Setting • Pet-keeping context	
<u>P2c:</u> Videos showing primate infants increase the likelihood that users comment that they want a pet primate, compared to videos showing non-infant primates.	Golle *et al.* (2013)*	0.35 (large)	54	• Primate infant presence* • Close human-primate contact • Days since upload • Genus • Setting • Primates in clothes • Pet-keeping context • Primate with domestic pets • Human-primate interaction	759
<u>P3a:</u> Videos including written context promoting primates as pets increase the	Riddle and Mackay (2020)*	0.02 (small)	791	• Pet-keeping context* • Days since upload • Genus • Primate infant presence	759

likelihood that users comment that they want a pet primate, compared to videos without this written context.				• Human-primate proximity (close contact) • Presence of domestic pets • Setting • Primates in clothes • Human-primate interaction	
<u>P3b:</u> Videos including written context promoting primates as pets receive more hearts than videos without this context.	Freund *et al.* (2021)*	0.35 (large)	57	• Pet-keeping context* • Human presence • Human-primate proximity • Human-primate interaction • Days since upload • Genus • Primate infant presence • Setting • Presence of domestic pets • Primates in clothes	759

P4a: Videos showing humans and primates within arm's reach receive more comments about wanting a pet primate than videos that show primates further away from humans.	Ross *et al.* (2011); Leighty *et al.* (2015)	0.01 (small)	1574	• Human-primate proximity (close contact)* • Days since upload • Genus • Setting • Pet-keeping context • Primate infant presence • Presence of domestic pets • Primates in clothes • Human-primate interaction	759
P4b: Videos showing humans and primates in direct contact are more likely to receive comments about wanting a pet primate than videos that show humans and primates	Ross *et al.* (2011); Leighty *et al.* (2015)	0.01 (small)	1510	• Human-primate proximity (0m vs. AR)* • Days since upload • Genus • Setting • Pet-keeping context • Primate infant presence • Presence of domestic pets • Primates in clothes	759

within arm's reach but not in direct contact.					
<u>P4c:</u> Videos showing human-primate interactions are more likely to receive comments about wanting a pet primate than videos that show no human-primate interaction.	Freund *et al.* (2021)*	0.35 (large)	54	• Human-primate interaction* • Human-primate proximity (close contact) • Days since upload • Genus • Setting • Pet-keeping context • Primate infant presence • Presence of domestic pets • Primates in clothes	759
<u>P5a:</u> Videos showing primates in zoos are less likely to receive comments about wanting a pet primate than videos showing	Ross *et al.* (2011)	0.01 (small)	1574	• Setting (zoo vs. non-zoo)* • Days since upload • Genus • Human presence • Human-primate proximity • Primate infant presence	759

primates in non-zoo settings.				• Presence of domestic pets • Primates in clothes • Pet-keeping context	
<u>P5b:</u> Videos showing primates in zoos receive less hearts than videos showing primates in other settings.	Ross *et al.* (2011)*	0.02 (small)	759	• Setting* • Human presence • Human-primate proximity • Human-primate interaction • Days since upload • Genus • Primate infant presence • Pet-keeping context • Presence of domestic pets • Primates in clothes	759
<u>P6:</u> Videos in zoos showing a visible barrier between humans and primates are less likely to receive comments about wanting a pet primate	Ross *et al.* (2011)	0.01 (small)	1289	• Barrier* • Days since upload • Great Ape presence • Primate infant presence • Close human-primate contact	647

than videos in zoo settings showing no barrier between humans and primates.					

Data collection procedure: Hypotheses 1 – 5

I collected data from 759 videos across 22 days (35 videos per day on 21 days, and 24 videos on day 22), using the search term 'monkey'. Collecting data from 759 videos allowed me to detect small effect sizes ($f^2 = 0.02$) (*Table 2.5*). I collected data on weekdays only, starting at 10am and finishing at 4.20pm. I spent a maximum of 10 minutes on each video and included a 30-minute break at 1pm.

I initially planned to collect primate data using the search term 'monkey' in the general video search tab. The general search tab seemed most appropriate, because I wanted to avoid excluding any videos that did not used the 'monkey' hashtag, but still used 'monkey' in the caption. However, I reached the end of the video list on the second data collection day, despite knowing that there was much more primate content on the platform. In response to this, I shifted my search strategy to collect data from videos found using 'monkey' in the hashtag search tab and excluded any videos from the first two days that did not include this hashtag.

I ignored videos that did not show live primates. I only collected data from each video once, even if it was posted more than once by different accounts. I excluded comments by content creators. I summarised comments that I did not categorise as expressions of entertainment, criticism, cuteness or wanting a pet primate as 'other'. When necessary, I translated comments using the app feature. *Table 2.6* provides an overview of the variables recorded.

Table 2.6 Variables collected per video, their descriptions and relevance to hypotheses. [1] Variables only included in the 'monkey' data set'; [2] Variables only included in the 'zoo monkey' data set.

Variable	Description	Relevance to hypotheses
Username	Name of the account	-
Days since upload	Days since the video was uploaded, including the day of viewing the video. I entered the date of upload into a time span calculator (www.timeanddate.de) and noted number of days since upload	-

Hashtags	Words starting with a hashtag (#)	-
Number of hearts	Number of hearts ('likes')	H1, H2, H5
Number of views	Number of views, visible when accessing the uploader's account on the bottom left of each video	-
Video type	Educational: If the video included information on primates (e.g., behaviour, diet, habitat, conservation issues) Non-educational: If the content had an entertainment value, or both.	-
Account type	Private, a non-governmental organisation (NGO), a zoo/sanctuary; or other, based on video content, username, and user profile.	-
Number of comments	If comments were disabled, the video was excluded	-
Number of account followers	Number of people following the account at the time of data collection	-
Genus	Primate genera present in a video	-
Human presence (in frame)	Human visible in frame of the video, including body parts like hands	H1

Human-primate proximity	Estimate of the minimum distance between humans and primates (0 m; AR = within arm's reach, but not touching; < 7 m, > 7 m), regardless of whether person is behind the camera or in the frame	H1, H4
Number of comments expressing a desire to own a pet primate	Noting desire to own a pet primate. For example: "How can I want one".	H2, H3, H4, H5, H6
Primate infant presence	Presence of infant (non-adult) primate in the video	H2
Video activity themes	Activities, which were mutually exclusive, noted as: • Human-primate interaction: Videos showing humans and primate directing behaviour at one another • Natural primate behaviours: Feeding, socialising (grooming, playing with conspecifics), vocalising, aggression, locomotion and resting • Inter-species interaction: Any interactions between a primate and another animal species (excluding humans)	-

	• Primate directing behaviour towards human environments/objects. Includes performance acts (e.g., cycling, dog riding)	
Video setting[1]	• Human indoor environments: Indoor living spaces in human houses/flats, as well as cars • Human outdoor environments: Urban outdoor spaces • Zoos/sanctuaries: Indoor and outdoor facilities • Non-human outdoor environments: Natural places without visible human structures (houses, streets) • Any other settings: Other	-
Zoo setting[1]	I considered videos set in zoos when the animals were shown in any type of zoo setting, and any other setting as a 'non-zoo' setting.	H5
Caption[1]	Description of the video provided by the uploaders	-
Pet primate[1]	I categorised primates as pets based on the overall context of the video, which included:	-

	• Close human-primate contact (direct contact or interactions) • Human settings (e.g., living rooms, kitchen, garden) • Primates wearing clothes or leashes • Written context provided by the uploaders in the caption, including hashtags (e.g., #pet #bestfriend)	
Number of comments expressing concern[1]	Expressions of concern. For example: "Primates should not be kept as pets"	-
Number of comments 'cute'[1]	Notes on the cuteness of the video/animal. For example: "This is the cutest thing I have ever seen"	H2
Number of 'cute' + 'want one'[1]	Notes on the cuteness of the video/animal *and* expressing to want a primate. For example: "This is soooo cute, I want one!".	-
Number of comments suggesting entertainment[1]	People express enjoying the video/are entertained by it. For example: "This is hilarious! Made my day".	-

Primates in clothes[1]	Video with primates wearing clothes, including diapers and leashes	-
Primate(s) with domestic pets[1]	Presence of domestic pets (e.g., cats, dogs) with primates	-
Close human-primate contact[1]	Humans within arm's reach of primates, including direct contact	H4
Human-primate behaviour[1]	Coded as: • Human-primate directed behaviour: Humans directing behaviour towards primates • Primate-human directed behaviour: Primates directing behaviour towards humans • Human-primate interaction: Humans' and primates' direct behaviours towards each other • No interaction: Neither primates nor humans' direct behaviours towards each other	H1
Human-primate interaction	Presence/absence of human-primate interactions.	H4
Written primate pet-keeping context[1]	Written pro primate pet-keeping contexts inferred from the username (e.g.,	H3

	@primatepetlover), captions and text on screen (e.g., "Meet my pet"), hashtags (e.g., #pet, #cute, #bestfriends, #exoticpets) used by content creator. I categorised videos that did not link primates to pets or included anti-primate pet-keeping context (e.g., #nopets) as having no written pro-primate pet-keeping context	
Great ape presence[2]	Presence of great apes	-
Barrier (any type)[2]	Presence of any type of visible barrier between human(s) and primate(s)	H6
Barrier (specific type)[2]	• Glass/fence-type barrier • Trench-type barrier • Both • None	-

Data collection procedure: Hypothesis 6

I collected data for hypothesis 6 after completing data collection for hypotheses 1-5, using the search term 'zoo monkey' in the general search tab. I collected data from 345 videos (70 videos per day on 4 days, 65 on the 5th day), at which point I reached the end of the video search list. Although I had planned to collect 647 videos ($f^2 = 0.02$), sampling 345 videos would still enable me to detect a small effect size ($f^2 = 0.04$).

I collected data on weekdays only, starting at 10am and finishing at 4.20pm. I spent a maximum of 5 minutes on each video and included a 30-minute break at 1pm. I excluded videos that did not show live primates, that showed primates not located in a zoo setting or

had a disabled comment section. I only collected a video once, even if it was posted by a different account. I categorised all comments not expressing a wish to have a pet primate as 'other'. *Table 2.6* provides an overview of variables collected for the 'zoo monkey' search data set.

2.4 Statistical analyses

I transferred the data from Excel to IBM SPSS Statistics Software 27. I tested predictions using multiple linear regression and selecting 'Enter' (all variables in a block are entered in a single step). I tested the model assumptions, including linearity, multicollinearity, independence, and homoscedasticity. When these were not met, I transformed the data (log10 or log10+1) and used bootstrapped regression models for robust confidence intervals and significance tests (*Table 2.7*). VIF Collinearity diagnostic values across all models showed no concern for multicollinearity between the predictor variables. Due to the large data sets, I assumed that non-normality of residuals did not influence the validity of the results (Fields, 2018). I considered p-values significant at ≤ 0.05. Except for p-values, I rounded results to two decimal places. I highlighted significant results in bold.

Lastly, I performed an inter-rater reliability test post-data collection (13th July – 18th July 2022) on 10% of my data. Collecting data from 20 videos per day (except for the last day), a lay observer and I categorised 34 comments per video by themes separately, resulting in 94.5% agreement.

Table 2.7 Description of statistical analyses used to test my predictions.

Model	Predictions, dependent and independent variables	Violations	Transformations	Models used
1	Dependent variable: Number of hearts Independent variable: Human presence (P1a), human-primate proximity (P1b), Human-primate	Linearity and homoscedasticity	Non-linear data transformation (Log10) of the continuous independent variable (number of days since	Multiple linear regression

	interaction (P1c), Infant presence (P2a), Pet-keeping context (P3b), Setting (P5b)		upload) and the dependent variable (number of hearts)	
2	Dependent variable: Cute-type comments (%) Independent variable: Infant presence (P2b)	Linearity and homoscedasticity	Non-linear data transformation of the dependent variables (% of 'want primate' comments (Log10+1), number of days since upload (Log10) fixed the violation of linearity, but not heteroscedasticity	Bootstrap regression
3	Dependent variable: Want-primate comments (%) Independent variable: Pet-keeping context (P3a), Human-primate proximity (AR vs. >AR) (P4a), Infant presence (P2c)	Homoscedasticity	Non-linear data transformation (Log10) of the continuous dependent variable (% of 'want primate' comments) did not fix heteroscedasticity	Bootstrap regression
4	Dependent variable: Want-primate comments (%) Independent variable:	Homoscedasticity	Excluded 154 videos showing humans and primates further	Bootstrap regression

	Human-primate proximity (0m vs. AR) (P4b)		away than arm's reach, using the 'Select cases' option. Non-linear data transformation of the dependent variable (% of 'want primate' comments) did not fix heteroscedasticity	
5	<u>Dependent variable:</u> Want-primate comments (%) <u>Independent variable:</u> Setting (P5a)	Linearity and homoscedasticity	Non-linear data transformation of the dependent variables (% of 'want primate' comments (Log10+1) and number of days since upload (Log10) fixed the violation of linearity, but not heteroscedasticity	Bootstrap regression
6	<u>Dependent variable:</u> Want-primate comments (%) <u>Independent variable:</u> Barrier presence (P6)	Size of variance compared to the mean number of 'want primate' comments revealed an	Model did not allow for categorical data with more than 2 groups. Hence, the primate	Zero-inflated negative binomial model

		overdispersion of zeros. Data did not fit Poisson distribution	genera variable was transformed into great ape presence (Y/N).	

2.5 Data storage

I entered all data into Microsoft Excel spreadsheets and stored files on the university approved Microsoft One Drive for maximum data protection.

Chapter 3: Overview of primate content on TikTok

The purpose of this chapter is to provide insights into (i) uploaders of primate content on TikTok, (ii) users' responses to videos, and (iii) specific video content variables.

3.1 Uploaders of primate content

Account and video types

Videos were published between 08 June 2018 and 12 May 2021 ('monkey' search data set; 759 videos), and between 18 January 2019 and 17 May 2021 ('zoo monkey' search data set; 345 videos), and almost all were posted by private accounts (97.9% in the 'monkey' search data set, 99.7% in the 'zoo monkey' data set). Only a few videos were posted by zookeepers (0.4% in the 'monkey' search data set, 0% in the 'zoo monkey' data set), NGOs (0.4% videos in the 'monkey' search data set, 0.3% video in the 'zoo monkey' data set), zoos (0.4% videos in the 'monkey' search data set, 0% in the 'zoo monkey' data set) and other accounts (0.9% in the 'monkey' search data set, 0% in the 'zoo monkey' data set). Across both data sets, all videos, except for one video in the 'zoo monkey' data set, were categorised as non-educational.

Account followers

The number of account followers ranged from 396 to 24.8 million with a median of 563 100 (IQR = 76 600 – 2.6 million) in the 'monkey' data set, while follower numbers ranged from 1 to 7.4 million with a median of 162 400 (IRQ = 8900 – 162 400) in the 'zoo monkey' data set.

Pet-keeping context and hashtag use

Significantly more videos in the 'monkey' data set had no pro-pet-keeping context than had a pro-pet keeping context ($x^2(1)= 275.16$, $p < 0.001$) (*Figure 3.1).* This is supported by a word cloud created using hashtags from the 'monkey' data set only (*Figure 3.2*). The hashtags "FORYOUPAGE", "FYP" (= for you page), "FY" (= for you), and "VIRAL" indicate the uploaders' goal of reaching as many users as possible, and, hence gaining more views. Furthermore, many uploaders labelled videos as "CUTE" and "FUNNY" , and labelled primates as a "PET".

