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## Anthropomorphism in the zoo: How do visitors perceive zoo animals?

verfasst von / submitted by

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# Abstract

Anthropomorphism is the attribution of human traits, capacities, or mental states to non-human animals. Numerous factors likely affect our tendency to anthropomorphise animals, such as the similarity and phylogenetic distance to humans. Empathy might have either coevolved or is even believed to be the foundation of anthropomorphism (Eddy et al., 1993; Gallup, 1985). Similarities to humans, e.g. in morphology, behaviour and appearance, lead to the association of higher cognitive abilities, which in turn mediates the empathic response. In addition, similarity is linked to a closer phylogenetic kinship, another factor influencing anthropomorphism. Therefore, species perception, e.g. the perceived similarity and the overall appearance, possibly play a key role in people's estimation of phylogenetic kinship as well as mediate people's propensity to anthropomorphise, two notions I aim to test in the course of this thesis. Furthermore, sociodemographic factors like gender might be the reason for differences in species perception, which could also impact the estimated level of relatedness or the tendency to anthropomorphise, a possible influence I want to investigate within this thesis. Therefore, focal observations of visitors at the Schönbrunn zoo in Vienna in front of five simian and three control mammal species were conducted to capture their natural anthropomorphic response. Additionally, questionnaire data supplied information on visitors' species perception. Men and women did not differ in their perception of the species similarity attributes, but a gender difference was found regarding the aesthetics (general appearance) and relatedness. Furthermore, the perceived similarity of a species positively affects male and female visitors' perception of phylogenetic kinship. Combining both datasets in the analysis revealed that zoo visitors were influenced to anthropomorphise simians more due to the effects of perceived similarity. However, the general appearance did not impact the estimated level of relatedness, nor did it affect the propensity to anthropomorphise. With its novel methodological approach, the study can add new insights into anthropomorphism research and contribute to animal conservation and welfare.

Keywords: Anthropomorphism, covert focal observation, questionnaire, phylogeny, behavioural biology, simians, mammals

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# 1 Introduction

Humans are generally biophilic (i.e., nature and animals are fascinating to us), and this already at a young age (DeLoache et al., 2011). Therefore, we have naturally developed mechanisms and skills to make sense of the environment and the (non-human) life around us. Humans are also naturally unable to see and perceive the world outside of their anthropocentric worldview (Werth, 1998). In particular, anthropomorphism is the use of human characteristics, emotions and intentions to describe and interpret non-human animal species behaviours (Noske, 1989; Shapiro, 1997). "Anthropomorphic belief" covers to which extent humans believe animals to be similar to them in terms of awareness, thoughts and emotions (Hills, 1995). It has been shown that people's attitudes towards animals, their anthropomorphic belief, and their ability to empathise with animals have already been found to correlate positively (Apostol et al., 2013). Anthropomorphism is not limited to non-human species (here always referred to as "animals"), as humans can also anthropomorphise inanimate objects and natural phenomena (Urquiza-Haas & Kotrschal, 2015). Particularly a high affinity to animals positively correlates with anthropomorphic behaviour and – vice versa – anthropomorphising animals seems to result in treating them better (Knight et al., 2004).

Anthropomorphism is quite common in the general public's perception of animal behaviour (Root-Bernstein et al., 2013), and it is a standard but mostly subconscious "tool" to make animals and their behaviour more understandable. Anthropomorphism is expressed differently in people and cultures (Eddy et al., 1993), and culture is believed to play a key role that has not been defined yet (Letheren et al., 2016). Therefore, even though the phenomenon is widely spread, it is not consistent in its appearance. The tendency to anthropomorphise differs, and reasons seem to be individual differences on the one hand and variations of animal species on the other. Several mental processes, such as the attribution of human-like cognitive abilities to a non-human individual, a closer phylogenetic distance and the perception of similarities to human morphology and behaviour, all seem to influence humans' anthropomorphic behaviour toward animals to some degree or another.

It is known that the emphasis on animals increases when human-like mental states are applied to them (Hills, 1995). Advertising has been benefiting from this increase of emphasis and sympathy towards animals: Multiple anthropomorphic "mascots" have been invented in advertising (e.g., Tony the Tiger of Kellogg's Frosties) (Connell, 2013). Those animated animals with human characteristics seem to trigger a positive response as we are drawn towards anything human-like (Byrne et al., 1986; Miller & Downs, 1998). Therefore, anthropomorphism in humans may have coevolved with empathy so individuals could understand each other's intentions and emotions (Eddy et al., 1993). Other theorists like Gallup (1985) have argued that empathy is the foundation of anthropomorphism. It may have also appeared as a "by-product" of empathy (Harrison & Hall, 2010) or of understanding one's intentions and emotions and applying them to someone else or even another species (Gallup, 1985).

Empathy is the "capacity to share and understand another's emotions or feelings" (Ioannidou, F & Konstantikaki, 2018). Feeling "true empathy" means being able to take the perspective of another individual (Batson et al., 1997). In order to do so, humans need to apply a matching, human-like mental state to the opponent. As the example in advertising showed, humans seem to automatically associate similarities to humans in morphology and appearance with higher cognitive abilities (Eddy et al., 1993), a mechanism that helps to understand and relate to non-human agents. Therefore, similarities between animals and humans may mediate the empathic response.

The degree of similarity with human traits (i.e., behavioural, general appearance, facial expression) is expected to positively affect the propensity to anthropomorphise (Eddy et al., 1993). Aesthetic quality or appeal (i.e., how attractive [beautiful/cute] they are to us) might also positively impact anthropomorphic tendencies (Borgi & Cirulli, 2015), though the findings on this relationship are sparse. Hume (cited by Preston & de Waal, 2002) already posited early on that morphology and movement of a species may mediate anthropomorphism as the more a species shows resemblance to humans, the more we anthropomorphise them (Borgi & Cirulli, 2015). This mechanism can explain why humans relate more easily to certain species than to others (Ioannidou, F & Konstantikaki, 2018), which can have significant implications, notably for conservation. Similarity does not only mean resemblance in morphology or behaviour. It also applies to cognitive abilities, which is one aspect that has been given much attention in anthropomorphism research (see Higgs et al., 2020). The more a species is morphologically similar to us and resembles us in behaviour, the quicker we apply human characteristics and mental states to them (Eddy et al., 1993; Harrison & Hall, 2010). Williams (2021) labelled anthropomorphism "a subjective assessment of species' similarity to humans" (Williams et al., 2021), which is supported by the "Simulation Theory" (Riek et al., 2009), which states that individuals tend to simulate others to understand their thoughts or feelings by putting themselves in the other one's shoes; a phrase which is also used in the context of empathy. Interestingly, between the different classes of vertebrates, taxa more closely related to us seem to trigger a higher empathic response (Borgi & Cirulli, 2015; Harrison & Hall, 2010; Prguda & Neumann, 2014).

Several findings point to the conclusion that genetic relatedness seems to impact our propensity to anthropomorphise animals. This makes sense as a closer phylogenetic distance increases an empathic response, and closely related animals are more human-like. Airenti et al. argue in a study about anthropomorphism towards robots that "relatedness is the precondition for empathy", and Harrison & Hall matched an increase of empathy to closer related animal species, based on higher usage of human pronouns for vertebrates than invertebrates (Airenti, 2015; Harrison & Hall, 2010). Vertebrates are also perceived as more complex, "phylogenetically newer," and to resemble humans more than invertebrates, a questionnaire conducted by Eddy et al. revealed. The study, using a "phylogenetic scale" in which 104 undergraduate students listed 30 animal species according to their perceived similarity to humans, also revealed that mammals have a better standing than birds, reptiles, amphibians or fish, regarding the same characteristics (Eddy et al., 1993). Furthermore, it has been demonstrated that people are more likely to show support for the conservation of birds and mammals – in which high cognitive abilities have been proven (Clark, 2000; Duncan, 2006) – over reptiles and invertebrates, and even inside these groups, some species are being favoured over others (Czech et al., 1998).

This is an important point as anthropomorphism is a driving factor for animals welfare and conservation (Watanabe, 2007). Not every species receives the same attention due to differences in popularity, which results in advantages for some species groups, e.g. mammals, and disadvantages for animal groups, which are not as popular in the public's eye, e.g. fish, reptiles and amphibians, and invertebrates in general. Therefore, researching people's anthropomorphic behaviour sheds light on the mechanisms behind it, which animal conservation organizations can implement in a strategy to make less favoured species more interesting for the general public.

For example, numerous intrinsic (human/observer attributes, e.g., gender, age; dispositions or motivations) and extrinsic (animal attributes, e.g., feral vs domestic species, age; conditions of observation, e.g. captivity vs wild) factors are also likely to mediate the tendency to ascribe human qualities and abilities to animals (Borgi & Cirulli, 2015; Epley et al., 2007; Guthrie, 1997; Urquiza-Haas & Kotrschal, 2015). Intrinsic factors – our basic sociodemographic features– like gender and age are crucial because they fundamentally influence an individual's behavioural intentions, a study found by questioning 200 participants regarding their familiarity with animals and whether animals are able to feel a range of 16 different emotions (Morris et al., 2012). Those differences could gradually disappear with age due to the findings of men slowly becoming more empathic when they get older (Fernández-Berrocal et al., 2012).

However, there is evidence that gender differences concerning empathy mediate gender differences in attitudes toward animals (Graça et al., 2018) and age has a less consistent association with empathy (Tam, 2013). Before discussing gender impact, it has to be said that the vast majority of studies discuss gender on the basis of a heteronormative approach. Generally, women show more empathic concern and less social dominance orientation (SDO) than men, which most likely also applies to their natural environment, including animals (Amiot & Bastian, 2015; Herzog, 2007; Milfont & Sibley, 2016). According to findings by Graça et al. in 2018, empathy and SDO partly mediate gender differences on the subject of anthropomorphism. Shao et al. (2021) acknowledged a literature gap regarding the influence of gender and age on the way individuals process anthropomorphism. However, gender is an essential factor to control when examining human behaviour (Harrison & Hall, 2010). A recent study found that older participants and men are less likely to believe that animals have human-like mental states (Sueur et al., 2020), and women may overall have an advantage over men in understanding the mental state of non-human objects (Warrier et al., 2018). Men seem less likely to emphasise non-human entities (Shao et al., 2021). Women show more empathy toward non-human objects and suffering in living beings (Urquiza-Haas & Kotrschal, 2015). Women also show higher tendencies for environmental issues more often. They also care more about animal suffering and generally exhibit more positive attitudes toward animals, which results in more pro-environmental engagement and animal protection (Amiot & Bastian, 2015; Herzog, 2007; Sakellari & Skanavis, 2013; Zelezny et al., 2000). It looks like women generally show an overall greater connection to anthropomorphic entities than men (Pak et al., 2012). One explanation is human pareidolia, i.e. the driving force behind people seeing faces or human-like features in inanimate objects, clouds or animals (Guthrie & Guthrie, 1995). Neuroscience backs that up as women tend to have higher pareidolia and a greater tendency to perceive and prefer faces in face-like stimuli (Williams et al., 2021). Therefore, women might have an advantage over men in understanding the mental status of non-human entities (Warrier et al., 2018) and in animals, respectively. And applying human-like mental states to animals is a decisive factor for anthropomorphic behaviour in humans. A lot of anthropomorphism studies do not consider the effect of gender (Letheren et al., 2016), even though there are findings on the subject indicating that gender roles affect an individual's ability to perceive or evaluate anthropomorphism (Epley et al., 2007).

To date, studies investigating our propensity to anthropomorphise are mainly based on questionnaires or online assessments using videos or images as visual stimuli (Harrison & Hall, 2010; Letheren et al., 2016; Miralles et al., 2019; Sueur et al., 2020b). These are proven methods that provide insights into people's subjective valuations, and emotions are appropriate for gathering information on people's perceptions of animals. However, questionnaires and surveys are less suitable to record spontaneous responses, which is only possible without people being briefed on the topic in advance. If we want to document anthropomorphic behaviour in humans, participants cannot even be aware of taking part in a study. Questionnaires and surveys potentially bias the observed response, especially if most people are usually unaware of their propensity to anthropomorphise. In addition, it can be immensely challenging to collect data on people's natural anthropomorphic behaviour in a neutral environment, which is not in the laboratory but the outside world, influenced by the social dynamics between themselves and peers or strangers.

Covert animal-focal sampling is a solution to study and quantify animal behaviour. Therefore, in order to document people's anthropomorphic behaviour, we applied covert focal observations to humans. This method can also be seen as a modified approach to the "covert participant observation" method, where researchers are embedded among the people studied (Gephart, 2004). In this study, the observer disguises herself as a biologist documenting animals' behaviour in order to write down every comment of the visitors related to the species in the enclosure, respectively. This way, the natural anthropomorphic response of visitors about the species can be observed. The benefit of this method is the absence of an observation bias or "Hawthorne effect" as focal individuals are unaware of being observed (Wu et al., 2017).

Most of the other studies researching anthropomorphic behaviour in humans used a wide range of species, from invertebrates to vertebrates (Batt, 2009; Harrison & Hall, 2010). Since similarity is believed to trigger anthropomorphic responses in humans, which is heavily dependent on phylogenetic distance, the choice of species was well considered. However, no study has tried to find an effect of anthropomorphism between various species of the same group, closely related to humans. This study focuses on five species within the simians (higher primates) to fill this literature gap. The control species are non-simian species but still within the order of mammals, as groups in a lower phylogenetic rank are not suitable due to people's preference of mammals over all other groups. All selected species have also been considered regarding their availability in zoos to increase the chance of replicating this study in other (European) zoos.

The study aims to investigate whether gender affects the perception of animals' appearances and whether species perception mediates people's propensity to anthropomorphise the observed species, and if so if significant differences based on gender or species group exist. The two-part data collection was conducted via a questionnaire to explore people's perception of the species and covert focal observations to document people's natural anthropomorphic response. In a novel approach, both datasets were combined to investigate the influence of species perception on the propensity to anthropomorphise.

The questionnaire's main focus was on similarity to humans, i.e. similarity in movement, facial expressions, similar appearance, estimated relatedness to humans, and general appearance, i.e. cuteness and beauty. In the first hypothesis, I test whether men and women perceive the animals differently, resulting in significant differences in questionnaire scores (H1).

The impact of similarity on anthropomorphism is well mentioned in the literature, whereas the impact of appearance also has positive connotations but is less represented overall. Following this notion, I expect similarity, i.e. similarity in appearance, facial expression and movement, to play a more important role than general appearance, i.e. cuteness and beauty. Therefore, in the second hypothesis (H2), I propose that the estimated level of phylogenetic distance is positively affected by similarity, and I will test whether there are differences based on gender or species group.