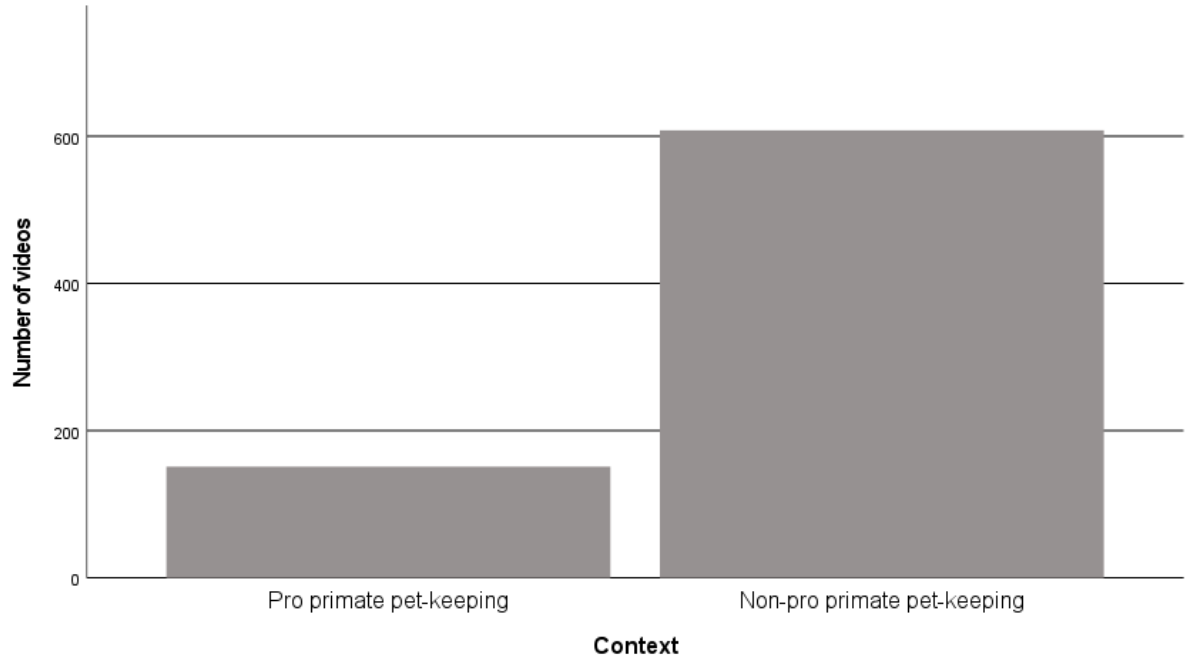

Figure 3.1 Videos with and without a pro-primate pet keeping context in the 'monkey' data set (n= 759), showing a significant difference.

Figure 3.2 Word cloud based on all hashtags found (n= 4362, excluding #monkey) on videos in the 'monkey' data set (total videos= 759).

3.2 Video outcomes

Total number of views

Across the 'monkey' data set, the total number of views ranged from 94 600 to 147.2 million with a median of 3.5 million (IQR = 1.7 – 6.5 million). Across the zoo 'monkey' data set, the total number of views ranged from 0 to 147.3 million with a median of 25 900 (IQR = 7200 – 83 000). Across both data sets most videos (80.9% of the 'monkey' and 97.7% of the 'zoo monkey' data set) received < 5 million views.

Number of hearts

Across the 'monkey' data set, the number of hearts ranged from 3133 to 17.2 million with a median of 133 600 (IQR = 80 600–291 200). Across the 'zoo monkey' data set, the number of hearts ranged from 0 to 11 million with a median of 965 (IQR = 253–2403). Most videos received <500 000 hearts (85.2% of the 'monkey' and 97.7% of the 'zoo monkey' data set).

Number of comments

The number of comments per video in the 'monkey' data set ranged from 30 to 378 700 comments with a median of 2394 (IQR = 1080 – 6275), however, most videos (93.9%) received < 15 000 comments. The number of comments per video in the 'zoo monkey' data set ranged from 0 to 87 600 comments with a median of 1 (IQR = 0 – 20 500). Most videos (96.5%) received < 3 000 comments.

Comments: Entertainment, primate cuteness, pet-primate desirability, and video criticism

Most comments (n= 10 555; 40.9%) were coded as expressions of entertainment, 2924 commenters (11.33%) labelled videos as cute, and 537 (2.08%) commenters criticised video content. Across both data sets, a relatively small percentage of commenters expressed a desire to own a pet primate (*Table 3.1*). These were, nonetheless, 1368 comments in the 'monkey' and 181 comments in the 'zoo monkey' data sets expressing a desire to have a pet primate.

Table 3.1 Percentage of comments by comment themes across the 'monkey' and 'zoo monkey' data set.. Comments in the 'monkey' data set numbers do not add up to 100%, because themes 2 and 3 both contain 0.35% of "I want one" and cute-type comments.

Comment themes	Comments (%)	
	'Monkey' search (n = 25 806)	'Zoo monkey' search (n = 3441)
1. Expressions of entertainment	40.90	-
2. Cute-type comments	11.68	-
3. Expressing desire to own a pet primate	5.38	0.7
4. Expressing concern (e.g., criticising pet ownership)	2.08	-
5. Others	40.66	99.3

3.3 Video content

Genera

Both data sets contained a considerable number of videos showing the genus *Macaca* (40.3% of the 'monkey' data set and 68.1% of the 'zoo monkey' data set) (*Figure 3.13 and 3.14*). There was a significant difference in the number of videos by primate genera across both data sets

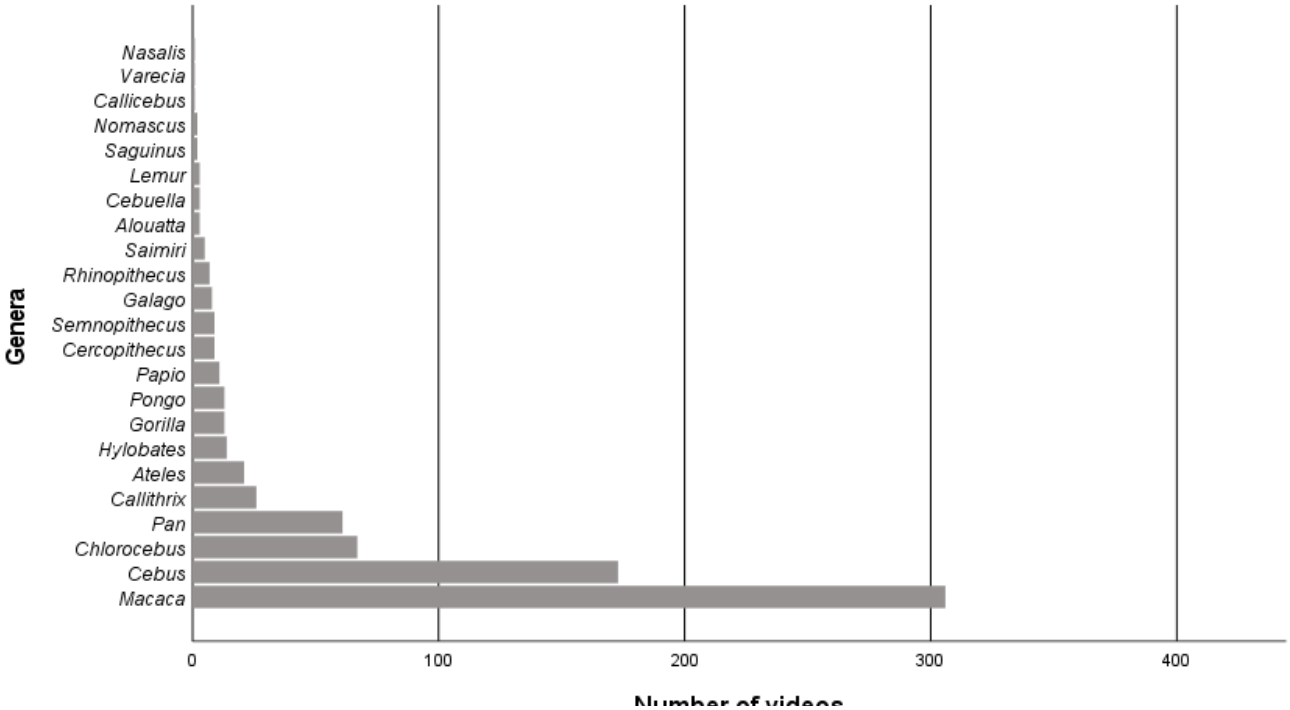

Figure 3.3 Videos by primate genus ('monkey' data set; n= 759).

('monkey' data set: x^2 (15)= 2075.32, p= <0.001; 'zoo monkey' data set: x^2 (9)= 1302.45, p= <0.001). The 'zoo monkey' data set did not include any strepsirrhine species.

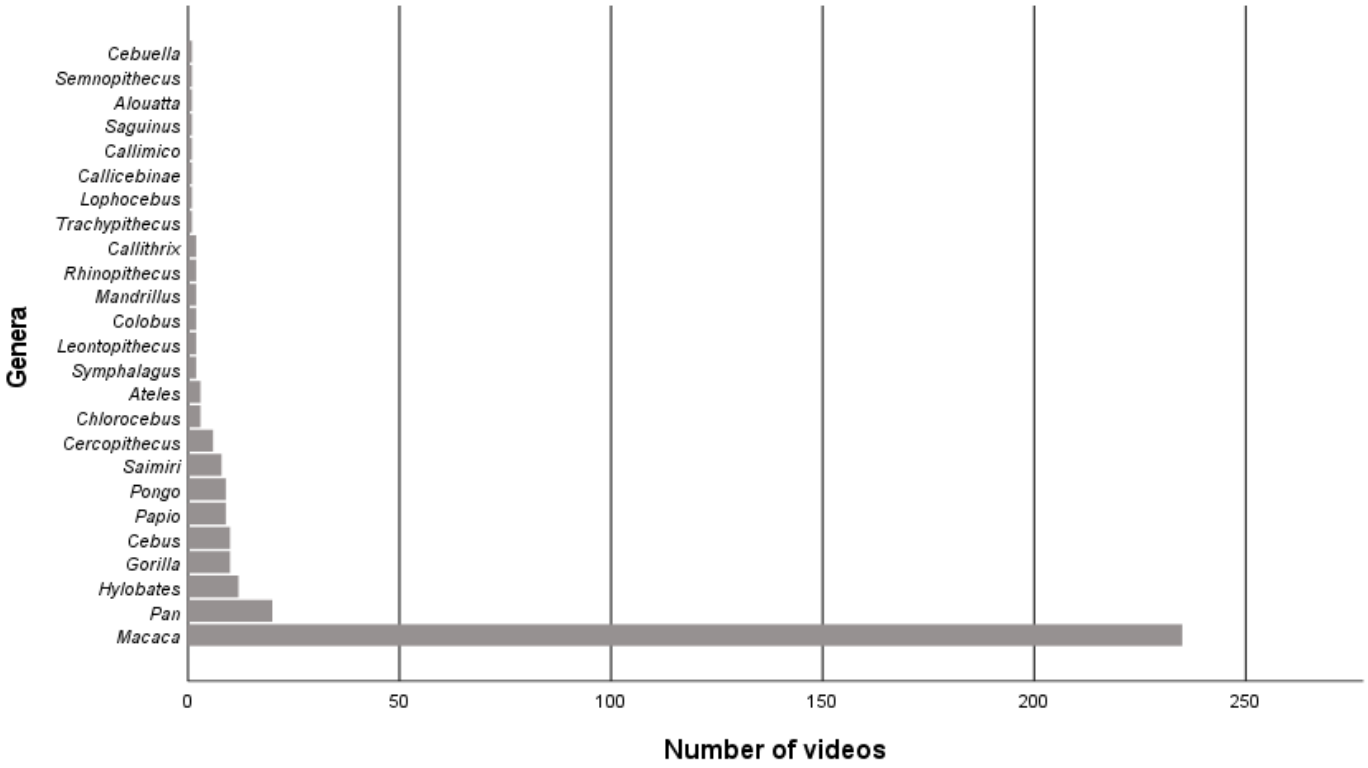

Figure 3.4 Videos by primate genus ('zoo monkey' data set; n= 345).

Primate infant presence, primate as pets and primates with domestic pets

Across both data sets, more than half of the videos included primate infants (Figure 3.5). There were significantly more videos without than with primate infants ('monkey' data set (x^2 (1)= 41.28, p < 0.001; 'zoo monkey' data set: x^2 (1)= 6.96, p= 0.008).

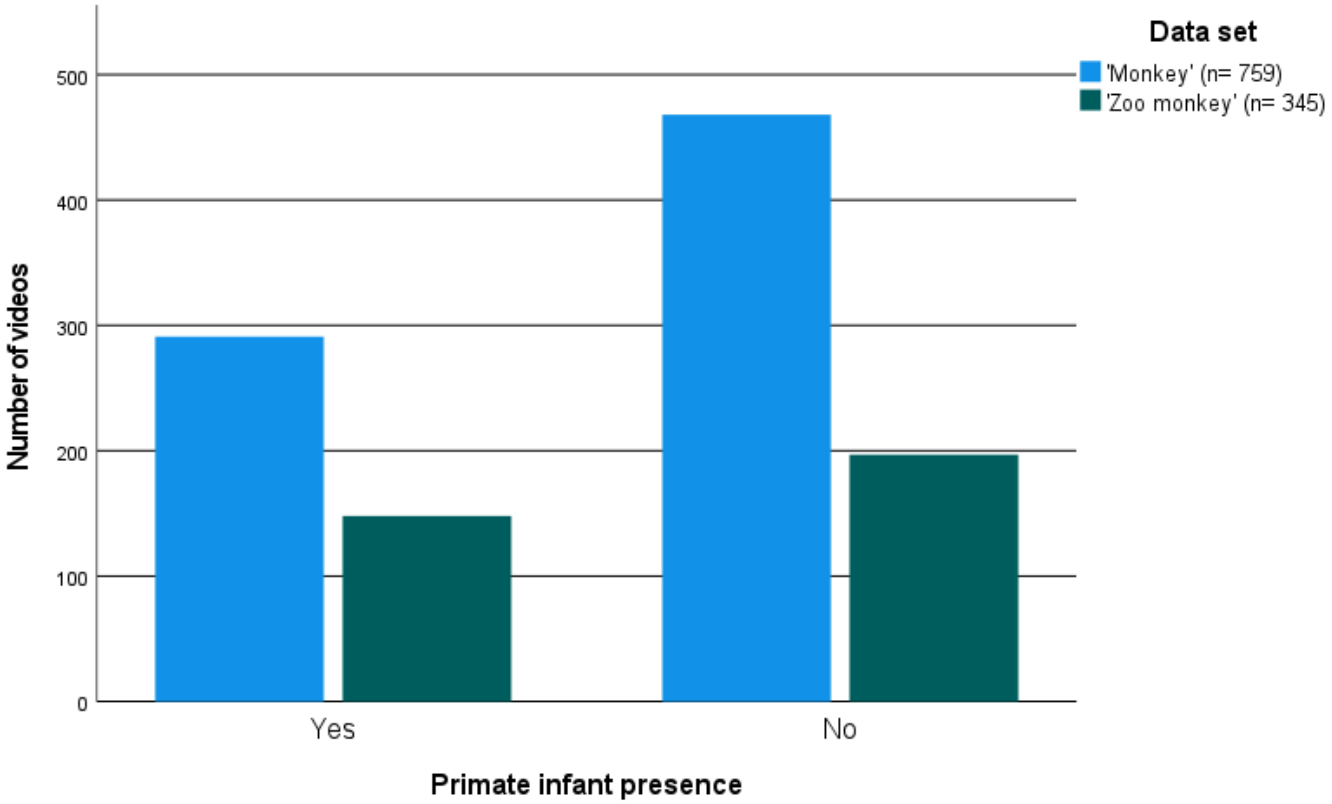

Figure 3.5 Videos by primate infant presence. In both data sets there are significantly more videos without than with primate infants.

More than half of all videos (63%) in the 'monkey' search data set showed primates as pets (*Figure 3.6*), significantly more than videos without pet primates (x^2 (1)= 52.77, p= <0.001).

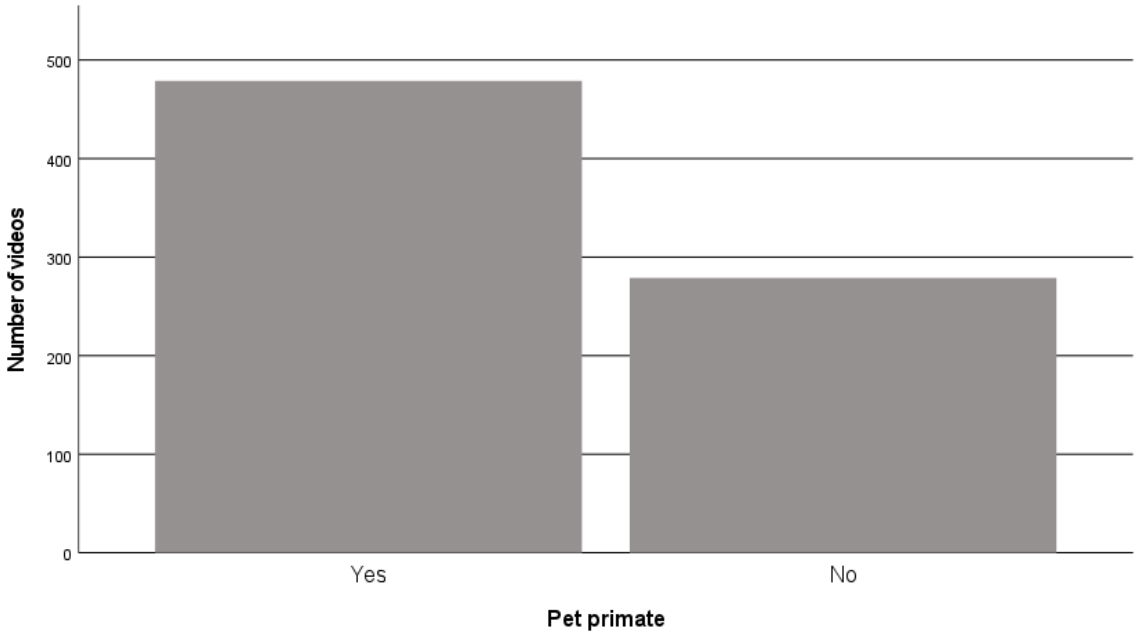

Figure 3.6 Videos by pet primate presence ('monkey' data set, n= 759).