By connecting the results of people's comments in the focal dataset with the information from the questionnaire dataset in a simulation approach, this study also anticipates answering the third question, also following the notion of similarity playing a key role in people's tendency to anthropomorphise: Does the perception of a species, i.e. similarity to humans and aesthetics (general appearance), affect people's propensity to anthropomorphise and if so, is this expressed differently in women vs men and simian vs control (H3).

# 2 Methods

## 2.1 Subjects: visitor profiles and animal species enclosures

Observed visitors: Visitors at the zoo were observed in front of eight different animal enclosures. Only German-speaking visitors were considered to avoid translation bias and reduce the bias linked to the cultural background. In addition, children were not included in the study. The chosen person had to be accompanied by at least one more person (adult or child) to ensure possible conversation between them as the target was to document the comments of the observed visitor.

Animal species: Observations were conducted in front of five different simian species enclosures and three control non-simian species across zoos. For the simian species, it was focused on: i. Great apes, *Hominidae*: orangutans (*Pongo pygmaeus*); ii. Lesser apes, *Hylobatidae*: white-handed gibbons (*Hylobates lar*); iii. New-world monkey: white-face saki (*Pitheca Pitheca*) and squirrel monkey (*Saimiri sciureus*); iv. Old-world monkey: Barbary macaque (*Macaca Sylvanus*). As control species, the focus laid on lemurs: Red Vari (*Varecia rubra*) (focal observations), ring-tailed lemurs (*Lemur catta*) (questionnaire), meerkats (*Suricata suricatta*) and black-tailed prairie dogs (*Cynomys ludovicianus*).

**Note:** At the start of the project, the focus was on six primate species (orangutans, Barbary macaques, gibbons, squirrel monkey, Red Vari (lemurs), sakis and on two control species (meerkats and prairie dogs). However, as the questionnaire only contained data of the species ring-tailed lemurs instead of Red Vari and the genus lemurs are the only of these selected primate species not belonging to the simians, the focus of this thesis shifted on to simians, and the data of the lemurs (questionnaire – ring-tailed lemur, focal observations – Red Vari) was treated as control.

## 2.2 Data overview

Two types of data were collected for this study: covert focal observations to assess visitors propensity to anthropomorphism and questionnaires to assess their perception of the observed species. The focal and questionnaire data were collected in front of five simians (orangutans, Barbary macaques, squirrel monkeys, gibbons, sakis) and three control species (meerkats, prairie dogs, lemurs). We collected the covert focal observations at the zoo of Vienna, "Tiergarten Schönbrunn", from the 21$^{st}$ of June until the 29$^{th}$ of August 2019. Focal observation sessions were conducted twice a week for each observed species. One session of observation consisted of six focal protocols on six different visitors. We collected a total of 1029 focal protocols from 485 focal visitors over 20 sessions (focal data collection sheet, see *Appendix I*). The questionnaire data were collected between the 29th of June and 31st of August 2020 at Tiergarten Schönbrunn, Vienna. The questionnaire was anonymous and contained six multiple-choice questions with a 5-point Likert scale to evaluate how the visitor perceived the observed species, with respect to general appearance (cuteness and beauty), similarity to humans (appearance, movement and facial expression. Additionally, it contained feeling towards the species (positive/negative), asking whether the visitors have seen juveniles in the animal group. Also, they were asked two questions concerning the zoo's visitor behaviour research: whether the participants plan to visit the restaurant at the zoo and which entrance they used (detailed description see *Appendix IV).* In total, 818 questionnaires were collected on eight observed species (orangutans 104, gibbons 101, Barbary macaques 101, sakis 96, squirrel monkeys 104, ring-tailed lemurs 100, meerkats 108, prairie dogs 104).

### 2.3 Ethics

Both parts of the data collection of this study were approved by the ethics committee of the University of Vienna. The ethics' committee approved the covert focal observations on the 27th of June 2019, with the reference number 00449. An addendum for both parts of the study was not necessary as the votes are still valid, confirmed in an email from the 22nd of march 2021. The questionnaire data collection was approved on the 3rd of June 2020, with the reference number 00548.

### 2.4 Procedure for covert focal observation

Each observation session contained six focal protocols per enclosure. Observations were always performed from outdoor enclosures to avoid differences in observation conditions. In addition, data were collected in the mornings (10 am to 1 pm), from Monday and Sunday. This way, we ensured good weather conditions and limited drastic weather variations across observation sessions. Day and time were systematically collected at the onset and termination of each session of observation. Observations have not been conducted whenever staff members were present in the enclosure, during feeding time, or during guided tours. One observer at a time was collecting data at a given enclosure.

The focal observations were: i. passive as it did not require direct interaction with the visitors, housed animals, or staff members; ii. covert as the focal visitors were not aware they were being observed. The observer always started a focal session from the same point at each enclosure. At the onset of each focal, the observer (re)positioned herself next to the starting point.

However, the observer was allowed to move inside the observation zone to maintain auditory contact with the focal visitor during each focal protocol. If the focal individual left the observation zone or the observer was too obvious, i.e. the observant noticed that he or she was being followed, the focal stopped. The observation zone was pre-defined for each enclosure, following its configuration (shape) and by a maximum distance of five meters from each point of the enclosure fence (Figure 1). Focal visitors were randomly chosen: the first visitor that entered the observation zone once the observer was positioned was automatically chosen as focal (see figure 1). If all visitors were already in the observation zone, the first one to pass the starting point was chosen. Visitors who talked while entering the observation zone were not selected as focal individuals. In case a visitor leaves the observation zone before three minutes, the focal protocol stops. A focal protocol was conducted for a maximum of three minutes. The exact duration of each focal protocol and the session of observation was also recorded. If, after 45 minutes, the observer did not manage to record six focal protocols, the observation session ended. Focal protocols were never made on more than one individual per group of visitors (e.g., a family). No visitor was observed more than one session, and possibly only once over the whole data collection if the visitor could be recognised across sessions.
The observer stood silent during observations and looked in the direction of the enclosure (not the visitors). Once the visitor was chosen, the observer listened and wrote down all animal-directed comments made by the visitor on the observed animal species for a maximum of three minutes. Note that the characterisation of the comments on the degree or type of anthropomorphism was done afterwards. The lack of a verbal comment on the observed species was also documented. Data were recorded with pen and paper, and the observer was also equipped with a timer. No video or audio recordings were made. Data were completely anonymous as no information on the identity of the visitors was collected.

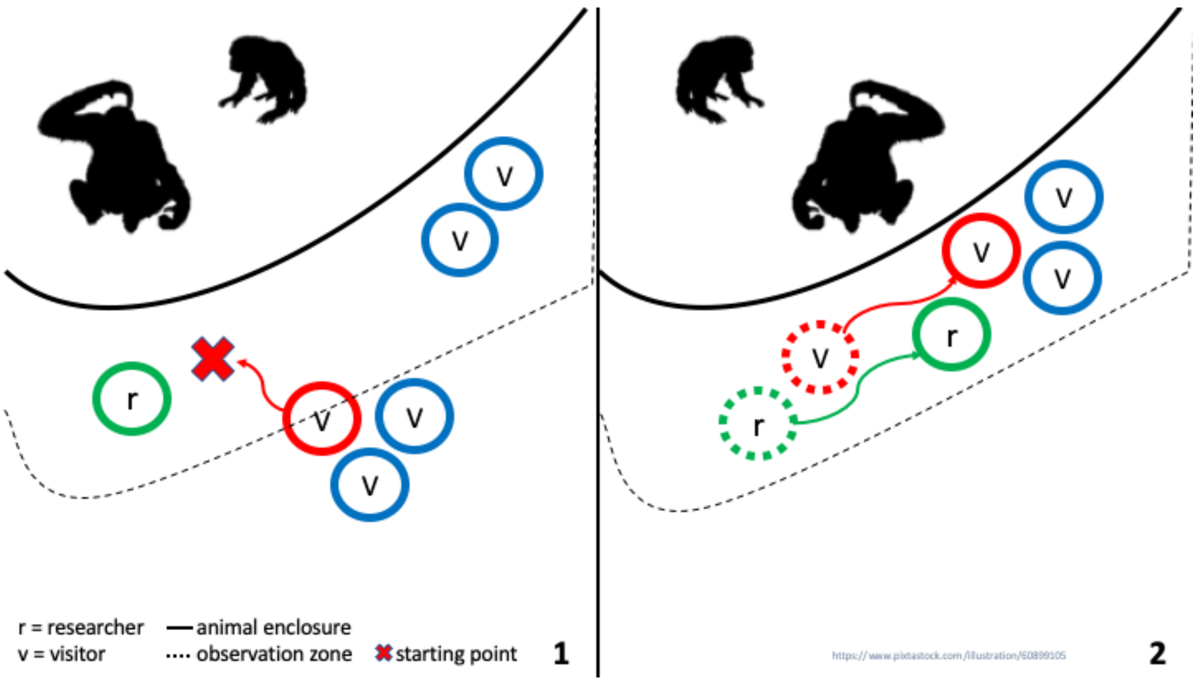


Figure 1: Left: The visitors are entering the observation zone; The visitor selected for the focal (red) will reach the starting point. The researcher (green) is located next to the starting point. Right: During the focal protocol, the researcher follows the focal individual as long as he/she moves inside the observation zone.

Note that handouts were prepared in advance and given to the visitors in cases they noticed the observer and questioned the purpose of the work. The handout contained general information on the study's purpose, emphasising its bilateral aspect (i.e., human-animal interactions). It focused on the incidental information we collected on the animal observed (e.g., group composition, animal behaviour, between animals and visitors) rather than on specific details on the procedure of observation of visitors. We did not intend to deceive the visitors, but observations had to be covert to avoid any direct influence on the recorded behaviour.

### 2.4.1 Visitors profiles and additional information on visitors and observed non-human species

<u>Information on the visitors:</u> For each focal visitor, the observer also collected estimated age class, gender, and the group composition to which he/she belonged (i.e., solitary vs group; for groups: group size, age classes and gender of the group members, and presence vs absence of children).

<u>Information on the observed species:</u> After each focal protocol, the observer collected information on the observed species, notably: current group composition, number of individuals visible, number of juveniles visible, food availability, any other specific remarks on the behaviour of the housed animals. Additionally, unusual behaviour or changes occurring during the focal were recorded, for example, when all animals suddenly left the outdoor enclosure to

go inside. Other factors such as the exact temperature, weather conditions, or humidity with every session were not documented; however, data were not collected during rainy days. The temperature was, on average, above 25 degrees during the Viennese summer.

### 2.4.2 Procedure for comments' categorisation

The comments were categorised in multiple steps. The first set of rules were developed based on literature review, and two people coded all comments independently, following these rules. The two outcomes were compared, and unclear cases or disagreements were discussed. The set of rules was accordingly adjusted, and all comments re-categorised. This procedure was repeated twice (i.e., in total, four independent coders categorised the comments). Note that in case opinions differed on a comment's anthropomorphic nature despite the rules, it was always decided conservatively, meaning the comments were categorised as "not anthropomorphic". At the end of the process, we differentiated six final categories: anthropomorphism, non-anthropomorphism, talking to the animal, zoomorphism, no comment, missed comment. Zoomorphism is the converse of anthropomorphism; here, animal-like mental states (and other traits) are applied to humans (Nanay, 2021). See the final set of rules in *Appendix II* and the distribution of the comments per category in Table 1.

Table 1: Distribution of comments by category.

| Type of comment | Count |
|---|---|
| **n** | 673 |
| **a** | 180 |
| **z** | 15 |
| **t** | 15 |
| **x** | 20 |
| **nc** | 120 |

**The categories:**

a = anthropomorphism

n = no anthropomorphism

t = talking to the animal

z = zoomorphism

x= missed comment

nc = no comment

<u>Grouping the comments in the focal dataset for analysis:</u>

First, I divided the comments (a, n, t, z) from the focal dataset into two new groups, introducing two new categories. The first category is anthropomorphic comments (anthro*=a, t), and the second one is non-anthropomorphic (non-anthro*= n, z) comments. I discarded missed and no comments (x, nc).

### 2.5 Procedure for questionnaires

The focus laid on five questions about the perception of the observed animal species, in particular, the participant's opinion on the level of cuteness ("how cute is this species?"), the beauty ("how visually appealing do you find this species/how beautiful is this species"), the similarity to humans ("how similar does this animal species look to humans?"; "how similar are the facial expressions of the species to the ones of humans", "how similar are the species movements compared to humans?") and the genetic relatedness to humans ("how close is this species genetically related to humans?"). The participants had to answer on a 1-5 Likert scale, five= being a highly positive response.

One survey session happened at one enclosure at the time (note that different people filled out questionnaires at separate enclosures, so no one filled out a survey twice). Questionnaire participation was voluntary and anonymous; all participants had to sign a form of consent (see *Appendix V*). The participants' age group, gender, and group size (i.e., how many adults and children are with them at the zoo) were also collected voluntarily along with the questionnaire. Only adults (18 years and higher) were allowed to participate. Children could also fill out the questionnaire, but these were not used for analysis. Questionnaires were collected twice a week, in the morning, and covered four species per day. Data collection was balanced between week and weekend.

One or two students were present at each enclosure at a time, with a table and a sign advertising that they were conducting a scientific study about zoo visitors' impression of zoo animals for the University of Vienna and the Tiergarten Schönbrunn and that questionnaires are available at the table. Interested participants were handed a questionnaire without further verbal instructions since all instructions were written to minimise any bias on the participants. Participants were instructed to watch the animals for an unspecific time first and then fill out the questionnaire alone. Additionally, participants were asked to read and sign a consent form (see *Appendix V*). If no visitor approached the table within 5 minutes, the students were instructed to randomly address visitors entering a 3-meter (invisible) circle around the table. Questionnaires from actively recruited participants were specifically marked to reassess a possible influence of recruitment in the analyses.

The students stayed a maximum of 60 minutes per enclosure or left once 50 questionnaires had been collected. The data collection (and timer) only started (and run) when the housed animals were visible. If invisible, students waited for a minimum of two minutes after re-appearance before approaching participants again to ensure the visitors had enough time to watch the animals.

## 2.6 Data Analysis

For the statistical analysis, the software R and the programming language Python were used.

### 2.6.1 Exploration of the visitor's species perception

Because the distributions between men and women were in focus, the individuals, who did not fill out the question about their gender, were removed. The options for gender were as follows: male (m), female (f), divers (d). Only two participants ticked the box for "d" when asked about their gender, so they were removed as well. In the analysis, a total of 726 questionnaires were evaluated.