Only few videos (6%) in the 'monkey' data set showed primates with domestic pets (*Figure 3.7*), and significantly more videos featured primates without than with domestic pets (x^2 (1)= 602.87, p < 0.001).

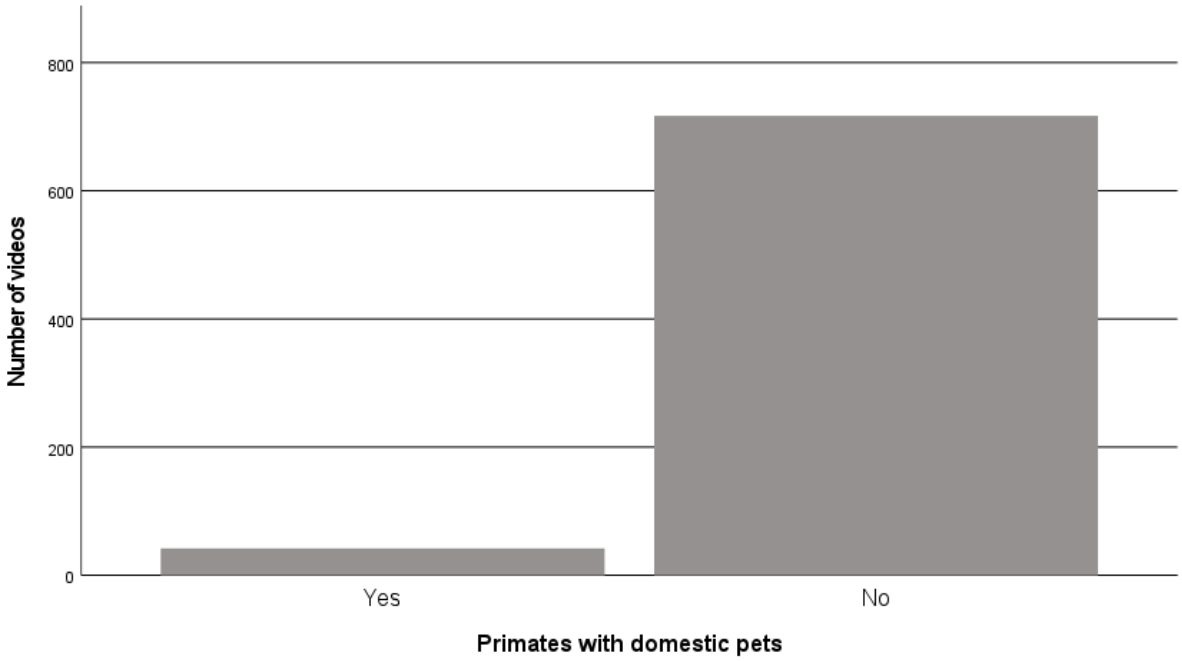

Figure 3.7 Videos by the presence/absence of domestic pets ('monkey' data set (n= 759).

More than half of the 'monkey' data set (58%) showed primates without clothes (*Figure 3.8*), significantly more than videos showing primates with clothes (x^2 (1)= 17.42, p= <0.001).

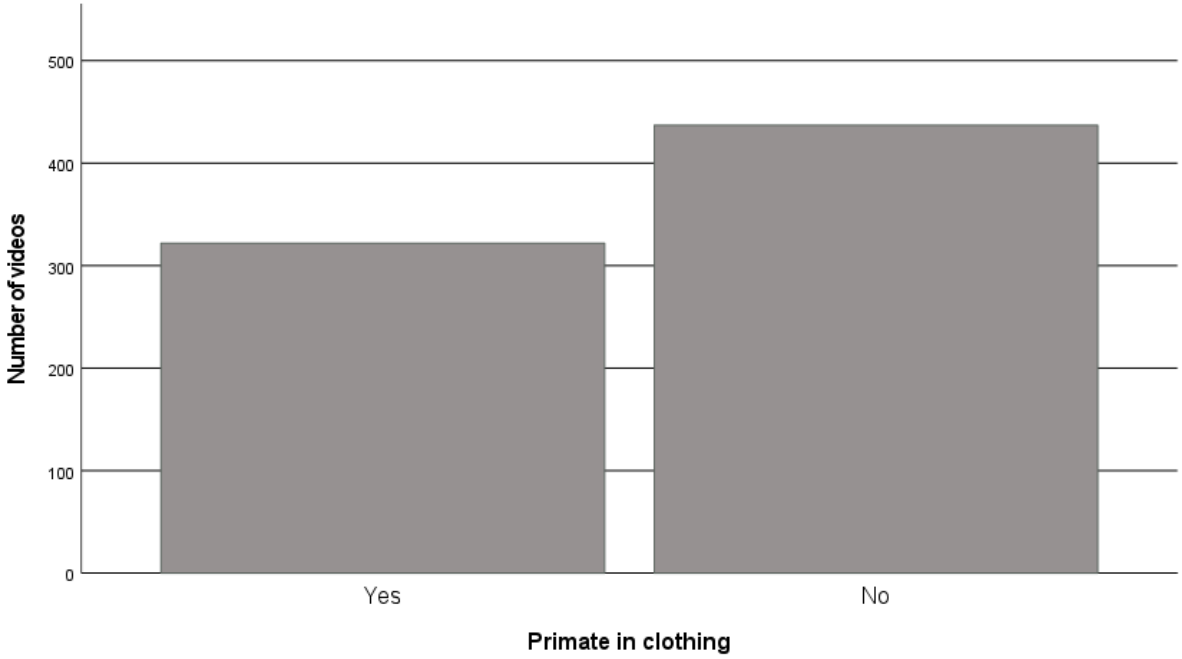

Figure 3.8 Videos by primates with and without clothing ('monkey' data set, n= 759).

Setting

The number of videos differed significantly across settings in the 'monkey' data set (x^2 (4)= 425.38, p < 0.001). The largest proportion of videos by setting showed primates in indoor human environments (45.1%) (*Figure 3.9*).

Figure 3.9 Videos by setting ('monkey' data set, n= 759).

Barrier

In the 'zoo monkey' data set, 255 videos (73.9%) showed no barrier between humans and primates (*Figure 3.10*). This was significantly more than videos showing a barrier between humans and primates ($x^2(1)= 78.91$, $p= <0.001$).

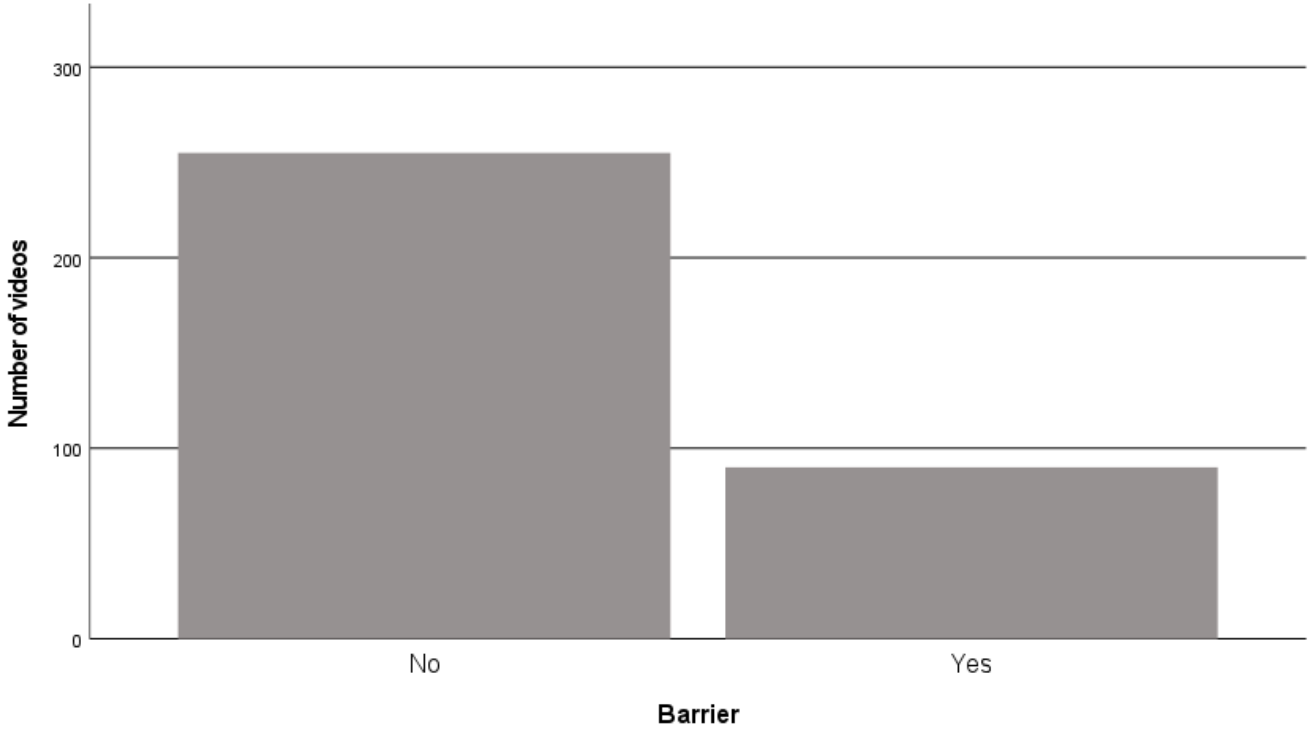

Figure 3.10 Videos with and without showing a barrier between humans and primates ('zoo monkey' data set, n= 345).

Human presence in the frame

The 'monkey' data set contained more than 500 videos (67.3%) showing humans in frame with primates, significantly more than videos showing primates alone ($x^2(1)= 91.13$, $p= <0.001$) (*Figure 3.11*). In contrast, the 'zoo monkey' data set, included significantly more videos of primates alone than videos with primates and humans in the frame ($x^2(1)= 160.07$, $p= <0.001$).

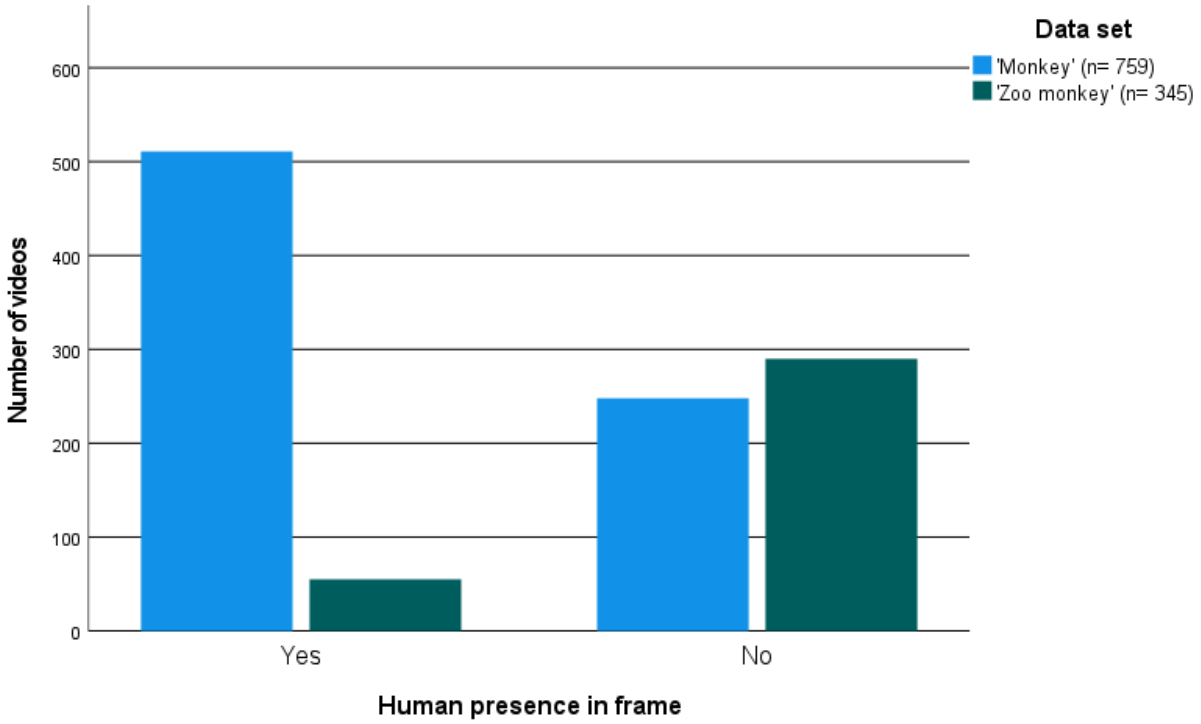

Figure 3.11 Videos showing primates with and without humans in frame.

Human-primate proximity

When considering the overall minimum distance between humans and primates, regardless of whether the humans were behind the camera or in frame, significantly more videos (605 79.7%) in the 'monkey' data set showed humans close to primates (≤ arm's reach, including direct contact) than humans further away ($x^2(1)= 267.99$, $p < 0.001$) (*Figure 3.12*).

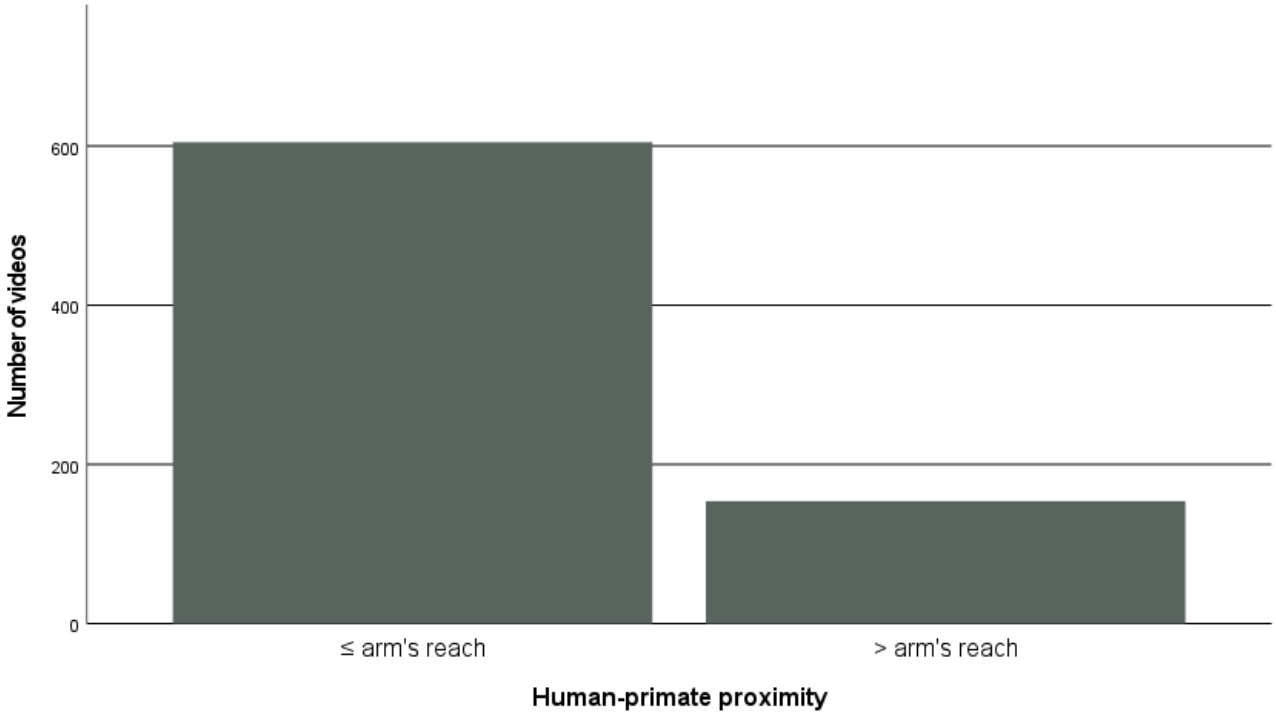

Figure 3.12 Videos showing primates within arm's reach (including direct contact) and further away in ('monkey' data set, n= 759).