First, I tested the effect of sex on the distribution of these six variables (*Similar Appearance, Similar Movement, Similar Expression, Relatedness, Cute, Beautiful)*; H0: male and female distributions do not differ. To do so, I ran six Mann-Whitney-U tests; it was not controlled for multiple comparisons.

In the second step, I descriptively explored the distribution of the six quantitative (ordinal) variables in the questionnaires. To do so, I calculated the mean value of each score per species and then according to visitors' gender and age class. Using histograms, I then plotted the count distribution of the ranking score (from 1 to 5) for each variable and according to the sex of the participants. To add valuable insights for interpreting the results in the discussion part later on in regards to the point of phylogenetic distance, I also showed the average scores for all attributes by species, marking which belong to simians and control.

### 2.6.2 Correlation between species perception and perceived relatedness

I finally used a principal component analysis (PCA) to explore correlations between five different variables of the questionnaires: *Cute, Beautiful, Similar Movement, Similar Expression, Similar Appearance*. I did not include *Relatedness* as in the next step; I explored possible correlations between the results of the PCA and the relatedness variable. The PCA also aimed at reducing the number of perception variables for use in the next steps of the analyses. Note that based on the literature, I expected the variables *Similarity* and *Relatedness* to co-vary. In contrast, I did not expect any correlation between *Cuteness* or *Beauty* of the species and *Relatedness*. Detailed results of the PCA are presented in the results section. To summarise, we found two principal components, covering 75% of the total variance: PCA-SIM = *Similar Movement, Similar Expression, Similar Appearance*; and PCA-CB = *Cute, Beautiful*. To test whether the results of the PCA, PCA-SIM including the similarity attributes on the one hand or the PCA-CB of the general appearance attributes, on the other hand, are correlated with *Relatedness*, I conducted three spearman correlations. First, I tested the correlation between PCA-Sim/PCA-CB and *Relatedness* overall. Then I ran a test splitting the data by gender and another one with the data grouped by species.

### 2.6.3 Effect of species perception on the propensity to anthropomorphise

To test whether the perception of a species impacts the tendency to anthropomorphise the species, a correlation between the PCA values and the propensity to anthropomorphise is calculated, and for that, the focal data and the questionnaire dataset are combined. The following approach is adopted to correlate data from two different data sets: The probability for an anthro*-comment (categorization for the analysis of the focal data, see 2.4.2) for each questionnaire individual is calculated using the information from the focal dataset.

<u>Calculate an average propensity for every combination of gender and species:</u>

First, the focal dataset was grouped by gender and species (i.e. 16 groups) and the average propensity of an anthro* vs non-anthro*-comment (e.g. group [m, Gibbons]: 23% "anthro*", 77% "non-anthro*") calculated. First, the average propensity for each of the 485 focal individuals is calculated taking the influence of the different number of comments per individual into account (i.e., first average on an individual level to get an "individual propensity"), see Figure 2. Then I calculated the average for the demographic group overall, e.g. the propensity for women to leave an anthropomorphic comment in front of the orangutans is 0.327. This propensity was further used as the probability in the Bernoulli process (see *Appendix III*, Table 11 for details).

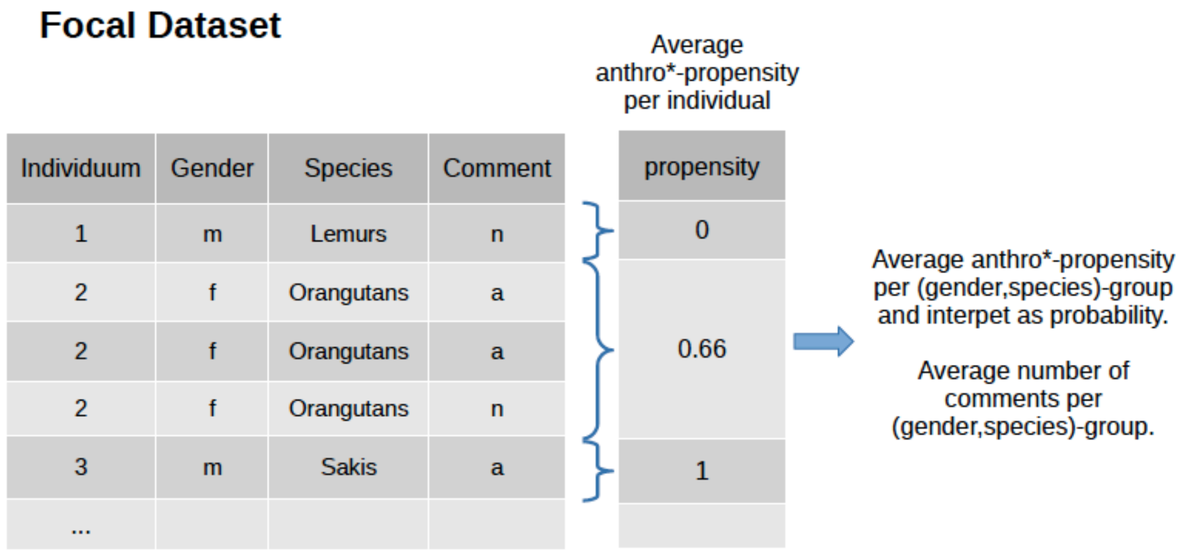


Figure 2: Example for the first step of calculating the average anthro*-propensities. The propensity is first calculated for every individual and then for the [gender, species] groups.

As we did not collect the same amount of focal protocols for every species or gender, and some individuals left more comments than others (see *Appendix III*, Table 16), the average number of comments was accounted for in the analysis below.

I identified the average number of comments for every demographic group in front of the different species and rounded to an integer number (see *Appendix III*, Table 11). This information was then used in the analysis below.

Then I used a Bernoulli process as a tool to simulate a propensity for anthropomorphic comments for every individual of the questionnaire. I chose this simulation approach due to a lack of information on some of the groups represented in the focal dataset. Some of the sociodemographic groups are clearly underrepresented in the current dataset (Table 2). Therefore, I did not choose an alternative approach like a regression model. However, a regression model would be a good choice to replicate this study and examine the research questions as soon as more data is collected.

This whole simulative approach is justified by the fact that there are enough data points in the focal dataset, allowing for a meaningful calculation of these probabilities, as well as the fact that the individuals in the focal dataset and the questionnaire dataset can be considered representative samples of the same population (German-speaking visitors of the Schönbrunn Zoo). Thus, attributes from one dataset should carry over to the other dataset after taking the specifics of each dataset into account and thus, allowing us to correlate attributes from the questionnaire dataset with these comments directly.

Table 2: Number of focal individuals from the focal data which have been considered for analysis, grouped by species, gender (f = female, m = male).

| Species | Gender | total |
|---|---|---|
| **Orangutan** | f | 56 |
| | m | 27 |
| **Barbary macaques** | f | 35 |
| | m | 22 |
| **Gibbons** | f | 46 |
| | m | 32 |
| **Squirrel monkey** | f | 29 |
| | m | 14 |
| **Saki** | f | 16 |
| | m | 13 |
| **Red Vari (lemurs)** | f | 26 |
| | m | 16 |
| **Meerkats** | f | 39 |
| | m | 19 |
| **Prairie dogs** | f | 44 |
| | m | 24 |

Bernoulli process: The decision for anthro* vs non-anthro*comment is a Bernoulli process with the probability given by the empirical probabilities:

$$p\ (\text{anthro*-comment} \mid \text{gender, species})$$

i.e. conditioned on gender and species as determined from the focal dataset.

**One iteration**: For every individual in the questionnaire dataset, I followed the Bernoulli Process, which is equivalent to a coin toss and thus can only decide between two options. The model is determined by the following parameters: In each iteration of this process, it performed "n" trials (where "n" is the average number of comments for the given group [gender, species]) with probability "p" (for the given group) and averaged the obtained result to get an estimated propensity. E.g. females in front of orangutans left an average of 3 comments. This means, every iteration of the Bernoulli process for women in front of orangutans contained three “coin-tosses” = three trials each calculated with the probability p (anthro*-comment | gender, species), resulting in three comments with the values 1 for a and 0 for n, from which the mean is calculated (see Figure 3). After this step, every individual of the questionnaire had an associated propensity. After every iteration, the dataset is grouped and the propensity correlated with the quantities of the PCA columns (PCA-SIM x anthro*-propensity; PCA-CB x anthro*-propensity). Therefore, after every iteration there is are 12 correlation coefficient calculated, one for each group : (simians total/PCA-SIM, control total/PCA-SIM, simians total/PCA-CB, control total/PCA-CB; women-simians/PCA-SIM, women-control/PCA-SIM, women-simian/PCA-CB, women-control/PCA-CB; men-simians/PCA-SIM, men-control/PCA-SIM, men-simians/PCA-CB, men-control/PCA-CB; The correlation coefficients are recorded, and the next iteration starts, repeating the steps just described.

| Gender | Species | PCA-SIM | PCA-CB | Iteration 1 | Iteration 2 | ... |
|---|---|---|---|---|---|---|
| m | Lemurs | 0.872 | 0.356 | 0, 0 → 0 | 0, 1 → 0.5 | |
| f | Orangutans | 0.123 | -0.145 | 1, 1, 0 → 0.66 | 0, 1, 1 → 0.66 | |
| m | Orangutans | 0.321 | 1.123 | 0, 1 → 0.5 | 0, 0 → 0 | |
| f | Gibbons | -1.02 | -0.553 | 1 → 1 | 1 → 1 | |
| f | Sakis | -0.223 | 0.235 | 1, 0, 0 → 0.33 | 0, 1, 0 → 0.33 | |
| ... | | | | | | |


Figure 3: Example for the process of calculating the anthro*-propensity for every individual of the questionnaire and the correlations with the PCA results.

This is done for 1000 iterations. Thus, there are 1000 values for each correlation coefficient (propensity for anthro*-comment correlated with PCA-SIM, PCA-CB. The 12 distributions of these correlations are plotted via histograms with summary statistics, i.e. mean value and standard deviation in Figures 12, 13, 14 and 15, grouped by species (simians vs control) as well as gender/species (women/simians vs women/control, men/simians vs men/control).

To test this statistically, I performed eight Mann-Whitney-U-tests on the distributions of PCA-SIM and PCA-CB for simians vs control and the distributions of the correlation coefficients between women/men and simians vs women/men control for both PCA dimensions.

**Effect Sizes:** Additionally, I calculated the effect sizes ("Cohen's d" as described by (Ellis 2009)) for the different distributions to see how much they differentiate. The higher the effect size, the greater the difference.

I estimated the effect size by the "standardized" mean difference.

$$\frac{|\mu 1 - \mu 2|}{\frac{\sigma_1 + \sigma_2}{2}}$$

μ = mean value

σ = standard deviation

# 3 Results

## 3.1 Exploration of the questionnaire variables

### 3.1.1 Mann-Whitney-U-Test

I found that males and female participants rated the species differently for three of the six variables. The results of the Mann-Whitney-U-Test in Table 3 show significant p-values for the variables *Cute* (p= 0.005847) *Beautiful* (p= 0.000570) and *Relatedness* (p= 0.000391). For those variables, the Null-hypothesis is therefore rejected. That indicates that female and male participants rate the species' cuteness, beauty, and level of relatedness to humans differently.

Table 3: Results of the non-parametric test comparing distributions for women and men for all six attributes of the questionnaire

| Attribute | MWU statistic | p-value |
|---|---|---|
| **Cute** | 52753.5 | 0.005847 |
| **Beautiful** | 50700.0 | 0.000570 |
| **Similar Appearance** | 55853.5 | 0.117384 |
| **Similar Movement** | 57899.0 | 0.345141 |
| **Similar Expression** | 58453.0 | 0.427500 |
| **Relatedness** | 50252.5 | 0.000391 |

### 3.1.2 Exploration of visitor's species perception

Table 4: Mean scores for questionnaire attributes by gender.

| Gender | Cute | Beautiful | Similar Appearance | Similar Expression | Similar Movement | Relatedness |
|---|---|---|---|---|---|---|
| **Female** | 4.31 | 4.11 | 2.64 | 3.16 | 2.95 | 3.09 |
| **Male** | 4.19 | 3.89 | 2.75 | 3.18 | 2.99 | 3.39 |

Visual inspection of Figure 4 shows that the two variables, *Cute* and *Beautiful,* show a "ceiling" effect, i.e., a large percentage of survey participants answered near the highest possible score and the majority of responses groups near this limit. Furthermore, when considering the sex of the participants, it appears that the ceiling effect is mainly due to women scoring higher than men. This backs up the results from the non-parametric test (Table 3).

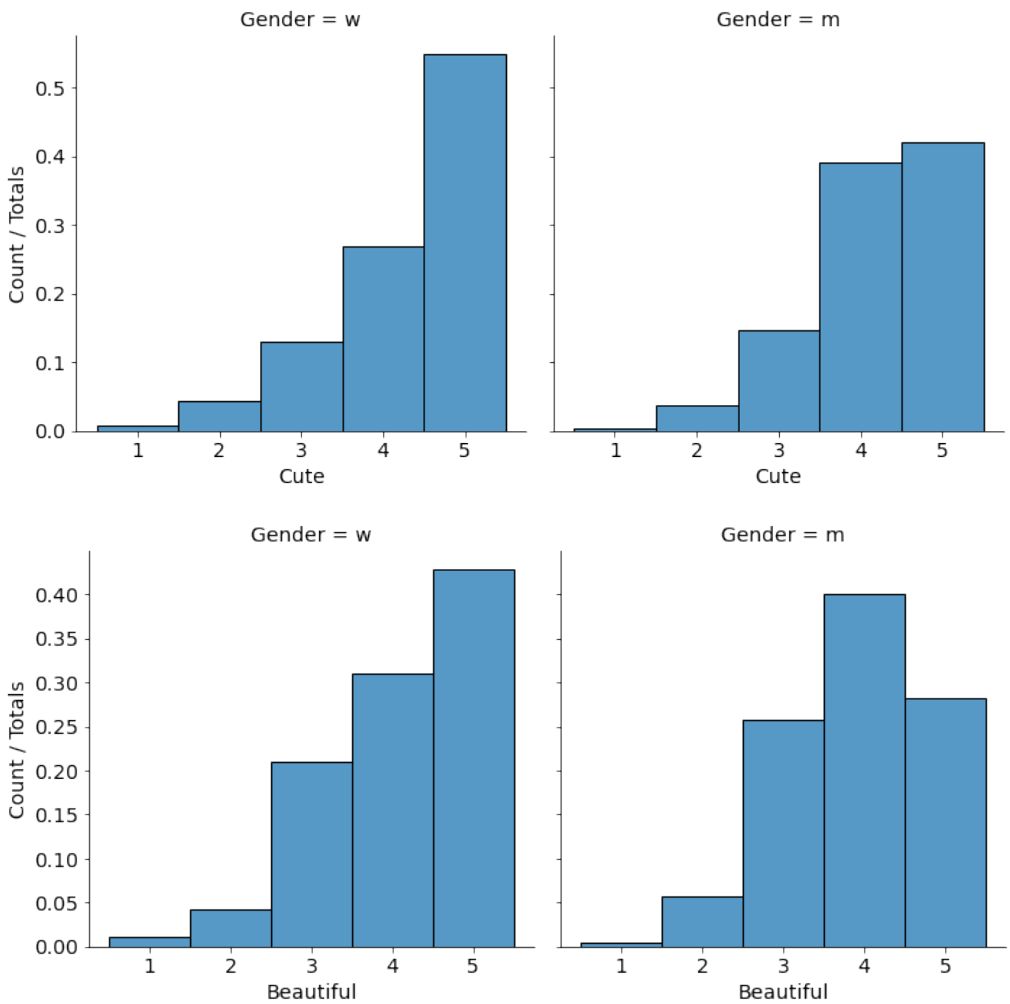


Figure 4: Histograms of the attributes Cute and Beautiful; grouped by gender. The individual counts are divided by the respective totals, i.e., women and men are normalised separately and can thus be directly compared.