In contrast, the 'zoo monkey' search data set included 240 videos (69.6%) showing primates at more than arm's reach from humans, significantly more than videos showing humans within arm's reach (including direct contact) ($x^2(1)= 52.83$, $p < 0.001$) (*Figure 3.13*).

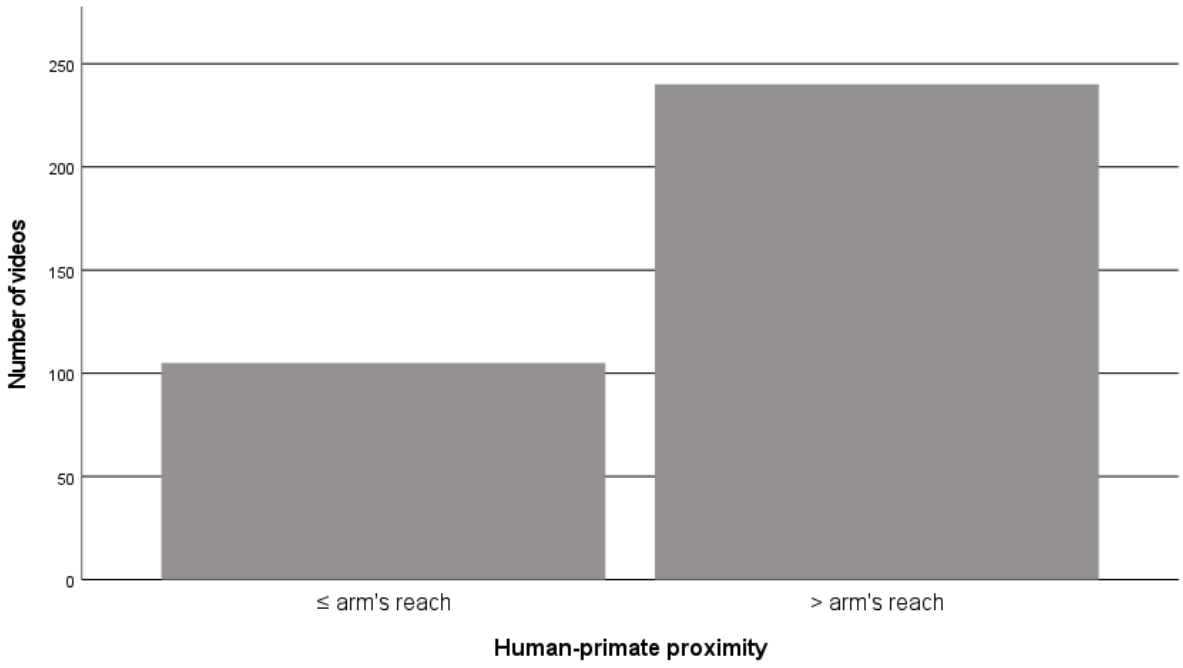

Figure 3.13 Videos showing primates within arm's reach (including direct contact) and further away ('zoo monkey' data set, n= 345).

There was a significant difference in the number of videos showing direct human-primate contact by setting (x^2 (4)= 493.73, p < 0.001). Primates in direct contact with humans were most frequently observed in human indoor environments (*Figure 3.14*).

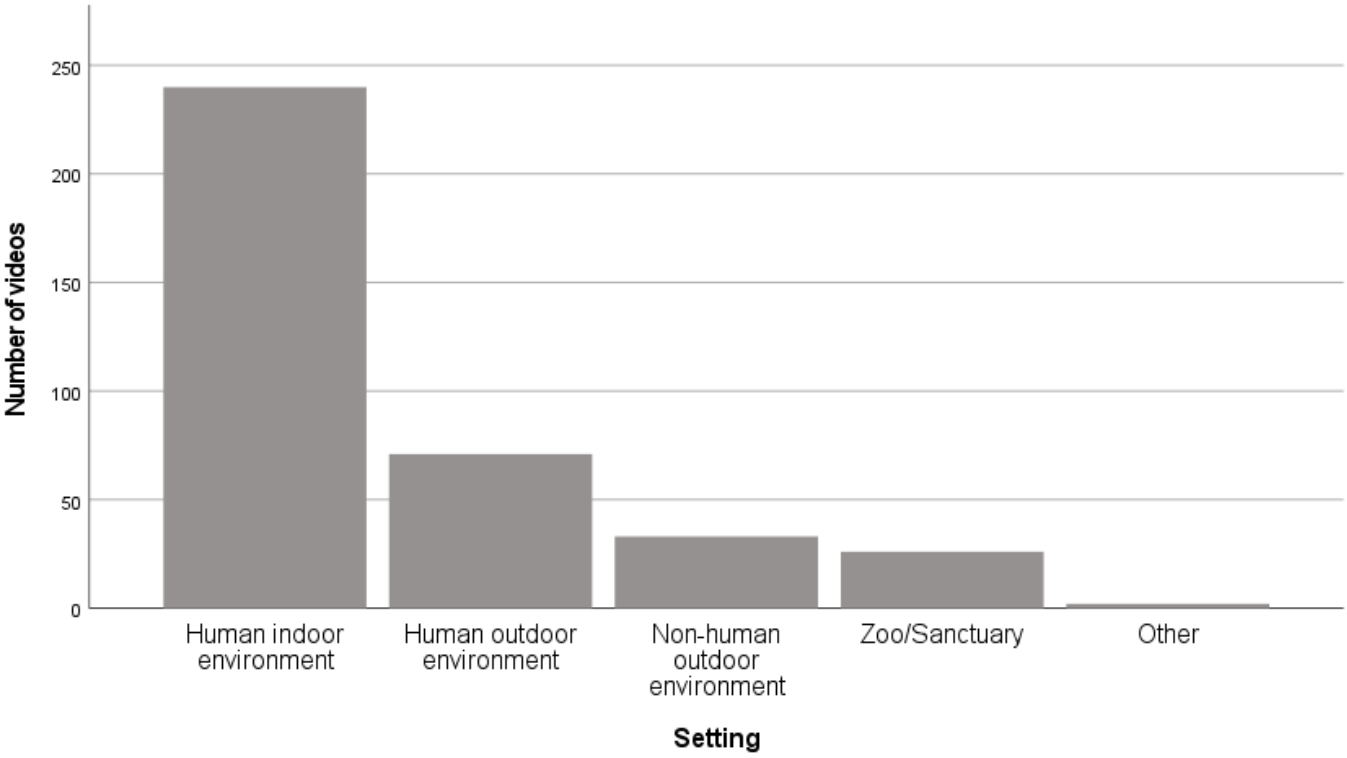

Figure 3.14 Videos of primates in direct contact with humans by setting ('monkey' data set, n= 759).

Across both data sets there was no significant difference in human-primate proximity between videos with and without infant primates ('monkey' data set: x^2 (3)= 7.19, p= 0.066; 'zoo monkey' data set: x^2(3)= 12.08, p= 0.007).

Based on the 'monkey' data set only, there were more videos of primates in direct contact with humans when the animals were pets than when they were not (*Figure 3.15*). Overall, human-primate proximities differed significantly between videos with and without primates as pets (x^2(3)= 107.18; p= <0.001).

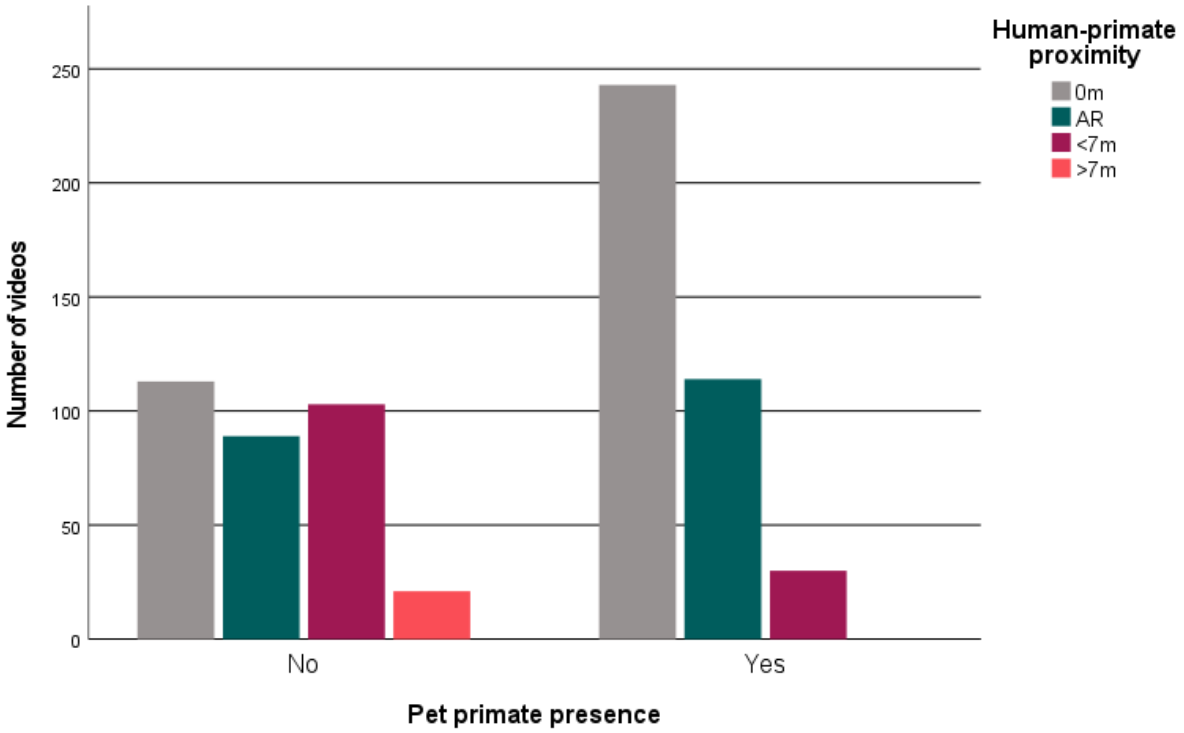

Figure 3.15 Videos with and without primates as pets by human-primate proximity ('monkey' data set, n= 759). AR= within arm's reach, but not touching.

In the 'zoo monkey' data set, where all videos were set in zoo settings, human-primate proximity did not significantly differ by barrier types ($x^2(3)= 9.78$, $p= 0.021$).

Activity theme

The most common video theme in the 'monkey' data set was human-primate interaction, with 468 videos (61.6%), and in the 'zoo monkey' data set it was natural primate behaviour with 304 videos (88.1%) (*Figure 3.16*). In the 'monkey' data set, significantly more videos included human-primate interactions than did not ($x^2(1)= 41.28$, $p < 0.001$) (*Figure 3.17*). The 'zoo monkey' data set included significantly more videos showing natural primate behaviours than the 'monkey' data set ($x^2(1)= 200.49$, $p < 0.001$) (*Figure 3.18*).

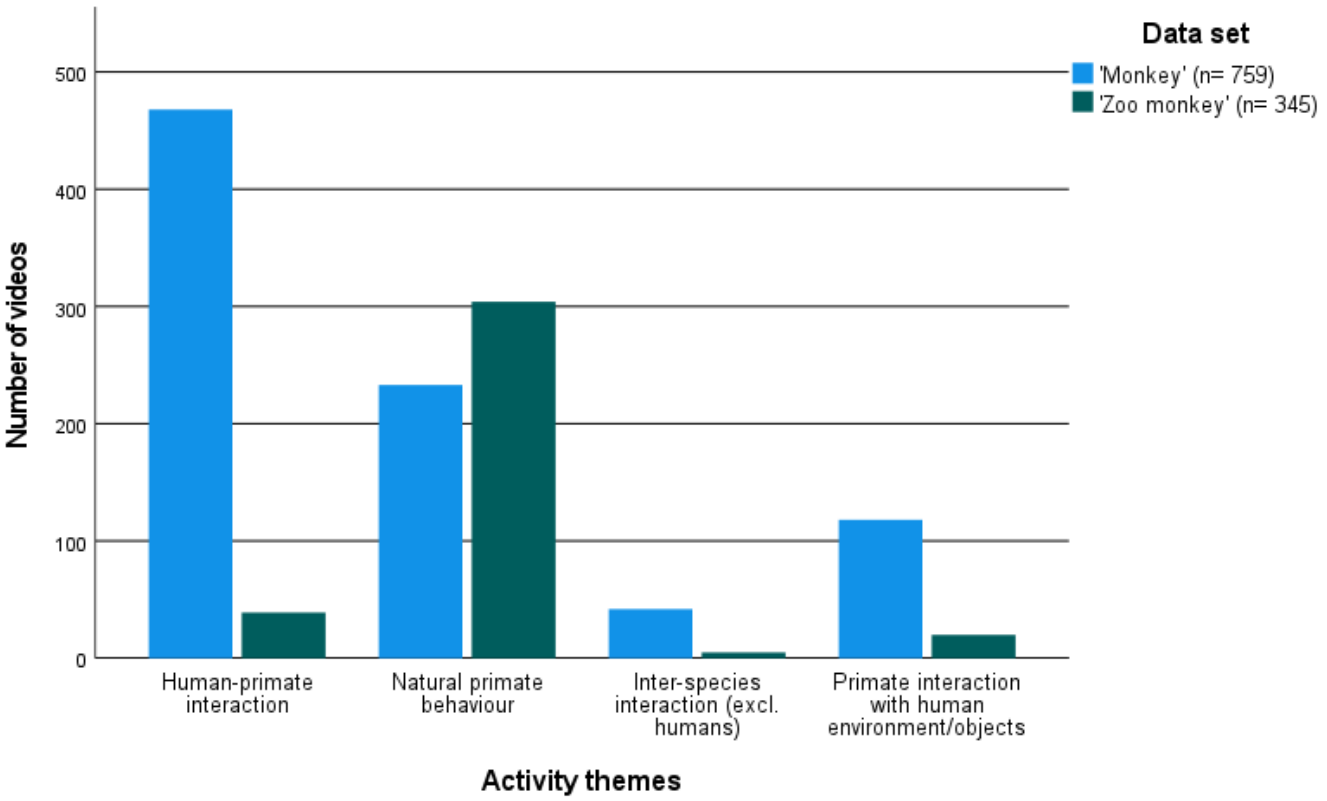

Figure 3.16 Number of videos by activity theme.

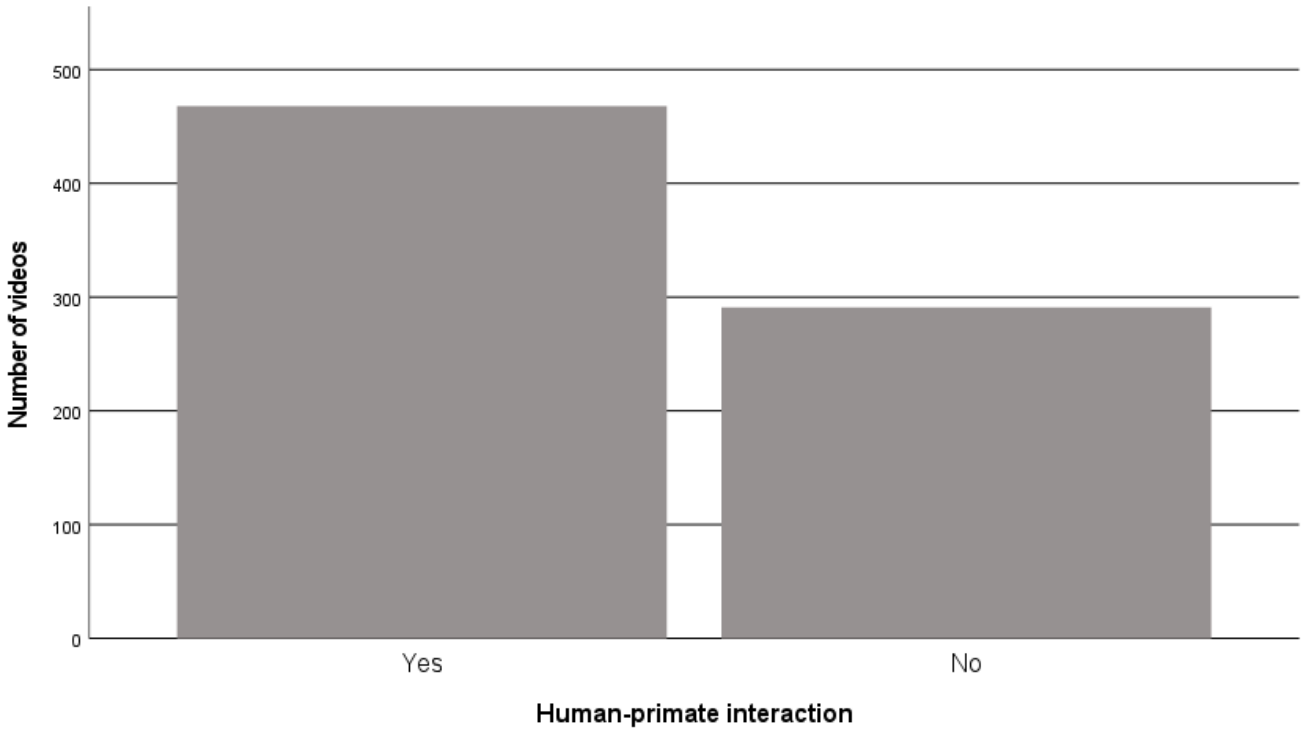

Figure 3.17 Videos with and without human-primate interactions primates ('monkey' data set, n= 759).