Between the scores 3 and 4 is a strong discontinuity, though, for *Beautiful,* most of the visitors went for 3,4 and 5, resulting in a jump between 2 and 3. Again, women used higher rankings for the species' beauty on average; roughly 45% of women ranked highest compared to 30% in men. For *Cute*, even about 55% of the women ranked 5 and roughly 40% men. So, in both of the attributes, there is a difference of about 15 percentage points between men and women.

The other attributes, shown in Figures 5 and 6, are more symmetrically distributed and grouped around the neutral value (3), with tendencies to the lower score 2 (*Similar Appearance, Similar Movement*) or higher (4) for *Relatedness and Similar Expression*.

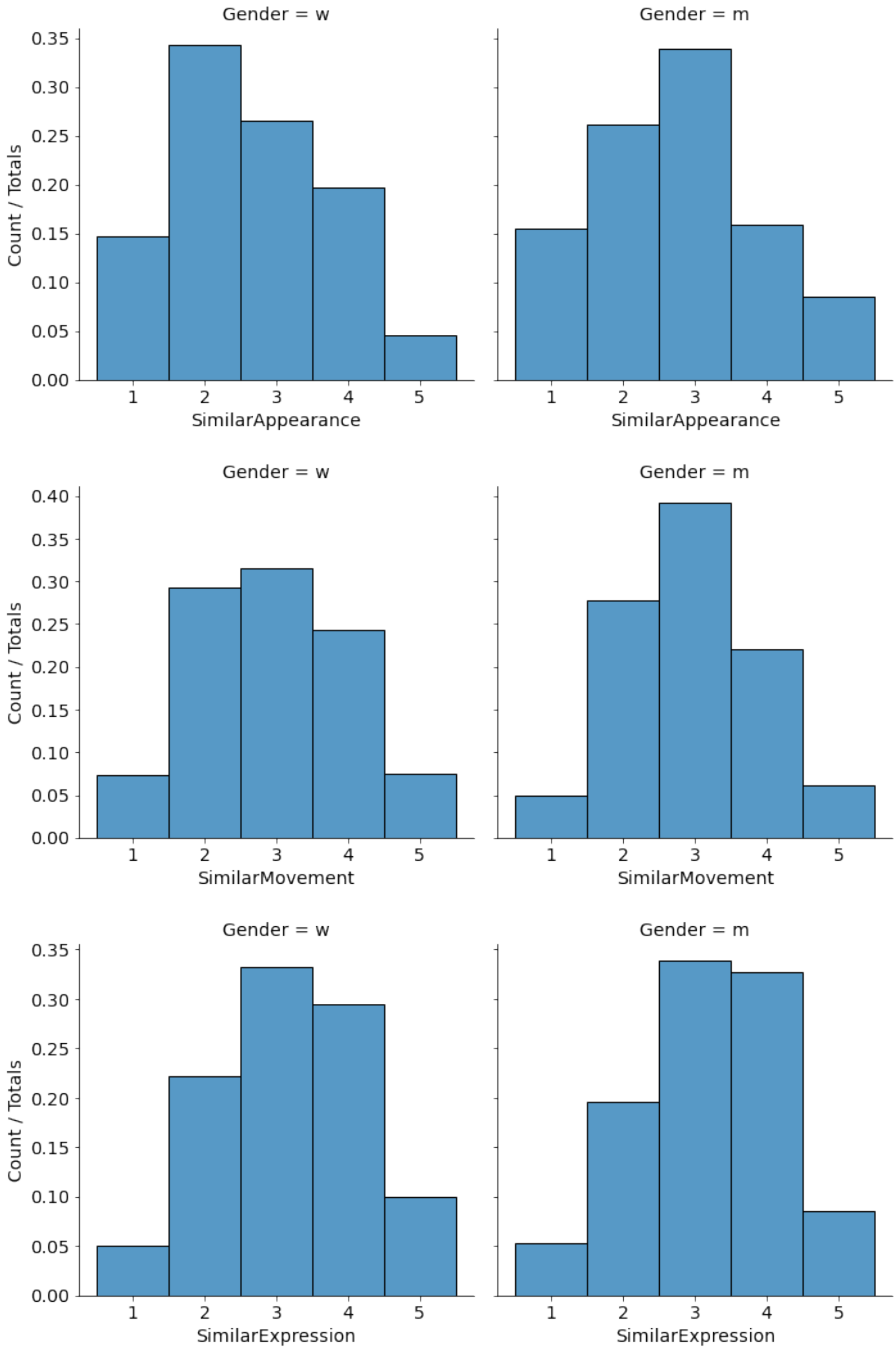


Figure 5: Histogram of the similarity attributes; grouped by gender; The individual counts are divided by the respective totals, i.e., women and men are normalised separately and can thus be directly compared.

However, the highest and the lowest scores were not popular for either of the Similarity attributes. For *Relatedness,* displayed in Figure 6, people also scored around 3 and 4 equally, though in this case, men ranked the estimated kinship to humans generally higher than women.

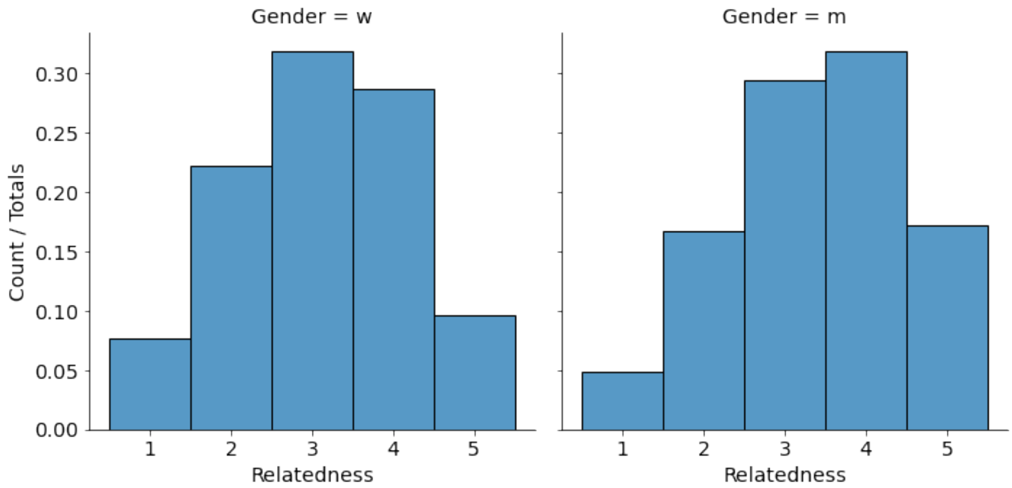


Figure 6: Histogram of the similarity attributes; grouped by gender; The individual counts are divided by the respective totals, i.e., women and men are normalised separately and can thus be directly compared.

Table 5: Mean scores for questionnaire variables by species out of a range of 1-5, 1 being the lowest option and 5 the highest.

| **Simians** | Cute | Beautiful | Similar Appearance | Similar Expression | Similar Movement | Relatedness |
|---|---|---|---|---|---|---|
| **Orangutan** | 3.83 | 3.94 | 3.68 | 4.09 | 3.67 | 4.19 |
| **Gibbons** | 4.49 | 4.23 | 3.15 | 3.29 | 3.12 | 3.63 |
| **Barbary macaques** | 4.03 | 3.78 | 3.17 | 3.77 | 3.53 | 3.64 |
| **Squirrel monkey** | 4.43 | 4.9 | 2.72 | 3.18 | 2.92 | 3.19 |
| **Sakis** | 3.26 | 3.16 | 2.64 | 3.16 | 3.01 | 3.34 |
| **Control** | | | | | | |
| **Ring-tailed lemurs** | 4.56 | 4.28 | 2.01 | 2.83 | 2.54 | 2.97 |
| **Meerkats** | 4.78 | 4.42 | 2.29 | 2.63 | 2.47 | 2.25 |
| **Prairie dogs** | 4.63 | 4.24 | 1.84 | 2.44 | 2.44 | 2.42 |

The distribution of the mean scores in Table 5 for the three similarity variables and *Relatedness* in the questionnaire show, overall, higher average values for the simians (orangutans, Barbary macaques, gibbons, squirrel monkeys and sakis) compared to the control species (ring-tailed lemur, meerkats and prairie dogs). The pattern is reversed for *Cuteness* and *Beauty*, the control species having higher average values than the simians.

## 3.2 Correlation between species perception and perceived relatedness

### 3.2.1 Principal Component Analysis

A PCA was performed on five dimensions with the following variables: *Cute, Beautiful, Similar Appearance, Similar Movement, Similar Expression* to identify potential clusters. The PCA results in five principal components, which are linear combinations of the original variables. The plot in Figure 7 (left) shows the five principal components and their explained variances. The first two principal components explain about 75% of the variances (Figure 7, left). These two dimensions thus hold most of the information of the original attributes. The right-hand side of Figure 7 shows the contribution of the original variables to the PCA dimensions and that the first two dimensions show a solid systematic correlation within "their" variables.

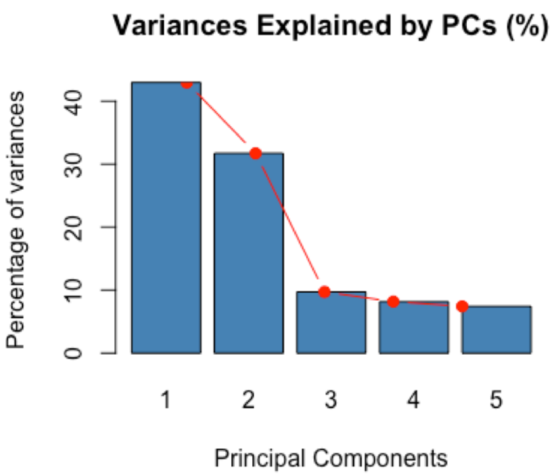



Figure 7: A plot showing the five principal components of the PCA and the variance percentage they explain (left); The plot (right image) with the five axes of the PCA dimensions shows the quality of the representation/projection. This plot allows for an interpretation of the PCA dimensions in terms of the original attributes.

Following the first two components, we see that variables *Similar Appearance, Similar Movement, Similar Expression* cluster and positively correlate in a new meta-variable that could be renamed "Similarity"; while the variables *Cute and Beautiful* cluster and positively correlate in a new meta-variable that could be renamed "Aesthetics" and relates to the species general appearance (Figure 8).

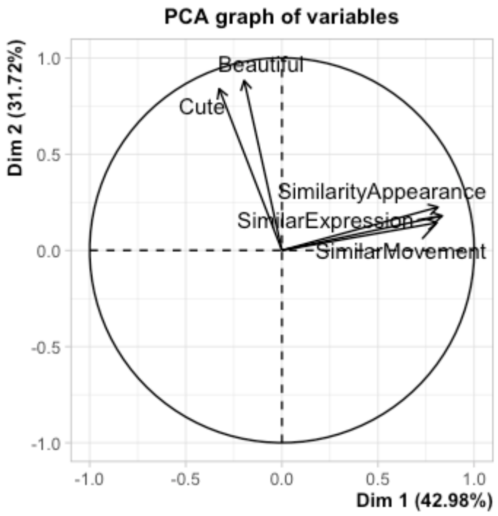


Figure 8: This plot shows the first two PCA dimensions and the alignment of the original attributes. The first dimension covers the similarity attributes and explains 42,98% of the total variance. Dimension 2 covers the variables Cute and Beautiful, explaining 31,72% of the total variance.

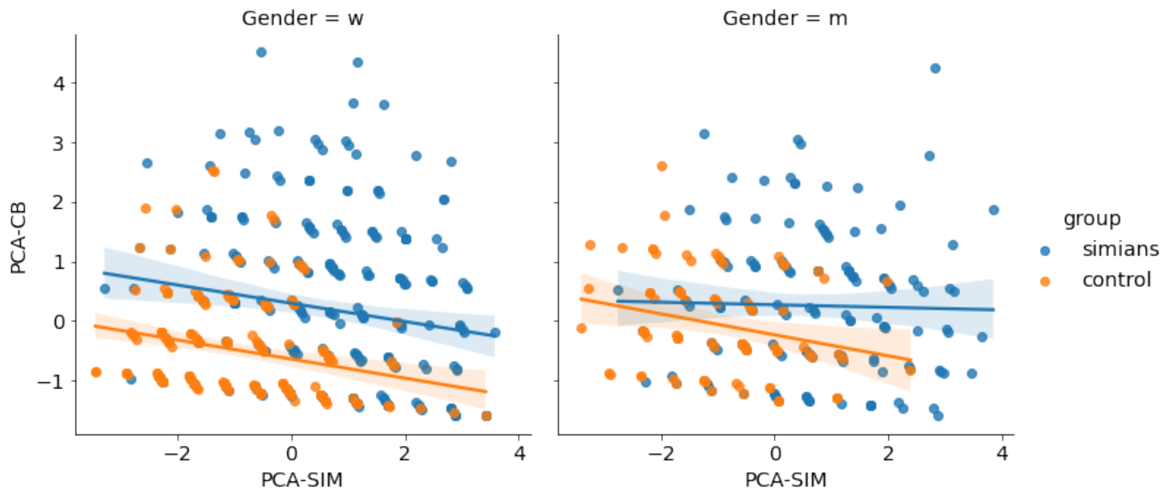


Figure 9: Scatter plot of the two PCA dimensions, women compared to men, grouped by simians vs control.