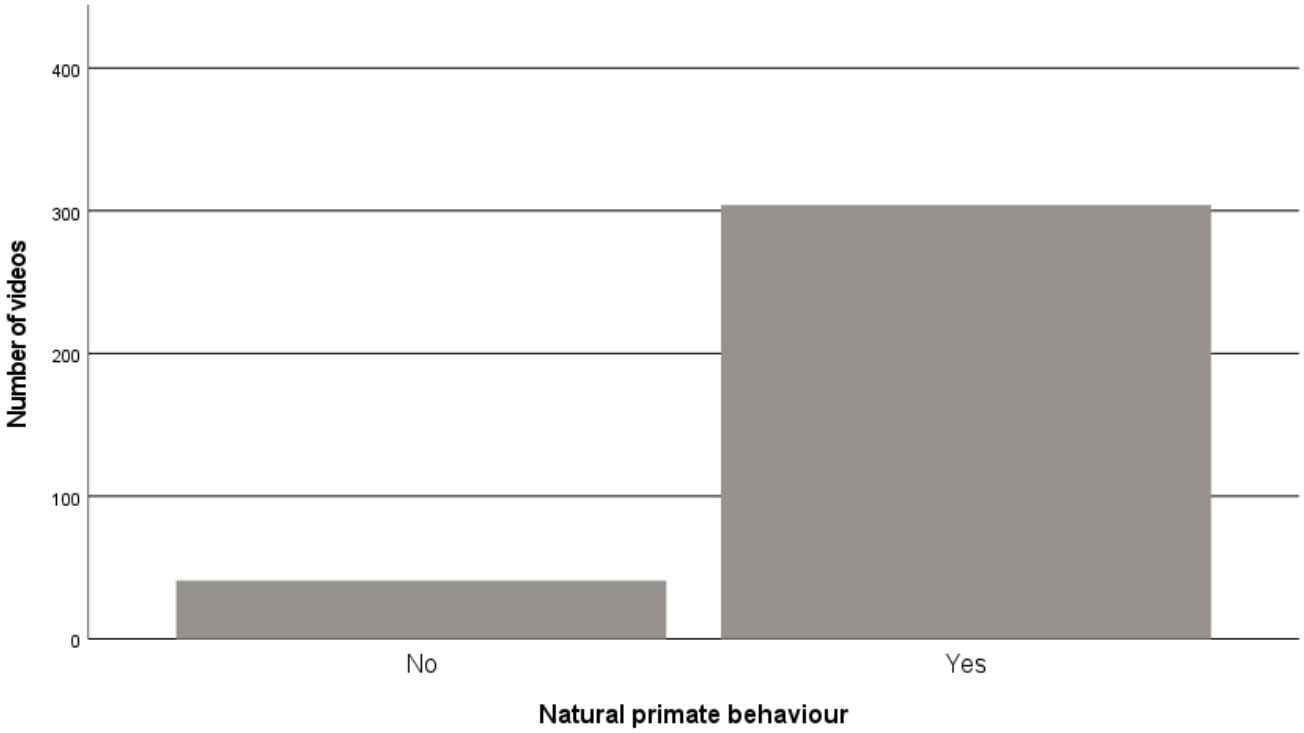

Figure 3.18 Videos with and without natural primate behaviour ('zoo monkey' data set, n= 345).

Human-primate interactions/directed behaviours

The type of human-primate interactions significantly influenced the number of videos ($x^2(3)= 302.84$, $p < 0.005$). Most videos in the 'monkey' data set showed human-primate interactions, where both humans and primates directed behaviours toward each other. Videos showing primates directing behaviours toward humans without humans responding were least represented (*Figure 3.19*).

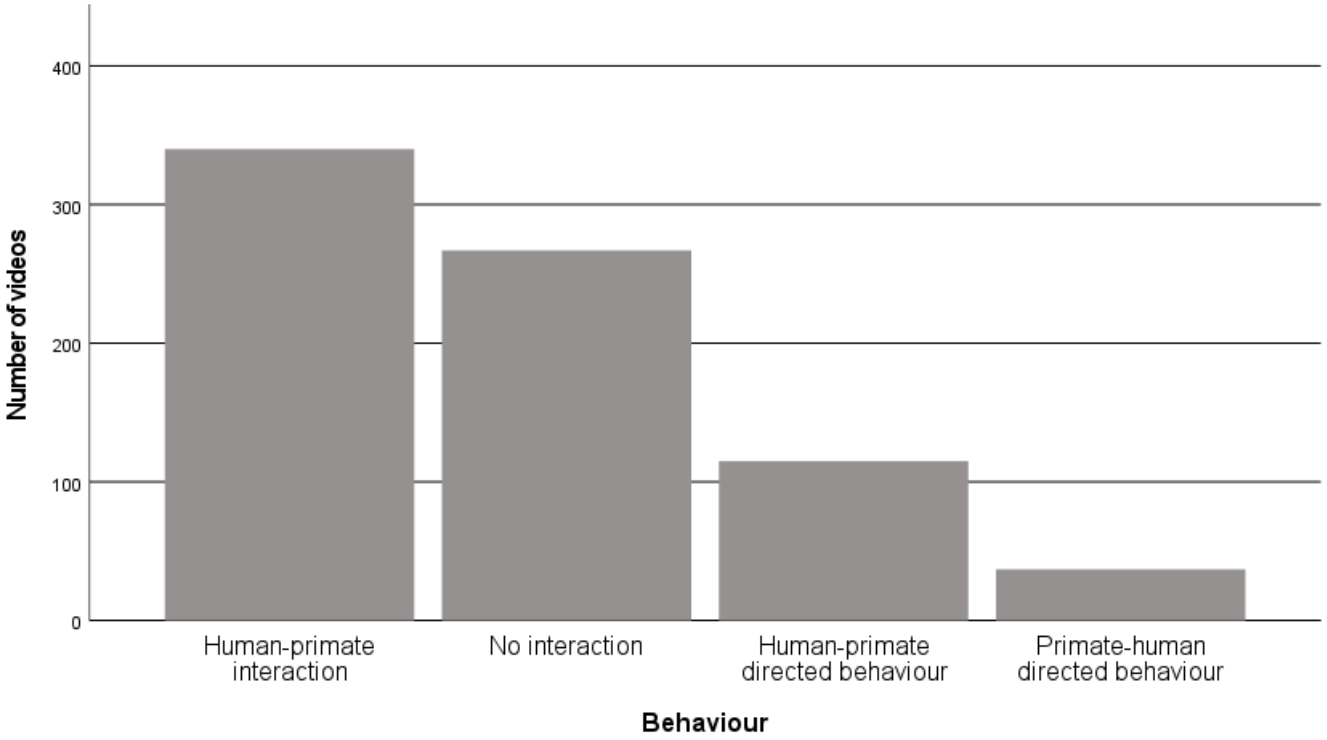

Figure 3.19 Videos for each type of human-primate behaviour ('monkey' data set, n= 759).

Chapter 4: Results of hypothesis testing

4.1 Hypothesis 1

Hypothesis 1: Videos of humans and primates together, in close proximity, or interacting are more popular than videos showing primates alone, further away from humans or videos without human-primate interactions, because users may be familiar with close human-animal encounters in the media, have an "innate human fascination for the animal 'other', which renders close proximity a desired and highly memorable occurrence" (p. 162), and because close encounters are particularly exciting and more intimate to watch (Curtin, 2010).

P1a: Videos showing humans and primates together receive more hearts than videos showing primates alone.

Videos showing humans with primates (mean = 401 940 hearts; SD= 1.11) received 3% more hearts than videos of primates alone (mean = 389 590 hearts; SD= 1.19), a difference which was not significant (*Table 4.1*), showing no support for P1a.

Table 4.1 Model 1, a multiple linear regression model based on the 'monkey' data set (n= 759), testing P1a, P1b, P1c, P2a, P3b and P5b with number of hearts as the outcome variable. The overall model is significant ($r^2 = 0.036$, $F(10, 748) = 2.76$; $p = 0.002$). [1]Key predictor variables; [2]Other predictor variables

Predictor variables	**Unstandardised Coefficients**		**95% CI**		**t**	**P**
	B	**SE**	**Lower**	**Upper**		
Human presence[1]	-0.07	0.05	-0.19	0.02	-1.53	0.127
Human-primate proximity[1]	-0.01	0.03	-0.07	0.05	-0.36	0.722
Human-primate interaction[1]	0.02	0.04	-0.06	0.10	0.50	0.615
Primate infant presence[1]	0.06	0.04	-0.01	0.13	1.59	0.112
Pet-keeping context[1]	-0.05	0.04	-0.14	0.03	-1.30	0.194
Setting (zoo vs. non-zoo)[1]	-0.12	0.03	-0.18	-0.06	-3.98	**< 0.001**

Primates in clothes²	0.01	0.04	-0.06	0.08	0.29	0.772
Primates with domestic pets²	-0.09	0.07	-0.23	0.06	-1.22	0.223
Days since upload²	0.05	0.04	-0.02	0.13	1.39	0.165
Genus²	-0.004	0.004	-0.01	0.004	-0.89	0.374

P1b: The number of hearts increases as human-primate proximity decreases.

The mean number of hearts by proximity category ranged 2-25%, with the largest difference between videos showing humans in direct contact with primates and videos showing humans <7 m from primates, and the smallest difference between videos showing humans within arm's reach of primates, but not touching, and videos showing humans <7 m from primates (mean 0 m = 439 410 hearts, SD= 1.21; AR = 357 220 hearts, SD= 1.01; <7 m = 351 040 hearts, SD= 1.21; >7 m= 410 780 hearts, SD= 0.18). There was no significant relationship between human-primate proximity and the number of hearts (*Table 4.1*), showing no support for P1b.

P1c: Videos showing human-primate interactions receive more hearts than videos showing no interactions.

Videos showing human-primate interactions (mean = 430 000 hearts; SD= 0.82), received 14% more hearts than videos without human-primate interactions (mean = 371 850 hearts; SD= 1.34), but there was no significant difference (*Table 4.1*), showing no support for P1c.

4.2 Hypothesis 2

Hypothesis 2: Primate cuteness influences video popularity and people's desire to own a pet primate, because people are attracted to infant-like features (baby schema) that result in an innate care-giving response (Glocker *et al*., 2009; Lorenz, 1971).

P2a: Videos showing primate infants receive more hearts than videos showing non-infant primates.

Videos showing infant primates (mean= 488 010 hearts; SD= 1.67) received 30% more hearts than videos without infant primates (mean= 341 860 hearts; SD= 0.58), but there was no significant difference (*Table 4.1*), showing no support for P2a.

P2b: Videos showing primate infants increase the likelihood that users comment on how cute the video is compared to videos showing non-infant primates.

Videos with infant primates (mean= 16.09% comments; SD= 13.56) received a significantly (2x) higher percentage of cute-type comments than videos without infant primates (mean= 8.36% comments; SD= 9.56) (*Table 4.2; Figure 4.1*), supporting P2b.

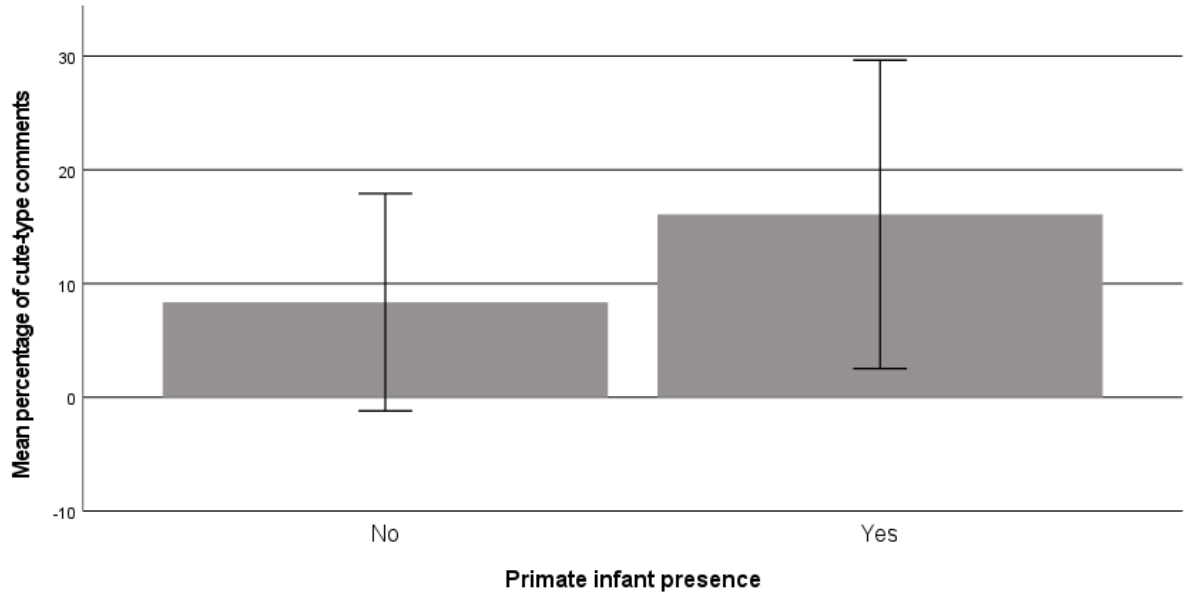

Figure 4.1 Mean percentage of 'cute-type' comments by primate infant presence ('monkey' data set, n= 759), showing a significant difference. Mean 'cute-type' comments (infant presence)= 16.09%; SD= 13.56; Mean 'cute-type' comments (infants absent)= 8.36%; SD= 9.56; Error bars= +/- 1SD.

Table 4.2 Model 2, a bootstrap regression model based on the 'monkey' data set (n= 759) testing P2b with the percentage of cute-type comments as the outcome variable. The full model is significant (r^2= 0.185, F(8, 750)= 21.333; p= <0.001). Standard errors (SE), confidence intervals (CI) and p-values are based on 1000 bootstrap samples. [1]Key predictor variables; [2]Other predictor variables

Predictor variables	B	SE	95% CI		t	P
			Lower	Upper		

Primate infant presence [1]	0.39	0.04	0.31	0.47	9.93	**0.001**
Pet-keeping context[2]	-0.15	0.05	-0.23	-0.05	-3.06	**0.004**
Primates in clothes[2]	0.13	0.05	0.04	0.22	2.77	**0.007**
Primates with domestic pets[2]	-0.001	0.09	-0.16	0.17	-0.01	0.993
Close human-primate contact[2]	-0.10	0.04	-0.19	-0.02	-2.39	**0.031**
Number of days since upload[2]	0.12	0.04	0.03	0.19	2.77	**0.006**
Genus[2]	0.001	0.01	-0.01	0.01	0.17	0.865
Setting[2]	-0.06	0.02	-0.09	-0.02	-2.98	**0.002**

P2c: Videos showing primate infants increase the likelihood that users comment that they want a pet primate, compared to videos showing non-infant primates.

Videos showing infant primates (mean= 5.61% comments; SD= 7.93) received significantly (1.2x) more comments (%) saying users wanting to own primates as pets than videos without infant primates (mean= 4.68% comments; SD= 6.84) (*Table, 4.3; Figure 4.2*), supporting P2c.