Figure 9 shows a scatter plot of the values of the two principal components separated by gender. Every dot represents a single participant of the questionnaire. Values for simians are more widely distributed, whereas the values for the control species tend to cluster around negative values for both the similarity cluster (PCA-SIM) and the appearance cluster (PCA-CB). For women, the interpolations of the data points show a slight negative slope. Men show a small negative incline for the control group but no correlation for simians. This means there is a slight tendency for women who rated Similarity (PCA-SIM) in simians or control higher to rate the Aesthetics, i.e. the PCA-CB cluster referring to beauty and cuteness, lower. This small effect can also be observed for men for the control group but not for simians, where no systematic correlation between PCA-SIM and PCA-CB can be seen. Of course, by construction, the PCA components tend to be independent and therefore, small correlations are to expect.

### 3.2.2 Relationship between the PC values and the variable Relatedness

Before testing the correlations statistically, the distributions of the PC values and the variable *Relatedness* are explored on an individual level via scatter plots shown in Figure 10.

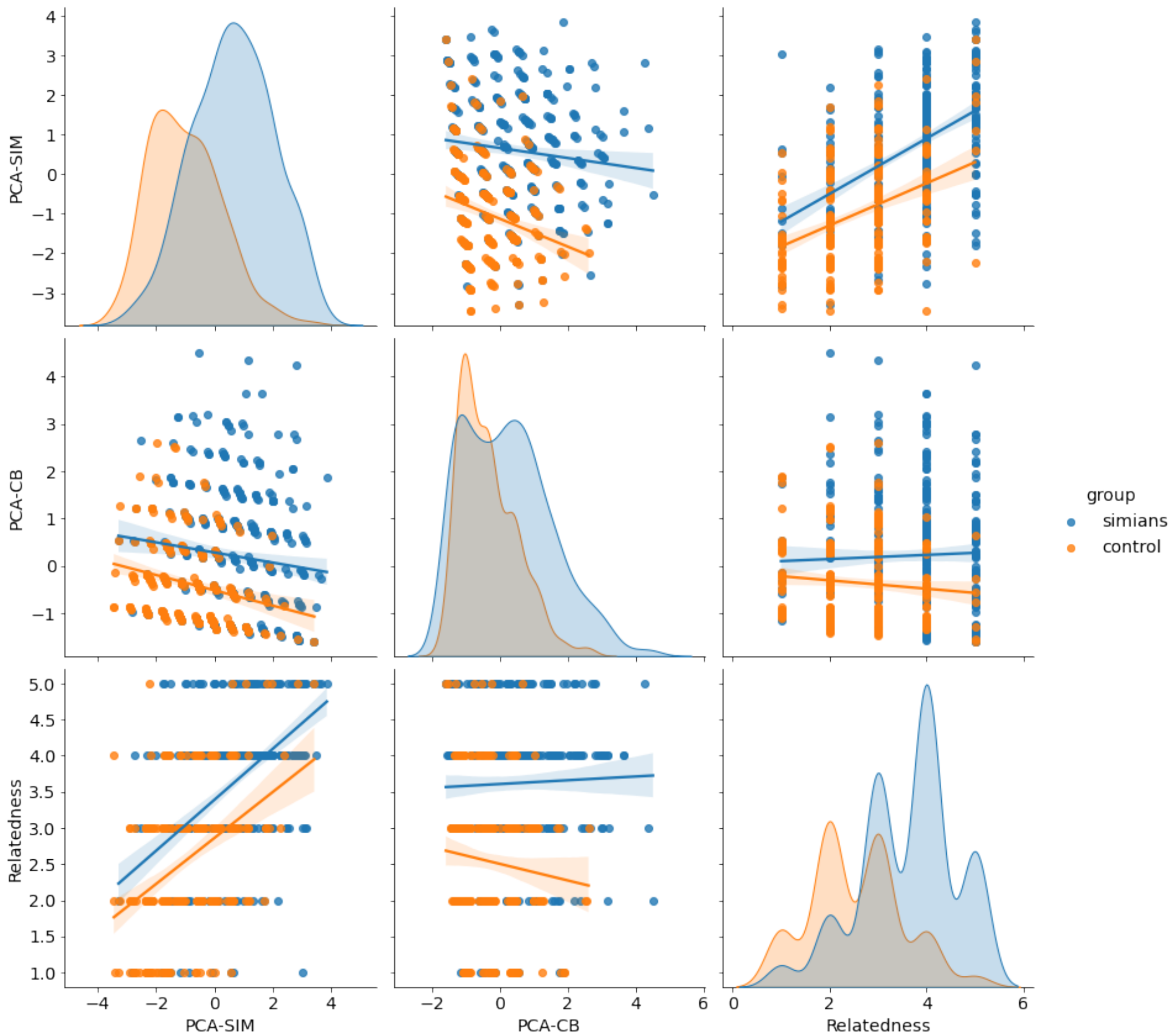


Figure 10: Pairwise scatter plots of the first two principal components PCA-SIM, PCA-CB and the original attribute *Relatedness* and smoothed density plots in the diagonal separated by simians vs control. Linear interpolations of the data points augment the scatter plots to guide the eye.

The linear regressions for PCA-SIM versus *Relatedness* show a pronounced positive slope for both control and simians, which means high scores in similarity are connected to high scores in *Relatedness* for both groups (Figure 10, bottom left). However, the PCA cluster containing the original variables *Cute* and *Beautiful* shows a slight negative slope for the control group and no clear correlation for simians (Figure 10, bottom middle). The smoothed density plot in the lower right diagonal of Figure 11 also shows the visitors rating of the relatedness to humans. For simians, this peaks around the scores 3 and 4, whereas the control group has been rated lower (peaks at 2,3), a notion which already stood out in Table 3 (see *Exploration of the questionnaire variables*).

In the other two diagonal plots, a stronger clustering is noticeable at lower values of PCA-SIM and PCA-CB for the control group than for simians, which are more widespread. This means the individuals left scores, which resulted in higher values for both the Similarity cluster (PCA-SIM) and Aesthetics (PCA-CB) for simians compared to the control species. The linear regression between Similarity and *Relatedness* shows a positive relationship for both groups, though the control group shows lower scores overall. For Aesthetics and *Relatedness,* there is even a small negative relation visible for the control group, which means high scores for PCA-CB for the control group leads to a less closely associated phylogenetic relatedness.

### 3.2.3 Spearman correlation

To test the results from scatter plots in Figure 10 (bottom left and bottom middle scatter plots) statistically – whether Similarity and Aesthetics positively impact people's perception of relatedness – a Spearman correlation was used to explore the relationship between the two PCA results and the variable *Relatedness*.

As shown in Tables 6, 7 and 8, PCA-SIM correlates significantly with *Relatedness* for all three set-ups, as the p-value is smaller than the numerical precision

Table 6: Results of the Spearman correlation between the values of the principal components (PCA-SIM, PCA-CB) and the attribute Relatedness.

| **Correlation with *Relatedness*** | **Correlation coefficient r** | **p-value** |
|---|---|---|
| **PCA-SIM** | 0.599 | 0.0 |
| **PCA-CB** | 0.076 | 0.03953 |

Only in the overall correlation of the two PC clusters with *Relatedness,* a correlation with a significant p-value can be noticed between PCA-CB and *Relatedness* (Table 6). However, the correlation is weak (r = 0.076, p=0.03953). For all other correlations grouped by species or by gender, PCA-CB does not correlate significantly. The results in Table 7 show that the results for men and women do not differ much. Both show positive correlations between the similarity attributes and the kinship to humans but not for the cuteness/beauty of the species. However, the correlation for women is slightly stronger than for men (r=0.63 for women and 0.53 for men, Table 7), and a difference between simians and the control group is also visible (Table 8).

Table 7: The correlation between the PC values (PCA-SIM, PCA-CB) and *Relatedness* by gender.

| **Correlation with *Relatedness*** | **Correlation coefficient r** | **p-value Men** | **Correlation coefficient r** | **p-value Women** |
|---|---|---|---|---|
| **PCA-SIM** | 0.53 | 0.0 | 0.634 | 0.0 |
| **PCA-CB** | 0.104 | 0.10346 | 0.025 | 0.57673 |

Table 8: Correlation of PCA dimensions with *Relatedness* attribute by simians and control group.

| **Correlation with *Relatedness*** | **Correlation coefficient r** | **p-value Simians** | **Correlation coefficient r** | **p-value Control** |
|---|---|---|---|---|
| **PCA-SIM** | 0.505 | 0.0 | 0.373 | 0.0 |
| **PCA-CB** | 0.01 | 0.8262 | -0.093 | 0.1222 |

### 3.3 Effect of species perception on the propensity to anthropomorphise

To test whether the perception of a species impacts the tendency to anthropomorphise the species groups (H3), the probability for an anthro*-comment for each questionnaire individual is simulated via a Bernoulli process using information from the focal. To compare two distributions of correlation coefficients quantitatively, the mean +/- a standard deviation (*SD*) is taken as the interval most likely containing the “true” value. Additionally, the effect sizes, i.e. the standardized mean difference, are calculated.

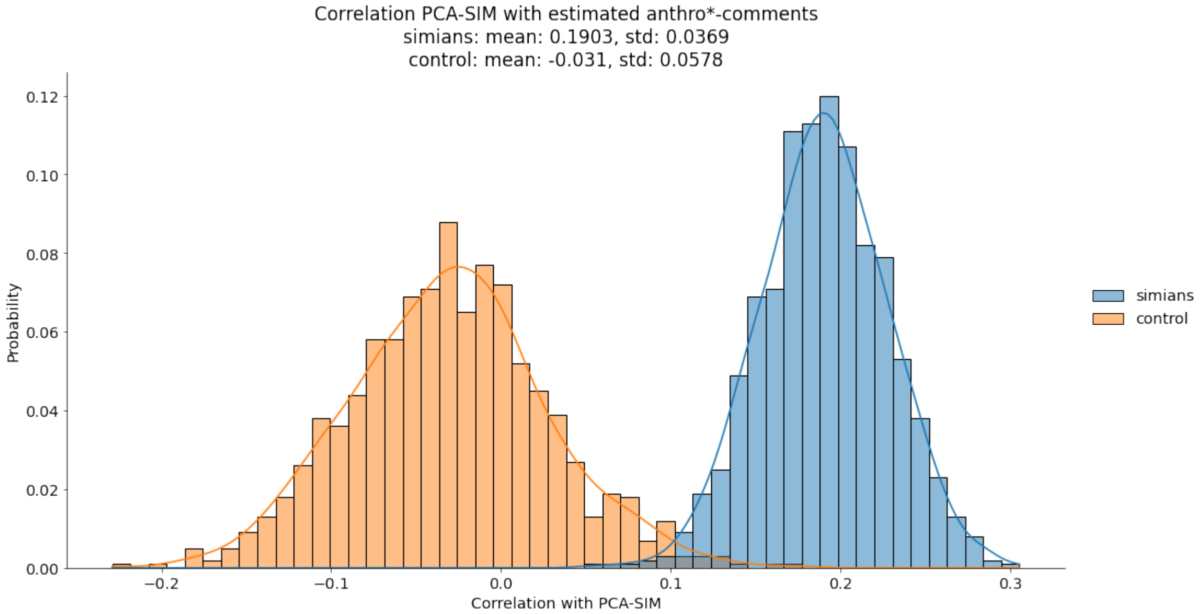


Figure 11: Distributions of the correlation coefficients of each of the 1000 correlations for every questionnaire individual between PCA-SIM and probability for an anthro*-comment, grouped by species. Effect size 4.674.

For simians, shown in Figure 11, the correlation between PCA-SIM and the evaluated propensity to anthropomorphise group around 0,2 with a mean of 0.1903 and a standard deviation of 0.0369. In comparison, for the control species, the results are compatible with 0, given the large *SD* of 0.0578 by a mean of -0.031. This indicates that Similarity positively correlates with a higher probability to anthropomorphise, but only for simians and not for the control species. However, the perceived Aesthetics of a species, PCA-CB, does not seem to correlate with the propensity to anthropomorphise (Figure 12). The distributions overlap within one standard deviation, which means the distributions are not clearly separated and lie close together. Here, a negative tendency can be observed in simians but not for the control group.

When we look at the results divided by men and women in Figures 13 and 14, the only significant non-zero correlations can be observed for Similarity (PCA-SIM) in simians (Figure 13) for both men and women.

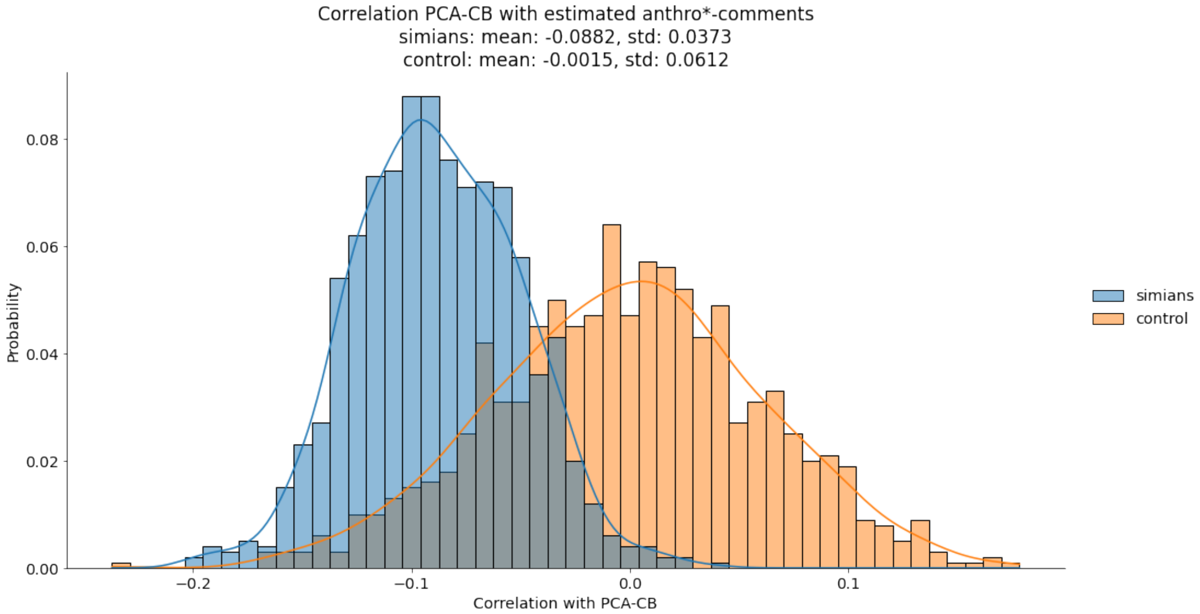


Figure 12: Distributions of the correlation coefficients of each of the 1000 correlations for every questionnaire individual between PCA-CB and probability for an anthro*-comment by species. Effect size 1.760.

Between men and women, the distributions are similar as the mean values are nearly congruent. Notably, the distribution for the control species for men is very spread out with a high standard deviation. Given this *SD*, though, the distributions for the control group between men and women do not show a clear separation.

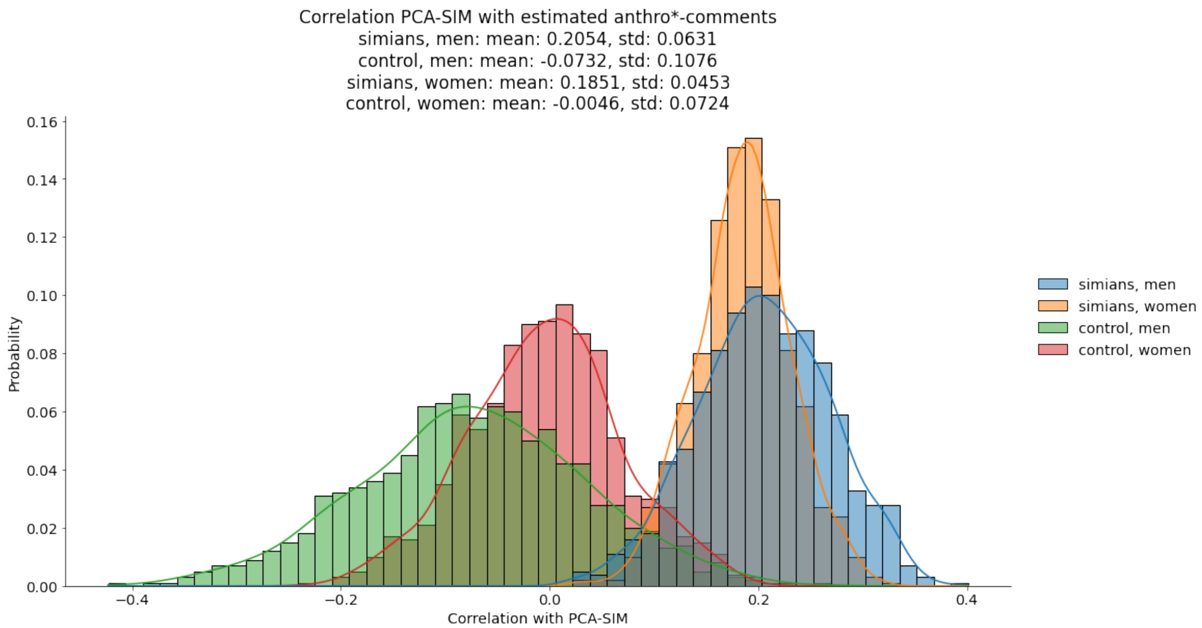


Figure 13: Distributions of the correlation coefficients of each of the 1000 correlations for every questionnaire individual between PCA-SIM and probability for an anthro*- comment grouped by gender and species. Effect sizes: men/simians vs control = 3.264; women/simians vs control = 3.223; simians/men vs women = 0.375; control/men vs women = 0.762.

Figure 14 shows all distributions grouped close together. Again, women show a slight negative correlation for PCA-CB results and the probability for anthro*-comments in simians compared to the control group. Men, however, do not show a clear difference between simians and control.

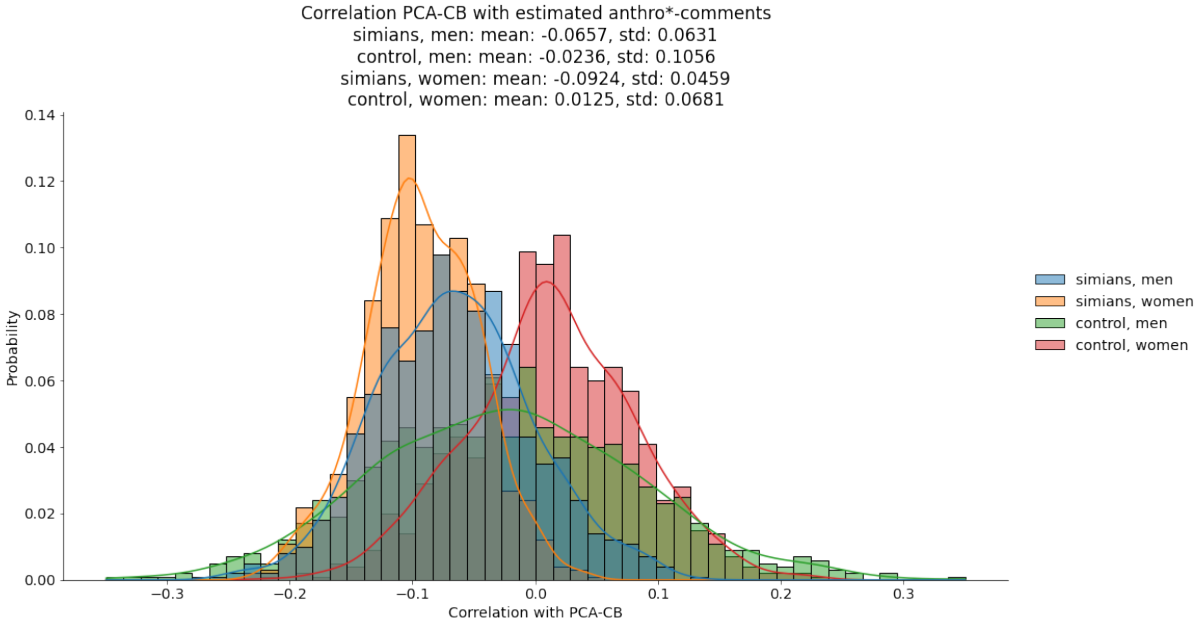


Figure 14: Distributions of the correlation coefficients of each of the 1000 correlations for every questionnaire individual between PCA-CB and probability for anthro*- comments grouped by species, gender. Effect sizes: men/simians vs control = 0.499; women/simians vs control = 1.840; simians/men vs women = 0.489; control/men vs women = 0.416.

To test these results statistically, a Mann-Whitney U test was performed on the distributions between the PC values of PCA-SIM/PCA-CB and the probability of anthro*-comments shown in Figure 11,12,13,14. The results are displayed in Tables 9 and 10 and are all significant. Correlation of the probability and PCA-SIM: Distributions between simians and control show the greatest difference for all distributions: for men (p=0.0) with a high effect size (3.264). Women also show a significantly great difference between simians and control with p=1.24e-310 and an effect size of 3.223. The distributions between women and men are also significant but with visibly smaller differences: for simians, the distributions between men and women with p=1.24e-15 have an effect size of only 0.375, which is the smallest difference from all compared distributions; for control between men and women (p=8.22e-55) a difference of 0.762 is shown. The distributions concerning the PCA-CB and correlated anthro*-comments were also significantly different but with small effect sizes overall. For men, the distributions between species show a p-value of p=6.77e-24 with an effect size of 0.499.

In comparison, women have a greater difference for species (p=1.16e-208) with an effect size of 1.8404. The differences between gender are significant by p-value (simians – men vs women p=1.38e-23) with a small effect size: 0.489. This is similar for control grouped by gender (p=1.38e-23, effect size 0.416).

Table 9: The Mann-Whitney-U test compared the distributions between simians and control, grouped by gender. The results all show highly significant p-values.

| Simians vs Control | MWU Statistic | p-value Men | MWU Statistic | p-value Women |
|---|---|---|---|---|
| **PCA-SIM** | 12311.0 | 0.0 | 13487.0 | 1.24e-310 |
| **PCA-CB** | 630165.0 | 6.77e-24 | 898064.0 | 1.16e-208 |

Table 10: The Mann-Whitney-U test compared the distributions between men and women, grouped by species. The results all show highly significant p-values.

| Men vs Women | MWU Statistic | p-value Simians | MWU Statistic | p-value Control |
|---|---|---|---|---|
| **PCA-SIM** | 603311.0 | 1.24e-15 | 298654.0 | 8.22e-55 |
| **PCA-CB** | 629252.0 | 1.38e-23 | 382961.0 | 1.38e-23 |

# 4 Discussion

## 4.1 Summary

In this study, I analysed survey data to answer whether the perception of zoo animals (focusing on simians and three mammal, non-simian control species) differs in men and women and whether it impacts people associating a closer phylogenetic distance with the species, respectively. I further combined the results from the questionnaire with the findings from covert focal observations to explore the influence of Similarity – concerning the similar appearance, similar movement and similar facial expression to humans – and Aesthetics – defined by the attributes cuteness and beauty of the species – on a simulated propensity to anthropomorphise. Also, for women and men, Similarity correlated significantly with *Relatedness*. Below I will discuss the findings in regards to the research questions. Then I will evaluate the advantages and the disadvantages of covert focal observations and the questionnaire method, respectively. Furthermore, the relevance and outlook of studies in anthropomorphism, the ethical component, and the educational potential of anthropomorphism, especially for animal welfare and conservation, are emphasised. In the end, I will summarise the key messages of this thesis.

## 4.2 Exploration of the questionnaire attributes

The histograms and average scores of the questionnaire results already gave rise to two impressions that solidified later: Simians scored higher ratings for all similarity attributes and *Relatedness.* At the same time, the control group was rated cuter and more beautiful on average. The analysis testing hypothesis 1 (H1) showed that men and women differed in their scorings for the overall appearance, i.e. cuteness and beauty, and also relatedness. However, there was no gender effect in the ratings of Similarity, which was true for all similarity attributes (Table 3). This corresponds to the average scores: women left higher scores for cuteness and beauty, but men rated the relatedness a little higher. On the other hand, the average scores were already foreshadowing the results of the non-parametric test as both women and men left similar average scores (Table 4).

## 4.3 Correlation of species perception and perceived relatedness

First, the similarity attributes were positively correlated with *Relatedness* for both simians and control (Table 6). Therefore, visitors associated higher ratings in Similarity with a closer phylogenetic kinship in both groups. On the other hand, the PCA-CB values (Aesthetics) correlation with *Relatedness* also resulted in a weak positive correlation. The exploration of the individual scores for Relatedness and PCA-SIM and PCA-CB also show a slight positive tendency in the linear regression line for PCA-CB in simians (Figure 10), but a negative tendency for control. When tested statistically grouped by gender and species, the slight positive effect of PCA-CB on *Relatedness* was no longer significant. Therefore, the second hypothesis can partly be confirmed: similarity to humans correlates positively with people estimating a closer degree of kinship. Nonetheless, significant results for differences in species or gender could not be found.

Also, women and men rated *Relatedness* differently on average, though it did not affect the correlation between Similarity (PCA-SIM) and the perceived phylogenetic kinship: men and women both associated similar-looking species with closer phylogenetic relatedness. The correlation coefficient for the Similarity with *Relatedness* is a little higher for women (Table 7). PCA-CB did not significantly correlate with *Relatedness* when grouped by gender, and the different average scores for general appearance do not seem to affect the results. More of the contrary: when comparing the individual scores for the PCA values in Figure 9, women tend to rate PCA-CB more negative when rating PCA-SIM higher, an effect showing for simians and control. However, men showed the same negative tendency for the control, but there was no linear regression for simians. It seems that Aesthetics has at least a small negative effect on the rating of Similarity in simians for women, but this did not affect the outcome of questions in focus.

## 4.4 Effects of species perception on people's propensity to anthropomorphise

Similarity positively impacts the propensity to anthropomorphise in simians, whereas appearance does not seem to have this effect, as it was already suggested by Eddy et al. in 1993. The qualitative results are corresponding to the correlation of the PCA-SIM with the propensity to anthropomorphise show different distributions between simians and control, resulting in a positive correlation in Figure 11 for simians and no correlation for the control, which groups around 0 given the mean +/- a standard deviation and the high effect size. On the other hand, PCA-CB, shown in Figure 12, shows a slight negative impact for simians grouping around -1 compared to no effect for the control grouping around 0. However, the effect size indicates only a minor difference, and they are clearly overlapping within one standard deviation. Hence, Aesthetics might slightly negatively impact people anthropomorphising simians, but it requires further research to confirm this notion.

The distributions show similar results when distinguishing between species and gender (Figure 13): PCA-SIM positively affects the propensity to anthropomorphise simians for women and men but not for the control. The non-parametric tests, displayed in Tables 9 and 10, show significant results for all distributions grouped by gender = men: simians vs control; women: simians vs control; and grouped by species= simians: men vs women; control: men vs women. Therefore, the distributions are all significantly different. However, Figure 13 shows a great difference between the impact of Similarity on women and men's propensity to anthropomorphise simians in comparison to the control, with high effect sizes for both comparisons. Despite the distributions between men and women (Figure 13) being significantly different (Table 10), the difference is very small and shows small effect sizes. This is also verified by the visual overlap of the distributions in Figure 13. Thus, the differences between men and women in the distributions regarding Similarity (Figure 13) reported by the non-parametric test might be due to the large sample size and resulting statistical divergence.

However, Aesthetics seems to have a slightly negative effect on women's propensity to anthropomorphise simians compared to the control, as displayed in Figure 14. The effect size between simians and control for women is average, indicating that there is indeed a tendency. It confirms the notion above, as a slight negative tendency for Aesthetics regarding simians, was discussed (Figure 12). However, PCA-CB does not seem to influence the other distributions. The effect sizes for men for simians vs control (PCA-CB) in this context is much smaller, and so are effect sizes for the distributions for the control, comparing men and women. A study conducted in 2016 by Letheren et al., who examined anthropomorphic tendencies from 509 participants via online surveys, also concluded that despite a significant result for higher tendencies in females at first, not gender but other personality traits, e.g. openness, faith in intuition and neuroticism have an impact on the tendency to anthropomorphise as they were significant covariates. As soon as personality, thinking style and age were taken into account, the higher tendency for females no longer existed (Letheren et al., 2016). Therefore, significant differences between men and women in this thesis might also be based on other variables I did not control for.