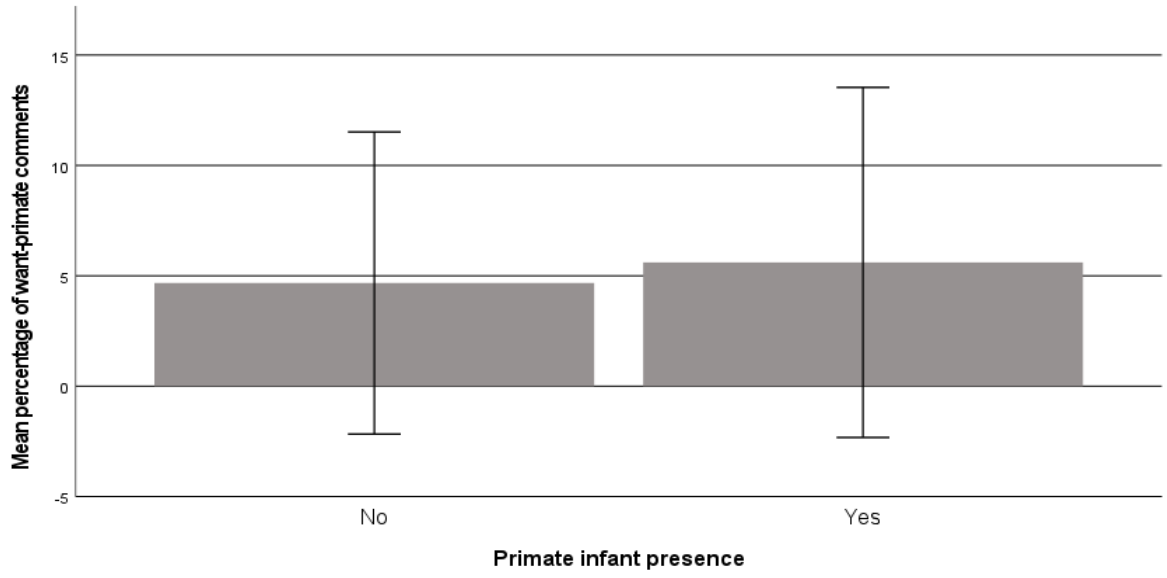

Figure 4.2 Mean percentage of 'want primate' comments by primate infant presence ('monkey' data set, n= 759), showing a significant difference. Mean 'want primate' comments (infant presence)=

6.61%; SD= 7.93; Mean 'want primate' comments (infant absence)= 4.68%; SD= 6.84; Error bars= +/- 1SD.

Table 4.3 Model 3, a bootstrap regression model based on the 'monkey' data set (n= 759) testing P2c, P3a, P4a and P4c with the percentage of comments expressing a desire to own a pet primate as the outcome variable. The full model is significant (r^2= 0.248, F(9, 748)= 27.48, p= <0.001). Standard errors (SE), confidence intervals (CI) and p-values are based on 1000 bootstrap samples. [1]Key predictor variables; [2]Other predictor variables

Predictor variables	B	SE	95% CI		t	P
			Lower	Upper		
Pet-keeping context[1]	-1.409	0.44	-2.61	-0.12	-2.36	**0.026**
Close human-primate contact[1]	-0.83	0.67	-2.09	0.51	-1.25	0.227
Primate infant presence[1]	1.90	-0.55	0.77	3.00	3.83	**0.001**
Human-primate interaction[1]	1.12	0.76	-0.42	2.56	1.77	0.139
Primates in clothes[2]	0.74	-0.69	-0.65	2.04	1.29	0.291
Primates with domestic pets[2]	-1.02	1.49	-3.77	1.98	-0.99	0.515
Days since upload[2]	-0.002	0.001	-0.004	0.001	-1.29	0.181
Genera[2]	0.16	0.07	0.04	0.31	2.76	**0.025**
Setting[2]	-2.08	0.26	-2.61	-1.57	-8.57	**0.001**

4.3 Hypothesis 3:

Hypothesis 3: Written pet-keeping context influences primate video popularity and people's desire to own a pet primate, because it alters how users perceive the content they are watching (Riddle and Mackay, 2020).

P3a: Videos including written context promoting primates as pets increase the likelihood that users comment that they want a pet primate, compared to videos without this written context.

Videos with a written pro-primate pet-keeping context (mean= 7.44% comments; SD= 7.51) received significantly (1.6x) more comments (%) expressing a desire to own a pet primate than videos with no-pro-primate pet-keeping context (mean= 4.43% comments; SD= 7.11) (*Figure 4.3*), supporting P3a.

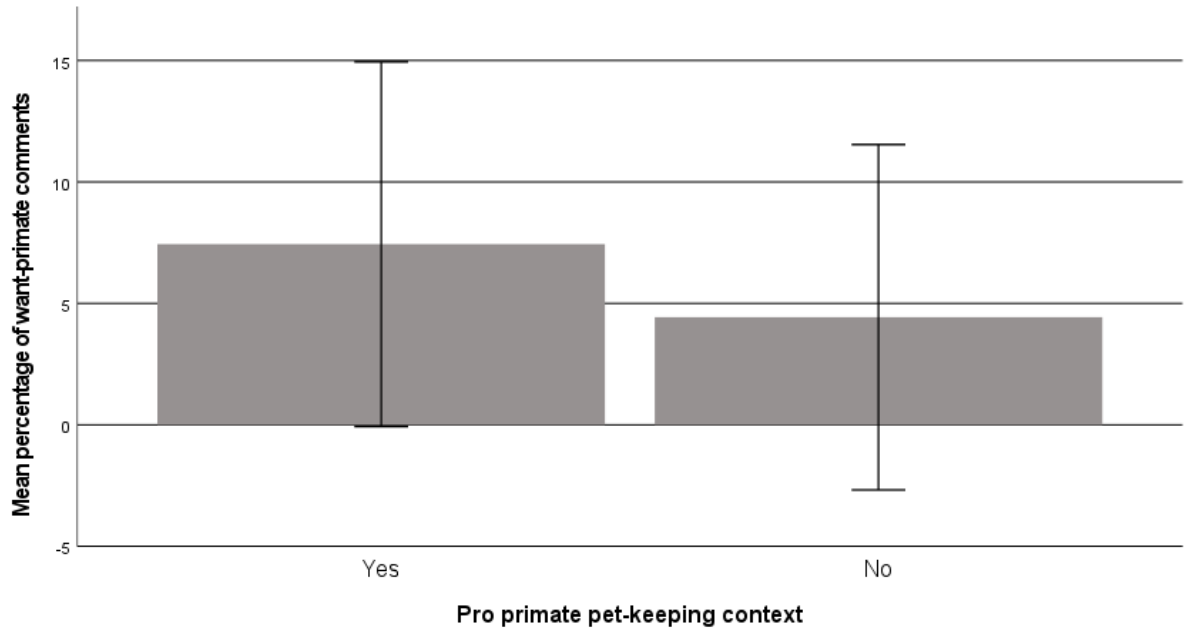

Figure 4.3 Mean percentage of 'want primate' comments by primate pet-keeping context ('monkey' data set, n = 759), showing a significant difference. Mean 'want primate' comments (Pro-pet keeping context) = 7.44%; SD = 7.51; Mean 'want primate' comments (No pro-pet keeping context) = 4.43%; SD = 7.11; Error bars= +/- 1SD.

P3b: Videos including written context promoting primates as pets receive more hearts than videos without this context.

Videos with a pro primate pet-keeping context received 37% more hearts (mean = 565 900; SD= 1.62) than videos without this context (mean = 356 200; SD= 0.98), but this difference was not significant (*Table 4.1)*, showing no support for P3b.

4.4 Hypothesis 4

Hypothesis 4: Videos showing close human-primate contact and interactions lead people to believe that primates are comparable to domesticated animals, and therefore suitable pets (Ross *et al.*, 2011).

P4a: Videos showing humans and primates within arm's reach receive more comments about wanting a pet primate than videos that show primates further away from humans.

Videos showing humans in close contact to primates (mean= 6.04% comments; SD= 7.70) received a significantly (5x) higher percentage of comments wanting to own primates as pets than videos showing humans and primates further apart than arm's reach (mean= 1.07% comments; SD= 2.99) (*Table 4.3*), showing no support for P4a.

P4b: Videos showing humans and primates in direct contact are more likely to receive comments about wanting a pet primate than videos that show humans and primates within arm's reach but not in direct contact.

Videos showing humans in direct contact (mean= 7.43% comments; SD= 8.03) with primates received a significantly (2x) higher percentage of comments expressing to want a pet primate than videos showing humans within arm's reach of primates, but not touching (mean= 3.84% comments; SD= 6.59) (*Table 4.4; Figure 4.4*), supporting P4b.

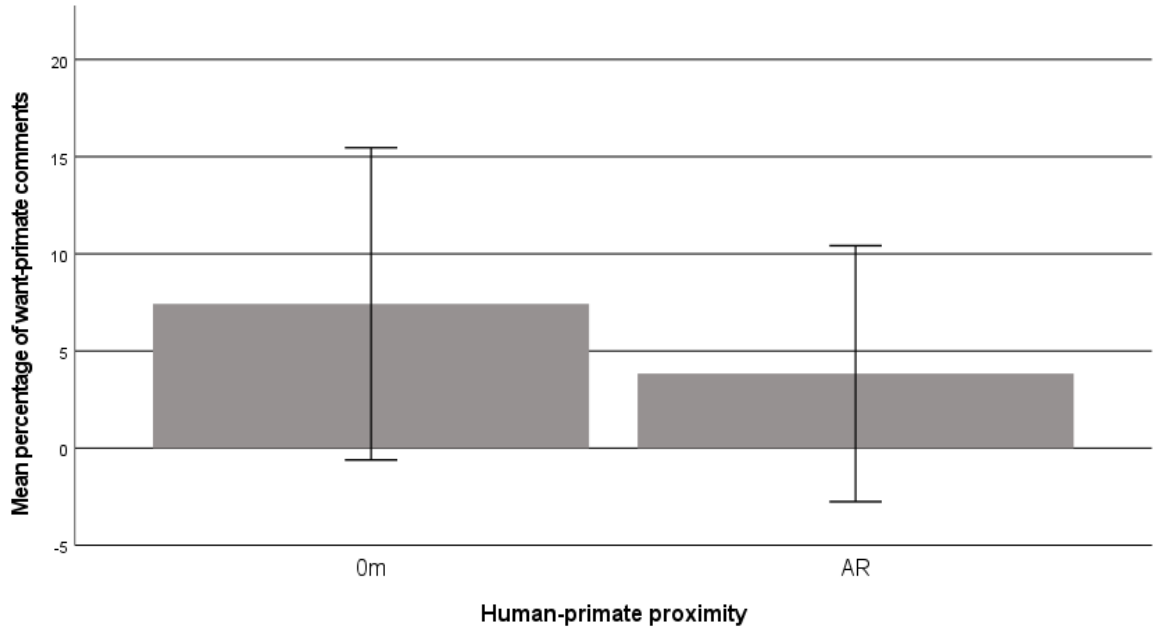

Figure 4.4 Mean percentage of 'want primate' comments by human-primate proximity (0m vs. AR) ('monkey' data set, n= 604), showing a significant difference. Mean 'want primate' comments (0m)=

(7.43%; SD= 8.03; Mean 'want primate' comments (AR, but not touching)= (3.84%; SD= 6.59; Error bars= +/- 1SD.

Table 4.4 Model 4, a bootstrap regression model based on the 'monkey' data set, ***excluding*** *videos of humans and primates further away than arm's reach (n= 605), testing P4b with the percentage of comments expressing a desire to own a pet primate as the outcome variable. The overall model is significant (r^2= 0.202, F(8, 595)= 18.786; p= < 0.001). Standard errors (SE), confidence intervals (CI), and p-values are based on 1000 bootstrap samples. [1]Key predictor variables; [2]Other predictor variables*

Predictor variables	B	SE	95% CI		t	P
			Lower	Upper		
Human-primate proximity (0 m vs. AR) [1]	-1.71	0.59	-2.88	-0.52	-2.79	**0.004**
Primate infant presence[2]	1.92	0.65	0.64	3.22	3.19	**0.003**
Pet-keeping context[2]	-1.37	0.76	-2.96	-0.03	-1.96	0.067
Primates in clothes[2]	0.60	0.77	-0.95	2.01	0.92	0.456
Primates with domestic pets[2]	-0.75	2.00	-4.25	3.61	-0.58	0.713
Setting[2]	-2.23	0.29	-2.81	-1.69	-7.49	**0.001**
Days since upload[2]	-0.002	0.002	-0.005	0.001	-1.14	0.232
Genera[2]	0.17	0.08	0.02	0.32	2.34	**0.037**

P4c: Videos showing human-primate interactions are more likely to receive comments about wanting a pet primate than videos that show no human-primate interaction.

Videos showing human-primate interactions (mean= 7.24% comments; SD= 7.51) received a more than 2x higher percentage of comments wanting primates as pets than videos without (mean= 3.24% comments; SD= 6.59). There was no significant relationship between human-primate interactions and the percentage of comments wanting a pet primate (*Table 4.3*), showing no support for P4c.

4.5 Hypothesis 5

Hypothesis 5: Zoo settings make primates appear more dangerous and hence less popular and desirable as a pet than non-zoo settings (Ross *et al.*, 2011).

P5a: Videos showing primates in zoos are less likely to receive comments about wanting a pet primate than videos showing primates in non-zoo settings.

Videos showing primates in non-zoo settings (mean= 5.41% comments; SD= 7.39) received a significantly (4x) higher percentage of comments wanting pet primates than videos showing primates in zoo settings (mean= 1.37% comments; SD= 4.87) (*Table 4.5; Figure 4.6*), supporting P5a.

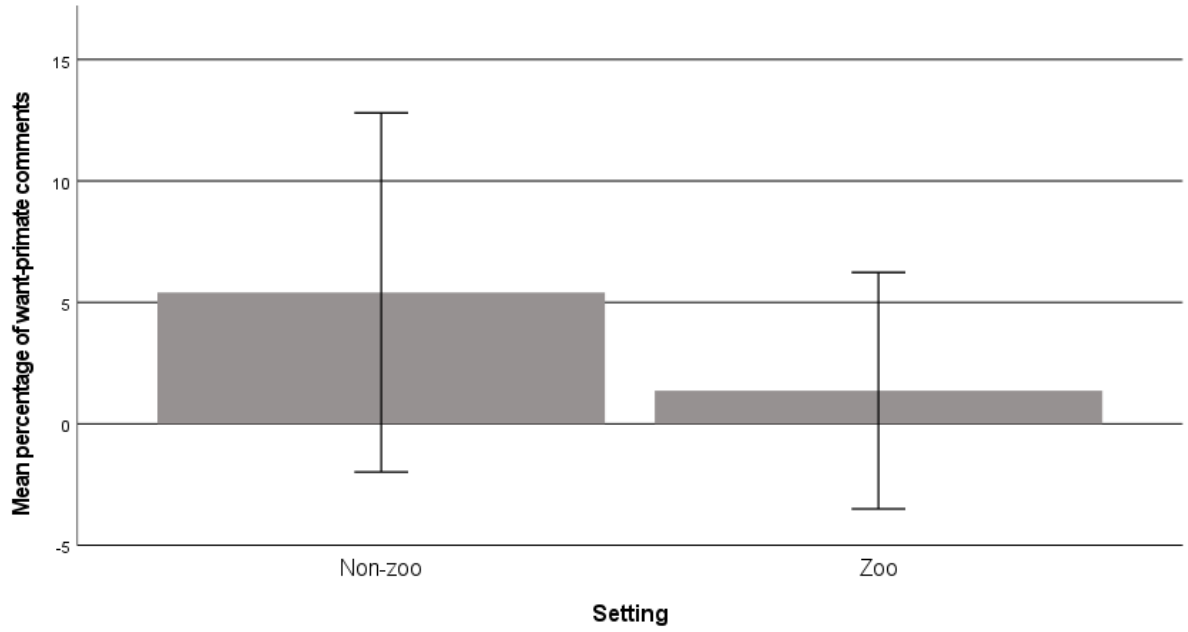

Figure 4.5 Mean percentage of 'want primate' comments by zoo/non-zoo setting ('monkey' data set, n= 759), showing a significant difference. Mean 'want primate' (zoo)= 1.37%; SD= 4.87; Mean 'want primate' (non-zoo)= 5.41%; SD= 7.39; Error bars= +/- 1SD.

Table 4.5 Model 5, a bootstrap regression model based on the 'monkey' data set (n= 759), testing P5a with the percentage of comments expressing a desire to own a pet primate as the outcome variable. The full model was significant (r^2= 0.317, F(9, 748)= 38.631; p= <0.001). Standard errors (SE), confidence intervals (CI), and p-values are based on 1000 bootstrap samples. [1]Key predictor variables; [2]Other predictor variables

Predictor variables	B	SE	95% CI		t	P
			Lower	Upper		
Setting (zoo vs. non-zoo) [1]	-0.10	0.02	-0.14	-1.05	-3.40	**0.001**
Human-primate proximity[2]	-0.18	0.03	-0.23	-0.13	-2.79	**0.001**
Pet-keeping context[2]	-0.19	0.04	-0.27	-0.12	-4.68	**0.001**

Human presence²	-0.01	0.05	-0.10	0.08	-0.26	0.769
Primates in clothes²	0.27	0.04	0.19	0.35	7.68	**0.001**
Primate infant presence²	0.05	0.04	-0.02	0.12	1.41	0.180
Primates with domestic pets²	-0.10	0.07	-0.24	0.04	-1.51	0.151
Days since upload²	-0.02	0.04	-0.10	0.06	-0.48	0.670
Genera²	0.02	0.004	0.01	0.03	5.27	**0.001**

P5b: Videos showing primates in zoos receive less hearts than videos showing primates in other settings.