Concerning the results for the last part of the analysis, it has to be kept in mind that the sample size is large, and the resulting statistical power means that minor effects are significant. Therefore, for the interpretation of the statistical tests, it is important to also consider the effect sizes as well as the visual representation of the distributions, including mean value and standard deviation. Generally, this approach of analysis has two major uncertainties, which have to be taken into account. First, the individuals from the questionnaire and the focal observations only represent only a sample of the whole population. This is true for all studies (and therefore all parts of this thesis' analysis), no matter the sample size. Generally, it is also uncommon to combine two independent datasets, which was done via a simulation and can only approximate how the questionnaire individuals **would have** commented on the animals **if** they had been observed. To counteract further insecurities, the average number of comments of the specific demographic groups (based on gender and observed species) has been considered in the model and the propensity to anthropomorphise as well, which considered the impact of the individual. However, the results regarding the simulated propensity to anthropomorphise should only be considered possible tendencies, which can be used as directories for further research, possibly reviewing the outcome of this thesis via a different method. One option would be a regression model, which was not chosen in this study due to the lack of data in many demographic groups.

## 4.5 The role of phylogenetic distance for anthropomorphism

A close phylogenetic distance accompanies more similarities in morphology; in this study, this effect was demonstrated the other way around: Similarity influenced peoples' estimation on kinship regarding simians vs control and further positively influenced visitors to anthropomorphise simians but not the control. However, even though the results showed that people associated all simians with a higher similarity and closer related than the control group, the rankings within these groups do not confirm that this understanding goes beyond the separation of simians and control (Table 5). On average, visitors ranked all simians as closer related (judging from the average scores in Table 5 of the results and the distribution in Figure 10) than all of the control group species, orangutans clearly at the top. The rest of the simians laid close together with only minor variations, and the ranking did not follow a phylogenetically correct order, nor did the scores within the control. Meerkats were ranked the furthest related even though prairie dogs should be at the bottom. This suggests that visitors' understanding of phylogenetic distance to the species, respectively, does not go beyond a certain point. However, where do the borders begin to blur? It has to be pointed out that the prosimian ring-tailed lemurs were more associated with prairie dogs and meerkats, even though they are phylogenetically closer to the new world monkeys, i.e. sakis and squirrel monkeys.

Interestingly, sakis scored the lowest in general appearance (cuteness and beauty), but they matched the other simians in similarity scores and *Relatedness*. This confirms that the low appearance rankings in sakis and high appearance rankings in lemurs do not affect the visitors' estimation regarding kinship to humans. The factor appearance can therefore be excluded in this context. Other anthropomorphism studies have compared different species within a wide phylogenetic rank, from invertebrates to vertebrates (Batt, 2009; Harrison & Hall, 2010). However, there is a lack of anthropomorphism studies looking at species within the same order or the same family. As Similarity is clearly positively affecting anthropomorphism behaviour, diving further into the specifics and details on a similar species line-up could shed more light on the underlying mechanisms.

### 4.6 Advantages and disadvantages of the methods used

In this study, a new approach for covert focal observation was chosen. The novelty was applying a method often used for researching animal behaviour, which I took and applied to collect data on anthropomorphic behaviour in humans. This was done by "eavesdropping" on zoo visitors while they were observing the animal species. Most studies on anthropomorphism were conducted via questionnaires or online assignments (Bartz et al., 2016; Batt, 2009; Harrison & Hall, 2010; Urquiza-Haas & Kotrschal, 2015). However, to answer questions on people's tendency or propensity to anthropomorphise – as was the anticipation of hypothesis 3 – those kinds of methods are not suitable. The participants' knowledge about the topic of anthropomorphism or even being aware of taking part in research would already cause a bias (Hawthorne effect), which would spoil the natural response.

Furthermore, the study design was conceived to avoid or reduce other biases, e.g. sample selection bias, which occurs when the criteria for selecting participants in different cohorts are naturally different (Pannucci & Wilkins, 2010). All participants for the focal sampling were German-speaking, included all ages from young to old adult, and no gender was excluded. It has to be considered that wrong estimations by the observant could occur, the division between young adults and middle-aged people in particular. As the group of young adults is made of only a few focal individuals, which resulted in very low or no representation of specific demographic groups, the explanation could be a) a generally low number of young adult zoo visitors or b) young adult focal individuals were mistaken for middle-aged by the observer. A solution to solving this kind of researcher bias could be redefining the age groups, for example, dependant on the presence of children. One reason for an age mix-up could be the presence of babies or toddlers/kids, which might be less associated with the term "young adult", and the observer automatically associates the person as being "middle-aged". However, the tendency to anthropomorphise is significantly linked to, inter alia, age; a study questioning 509 participants via online surveys confirmed (Letheren et al., 2016). Therefore, as the influence of gender was considered for this analysis, further studies should focus on age as another particular sociodemographic attribute. The company of children is also a possible influence on anthropomorphic behaviour, which was not controlled for. It would be an excellent opportunity to challenge the impact of the group and the presence of children in particular. It is known that the group tends to polarise attitudes, though the study of behaviours in humans usually focuses on the single individual isolated from any frame of reference (Moscovici & Zavalloni, 1969), which does not apply here.

The researcher bias could also be the reason for the discrepancy between women and men focal protocols. Nearly double the focal individuals are female. Even though the focal observation process is designed in such a way as to reduce any selection bias, an underlying form of preference could have caused this outcome. To counteract gender selection bias, the focal protocols should be checked after a certain amount to re-establish the balance between male and female focal individuals. Possible influences of factors like juveniles of the animals or the active status of the animals were considered and documented though they have not yet been accounted for in the analysis.

## 4.7 Ethics

Covert observations in social sciences have been the reason for a debate in the literature, as the advantages are significant, but the ethical concerns regarding the method are heavily discussed. The most prominent critic is the lack of consent of the participants as the researchers are using deception to collect data (Walters & Godbold, 2014), often by going undercover and infiltrating certain social groups. The British Sociological Society released a statement, which states covert observations as justifiable. Still, they should only be applied in "certain circumstances" (British Sociological Society, 2002), which was not defined further, but after considering the literature on the research being done, it seems to be very dependent on context. In the end, the advantages have to outnumber the disadvantages. The privacy and safety of participants and also observers are the main reasons the method moves in an ethical "grey zone".

In this case, the study focuses on visitors' behaviour in a biological and social science context, contributing to researching human-animal relations. It has been critiqued by Riley and Manias that multiple studies lacked adequate explanations on ethical requirements were met (Riley & Manias, 2004). Still, the focal data and the questionnaire data collection were fully anonymous and approved by an ethics committee. Every questionnaire participant had to fill out a consent form, see *Appendix V*. After weighing the pros and cons of the methods, it is essential to mention that the ends have justified the means.

## 4.8 Relevance of the study and outlook

Due to this approach of witnessing people's behaviour "in the wild", the findings are also of high interest to the zoo in which the study was conducted. Tiergarten Schönbrunn will use the studies' results to conclude visitors' behaviour and work in animal conservation and welfare. As mentioned in the introduction, anthropomorphism is very useful in advertising due to its empathy-evoking properties. Based on similar mechanisms, anthropomorphism is one of the most potent tools in animal welfare, as it increases people's empathy towards animals (Watanabe, 2007). With its multi-methodological approach, in particular, this study holds the potential to contribute to educating about anthropomorphism, raise peoples' awareness on the subject in regards to animal welfare, and shed light on the process behind behavioural and cognitive research. It is planned to establish a website for the study, in which the term and mechanisms behind anthropomorphism will be explained in an exciting and non-complex way. The findings of this and future studies will provide the theoretical base. Still, exclusive insights into data collection and the development of research questions are also a chance to make research more accessible.

In times of climate change and the threat of mass extinction, animal well-being and conservation are public interests. Understanding human-animal-relations better can contribute to a higher awareness of the topic and raise trust in scientific research in general.

## 4.9 Conclusion

The results showed that women and men differed in rating the species cuteness, beauty and relatedness, but not the similarity attributes, i.e. similar movement, similar facial expression and similar appearance (H1).

I can positively confirm that Similarity, the PCA cluster containing all similarity variables, correlates with an estimated phylogenetic kinship (H2). However, the results show no difference in species or gender. Aesthetics showed a weak positive correlation, but the effect disappeared when gender and species were compared.

The third research question (H3), asking whether similarity or general appearance positively affects people's propensity to anthropomorphise, was answered: Similarity indeed enhances women and men's propensity to anthropomorphise simians equally, but it did not have the same effect on the control species.

Aesthetics did not have this effect on simians nor the control. Moreover, there was a slightly negative effect for simians detected, which also appeared when grouped by gender: for women, the overall appearance seems to slightly decrease the tendency to anthropomorphise simians.

For the control, there was no effect either for men overall. Hence the differences between simians and control were that clear; it would be interesting to go more into detail regarding the role of phylogenetic distance for anthropomorphism in humans in further studies.
Also, as the positive impact of Similarity has been established on either the estimated relatedness and also the propensity to anthropomorphise in men and women, it might be worth investigating the possible negative impact Aesthetics seems to have on women anthropomorphising simians as women also left significantly different (higher) scores for general appearance than men. In this context, it might also be interesting to remind of the minor positive correlation Aesthetics had on estimated relatedness (H2), a variable men and women also significantly differed in. However, the role of Aesthetics in anthropomorphism research is unclear, and the slight negative impact reported in this study might also be due to other factors. However, replicating this study with a different method of analysing the propensity to anthropomorphise could make sure the simulated approach reflects realistic anthropomorphic behaviour of zoo visitors and double-check whether a negative impact of Aesthetics is still present. Furthermore, it gives the chance to control for the influence of other sociodemographic key features like age, the presence of children or the group dynamic.

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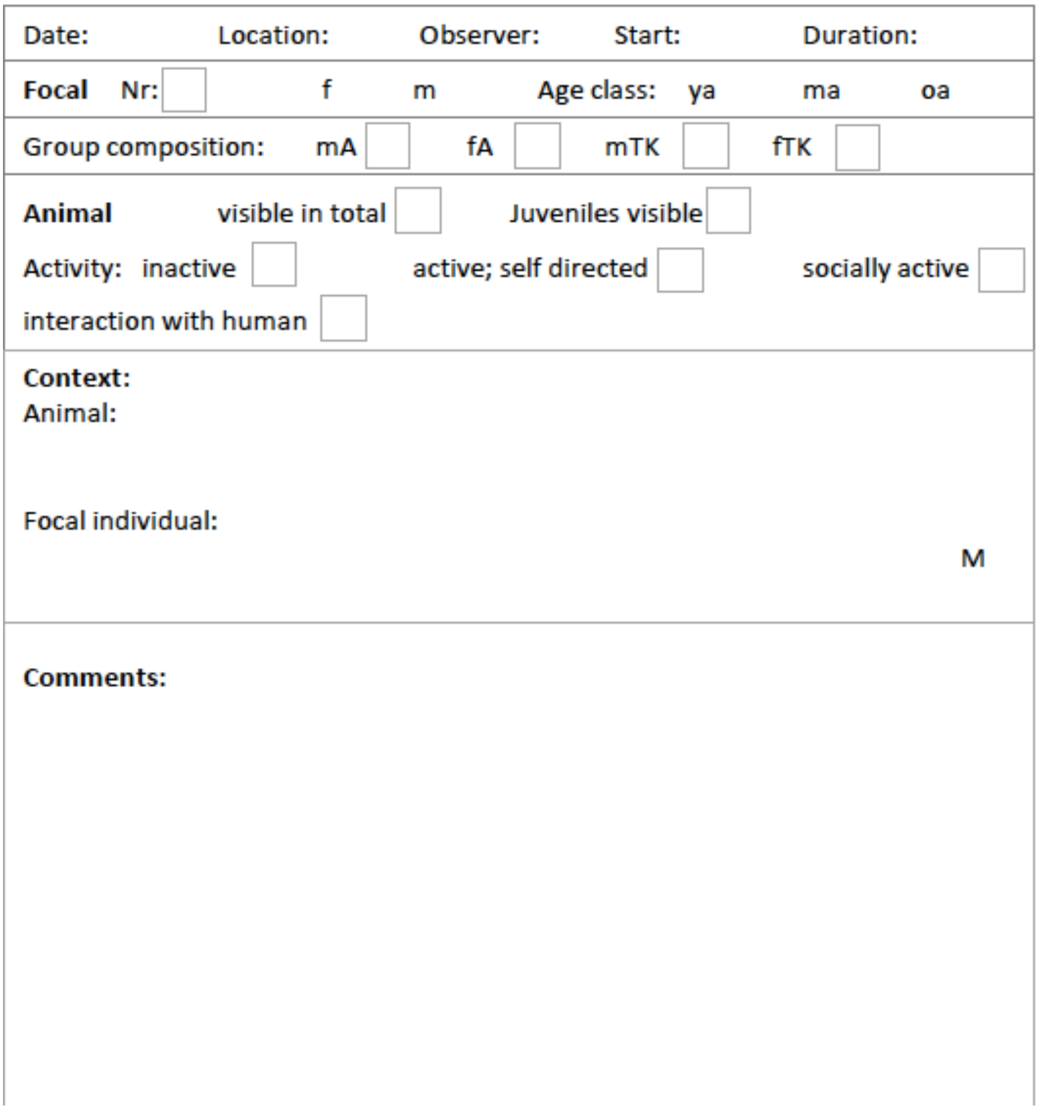
# Appendix

## I Focal data collection sheet



Date: Location: Observer: Start: Duration:

**Focal** Nr: f m Age class: ya ma oa

Group composition: mA fA mTK fTK

**Animal** visible in total Juveniles visible

Activity: inactive active; self directed socially active

interaction with human

**Context:**
Animal:

Focal individual:

M

**Comments:**

Figure 15: Focal data collection sheet

Legend:

Focal: f = female, m = male; Age class: ya = young adult, ma = middle-aged, oa= old adult; Group composition: mA = male adult, fA= female adult, mTK = male Teenager/kid, fTK= female Teenger/kid; Context: M = mask/no mask (added for data collection during the pandemic in 2020.

## II Comment categorisation guidelines

Task: in the table, enter a new column with categorizations as defined below (a/n/z/t/x/u). Enter in a second column the sub-category that motivated your decision (e.g. appearance / emotions / ... for a).

Anthropomorphism can be defined as the use of human characteristics, emotions and intentions to describe and interpret non-human animal species behaviours (Noske 1989; Shapiro 1997).