Videos in non-zoo settings received significantly (1.13x) more hearts (mean= 398 300 hearts; SD= 1.12) than videos in zoos (mean= 393 800 hearts; SD= 1.31) (*Table 4.1; Figure 4.6*), supporting P5b.

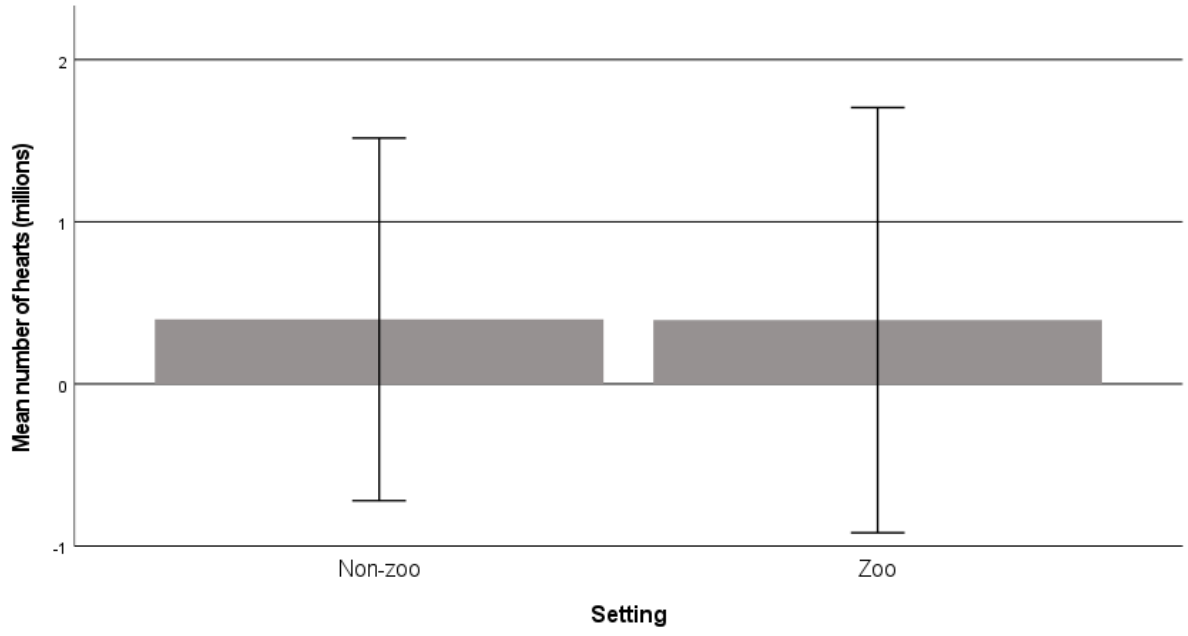

Figure 4.6 Mean number of hearts by zoo/non-zoo setting ('monkey' data set, n= 759), showing a significant difference. Mean number of hearts (non-zoo setting)= 398 300, SD= 1.12; Mean number of hearts (zoo)= 393 800, SD= 1.31; Error bars= +/- 1SD.

4.6 Hypothesis 6

Hypothesis 6: Videos with a visible barrier between humans and primates imply that primates are dangerous and need to be kept away from humans, and do not make suitable pets (Ross *et al.*, 2011).

P6: Videos in zoos showing a visible barrier between humans and primates are less likely to receive comments about wanting a pet primate than videos in zoo settings showing no barrier between humans and primates.

Videos without a visible barrier between humans and primates (mean= 2.65% comments; SD= 2.14) received (4x) more comments about wanting a pet primate than videos without a barrier (mean= 0.64% comments; SD= 6.49) , but this difference was not significant (*Table 4.6*), showing no support for P6.

Table 4.6 Model 6, a zero-inflation negative binomial model accounting for overdispersion and observed inflation of zeros based on the 'zoo monkey' data set (n=345), testing P6. [1]*Key predictor variables;* [2]*Other predictor variables*

Predictor variables	Estimate	Std. Error	z Value	p
Barrier [1]	16.69	44.45	0.38	0.707
Presence of primate infant[2]	-22.93	44.71	-0.51	0.608
Close human-primate contact[2]	-10.33	10.30	-1.003	0.316
Days since upload[2]	0.01	0.01	0.99	0.320
Great ape presence[2]	-3.40	2.31	-1.47	0.141

Chapter 5: Discussion

5.1 Summary of key findings

Primate videos on TikTok received millions of views and hearts, indicating that they are very popular. Almost all videos were entertainment focused. Setting (zoo vs. non-zoo) had a significant effect on video popularity, suggesting that primates in zoos were least enjoyable to watch compared to primates in non-zoo settings. Primates in zoos provoked significantly fewer comments about wanting a primate pet than primates shown in non-zoo settings, suggesting that zoos make animals appear more dangerous than non-zoo settings. When videos included written context promoting primate pet-keeping, users were significantly more interested in pet primates than videos without this context. Direct human-primate contact resulted in significantly more users wanting pet primates than videos showing humans within arm's reach of primates, but not touching them. Videos including infants received significantly more comments referring to 'cuteness' and comments expressing a desire for a pet primate than videos without infants did.

5.2 Overview of primate videos on TikTok

Video metrics

Primate videos on TikTok can undoubtably be considered as popular, with millions of account followers, views and hearts and thousands of comments per video.

Who uses TikTok?

Despite TikTok's great potential to educate a large audience (62% being under the age of 30 (Iqbal, 2022)) and generate great user engagement, I found that the platform has not yet been used greatly by conservationists. This may be due to a lack of knowledge as well as resources to invest into the development and growth of an account.

Although I had no access to the user demographic watching primate videos in my study, TikTok's biggest markets currently are the USA, Indonesia, and Brazil (Iqbal, 2022). This is worrying, because Indonesia and Brazil are some of the richest countries in primate species, and because their primate populations face major anthropogenic threats, including the legal

and illegal trade of live primates (Estrada *et al.*, 2018). *Table 5.1* provides details on the legality of pet primates in these three countries.

Table 5.1 TikTok's top markets and the legal restrictions for keeping pet primates.

Country	Legal to own pet primates
USA	-Yes- More than 13 US states allow primates to be kept as pets, mostly with permits only (AZ Animal Staff, 2022; Krunzel, 2022).
Indonesia	-No- Some primate species are protected under the Indonesian law, however illegal pet trade (especially in markets) and pet keeping continues due to poor law reinforcements (Nijman *et al*., 2017).
Brazil	-No- Weak governance, and corruption (linked to inequality) are major challenges to protect primates from the pet trade (Estrada *et al*., 2018).

The ability to easily obtain a pet primate in Indonesia (Nijman *et al*., 2017) may partially explain the heavy representation of *Macaca* videos across my data sets. Furthermore, *Macaca* species ability to adapt to human environments increases the probability of human-primate encounters (Lindburg, 1980) and content being posted online. Nonetheless, the search term selection, as well as the genus' overall great geographical presence may have played a role. These findings suggest that TikTok holds huge potential for primate conservation work tailored to these key countries (*Table 5.1*).

Primate video content

The most popular video category on TikTok is entertainment (Shutsko, 2020; Statista, 2020), suggesting that users' demand and expectation for and interest in educational content is limited. If users use the app for entertainment purposes, and users are less likely to evaluate content critically, it was unsurprising that most videos in my study were categorised as non-educational, and that a large percentage of comments were expressions of entertainment.

Hence, it was particularly concerning to find that a very small percentage of users (2%) criticised the ownership of primates as pets in the comments. The most common video theme in the 'monkey' data set showed humans interacting with primates. While the frequency of the latter may be the result of significantly more videos showing primates as pets that not, in combination with the limited amount of criticism suggests that TikTok users may be generally accepting of primate pet-ownership. This may be because, according to cultivation theory (Gerbner and Gross, 1976 as cited in Grasso *et al*., 2020), the more time users spend on TikTok watching primate pet content, the more likely they are to believe that primate-pets are more common, and can therefore be considered normal pets, than they are (Soulsbury *et al*., 2009). The normalisation of primates as pets may be further strengthened by their anthropomorphisation, the attribution of human traits, which is a common trait among pet owners (Serpell, 2003). 42% of videos in the 'monkey' data set showed primates in clothes, suggesting that the animals were indeed frequently anthropomorphised. A future study should further investigate the role of primates wearing clothes, perhaps different types of clothing (variation in outfits) and its effect on peoples' perception of primates as suitable pets.

The largest percentage of videos (45%) in the 'monkey' data set showed primates in indoor human settings, including living rooms, kitchens, and bathrooms, and, unsurprisingly, there were significantly more videos showing humans in close contact with primates (within arm's reach, including direct contact) than videos set in other environments. In contrast, videos in the 'zoo monkey' data set, which were set in zoo settings only, videos showing close human-primate contact were significantly less common than distances greater than arm's reach. This is interesting, because there were significantly more videos showing no barrier between humans and primates than videos with a barrier. In addition, significantly more videos showed primates behaving naturally compared to videos that did not. These findings may be the result

of effective reinforcement of visitor rules in free-ranging exhibits, animals were able to retreat and not habituated to allow direct contact in comparison to primates in human indoor settings. The few exceptions of direct human-primate contact in the 'zoo monkey' data set were videos of zookeepers who held a primate, and when an animal was used as a photo prop. For example, some videos showed animals from the genus *Pongo* used as photo props, which is a known problem (e.g., Mutalib, 2018). Overall, the above findings suggest that the video setting may affect human-primate proximities.

Initial findings raised several concerns:

- Primate content is largely entertainment-based
- Many videos show primates as pets, anthropomorphised (wearing clothes), and interacting closely with humans in human indoor settings
- In combination with the rarity of criticism and prominence of expressions of entertainment in the comments, primates seem to be normalised on TikTok

5.3 Factors influencing the popularity of primate videos

Human presence, human-primate proximity, and human-primate interaction

The study results did not support the hypothesis (H1) that videos showing humans and primates together, in close proximity, or interacting are more popular than showing primates alone, further away from humans or videos without human-primate interactions, because users may be familiar with close human-animal encounters in the media, humans' "innate human fascination for the animal 'other', which renders close proximity a desired and highly memorable occurrence" (p. 162), and because close encounters may be particularly exciting and more intimate to watch (Curtin, 2010) (*Table 5.2*).

Table 5.2 Summary of results of hypothesis-testing.

Hypothesis	Prediction	Result
H1: Videos of humans and primates together, in close proximity, or interacting are more popular than videos showing primates alone, further away from humans or videos without human-primate interactions, because users may be familiar with close human-animal encounters in the media, have an "innate human fascination for the animal 'other', which renders close proximity a desired and highly memorable occurrence" (p. 162), and because close encounters are particularly exciting and more intimate to watch (Curtin, 2010).	P1a: Videos showing humans and primates together receive more hearts than videos showing primates alone.	There was no significant relationship between human presence and the number of hearts. The hypothesis can be **rejected**.
	P1b: The number of hearts increases as human-primate proximity decreases.	There was no significant relationship between human-primate proximity and the number of hearts. The hypothesis can be **rejected**.
	P1c: Videos showing human-primate interactions receive more hearts than videos showing no interactions.	There was no significant relationship between human-primate interaction and the number of hearts. The hypothesis can be **rejected**.
H2: Primate cuteness influences video popularity and people's desire to own a pet primate, because	P2a: Videos showing primate infants receive more hearts than videos showing non-infant primates.	There was no significant relationship between primate infants and the number of hearts. The hypothesis can be **rejected**.

people are attracted to infant-like features (baby schema) that result in an innate care-giving response (Glocker *et al*., 2009; Lorenz, 1971).	<u>P2b:</u> Videos showing primate infants increase the likelihood that users comment on how cute the video is compared to videos showing non-infant primates.	There was a significant relationship between primate infants and the percentage of cute-type comments. The hypothesis is **supported**.
	<u>P2c:</u> Videos showing primate infants increase the likelihood that users comment that they want a pet primate, compared to videos showing non-infant primates.	There was a significant relationship between primate infants and the percentage of comments expressing a desire to own a pet primate. The hypothesis is **supported**.
<u>H3:</u> Written pet-keeping context influences primate video popularity and people's desire to own a pet primate, because it alters how users perceive the content they are watching (Riddle and Mackay, 2020).	<u>P3a:</u> Videos including written context promoting primates as pets increase the likelihood that users comment that they want a pet primate, compared to videos without this written context.	There was a significant relationship between written context and the percentage of comments expressing a desire to own a pet primate. The hypothesis is **supported**.
	<u>P3b:</u> Videos including written context promoting primates as pets receive more hearts than videos without this context.	There was no significant relationship between written context and the number of hearts. The hypothesis can be **rejected**.

H4: Videos showing close human-primate contact and interactions lead people to believe that primates are comparable to domesticated animals, and therefore suitable pets (Ross *et al.*, 2011).	P4a: Videos showing humans and primates within arm's reach receive more comments about wanting a pet primate than videos that show primates further away from humans.	There was no significant relationship between human-primate contact and the percentage of comments wanting a pet primate. The hypothesis can be **rejected**.
	P4b: Videos showing humans and primates in direct contact are more likely to receive comments about wanting a pet primate than videos that show humans and primates within arm's reach but not in direct contact.	There was a significant relationship between close human primate contact (0m vs. AR) and the percentage of comments expressing to want a pet primate. The hypothesis can be **accepted**.
	P4c: Videos showing human-primate interactions are more likely to receive comments about wanting a pet primate than videos that show no human-primate interaction.	There was no significant relationship between human-primate interactions and the percentage of comments wanting a pet primate. The hypothesis can be **rejected**.

H5: Zoo settings make primates appear more dangerous and hence less popular and desirable as a pet than non-zoo settings (Ross *et al.*, 2011).	P5a: Videos showing primates in zoos are less likely to receive comments about wanting a pet primate than videos showing primates in non-zoo settings.	There was a significant relationship between the setting and the percentage of comments wanting a pet primate. The hypothesis is **supported**.
	P5b: Videos showing primates in zoos receive less hearts than videos showing primates in other settings.	There was a significant relationship between the video setting and the number of hearts. The hypothesis is **supported.**
H6: Videos with a visible barrier between humans and primates imply that primates are dangerous and need to be kept away from humans, and do not make suitable pets (Ross *et al.*, 2011).	P6: Videos in zoos showing a visible barrier between humans and primates are less likely to receive comments about wanting a pet primate than videos in zoo settings showing no barrier between humans and primates.	There was no significant influence of a barrier on the number of comments expressing a desire to own a pet primate. The hypothesis can be **rejected**.

My results on human presence and human-primate proximity contrast with those of a study on mountain gorilla tourism videos, which found that these variables (positively) influenced video popularity (Otsuka and Yamakoshi, 2020). This could be due to differences in the study design and context. My finding on the popularity of videos featuring human-primate interactions is consistent with a previous study (Freund *et al.*, 2021). In my study, videos showing human-primate interactions did not receive significantly more likes than videos that did not. Similarly, Freund *et al.* (2021) found that the shorter the interaction time ratio, the higher the probability of a video receiving a like. Together, it seems that videos showing

human-primate interactions are not more 'likable' than videos showing minimal/ no human-primate interactions. Hence, for stake holders aiming to increase more likes, as a type of user engagement, TikTok content is not required to feature humans with primates, close human-primate contact, or interactions.

Presence of infant primates

Surprisingly, primate cuteness did not seem to influence video popularity. However, videos with infant primates did receive a significantly higher percentage of cute-type comments than videos without infant primates, which does support the hypothesis of the universality of baby schema in non-human animals (Kruger and Miller, 2016; Borgi *et al.*, 2014; Golle *et al*., 2013; Lehmann *et al.*, 2013; Little, 2012; Archer and Monton, 2011; Sherman *et al.*, 2009). This is similar to a study of orangutan videos, finding that videos of infant orangutans were liked least compared to older age groups (Freund *et al.*, 2021), suggesting that videos of infant primates are not more likable than videos without. This may have important implications for the use of primate imagery in conservation in general, where NGOs aim to elicit support and donations. In other words, featuring primate infants in videos is not a useful way to increase content popularity. It is also worth mentioning, that imagery popularity does not necessarily equate to people's willingness to donate to conservation, because the latter may be affected by many other factors such as person's knowledge of the species and education level (Lundberg *et al.*, 2019; Verissimo *et al*., 2018).