Therefore, if unsure where to put a comment, go for the **conservative** option, i.e. **n** vs **a**].
Anthropomorphism (a):
Every recorded comment that is **comparing the animal to a human**, for example, in terms of:

- Appearance, e.g. he looks like you, he eats like you
- Emotions, e.g. he is lonely, he is sad
- Intentions, e.g. wants to be let alone, hiding, wants [to do anything], he is planning to jump up there
- direct comparisons, e.g. like daddy in the mornings, spiderman [check context]
- human-like abilities, e.g. intelligent, stupid
- human social relationship, e.g. his mum, aunty, daddy, family
- typically, human descriptions, e.g. naughty, chill, lazy, ‘kaputt’, strolling [spazieren]
- typically, human activities, e.g. chilling, snuggling [kuscheln], eating breakfast [frühstücken]
- state of mind/body, e.g. enjoying, brave, bored, wise, tired, hungry, thirsty
- intentional behaviour,e.g. walking away from you, looking for something [see below for looking!], having a rest [vs. sleeping = n], he is walking away from me, he is hiding from us, which is considered an anthropomorphic comment.

Zoomorphism (z):
The cases where the human is comparing himself to the animal, e.g. I can do that too, you look like him.

Talking to the animal (t):
All the cases in which the human is talking or telling someone to tell the animal something, e.g. Hallo/ Goodbye monkey.
Non-anthropomorphism (n):

- descriptions of the animals' behaviour e.g. he is walking, he is scratching, sleeping
- descriptions of the animal itself, e.g. cute, fluffy, beautiful, ugly, looks like Herr Nielson
- not exclusively human activities, e.g. play [take care of context! See below], climbing, tumbling ('turnen')
- and everything else that is not fitting in any of the categories above

Special cases:

- **How** he is looking **at you** (wie er dich anguckt) is **a**nthropomorphism because it implies something looking a certain "meaningful" way. A "he is looking at ..." is, depending on the context, a **non-anthropomorphic** comment. Is the animal just described to be looking in a specific direction? If so, it's non.
- **Baby rule:** words like "baby" and "kind/kinder" count as anthropomorphic, whereas words like "junge" and "kleine" do not count as anthropomorphic. This is independent from juveniles present or not.
- **Play:** If the animal's behaviour is described as "Spielen" (playing), then the comment is categorised as a.
- **German/Austrian nicknames:** German nicknames such as "dummer Esel"(dumb donkey) or "komischer Vogel" (weird bird) are used to describe a particular behaviour or characterisation of a person. If it is applied to an animal, it is therefore also considered anthropomorphic.

To be excluded (x):
Observers were instructed to write down only those comments relating to the animals. However, comments that relate to the enclosure but not to the animal's behaviour might have been left in the data table. These should not be counted as non-anthro unless they relate to the animal's behaviour! Those which should be excluded get category X., e.g. "die haben einen Spielplatz".

Uncertain (u):
All the cases in which you do not know what to choose from all of the above! These should be discussed later in a larger group. This category cannot be included for analysis.

## III Table of propensities of anthro*-comments and the average number of comments by species and gender

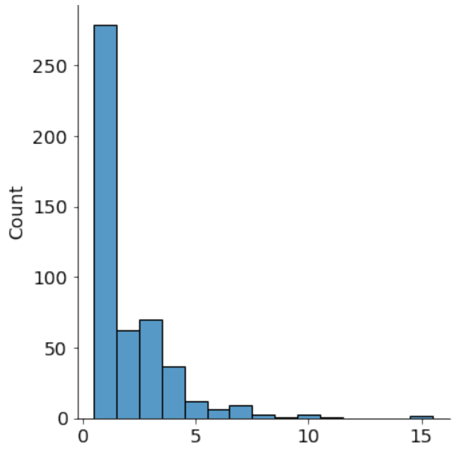



Figure 16: Histogram of comments per individual

Table 11: Overview on the calculated propensity of anthro*-comments in the focal dataset and average number of comments (anthro*- or non-anthro*) of each demographic group [gender (f = female, m = male) and species].

| Species | f – propensity | f – average number of comments | m – propensity | m – average number of comments |
|---|---|---|---|---|
| **Orangutans** | 0.35 | 3 | 0.389 | 3 |
| **Gibbons** | 0.271 | 4 | 0.131 | 3 |
| **Barbary macaques** | 0.103 | 2 | 0.069 | 2 |
| **Squirrel monkeys** | 0.012 | 2 | 0.015 | 2 |
| **Sakis** | 0.088 | 1 | 0.045 | 2 |
| **Red Vari (lemurs)** | 0.162 | 2 | 0.167 | 1 |
| **Prairie dogs** | 0.254 | 3 | 0.271 | 3 |
| **Meerkats** | 0.229 | 2 | 0.228 | 2 |

The values in Table 10 show the propensity of anthro*-comments by men (m) and women (f) for each species and also the average amount of comments left in front of the animal species.

## IV Questionnaire

**Freiwillige Angaben:** Alter: _____ Geschlecht: männlich □ weiblich □ divers □

Größe der Gruppe, mit der Sie heute den Zoo besuchen: ___ Kinder, ___ Erwachsene

Aus welchem Bundesland kommen Sie: Burgenland □ Kärnten □ Niederösterreich □
Oberösterreich □ Salzburg □ Steiermark □ Tirol □ Vorarlberg □ Wien □ Aus dem Ausland□

*Bitte schauen Sie sich die* **> insert species <** *in dem Gehege eine Zeit lang an und beantworten Sie anschließend die folgenden Fragen. Wir sind an* *<u>Ihrer</u>* *Meinung interessiert, deshalb bitten wir Sie, den Fragebogen individuell und nicht als Gruppe auszufüllen. Bitte beantworten Sie die Fragen intuitiv und informieren Sie sich nicht im Internet oder an den Gehegeschildern.*

*Vielen Dank für Ihre Teilnahme!*

1. Wie niedlich ist diese Tierart?

| gar nicht | wenig | mittelmäßig | ziemlich | sehr |
|---|---|---|---|---|
| □ | □ | □ | □ | □ |

2. Wie ansprechend finden Sie diese Tierart optisch? (Wie schön ist diese Tierart?)

| gar nicht | wenig | mittelmäßig | ziemlich | sehr |
|---|---|---|---|---|
| □ | □ | □ | □ | □ |

3. Wie ähnlich sieht diese Tierart dem Menschen?

| gar nicht | wenig | mittelmäßig | ziemlich | sehr |
|---|---|---|---|---|
| □ | □ | □ | □ | □ |

4. Wie ähnlich sind die Gesichtsausdrücke der Tiere zu denen von Menschen?

| gar nicht | wenig | mittelmäßig | ziemlich | sehr |
|---|---|---|---|---|
| □ | □ | □ | □ | □ |

5. Wie ähnlich sind die Bewegungen der Tiere zu denen von Menschen?

| gar nicht | wenig | mittelmäßig | ziemlich | sehr |
|---|---|---|---|---|
| □ | □ | □ | □ | □ |

6. Wie nah würden Sie sagen ist diese Tierart mit dem Menschen genetisch verwandt?

| gar nicht | wenig | mittelmäßig | ziemlich | sehr |
|---|---|---|---|---|
| □ | □ | □ | □ | □ |

7. Haben Sie eher einen positiven oder einen negativen Bezug zu dieser Tierart?
   Positiv □ Negativ □
8. Haben Sie heute Babys/Junge in der Tiergruppe gesehen?
   Ja □ Nein □
9. Haben Sie den Tirolerhof heute besucht oder planen Sie dies noch zu tun?
   Ja □ Nein □
10. Durch welchen Eingang sind Sie in den Tiergarten gekommen?
    Haupteingang Hietzing □ Eingang Neptun □ Eingang Tirolergarten □

# V Information and declaration of consent for participants of questionnaire (german)

TeilnehmerInneninformation und Einwilligungserklärung zur Teilnahme an der Studie: Wie nehmen wir Tiere im Zoo wahr?

Sehr geehrte Teilnehmerin, sehr geehrter Teilnehmer,
wir laden Sie ein, an der oben genannten Studie teilzunehmen.

Ihre Teilnahme an dieser Studie erfolgt freiwillig. Sie können jederzeit, ohne Angabe von Gründen, Ihre Bereitschaft zur Teilnahme ablehnen oder auch im Verlauf der Studie zurückziehen. Die Ablehnung der Teilnahme oder ein vorzeitiges Ausscheiden aus dieser Studie haben keine nachteiligen Folgen für Sie.
Diese Art von Studien ist notwendig, um verlässliche neue wissenschaftliche Forschungsergebnisse zu gewinnen. Unverzichtbare Voraussetzung für die Durchführung von Studien ist jedoch, dass Sie Ihr Einverständnis zur Teilnahme an dieser Studie schriftlich erklären. Bitte lesen Sie den folgenden Text sorgfältig durch und zögern Sie nicht, Fragen zu stellen.
Damit wir besser verstehen können wie Zoobesucher Tiere im Zoo wahrnehmen, haben wir einen Fragebogen mit 8 Fragen für Sie vorbereitet. Ihre Teilnahme dauert etwa 5 Minuten und keine Risiken sind vorgesehen. Ihre Antworten sind völlig anonym. Wir werden die Antworten von so vielen Zoobesucher wie möglich erheben um die durchschnittliche Wahrnehmung von 8 verschiedene Tierarten zu verfassen. Vielleicht sehen wir uns später an einem anderen Tiergehege!

Falls Sie Fragen im Zusammenhang mit der Studie haben, bitte sprechen Sie uns an. Wir beantworten auch gerne Ihre Fragen zur Teilnahme, falls Sie welche haben. Bitte dieses Formular unterschreiben und mit dem ausgefüllten Fragebogen zurückgeben.

Vielen Dank!

Kontaktperson:

| | |
|---|---|
| LeiterIn | Name:xxxxx<br>E-Mail: xxxxx@xxxxxx<br>Tel.: xxxxxxxxxxxxx |

Einwilligungserklärung

Name der teilnehmenden Person in Druckbuchstaben: ........................................................

Ich erkläre mich bereit, an der Studie ***Wie nehmen wir Tiere im Zoo wahr?*** teilzunehmen.

Ich bin von „..........................................“ (Studienleitung) ausführlich und verständlich über Zielsetzung, Bedeutung und Tragweite der Studie und die sich für mich daraus ergebenden Anforderungen aufgeklärt worden. Ich habe darüber hinaus den Text dieser TeilnehmerInneninformation und Einwilligungserklärung gelesen. Aufgetretene Fragen wurden mir von der Studienleitung verständlich und ausreichend beantwortet. Ich hatte genügend Zeit, mich zu entscheiden, ob ich an der Studie teilnehmen möchte. Ich habe zurzeit keine weiteren Fragen mehr.

Ich werde die Hinweise, die für die Durchführung der Studie erforderlich sind, befolgen, behalte mir jedoch das Recht vor, meine freiwillige Mitwirkung jederzeit zu beenden, ohne dass mir daraus Nachteile entstehen.

Ich bin zugleich damit einverstanden, dass meine im Rahmen dieser Studie erhobenen Daten aufgezeichnet und ausgewertet werden.

Ich stimme zu, dass meine Daten dauerhaft in anonymisierter Form elektronisch gespeichert werden. Die Daten werden in einer nur der Projektleitung zugänglichen Form gespeichert, die gemäß aktueller Standards gesichert ist.

Den Aufklärungsteil habe ich gelesen und verstanden. Ich konnte im Aufklärungsgespräch alle mich interessierenden Fragen stellen. Sie wurden vollständig und verständlich beantwortet.

Eine Kopie dieser TeilnehmerInneninformation und Einwilligungserklärung habe ich erhalten. Das Original verbleibt bei der Studienleitung.

(Datum und Unterschrift der Teilnehmerin/des Teilnehmers)

.........................................................................................................

(Datum, Name und Unterschrift der Studienleitung)

............................................................................................................

## VI Zusammenfassung

Anthropomorphismus ist die Zuschreibung menschlicher Eigenschaften, Fähigkeiten oder mentaler Zustände an nicht-menschliche Tiere. Zahlreiche Faktoren beeinflussen wahrscheinlich unsere Neigung, Tiere zu anthropomorphisieren, wie z. B. die Ähnlichkeit und der phylogenetische Verwandtschaftsgrad zum Menschen. Die Fähigkeit, Empathie zu empfinden, könnte sich entweder mitentwickelt haben oder es wird sogar angenommen, dass es die Grundlage des Anthropomorphismus ist (Eddy et al., 1993; Gallup, 1985). Ähnlichkeiten mit dem Menschen, z. B. in Morphologie, Verhalten und Aussehen, führen dazu, dass wir Tieren höhere kognitive Fähigkeiten zuschreiben, was wiederum die empathische Reaktion beeinflusst. Andererseits ist Ähnlichkeit zum Menschen mit einer phylogenetischen Nähe verbunden, ein weiterer Faktor, der den Anthropomorphismus beeinflusst. Daher spielt die Artwahrnehmung, z.B. die wahrgenommene Ähnlichkeit und das allgemeine Erscheinungsbild, möglicherweise eine Schlüsselrolle bei der Einschätzung des phylogenetischen Verwandtschaftsgrads mit Menschen und beeinflusst die Neigung der Menschen zu anthropomorphisieren. Darüber hinaus könnten soziodemografische Faktoren, wie das Geschlecht, der Grund für Unterschiede in der Artenwahrnehmung sein, die auch das geschätzte Maß an Verwandtschaft oder die Neigung zum Anthropomorphisieren beeinflussen könnten. Wir führten verdeckte fokale Beobachtungen von Besuchern des Tiergartens Schönbrunn in Wien vor fünf Arten der „höhere Affen" und drei anderen Säugetierarten durch, um ihre natürliche anthropomorphe Reaktion zu erfassen. Zusätzlich lieferten Fragebogendaten Informationen über die Artwahrnehmung der Besucher. Männer und Frauen unterschieden sich nicht in der Bewertung der Ähnlichkeit, aber es wurde ein Geschlechtsunterschied in Bezug auf die Ästhetik (allgemeines Aussehen) und die Verwandtschaft festgestellt. Außerdem wirkt sich die wahrgenommene Ähnlichkeit einer Art positiv auf die Wahrnehmung der phylogenetischen Verwandtschaft durch männliche und weibliche Besucher aus. Die Kombination beider Datensätze in der Analyse ergab, dass die Zoobesucher aufgrund der Auswirkungen der wahrgenommenen Ähnlichkeit eher dazu neigen, höhere Affen zu anthropomorphisieren. Das allgemeine Erscheinungsbild hatte jedoch keinen Einfluss auf den geschätzten Verwandtschaftsgrad und auch nicht auf die Neigung zur Vermenschlichung. Mit ihrem neuartigen methodischen Ansatz kann diese Studie neue Erkenntnisse in die Anthropomorphismus-Forschung einbringen und einen Beitrag zum Tierschutz leisten.