Written pet-keeping context

Whether uploaders promoted primates as pets or not had no significant influence on video popularity, suggesting that viewers may be more focused on what they see in the video than written context provided by uploaders (Riddle and Mackay, 2020). This is a positive result, because it means that written context promoting primates as pets does not make users more likely to 'heart' videos than videos that do not include this written context. This may be of particular interest to stakeholders, who aim to increase content popularity but are unsure whether the absence of a conservation message (e.g., 'primates are no pets') could negatively affect content popularity.

Zoo vs. non-zoo settings

Primates in zoo settings received significantly fewer hearts than other settings, supporting the hypothesis that people perceive primates in zoo settings as more dangerous (Ross *et al.*, 2011). Perhaps, videos showing primates in non-zoo environments (73% in human settings, 26% in non-human (wild) settings and 1% in others) may also be more likable than primates in zoos, because primates appear to have more freedom and, if in relatable human settings, more comfort similarly to domestic pets.

Overall, my findings that videos showing primates in non-zoo settings are significantly more popular than videos of primates in zoo settings, and the lack of significant influences of human presence, human-primate proximity, human-primate interactions, primate infant presence, written primate pet-keeping context, primates in clothes and with domestic pets as well as the control variables (days since upload and primate genera) on video popularity support the conclusion from my descriptive findings that primates as pets, close human-primate contact, and interactions are normalised on TikTok. This distorts reality and dismisses primate conservation challenges (e.g., Estrada *et al*., 2017).

5.4 Desire for primates as pets

Written pet-keeping context

Written context influenced users' desire to own a pet primate significantly, with a pro primate pet-keeping context receiving a two times higher percentage of comments expressing a desire for primates as pets than videos without this context. This result contrasts with that of a study by Riddle and Mackay (2020), who proposed that the imagery itself may be enough to allow viewers to evaluate whether the animals make a suitable pet, regardless of the added written context. However, their study only showed an animated image of a cotton-top tamarin sitting on an artificial branch, with a green enclosure wall in the background. Imagery of a primate in a human setting, for example, in combination with a pro primate pet trade narrative may have increased the likelihood of participants perceiving primates as suitable pets. An additional difference between the two studies may also be due to the observational study design (my study is observational, while Riddle and Mackay (2020) is experimental). Participants taking part in an experiment may have been more critical than people browsing social media. If

TikTok users are less critical of what they are watching and how they respond to primate content than participants in an experiment, "I want one" comments in my study may be questionable, because they could also mean I really like what I see, but I will not actually get a pet primate". My study also included comments from users with very specific queries about how to buy a pet primate, which may be of greater concern because these users may be more serious about getting a pet primate. However, I did not differentiate between comments within the category of comments expressing a desire for pet primates. Most importantly, my results suggest that regulating the promotion of primates as pets as part of the written video context could greatly reduce users expressing a desire for primates as pets.

Close human-primate contact and human-primate interaction

Viewers were not significantly more likely to express a desire for a primate as a pet when videos showed humans close to primates or human-primate interactions than when videos showed greater distances between humans and primates, or videos without human-primate interactions. These differ from studies finding that both humans within arm's reach of primates and human-primate interactions were associated with negative perceptions of primates, including peoples' desire to own a pet (Freund *et al.*, 2021; Leighty *et al.*, 2014; Ross *et al.*, 2011). However, I did find that videos showing humans in direct contact with primates received a significantly (68%) higher percentage of comments expressing a desire for pet primate than videos showing humans within arm's reach of primates, but not touching. These findings suggest that, in contrast to the non-significant effect of how close humans are to primates if they are not touching, it does matter if videos show humans in direct contact with primates. This may also explain why I did not find a significant difference between videos with and without human-primate interactions, because interactions did not require humans to be in direct contact with the animals. Thus, my data support the hypothesis that direct human-primate contact mimics human relationships with domestic pets (e.g., cats, dogs) (Ross *et al.*, 2011) and hence makes primates more desirable as pets than videos showing primates not in physical contact with humans.

Presence of primate infants

The presence of infant primates significantly increased the percentage of comments expressing a desire to own a pet primate by 20%, supporting my hypothesis that primate

cuteness makes the animals more desirable as pets, because people are attracted to infant-like features (baby schema) that result in an innate care-giving response (Glocker *et al*., 2009; Lorenz, 1971). My findings support a recent study, showing that videos of infant orangutans were five times more likely to receive negative comments for orangutan conservation (e.g., wanting a pet orangutan) than videos of adult orangutans (Freund *et al.*, 2021). Hence, posting imagery of primate infants could harm primate conservation efforts by increasing primates' attractiveness as pets.

Zoo vs. non-zoo settings

Primates in zoo settings were significantly (four times) less appealing as a pet than in non-zoo settings, supporting the hypothesis that zoo settings make primates appear particularly more dangerous (Ross *et al.*, 2011) than other settings. In addition, populations, who have grown up with zoos as the nearest place to view unfamiliar, non-domesticated animals, may believe that zoo primates must be looked after appropriately by trained professionals. In contrast, when primates are shown in non-zoo settings, such as human homes, people may find it more difficult to justify why primates are not suitable as pets, because they can see owners 'safely' interacting with primates. These findings are of particular interest to zoos, who may feel more confident to post about their animals online.

The role of a visible barrier in zoo settings

The IUCN primate specialist group section for human-primate interactions proposed to include a visible barrier when taking images of humans and primates together (Waters *et al*., 2021). However, I found that a visible barrier made no difference to users wanting a pet primate, at least in a zoo setting. It seems, therefore, that a visible barrier in imagery posted is not an effective tool to minimise peoples' interest in pet primates. Although my study showed that primates in zoos made people least likely to want a pet primate, this does not mean that zoos and their visitors can happily post content showing people in physical contact with primates, because direct human-primate contact significantly (68%) increased users' desire to own a pet primate compared to videos showing humans within arm's reach of primates, but not touching.

5.5 Limitations of the study

- I used English search terms, which may have influenced the videos I found and collected data from. The order of comments below videos is not organised by time or popularity on TikTok, but new comments may be influenced by existing comments. For example, if a video received only comments about how cute the animal was, the next commenter is more likely to comment on cuteness too.
- If commenters were familiar with the account, this may have shaped their responses to the video. It is impossible to control for this outside an experimental context. In cases where the video uploaders left comments on their own video (either as additional context, or as replies to other users), which I did not collect, these comments may have also influenced viewers' reactions. This may be particularly true if the account is well known and verified by TikTok (evident from a blue tick next to the username), because the comment will stand out by its position in the comments and due to the blue tick.
- Comments may have also differed due to socio-cultural variation. For example, I noticed that some videos showing people feeding primates on the side of the road was praised by some users.
- The representation of strepsirrhine videos was limited, as the 'zoo monkey' data set included no videos of strepsirrhines, and the 'monkey' data set included only few videos. Hence, interpretations of the results are limited to anthropoids.
- While data transformations and bootstrapping reduce the effect of outliers (Field, 2018), it would be worth re-running the models without outliers to confirm the patterns.
- Lastly, I did not control for the effect of music, which could have influenced users' responses. For example, a particularly memorable song called 'Cuppy Cake Song' sung by a child (Amy Clast, Amy J. Music, 2006) was often added to videos and may have made the animals appear cuter and more desirable as a pet.

5.6 Future research

- We must differentiate between comments expressing an interest in primates as pets to assess their frequency and evaluate their risk more accurately.

- If physical contact between humans and primates increases the likelihood of viewers expressing a desire to own a pet primate this has important implications. Conservation organisations post videos showing unavoidable physical contact between humans and primates, such as veterinary work (Freund *et al.*, 2021). Waters *et al.* (2021) proposed that no photographs should be published showing primates "being hand-fed by, playing with or interacting directly with carers, volunteers or donors unless the humans wear appropriate protective personal equipment" (p. 3). However, as of yet, we do not know whether primate imagery showing humans without protective equipment when handling primates has a negative effect on people's perceptions of primates compared to primate imagery showing humans with protective equipment. Investigating this would improve existing guidelines for posting primate content online (Waters *et al.*, 2021).
- Although primate videos on TikTok set in zoos appear to be less of a concern than videos set in other non-zoo settings, human environments may have a very different effect on people's perceptions of primates as suitable pets than non-human (wild) settings. Further studies should thus investigate the effect of different non-zoo settings on video popularity and people's perceptions of primates as suitable pets compared to zoo settings.
- An experimental study should specifically investigate the interactions between zoo settings, human-primate proximity, and the presence of a barrier to inform regulations for posting human-primate imagery in zoos online.
- A follow-up study should investigate the effect of primate imagery with and without music, using an experimental study design, on video popularity and people's desire for pet primates.
- An investigation into pop-up warnings on social media platforms would be useful to see if they effectively reduce potentially harmful primate content.
- Because most videos in my study were non-educational (entertaining), and TikTok is set out to entertain its audience (TikTok, 2020), the popularity of primate videos on TikTok may also be based on entertainment value. In other words, primate videos are more popular if the video is entertaining. To take advantage of this, I propose the 'positive input – positive output' hypothesis, which addresses how posting entertaining primate conservation videos on TikTok could change public outreach online and promote pro-conservation behaviours more effectively (*Figure 5.1*). Specifically, if entertaining videos (positive input) increase the

popularity of primate videos, more people are aware of conservation challenges (including the demand for primates as pets) and are more likely to show their support through changes in their behaviour and donations (positive output). For example, uploaders could show-case interventions that *have* worked to minimise the threat of 'X', with a focus on making the video entertaining. Before testing this hypothesis, both in an experimental context and on TikTok to narrow down what strategies work most effectively, the greatest challenge will be to develop a sound definition and scale of what constitutes an entertaining primate conservation video. Demographic differences must be accounted for. I suggest future studies focusing on the top TikTok markets US, Brazil, and Indonesia for maximum impact. I believe that this direction of conservation research is an essential response to adapt to the vast-changing social media landscape.

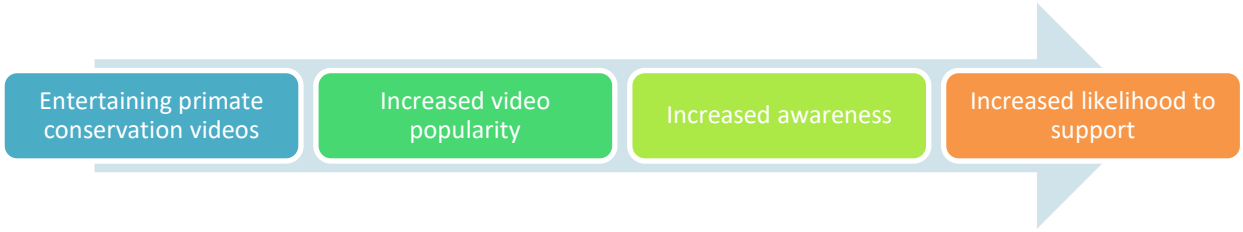

Figure 5.1 A 'positive input – positive output' hypothesis, addressing how posting entertaining conservation videos could increase content popularity and public awareness and thus improve pro-conservation behaviours by users online.

5.7 Recommendations for posting primate videos on TikTok

1. Do not publish videos of primates in direct contact with humans. Because there is no data yet to say otherwise, exceptions to the former include imagery showing individuals wearing protective equipment during veterinary work, handfeeding, playing, and interacting with primates (Freund *et al.*, 2021; Water *et al*., 2021).
2. Do not publish videos of infant primates.
3. Do not promote primates as pets and, ideally, educate viewers using the caption, hashtags, and text on screen.

These recommendations may contribute to a shift in the normative narratives about how conservationists communicate about the natural world in the future: From David Attenborough documentaries presenting species in their pristine environments (without showing the human impact) from an, predominantly, outsider perspective (Jones *et al.,* 2019), to much more personal, day-to-day content posted on fast-paced social platforms like TikTok.

5.8 Conclusion

This study provides insights into primate imagery posted on one of the most influential social media platforms to date. My findings highlight the popularity of primate videos on TikTok, especially outside zoos, and identify written pro primate pet-keeping contexts, the presence of infant primates, physical contact between humans and primates, and non-zoo settings as factors that significantly and strongly increased the percentage of users that express a desire for pet primates. The regulation of written context and avoiding publishing videos of infant primates and humans in direct contact with primates may help to reduce users desire for pet primates. While a critical approach to posting primate content on TikTok and other social platforms is essential, exploring the use of entertainment-based primate conservation videos opens up a particularly exciting avenue for research with the potential to change how users perceive primates and revolutionise conservation outreach online.

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Appendix

1.0 Ethics approval form

CARSTENS, MILENA

From: Ethics <no-reply@sharepointonline.com>
Sent: Mittwoch, 9. Dezember 2020 11:09
To: CARSTENS, MILENA
Cc: [redacted]
Subject: Ethical Approval: ANTH-2020-10-30T15_38_31[redacted]

Follow Up Flag: Follow up
Flag Status: Flagged

[EXTERNAL EMAIL] Do not open links or attachments unless you recognise the sender and know the content is safe. Otherwise, use the Report Message button or report to **phishing@durham.ac.uk**.

Please do not reply to this email.

Dear Milena,

The following project has received ethical approval:

Project Title: *Time is Tik-Toking: An overview of primate videos on one of the fastest growing social media platforms;*
Start Date: *17 November 2020*;
End Date: *31 August 2021;*
Reference: *ANTH-2020-10-30T15_38_31*[redacted]
Date of ethical approval: *09 December 2020.*

This project has been approved by AWERB and by Anthropology Ethics chair.

Please be aware that if you make any significant changes to the design, duration or delivery of your project, you should contact your department ethics representative for advice, as further consideration and approval may then be required.

If you have any queries regarding this approval or need anything further, please contact research.policy@durham.ac.uk

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If you have any queries relating to the ethical review process, please contact your supervisor (where applicable) or departmental ethics representative in the first instance. If you have any queries relating to the online system, please contact research.policy@durham.ac.uk.

1

1.1 Data coding example (Pilot study)

Example of how the comment section of a video was coded by themes to help decide on the number of comments to sample per video for the main data collection.

Comment position	Content	Themes	Frequency of themes
1	I love monkeys there so cute and I wish I can see one one day	Cute-type comment (1.); Interest in seeing animal in real life (2.)	2
2	adorable little babies monkey's they looks like real humans babies	Cute-type comment; Humans comparison (3.)	3
3	Stop I can't Their little snow suit; that it I am buying a monkey	Cute-type comment; Interest in pet primate (4.)	4
4	That was the cutest little fall	Cute-type comment	4
5	That is oo cutee with their little jackets	Cute-type comment	4
6	he is so cute and so fluffy, i want one	Cute-type comment; Interest in pet primate	4
7	polar bears are know	Not relevant to the video (5.)	5

8	they have coats	Describe content objectively (6.)	6
9	lol why was it o funny when he fell lo, I laughsed so hard I started to cry. The beat was right when he fell. I am so	Entertained (laughing) (7.); Cute type comment	7
10	@(anonym) I want a monkey	Tagging other user (8.); Interest in pet primate	8
11	I never see two beautiful siblings	Cute-type comment	8
12	OMG IS HE OR SHE OK	Expressing concern (9.)	9
13	lol so funny	Expression of entertainment	9
15	I want one	Interest in pet primate	9
16	They are SO cute	Cute-type comment	9
17	aww monkey	Cute-type comment	9

18	I want one they are so adorbale	Cute-type comment; Interested in pet primate	9
19	Their snow suits and lttle boots	Describe content objectively	9
20	@(anonym) stop i cant take this rn this literary the best thang ever	Tagging other user, expression of entertainment	9

1.2 Example of the main data collection form in Microsoft Excel

Username	Caption	#'s	Hearts (millions)	Days since upload	Total Nr. comments (k)	Nr. Followers (millions)	Total views (millions)	Genus	Nr. Comments: Concern	Nr. comments: Entertainment	Nr. Commence: WantPet	Nr. Comments: Cute	Nr. comment:Want+Cute	Pro/no pro p-pet-keeping context
X	/	fyp, xyzb, monkey, shower, YesDayChallenge	7.4	26	208.4	0.6	44.3	Macaca	2	8	12	7	1	2
y	Bath time	chimp, monkey, bathtime	0.6	100	0.3	1.3	5.2m	Pan	0	13	2	4	0	2

➔ Table continued

Video type	Account type	Activity description	Theme	Pet?	Setting	Domestic pets	Pr. Infant present	P. clothing	H. presence in frame	Close h-p contact	H-p interaction	Type of h-p interaction
2	1	Washing p. infant in bathroom sink	1	1	1	0	1	0	1	1	1	1
2	1	Washing chimp in industrial sink	1	1	1	0	0	0	1	1	1	3